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Industrial Partnership Prosperity Game™

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INDUSTRIAL PARTNERSHIP PROSPERITY GAME™

SEPTEMBER 3-5, 1997

SHERATON UPTOWN HOTEL
ALBUQUERQUE, NEW MEXICO

SPONSORED BY
TECHNOLOGY PARTNERSHIPS AND COMMERCIALIZATION CENTER
SANDIA NATIONAL LABORATORIES

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ABSTRACT

Prosperity Games™ are an outgrowth and adaptation of move/countermove and seminar War Games. Prosperity Games™ are simulations that explore complex issues in a variety of areas including economics, politics, sociology, environment, education, and research. These issues can be examined from a variety of perspectives ranging from a global, macroeconomic and geopolitical viewpoint down to the details of customer/supplier/market interactions in specific industries. All Prosperity Games™ are unique in that both the game format and the player contributions vary from game to game.

This report documents the Industry Partnership Prosperity Game™ sponsored by the *Technology Partnerships and Commercialization Center* at Sandia National Laboratories. Players came from the Sandia line organizations, the Sandia business development and technology partnerships organizations, the U.S. Department of Energy, academia, and industry.

The primary objectives of this game were to:

- Explore ways to increase industry partnerships to meet long-term Sandia goals.
- Improve Sandia business development and marketing strategies and tactics.
- Improve the process by which Sandia develops long-term strategic alliances.

The game actions and recommendations of these players provided valuable insights as to what Sandia can do to meet these objectives.

ACKNOWLEDGMENTS

A complex event such as a Prosperity Game™ requires the efforts and encouragement of many people. Many of the ideas for this game came from Warren Siemens, Director of the *Technology Partnerships and Commercialization Center* at Sandia National Laboratories. His continued support and interest helped make this game a success. We also acknowledge Sandia Vice President Dan Hartley for his support and participation in the game.

Shanna Narath and her staff, as well as staff and managers in *Technology Partnerships and Commercialization*, were a great help in recruiting players for the game. Olin Bray and Deborah Payne were instrumental in organizing and conducting a tour of Sandia for industry visitors held in conjunction with the game. Gladys Shaw, as always, did a wonderful job in arranging for facilities and equipment and making sure all went smoothly.

Seventy-three players and twenty-eight staff committed themselves to the success of this game, and their efforts are greatly appreciated. Special thanks to those players from industry, labs, academia, and DOE who took time out from their busy schedules to contribute to this effort. Thanks also to the staff who provided outstanding facilitation for the game and analyses of the results.

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EXECUTIVE SUMMARY

Sandia's strategy for participating in partnering agreements with private-sector partners has been evolving since 1991 when we began implementing the National Competitiveness Technology Transfer Act of 1989. To help achieve continued success in our partnering activities during the next few years, the *Technology Partnerships & Commercialization* organization established three important thrust areas: strategic partnerships, licensing and intellectual property, and regional economic development.

The *Technology Partnerships & Commercialization Center* at Sandia National Laboratories sponsored this Industrial Partnership Prosperity Game™ to explore ways to meet its partnership goals of the future. The game was designed to accomplish the following specific objectives:

- Explore ways to increase industry partnerships to meet long-term Sandia goals.
- Improve Sandia business development and marketing strategies and tactics.
- Improve the process by which Sandia develops long-term strategic alliances.

The game incorporated 13 teams. Sandia was represented by four line organization teams aligned with the four 'whats' of the strategic plan, a business development team, and an agreements team. Industry was represented by four teams divided by technology sector. The DOE partnership interests were represented by one team. A Red team representing other federal laboratories and universities was designed to compete with the Sandia teams. The Control team helped run the game and represented all other entities.

At the start of the game, teams were given time to plan their strategies for the coming eight years. The Sandia Line, Industry, and Red teams were each required to define four specific technology goals with four intermediate milestones for each goal. An analysis of these goals and milestones showed that 25 of the 36 goals could be classified in either the *Information Technology* or *Monitoring and Sensors* technology areas. Further, 75% of the Sandia Line team goals fell within these two areas. All teams had goals and formed partnerships in one or both of these areas. This suggests that the two areas are very complementary, and that a focus on them will have major impact across the Labs and industry.

The *Security, Energy and Environment*, and *Materials* technology areas were also well represented by team goals. The *Security* area was strongly coupled with both the *Information Technology* and *Monitoring and Sensors* areas.

One significant policy change was implemented during the game. The depreciation and added factor costs (~25% total) were waived by DOE for a period of time. Both Sandia and industry viewed this change as very positive and beneficial to forming partnerships. However, DOE felt that they had succumbed to pressure and had taken themselves somewhat out of the loop.

Some of the major findings of the game, as expressed by the players in debriefing sessions and written comments are as follows:

- Sandia is organized in terms of its missions and projects. This is appropriate for dealing with its sponsors and government customers, but is very confusing to a potential industry partner. Industry is interested in Sandia's capabilities, technologies, and points-of-contact. Industry feels that the technologies are there, but are difficult to find beneath the mission and project layers. Sandia needs to present an accurate technology-oriented image to potential partners while maintaining the mission focus to its sponsors. We need improved methods for telling industry what Sandia does.
- Sandia needs more internal coordination to bring about more strategic partnerships. The game pointed out instances where there was duplication of strategic goals between Sandia organizations. Internal teaming in these cases makes Sandia a more attractive potential partner.
- Industry urged Sandia to have single points-of-contact that would be there to help them through all phases of the partnering process. Industry also requested that people with the authority to commit resources be brought into the negotiation process early.
- Sandia needs to be more customer focused. In the past, Sandia has often approached industry with a "this is what we're doing, this is what we want to do" attitude. We must become better salespeople by understanding what industry's needs and goals are, and then showing them (in a technology-focused way) how we can help them meet their needs. In addition, some industry players feel that Sandia

makes them learn our rules (for engagement) or we won't play. We need more customer focus.

- The Sandia Business Development team filled the roles of identifying points-of-contact and helping in all phases of the partnering process during the game. In this effort they were assisted by the Agreements team.
- There is some confusion on the split of responsibilities between the business development and agreements people and functions. There is often no coordination on who is responsible for what part of the process. This is confusing to the line organizations, and embarrassing to the business development and agreements people.
- Many players from both Sandia and industry recognized and appreciated the contribution of the Business Development team and suggested that its role be expanded. Time compression in the game did not allow for full communication between the business development representatives and other teams, which was clearly something all players wanted to have.
- A specific suggestion was to have business development staff in the line organizations provide the needed interface between technical staff and industry with coordination at the corporate level. It was also suggested that the business development and agreements functions be merged.
- During the partnership process, there were times that Sandia wasn't quite sure why it was partnering. Was it to do joint R&D, to commercialize a product, to sell intellectual property, or just to get funds-in? The reasons for partnership are not always apparent. Sandians need to do more thinking about this.
- Industry would like to see more coordination between Sandia and DOE, particularly in simplifying and possibly speeding up the process. Sandia also needs to provide industry with a simple way to understand the different types of agreements, how they work, and what is needed to construct them.

The entrance and exit polls conducted as part of the game also reveal many important attitudes toward partnerships:

- All players felt that partnerships were very important to their companies.
- Sandians felt that partnerships were more important to Sandia as a whole (4.3) than to their own line organizations (3.4).
- The Sandia Line 2 team (Energy and Environment) felt that partnerships were of less than average importance (2.6) to their own organization. This view did not change over the course of the game.

- Business development efforts were very important to industry (4.3), but less so to Sandians (3.8). The perception of the importance of business development increased over the course of the game for all groups of players.
- DOE initially felt that forming industry-Sandia partnerships was fairly easy (3.5), while industry and Sandians (2.4) felt it was significantly more difficult.
- By the end of the game, DOE's perception of the ease of partnering had decreased (to 2.8) while that of the other players remained the same.
- Knowledge of the Sandia partnership process increased dramatically for industry players (3.15 to 4.0) due to the game, but only slightly for the Sandia Line players (3.5 to 3.6).

This Prosperity Game™ was among the best of the eighteen games we have conducted as measured by exit poll responses. Notably, this game received the highest response ever in terms of meeting the sponsors' objectives. This correlates well with the number and type of suggestions received (such as those mentioned in this summary) that will help Sandia to reach its partnership goals.

Another reason the game was so successful was that real-life issues arose and were dealt with despite the time compression of the game environment. This in turn led to a good understanding of the roles and relationships (another highest-ever exit poll score) between potential partners. Some of these relationships have been pursued beyond the game environment; at least one company has entered into discussions with Sandia to develop large-scale umbrella agreements for future partnerships as a result of the game.

Individual player satisfaction with the game was also very high:

- "Great concept for both learning and developing relationships. Really helps understanding of the roles of many groups beyond Sandia line organizations."
- "Sandia folks modified their behaviors in response to industry, which was the positive result for me."
- "Pretty realistic for a game. Very good. Lots of lessons learned."
- "Some good relationships developed - maybe some 'real' teaming."
- "The game was a success in that I was able to assess the state of partnering and dealing with SNL as it currently exists and can see the direction it is heading."

Additional follow-on suggestions included the development of new games focusing on regional economic development or partnership training at the center level.

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INTRODUCTION

Sandia's strategy for participating in collaborative research and development agreements with private-sector partners has been evolving since 1991 when we began implementing the National Competitiveness Technology Transfer Act of 1989. Guided by that legislation, Sandia's initial strategy for partnering was to seek cooperative research and development agreements with individual companies. Such alliances targeted major national technology goals by focusing on generic, pre-competitive research that can be broadly useful to an entire industry. Under the new legislation, Sandia's primary goal was to make measurable contributions to the global technology leadership of US industry by transferring Sandia-developed technologies to industry. As Sandia subsequently developed the largest portfolio of partnerships of any federally sponsored institution, our partnering strategy evolved beyond the simple transfer of technology to individual companies. We found that alliances involving industry, universities, and other laboratories were an excellent mechanism for advancing the technology of our mission requirements.¹

Sandia has successfully conducted research in areas supporting national missions for almost 50 years. Having established a successful record in obtaining dual benefits, Sandia will move increasingly to partner, where appropriate, in these areas rather than do the work alone. To help us achieve continued success in our partnering activities during the next few years, the *Technology Partnerships & Commercialization* organization has established three important thrust areas: strategic partnerships, licensing and intellectual property, and regional economic development.¹

The strategic partnerships thrust emphasizes long-term collaborations with industry, universities, state and local agencies, and foreign entities. Strategic partnerships are intended to support Sandia's traditional mission requirements by:¹

- leveraging government funding in critical areas,
- sustaining and strengthening Sandia's scientific and technical excellence,
- accelerating technology development and deployment, and

- fostering closer relationships with industries critical to our primary missions.

The *Technology Partnerships & Commercialization Center* at Sandia National Laboratories has sponsored this Industrial Partnership Prosperity Game™ to explore ways to meet its partnership goals of the future.

As Sandia approaches the 21st Century, several conditions prevail that suggest the need for continued change. Federal funding for research has dropped more than 3% in real terms in the last three years. The forecast in the President's proposed budget is an additional 14% decline in R&D over the next five years. With the reduction of the threat of nuclear war, national priorities are changing, and the labs' role in these is not clear. Some are calling for downsizing the federal laboratories, both in terms of their number and size. Furthermore, some in industry view federal laboratories as difficult to partner with. This Prosperity Game™ was designed to explore the role of industry-Sandia partnerships in the face of these and similar challenges.

Prosperity Games™ are an invaluable learning experience that can create exciting alternative futures as well as explore the current real world through planning, interaction and negotiation. One purpose of this game was to provide participants from Sandia, industry and DOE with a chance to understand different facets of partnerships and explore how they can be used and improved to produce win-win results.

The Industrial Partnership Prosperity Game™ was designed to accomplish the following specific objectives:

SPECIFIC OBJECTIVES:

- Explore ways to increase industry partnerships to meet long-term Sandia goals.
- Improve Sandia business development and marketing strategies and tactics.
- Improve the process by which Sandia develops long-term strategic alliances.

This report describes the Industrial Partnership Prosperity Game™ that was held in Albuquerque, NM on September 3-5, 1997, and how its objectives were met. Specific results, findings, and suggested follow-on activities are also documented here.

1. Sandia National Laboratories Institutional Plan, Section 4.3, Future Thrusts. <http://www.sandia.gov/ip/ch400001.htm>

GAME CONCEPT AND DESCRIPTION

PROSPERITY GAMES™

Prosperity Games™ were adapted from strategic war games to simulate current realities and possible alternative futures as influenced by executive-level decisions. Prosperity Games™ are about leadership and strategy development. They provide a high-level interactive simulation that models the complex world of values, propositions, and persuasion. They are not people playing against a computer.

The environment engendered in every Prosperity Game™ serves to meet a set of general objectives simply by participation in the simulation process itself.

These objectives include:

GENERAL OBJECTIVES:

- Develop partnerships, teamwork, and a spirit of cooperation among industry, government, university, and public stakeholders.
- Increase awareness of the needs, desires and motivations of the different stakeholders.
- Bring conflict into the open and manage it productively.
- Explore long-term strategies and policies.
- Provide input for possible future legislation.
- Stimulate thinking.
- Provide a major learning experience.

The players involved in a Prosperity Games™ simulation represent a wide range of different interests and often have different views on key issues. Each participant is responsible for representing his or her team's "real life" constituency. The format of the Prosperity Games™ allows the viewpoints of the different teams' constituencies to be understood in small groups and synthesized into a working consensus – one which all parties can support, even if it is not the optimum for a particular interest group.

Prosperity Game™ play takes place in an open environment that features the processes of planning and negotiation. A game typically compresses five to ten years of real time into two days of play. Players control the content of the games and generate their own strategies and goals or objectives, which are one of the major outputs of the game. High-level players create new insights and options that often develop into post-game opportunities. Teams are designed to provide sufficient knowledge

and judgment necessary to make decisions as well as to contain the diversity needed to create stimulating and engaging interactions.

Prosperity Games™ are viscerally engaging. This serves to generate enthusiasm and commitment, and to bring conflict into the open in a safe environment where it can be managed productively. The Prosperity Game™ simulation explores empathic and learning experiences, collaborative and competitive interactions, experimentation, decision making, and innovation. Players who fully engage in the process of creating a constructed reality and in testing each other's ideas benefit the most. The games are so interactive, fast paced, and complex that the few players who try to "game the game" are usually unsuccessful and disappointed.

A final debriefing allows the teams to share their experiences. The game experiences of the players are then collected, discussed, prioritized, and documented in a final report. This experiential process develops the relationships and provides the inputs and innovative thinking that will be used for follow-on activities and planning.

PARTNERSHIP GAME CONCEPT

To meet the specific objectives of the Industrial Partnership Prosperity Game™, stakeholders were categorized into four groups:

STAKEHOLDER GROUPS:

- Sandia Line
- Agreements/Administration
- Industry
- Rest of the World

The central theme of the game was the relationship among all the stakeholders in the competition for scarce public and private resources and how they could be used to create the most progress. The labs are concerned about maintaining core capabilities to meet their government-mandated missions. Industry is concerned about the allocation of resources to fund ongoing company operations versus future investments. All stakeholders would like to have metrics to evaluate the success or failure of previous decisions and to help guide future decisions.

In order for this simulation to adequately represent the wide range of different interests and to stimulate interaction, the five stakeholder groups were further subdivided into 13 teams. Team designations within these groups are illustrated in Figure 1 and are discussed below.

Organization and role assignments within the teams to accomplish the tasks "at hand" were the responsibility of the players assigned to each team (e.g., leaders, negotiators, decision-makers, "home-basers," recorders, advocates, etc.). Each team was assigned a process manager (game staff) to facilitate team interactions, provide process guidance, capture information, and flag upcoming deadlines.

The Sandia and DOE interests were allocated among seven teams. Four of the seven teams were aligned with the four 'whats' of Sandia's strategic plan. Two Sandia teams represent the business development, marketing, intellectual property, licensing, agreements and related functions. The DOE team represents the DOE interests and requirements in the partnership process.

SANDIA LINE TEAMS:

- Sandia Line 1 (nuclear weapons, stockpile stewardship, deterrence)
- Sandia Line 2 (nonproliferation, other weapons, threat reduction, other nuclear incidents)
- Sandia Line 3 (energy, environment, critical infrastructure surety)

- Sandia Line 4 (emerging national security threats, terrorism, military, space, etc.)
- Sandia Business Development (including marketing)

AGREEMENTS/ADMINISTRATION TEAMS:

- Sandia Agreements (licensing, intellectual property, patents, contracts, etc.)
- DOE Administration

These seven teams were to work together to produce partnerships and agreements from the Sandia side.

Industry was represented by four teams.

INDUSTRY TEAMS:

- Information Technology and Computing
- Energy, Environment, and Transportation
- Advanced Manufacturing and Materials
- National Security and Criminal Justice

Each industry team represented a defined group of companies and were given R&D resources to help them reach their goals. Industry teams were allowed to partner with each other, the Sandia teams, or a Competitor team. More information is given in the section on team-specific information in Appendix E.

The REST OF THE WORLD was represented by two teams:

- Competitor team
- Control team

The Competitor Team represented competitors (or in some cases, potential partners) to Sandia for industrial partnerships. These competitors include other federal laboratories and universities. Although these entities can in many cases be partners themselves, this game focused on industrial partnerships. The primary role for the competitor team was thus to compete with Sandia, and provide incentives for the Sandia teams to improve their partnership processes and relationships.

Finally, the Control Team was primarily responsible for conducting the game, including polling, game play support simulations, agreement evaluations, publications, etc. It was also responsible for resolving all disputes, and for playing all other roles and functions not otherwise assigned that arose during the game (e.g., Congress).

Team players were expected to remain faithful to their assigned roles by protecting the interests of their constituents. Pre-game information in the form of team descriptions and challenges (see Appendix E), coupled with the experience and expertise of the players, were the information base for the real-world simulation of the

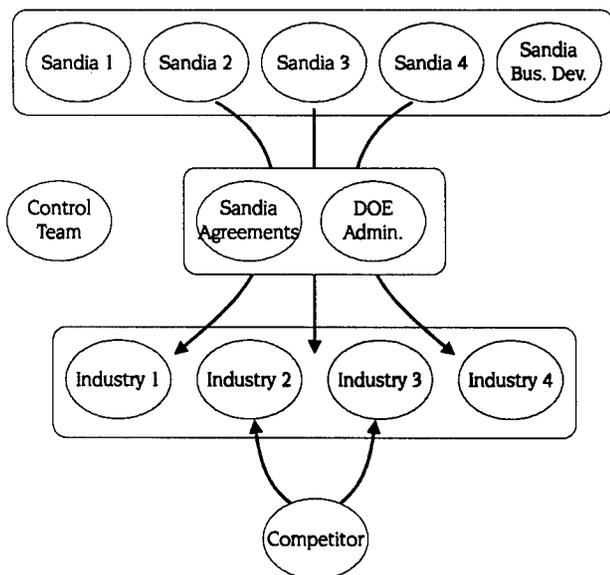


Figure 1. Industrial Partnership Prosperity Game™ teams.

game. Teams were encouraged to draw upon their own resources (players) and others to accomplish their goals.

PLAYERS:

Players were recruited based on their real-life roles, and assigned to the appropriate stakeholder teams. The game environment requires highly skilled players with a strong knowledge of their business assets and needs, and the confidence to make decisions, observe their consequences, and alter their decisions accordingly. The players must also be self-starters who are highly motivated to work toward perceived goals. Their creativity and commitment to the simulation determine the success of the game. A list of the players on each team is given in the team report section of Appendix A.

GAME PLAY:

Pre-game – Players were instructed to come to the Prosperity Game™ having read the handbook completely, and having a working knowledge of the issues confronting his or her team. This allows each team to use the game time in the most effective way, and allows each player to be an effective contributor to the team.

Planning – Every Prosperity Game™ is unique because the outcomes depend upon the players. In Prosperity Games™, the players own the final content of the game. Thus, the most critical element in any game is for each team to clearly decide upon a course of action and document it in a plan.

Pre-game information available to each team is given in Appendix E. After a review of this information and any other player experience or knowledge that was relevant, the players were to develop team strategies that would best meet the interests of their stakeholder groups.

Basic moves – The game had few rules. Team members were to play their roles by planning (identifying specific goals and milestones), and pursuing actions to meet those goals, whether by themselves or in partnership with other teams. New policies and processes could also be proposed and put into action as they would be in real life. The final rule was "If you don't know if it's allowed, either try it or ask." The game was very flexible.

Game play utilized an 'agreement' as the one basic 'move' which players used as a means to pursue their goals and milestones. In the context of the game, most long-duration events (such as building new facilities)

were assumed to have already been accomplished in the event of a successful move.

Agreements – The 'agreement' was a completed contract which represents investment decisions and inter-team agreements. The agreement move replicates real-life activities, including negotiations, consensus building, resource allocation, and contracting, between stakeholders, and was recorded on a standard game agreement form.

Agreements were required to describe the value-for-value exchange, include any assigned resources, and be approved and signed by each negotiating party. Agreements made by industry with the Sandia teams were required to have *Sandia Agreements Team* and *DOE Administration Team* approval as needed. Agreements made by the *Competitor Team* operating as a federal laboratory were to also go through the *Agreements* and *DOE Teams* to simulate real-life processes. All agreements were also required to be submitted to the Control Team for final acceptance and approval. The Control Team had the latitude to make changes to any agreement based on an overall game perspective. Pricing (in terms of chits) of the agreement was also done by the Control Team. Process and policy changes were also allowed to be made by those who would have similar authority in real life, subject to the approval of the Control Team.

The most important test for any move (action, agreement, contract, partnership) was its reasonableness evaluated from the perspective of the real world. This test does not discriminate against creative or innovative thinking, but was intended to discriminate against fantasy. Open negotiation sessions should produce agreements that are based on quality, valid negotiations, and partnering or strategic alliances.

The concept of resource scarcity was modeled by introducing chits (a substitute for money) into each session. Teams received chits to be used in pursuing their strategies and objectives. Since chits were relatively scarce, it was to a team's advantage to partner. Teams reluctant to pursue alliances or partnering to create agreements might have found themselves isolated and ineffective in making any progress toward their strategic objectives.

Electronic communication – Laptop computers linked together to form a game intra-net were available at each team table. This intra-net had both E-mail and web features. This system had several purposes in the game:

- planning summaries and agreements were to be sent to the Control Team by E-mail,

- teams could communicate with each other by E-mail as well as in person,
- information sent to the Control Team was posted on a 'Game Web' which could be accessed by any of the computers on the network, and
- players were asked to respond to entry and exit polling questions on the 'Game Web.'

Proprietary data – The purpose of this game was to explore and refine the partnership process. Therefore, any data that would not be shared in the initial talks between companies in real life was not to be shared in this setting.

Commitments in the game context – All commitments, written or verbal, made while the game was in progress (including evenings away from active game play) were to be considered by all players to be "game moves," and not binding outside the game. However, players were encouraged to pursue real partnerships after the game that are based on relationships formed during the game.

Winning the game – The game was "won" by successfully meeting the strategies, goals and milestones embraced by one's team. Another form of "winning" was in the experience and relationships that one forms and carries away from the game. Circumventing or "gaming the game" was not winning, desirable, or of benefit to the other players.

PARTNERSHIP GAME SCHEDULE

This Prosperity Game™ included an orientation followed by seven sessions of play. A tabular summary of play and detailed schedule are included in Appendix E. The play simulated the time period from the present (Sept. 1997) to the end of 2005. On the basis of play times, this represents a compression ratio in excess of 1250:1 (2 game minutes ~ 1 business week). This naturally means that many details of real-life were treated very approximately.

SESSION 1: PLANNING AND STRATEGY

In this session, teams focused on strategic planning and organizing themselves to best deal with the coming events. Teams were to decide on ground rules for making decisions, individual roles and responsibilities, initiating processes for accountability and correcting errors, and planning to meet deadlines and deliverables. Outstanding questions about the game were to be resolved at this time. Teams were to review their current states

and decide where they would like to be in the year 2005. Teams were then to identify specific goals and milestones for meeting those goals. The industry, Sandia Line, and Competitor teams were to use the specific template shown in Table 1, while the remaining teams were allowed to set goals and milestones in a less structured manner. Additional, team-specific information on the planning session is given in Appendix E.

Table 1: Example matrix of goals and milestones.

Milestone 1 (2 yr)	Milestone 2 (4 yr)	Milestone 3 (6 yr)	Milestone 4 (8 yr)	GOAL (2005)

Midway through this planning session, the teams were gathered together to present their initial plans in a plenary session. These presentations were limited to three minutes each, and were intended to spread early planning information very quickly. After the briefing, teams returned to their tables to finish planning, modifying their plans based on what they learned from other teams if applicable. Team challenges, goals and milestones were submitted electronically to the Control Team at the close of this session.

SESSION 2: OPEN NEGOTIATION

At the beginning of this session, teams received a distribution of resources (chits). These resources were intended to 'pay' for the work done in the game, but could be used in any way a team chose. Teams were to use the time in this session to pursue actions, build partnerships or implement process or policy changes to meet their goals and objectives. Teams were encouraged to be continually engaged in intelligence gathering, as keeping abreast of the information in the game would provide them with more options in meeting their goals.

Teams were also encouraged to update their plans (goals and objectives) as information became available. Although a team's high-level objectives were to remain fixed, the strategies used to reach those objectives could change with changing information. A robust plan will allow for this kind of flexibility.

All "moves" were to be documented on a game agreement form. Any costs involved in paying for these moves were to be done with chits. The real-life signoff process

for any agreement was to be followed. For example, a CRADA was to undergo the necessary legal and intellectual property reviews, among other things. Some agreements require DOE approvals or waivers. These parts of the process were to be represented in the game agreements. Any changes in these processes were to be implemented into the game and followed from that time forward.

Following this session, the *Sandia Business Development Team* presented their key observations of the game play up until that time.

SESSION 3: OPEN NEGOTIATION

Teams received additional resources to continue their partnering efforts. Teams were to continue to pursue their strategies through partnering, and policy and procedure changes. Following this session, the *Sandia Agreements Team* presented their key observations of the game play up until that time.

SESSION 4: TEAM DEBRIEFING

A debriefing meeting was held to start the final day's play. For this session each team met and answered several questions based on the previous days' play. Each team (with the exception of the *Sandia Business Development* and *Agreements Teams* that already had their turn) then presented its answers to the group.

SESSION 5: OPEN NEGOTIATION

In past games, the debriefing session has often served as a transition point. After a full day of planning and negotiation, the debriefing gives all players additional perspective on parts of game play of which they were previously unaware. This often stimulates a flood of new ideas and enthusiasm.

Active play resumed with the allocation of additional resources. Each team was to briefly review its planning document for possible revision based on previous play and the results of the debriefing. Play was to continue as in sessions 2 and 3 though the use of partnerships and other positive changes that build on earlier successes.

Following this session, the *DOE Administration Team* presented their key observations of the game play up until that time.

SESSION 6: OPEN NEGOTIATION

Teams received additional resources to continue their partnering efforts. Teams were to continue to pursue their strategies through partnering and policy and procedure changes.

SESSION 7: FINAL DEBRIEFING

The final game session was a debriefing in which facilitators collected the observations of their teams, and delivered the results to the Control Team. The debriefing addressed: (1) how well the team met its specific goals and milestones; (2) what impact the team had on the Sandia partnership process; (3) speculation on the future state of the labs, industry, and DOE based on overall game play; (4) suggested process improvements for real-life implementation; and (5) discussion of potential follow-on activities. The session concluded with a town meeting during which any player could respond to questions posed by the Control Team and others.

RESULTS AND OBSERVATIONS

TECHNOLOGY AREAS

The Sandia Line, Industry, and Competitor teams were each asked to identify a set of four technology goals as part of their team planning process. It was not necessary that these goals cover the entire mission space for the team, but rather that they each be goals that could be pursued in the game context. Teams were also instructed to identify four intermediate milestones for each goal. These milestones were to be technologies that were on the critical path to achieving the goal.

Each of these nine teams identified their goals and milestones during the planning session. The initial versions of milestones were more specific for some teams than for others. However, by the middle of the game, all teams had updated or modified their milestones such that they had become very specific.

The goals and milestones identified during the game have been analyzed to show some of the technology areas in which the players felt that Industry-Sandia partnerships were viable and desirable. This type of analysis is pertinent in that the Sandia Line teams were aligned with the four 'whats' of Sandia's strategic plan. Thus, the goals set by these teams, along with any partnerships entered into, give an indication of the core technology areas that contribute to the Lab's missions in the strategic plan areas.

All of the goals from each of the nine teams are shown in Table 2. Many of the goals have been rewritten for this presentation of the data to shorten their titles and highlight the key technology areas. In addition, one or two colored symbols are shown with each goal. These symbols designate the technology areas that fit with each goal and its associated milestones. Technology areas were attached to goals not only by analyzing the goals, but also each of the milestones associated with those goals.

The legend at the bottom of Table 2 shows the eight technology areas along with the number of teams and total number of goals aligned with each technology area. A detailed look at Table 2 leads to many interesting observations.

- *Information Technology* and *Monitoring / Sensors* were the two most prevalent technology areas, both in number of teams and in number of goals. The number of

goals represented for each of these areas was more than twice that of any other technology area.

- *Information Technology* and *Monitoring / Sensors* cover 25 of the 36 goals, and all nine teams. Further, they cover 12 of the 16 Sandia Line goals. This suggests that the two areas are very complementary, and that a focus on them will have major impact across the Labs and industry.
- The *Security, Energy / Environment* and *Materials* areas were also well represented with three teams and six goals each.
- *Health Care, Manufacturing* and *Computing* were represented by two teams and two or three goals each.
- *Health care* was always coupled with *Information Technologies*, suggesting that it might more properly be labeled an application than a technology area.
- *Security* and *Monitoring / Sensors* showed a high degree of correlation, particularly on the I4 (National Security & Criminal Justice) team.
- *Materials* and *Manufacturing* were strongly associated, with the majority of the occurrences on just two teams, S1 (Nuclear Weapons) and I3 (Advanced Manufacturing & Materials).
- *Information Technology* and *Security* were coupled twice, once for S3-Goal 1, and once for Red-Goal 4. These two goals are very similar.
- The S1 (Nuclear Weapons) team had goals in five different technology areas: *Information Technology, Monitoring / Sensors, Materials, Manufacturing, and Computing*. This suggests that a wide variety of core competencies are required to maintain a robust weapons and stockpile stewardship program. The S1 team partnered with industry in ALL of these areas during the game, highlighting the role that industry partnerships can play in the weapons programs.
- The S2 (Nonproliferation) team was centered almost entirely in *Monitoring / Sensors*, suggesting that without improved sensors and other intelligence gathering (monitoring), nonproliferation activities will be extremely difficult.
- The S3 (Energy, Environment & Critical Infrastructures) team split their goals among *Energy / Environment, Information Technologies* and *Security*. These areas are what would be expected given the team name.
- The S4 (Emerging Threats) team focused their goals in the *Monitoring / Sensors* and *Information Technology* areas. This suggests that they see these technologies

Table 2: Technology-oriented team goals classified by technology area.

	Goal 1	Goal 2	Goal 3	Goal 4
S1	● Product realization at reduced time, cost, parts and defects *	○ High volume, high yield, reliable integrated microsystem capability	○ Implement new MSBLCE (Model/Simulation-Based Life-Cycle Engineering)	● Monitoring capability to ensure stockpile surety and reliability
S2	● Arrangement to monitor nuclear weapons, materials, expertise in Russia	● Reduce threat of use of chemical and biological weapons	● Nonproliferation systems using sensors and information systems	● Application of monitoring outreach in countries of concern (e.g., China)
S3	● Ensure reliability and security of 'bit-moving' industry	● Increase robustness of electric power distribution industry	● Develop system to improve road transportation efficiency by 10%	● Develop plant process to optimize use of feeds and energy with zero waste
S4	● SYM-PRO: harvest real-time sensor information on proliferation threats	● SYM-INFO: surety and security for federal agency intranet	● SYM-MIL: replace humans in scouting, low-intensity, etc. operations	● SYM-TER: rapid, portable, inexpensive detection of terrorism agents
I1	● Commercialize secure IT architecture and establish as standard	● Develop diagnostics for the medical market	● Develop remote doctor-patient interface	● Small business spin-off to leverage core technologies in other industries
I2	● Develop on-line sensors for petroleum refining	● Reduce auto emissions by 90% ○	● Reduce aircraft (incl. engine) maintenance cost and time by 50% ○	● Reduce time/cost of hazardous material clean-up
I3	○ Dominate the world in optoelectronic devices and systems *	* Develop prototype-less and rapid manufacturing	○ Develop intelligent engineering materials ●	○ Control and optimize corrosion through advanced materials
I4	● Develop and deploy a globally secure financial system	● Protect energy supply, production and distribution systems	● Non-intrusively deter and contain threats to security of transportation systems	● Protect telecom system and data transmission for command and control
RED	● Patient information diagnostic network	○ Modeling, simulation, and validation	● Virtual education to match students with needs	● Information security (incl. encryption, financial)
	LEGEND: Technology Area #teams/#goals ● Information Technology 7 / 13 ○ Materials 3 / 6 ● Monitoring / Sensors 6 / 14 ○ Health Care 2 / 3 ● Security 3 / 6 * Manufacturing 2 / 3 ● Energy or Environment 3 / 6 ○ Computing 2 / 2			

as the most promising means of mitigating emerging national security threats, including terrorism.

- The Industry teams all had goals in technology areas consistent with their assigned team scope. The degree to which the Energy and Environmental industries (I2 team) rely on *Sensors* and *Materials* is highlighted by their choice of goals.

- The Competitor (Red) team chose early in the game to focus on information sciences and technology. This was reflected in their goals which centered on the *Information Technology* area and the related areas of *Health Care* and *Computing*.

The first specific objective of this Prosperity Game™ was to explore ways to increase industry partnerships to meet Sandia goals. The Sandia mission-related technology areas of *Information Technology* and *Monitoring / Sensors* have broad-based use and applicability both within Sandia and in Industry. A focus on forming strategic partnerships in this area could position Sandia very well for future interactions with industry, as well as meet mission needs.

POLICY CHANGES AND IMPACTS

Late in the planning session, a landmark agreement was reached between the Competitor team and DOE. The Red Team had just created NAISTE, the National Alliance for Information Sciences, Technology and Education, a virtual system of DOE Labs (LLNL, LANL, LBL, ORNL) and universities (MIT, UCSD, Illinois, UNM). The agreement (Move #1 in Appendix C) created an umbrella CRADA under which DOE would give advanced approval, and waive the Depreciation and Added Factor (11.5% and 12.4%, respectively at the time of the game). The terms and conditions would be agreed to up front; only the statement of work and funds would change for each partnership. This agreement was intended to give the Red team an advantage over the Sandia teams in attracting industry partners. The Sandia teams soon found out about this development and demanded equal treatment from DOE, which was granted.

Game participants responded to this policy change in the following way:

Industry: "We found the waiving of the overhead and depreciation greatly enhanced the process of partnering, both in cost and in time."

Agreements Team: "The first is we have a waiver of depreciation and overhead for one year from the DOE for all CRADAs for all reasons. We thought that that was really spectacular ... But this represents a significant cost of doing business. As you all know, you have to be able to give your partner a firm cost. And this really helps in that way."

Red Team: "We immediately got the DOE umbrella in the waiver of depreciation and overhead, which made a big difference and gave us a brief window of opportunity."

DOE felt differently. They felt like they had given in to the pressure. They also saw a decrease in traffic as a result of the policy change, and viewed that as evidence that depreciation and overhead were not encumbrances.

DOE also felt that the labs started playing a little fast and loose as a result of the change, and that the deals being done were substandard (in terms of checking for things like multinationals and US preference).

Later in the game, DOE rescinded the automatic waiver of depreciation and added factor, but set up a new program in which they would contribute funding to agreements that would benefit their supplier base. This money was used by several teams in their agreements. DOE also retained the right to grant a waiver of depreciation and overhead on a case-by-case basis.

TEAM DEBRIEFINGS

This section highlights comments from the team debriefings that focus on the game objectives, either in terms of how things are, or on how they can be improved. Full transcripts of the debriefings are given in Appendix D.

SANDIA BUSINESS DEVELOPMENT (SBD)

This team knew coming in to the game that they had to demonstrate value to the line and to industry. They spread out to determine others' needs before offering assistance. They felt some frustration in that they needed to plan as a team, yet many of the other teams wanted the SBD players to stay with them. There was good overall acceptance of the SBD team.

Sandia talks and is organized in terms of strategic objectives, but that's not how industry thinks. They want capabilities, technologies, who's in charge, and points of contact. So, in the game, SBD identified points of contact within the Sandia Line teams.

When Sandia has approached industry, it has been "Hi, this is what we're doing, this is what we want to do." Sandia has not made a good attempt to show that they understand what industry's needs and goals are, and how they can help them meet their needs. Sandia needs to do a better job of that.

During the partnership process, there were times that Sandia wasn't quite sure why it was partnering. Was it to do joint R&D, to commercialize a product, to sell intellectual property, or just to get funds-in. The reasons for partnership are not always apparent. Sandians need to do more thinking about this.

There is some confusion on the split of responsibilities between the business development and agreements

people and functions. There is often no coordination on who is responsible for what part of the process. This is confusing to the line organizations, and embarrassing to the business development and agreements people.

There is a problem with multiple Sandia people talking to the same industry (game and real life).

Industry groups have a good focus on their needs and goals. They have a general acceptance that partnering requires give and take.

Sandia is trying to partner.

SANDIA AGREEMENTS (AG)

The DOE waiver of Depreciation & Added Factor was tremendous. It is a significant cost of doing business, and the waiver allows Sandia to bid a firm cost.

The dynamic nature of the agreement (partnership) process works well when all parties are in one room. We can facilitate, answer questions, and nudge the process. When I asked one game participant "Can we do in 2-3 hours [next week in real life] what we did here in 15 minutes?" he said "Yes!"

The pace of activity in the game was very much like what the agreements people live with day in and day out.

Deals are really done between the line and industry. *Technology Partnerships & Commercialization* facilitates many things, business development is part of that role, but the partnership is really between line and industry.

The implications of intellectual property disposition are increasingly important in the game. They have been discussed in a more forthright and intense manner than in real life.

Sandia needs coordination. There are no perfect ways to be matched (organizationally) with industry.

Sandia needs to distinguish between projects and technology. One example might be an E/E project, but the real underlying technology that industry would have interest in is sensors and software.

DOE TEAM

Deals in the game have been too perfect. In the real world issues arise - issues such as multi-national corporations and US preference, and licensing details.

The Labs have played fast and loose with the rules of interpretation, taking the most liberal interpretation possible.

There was pressure in the game on DOE and AG to speed the process up. The quality of the process and the partnership is reduced by that.

A question for the group: "Who determines the quality of the deal?" No answer was given. However, DOE determines if the deal serves DOE's interest, and therefore lab participation is relevant.

Sandia presents itself in a mission-oriented light to industry. It's poor salesmanship. Industry doesn't care about Sandia missions. This results in a need to negotiate a harmonization of goals, which shouldn't have to take place [if the salesmanship were right].

Industry wants to harvest technology, but not necessarily to partner. Industry needs to recognize that even if goals and objectives with a lab partner are dissimilar, good technical work that supports their products shouldn't be abandoned.

SANDIA LINE 4

There is some internal duplication of strategic goals. Sandia needs to improve internal coordination.

The Sandia lines are getting better help from SBD than in real life. Maybe it's an artifact of the game. Also, the game time constraints made it so that the lines didn't have time to train SBD in what they do to allow them to communicate effectively with industry.

Sandia Line 4 felt successful in that industry asked them to team.

INDUSTRY 4

Some successes in the partnering area were the good cooperation with DOE and the agreements people. It was also great to work directly with the Sandia line.

Since the Sandia line was turned on to deal-making, we were inundated with Sandia people, many from the same areas. It was still not clear who we needed to talk to, and what expertise exists. The role of SBD is becoming clearer over time.

The industry focus on how to make money quickly, and lab focus on great science and engineering, don't jive.

Industry 4 suggests a greater empowerment for decision-making at lower levels at Sandia. Thus, lower levels need more education on legalities and ramifications and need to know who the information resources are.

Industry needs better communication on how to work with Sandia for medium-sized companies. Large companies have legal staff for negotiations, small companies get free assistance, medium-sized companies are on their own.

Sandia needs improved methods for telling industry what it does. There is still confusion on what expertise is available there.

Sandians developed a better perspective on the importance of time to making money by industry.

The conflict-of-interest perception with regard to Lockheed Martin is a barrier.

SANDIA LINE 3

"If Sandia would team with Sandia, we'd be a lot better at approaching industry."

Sandia will have more effective conversations with industry if multiple Sandia organizations are involved.

Many Sandia lines were knocking on the same industry doors at the same time for the same appointment.

The major cultural barriers within Sandia were not represented in the game. There was no creativity in the formation of new types of agreements.

SBD was very helpful in bringing business, especially later in the game when they had more information on industry needs.

Having AG and SBD people there for most of the partnering process was useful and helpful.

Time hindered our ability to improve business development strategies. There was no time for feedback to SBD to help them globally improve their strategies. [Ed. - However, the fact that these processes were recognized to be crucial is an important outcome for these players.]

The game showed weakness in the E/E sector three to five year goals.

In the game, there was pressure to partner, so Sandia Line 3 wasn't sure if the partnerships were strategic. [Ed. - A lesson from this is that it is important to assess the strategic nature of a partnership before entering into it.]

INDUSTRY 3

Sandia is focused on programs. It's hard for industry to find where to mesh in the programs.

SBD was helpful in finding where the Sandia technologies were.

The DOE waiver of depreciation and added factor greatly enhanced the process of partnering in terms of cost and time.

SANDIA LINE 2

They tried to find good matches early on. SBD and AG were helpful in doing that.

Sandia Line 2 felt that the game is a validation of what SBD is doing - they used them early to find suitable partners.

A preliminary letter of intent worked well for this team in establishing communications with industry teams.

"Sandia doesn't know what Sandia does." Those in outreach work should be trained to know what goes on here.

INDUSTRY 1

As industry, this team wasn't here to meet Sandia goals. They were here to meet industry goals.

Industry 1 urged Sandia teams to have a more user-friendly or simplified process and had some success. They found it useful to have DOE involved early in the negotiation process.

They wanted to negotiate with decision makers. It's hard to find the people with the authority to say "YES." Bring those people who can commit into the decision process early.

SBD brought Sandia line POC's to industry. SBD and AG were proactive.

Industry suggests that Sandia emulate world-class consulting firms, using a single POC, a person that takes you through the entire process.

Initially it was, "Hi, we're from Sandia, here's our bag of goodies. We really need to partner because our money runs out at the end of the session." As the game progressed, Sandia began to ask what industry needed.

It was up to industry to learn what Sandia's rules were in order to partner - "Our way or the highway" approach.

INDUSTRY 2

Game objective number one (increase partnerships) is being met in that representative problems are surfacing in the game. For instance, the issue of Sandia's focus on programs versus industry's focus on technology.

There needs to be more follow-up to meet game objectives 2 and 3.

Comment from I3 player: Sandia is still so involved with weapons that it's hard to cut through to technologies. It's a packaging issue. Industry feels that the technologies are there, they are just hard to find.

SANDIA LINE 1

To meet objective three (improve long-term strategic alliance process), SBD should be co-located with the line organizations.

One-stop shopping, an SBD POC, would be good to shepherd the process.

COMPETITOR

This team formed NAISTE (National Alliance for Information Sciences, Technology and Education), which consisted of 4 national labs and 4 universities, and made it work.

They gathered data on industry needs to help in setting our goals.

QUOTES

From a high-ranking industry executive:

"I'd like to make a comment to put things in perspective as far as the whole journey into one of those partnerships. And that is that all these trials and tribulations that we're going [through] here, and other concerns, are really the beginning of a relationship.

"Once a relationship is in place, what's most important is the quality of work being done under the agreement. And, really, to get a win-win situation you have to have from both sides, from industry and the government lab, the staff people that would like to work on whatever the project is, and committed to make it a success, not to just make it as an assignment.

"Because, really, industry does not come to Sandia to contract work. We have problems that are at the forefront of technology, and we want to work together to

push the frontiers of [the] unknown and share that thing. And that is the most important thing in making a project successful, after we finish all this bureaucratic exercise, is to make sure that both sides are ready to commit themselves to get the job done. If that happens, all this is worth it, I mean all the bureaucracy and the paperwork, and who pays what, and satisfying DOE in this. If you do not have the right people that really want to work on the project, it's not worth it."

TOWN HALL

Sandia player: If we had had a Science & Technology Council team, the line teams would have been out of the loop in a lot of the deals. I think it's true of real life as well. If we're going to partner, we're going to have to find a way to show value of our missions to industry. Although we talk about missions, most of the partnerships were on technology.

Industry player: I was impressed by the SBD team coming and saying "This is what we have to offer." If someone would do this in real life - "IN PERSON" as opposed to some general announcement or web page, you might get a different response from industry. Use a sales-force-like mentality.

DOE player: As partnerships occur, an understanding of Sandia missions increases and permeates the partnership. Then it can snowball - industry learns how to see through the missions to the technology.

Industry player: Sandia teams seemed to be overlapping, competing with each other. The game didn't need a red team. Sandia had it's own internal competition. You need more of a corporate persona. Your people need to represent the corporation. Industry doesn't care who they work with at Sandia, as long as it's someone who can help solve their problem.

Industry player: I hope the insights from this game will go to the staff level at Sandia.

Dan Hartley: "One of the messages going back will be delivered Monday. Monday we have our Senior Management Council meeting, and I'm going to be reporting to them, to my peers and bosses, the other Vice Presidents, about what happened here. I'm probably one of the biggest benefactors of the results of this whole exercise. We've been growing a small and energetic business development team in my organization. But it is small, it's new, the whole idea is new to Sandia. We're a culture of 70 independent businesses at Sandia. If you look at

each center, each director, largely our culture has been one of each of them owning a certain area of responsibility, or business, or product, or capability, and protecting it, naturally. We're trying to go to a higher order way of thinking. That first construct is mission oriented, which tends to blind you, now, to the technologies. So we're trying to work, in our new construct, on how we do business. There are six entry points now to the company, which are the four lines of business, and then science and technology and industry partnerships. Those two have to be managed, as this group keeps saying, it has to be managed strategically, with customer contact management, with investment, just like you do anything else. And we will be doing that."

"I had a great fear that the laboratory wasn't ready yet for us to initiate a corporate central program development operation, on a big scale, and even then we're thinking about it being a network where the program development people that already exist in the line are just networked in for information's sake. From what I heard here, I think we're ready for it. Not only do I hear a lot of people in the line talk about 'This is a very useful function,' but even the people we have that are starting to work in that area have some talents that they've shown are useful. So some things are going to change. I have most of the resources you talk about here, whether it's the agreements people, the tech transfer people, all the investment people, the LDRD, everything's in my organization. So I have an opportunity, a challenge, whether I can succeed or not, in aligning all that in a way that makes this come out right. So I thank you all a great deal."

Sandia player: I felt successful due to teaming with another Sandia line and made strong deals with industry based on cross-cuts of mission areas. How do we find out who we can team with internally? Working on similar technologies, so we can build strong teams and work together rather than competing.

PLAYER EVALUATIONS

POLLING RESULTS

In order to assess how well the game objectives were met, and how effectively the game was designed and conducted, players were polled both at the beginning and at the end of the game. Polling was done anonymously using Game-Web based polls that each player could fill out using laptop computers placed at the team tables. Questions were asked about both the specific and general Prosperity Game™ objectives. In addition, team demographics were also collected so that differences between teams or groups of people could be distinguished.

SPECIFIC OBJECTIVES

The primary objectives of this game were to explore ways to increase industry partnerships and to improve Sandia business development and marketing strategies. The players were asked several questions both at the start and end of the game to measure their attitudes and any changes that might have occurred relative to these primary objectives.

The first two pre-game questions dealt with the perceived importance of external partnerships at both the company and organization levels. Figure 2 shows that the players felt that partnerships were important, with nearly 85% of the players feeling that partnerships were

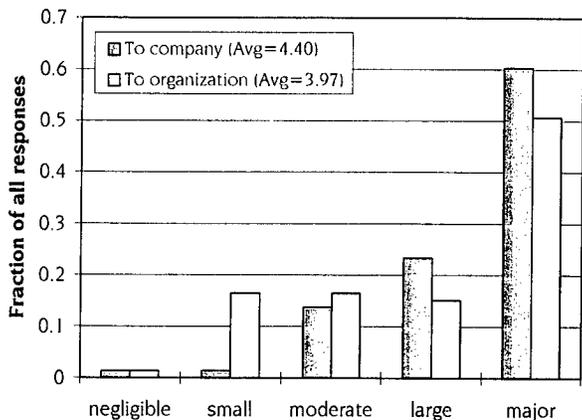


Figure 2. Pre-game: External partnerships are of _____ importance to my company / organization.

of large or major importance to their company. However, many players felt that partnerships were less important to their own organization than they were to their company as a whole.

This perception was more pronounced for those players on the Sandia Line teams. On a scale from 1 = negligible to 5 = major (as shown in Figure 2), the Sandia Line players felt that external partnerships were much less important to their own organizations (3.43) than to Sandia as a whole (4.30), a difference of 0.93. The corresponding difference for Industry players was much less (0.33).

A related question was asked at the end of the game in which players were to state if they felt partnerships were more or less important than they had thought at the start of the game. Figure 3 shows that while about 60% had the same impression (high to start with) of the importance of partnerships, nearly 40% of the players felt that partnerships were of more or much more importance than they had felt previously. This is significant in that an increased awareness of the importance of external partnerships is critical to increasing their number and scope.

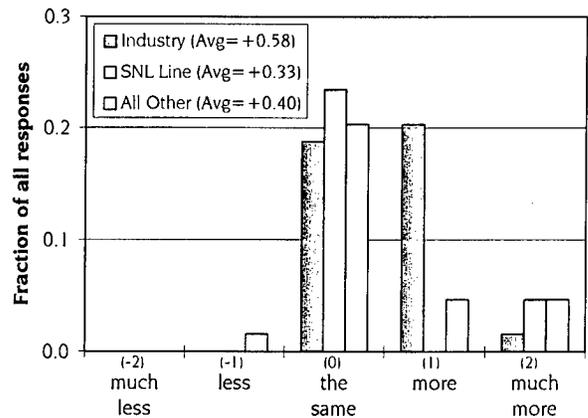


Figure 3. Post-game: "I now think that external partnerships are of _____ importance than I did before playing the game."

The largest increase in importance was felt by the industry players, while the smallest was felt by the Sandia Line players. Also of note is that the Sandia Line 3 (E&E, Critical Infrastructures) team felt that external partnerships were of less than moderate importance (2.83) to their

organizations. This view did not change over the course of the game.

The results to another related post-game question are shown in Figure 4. Nearly 50% of the players felt that

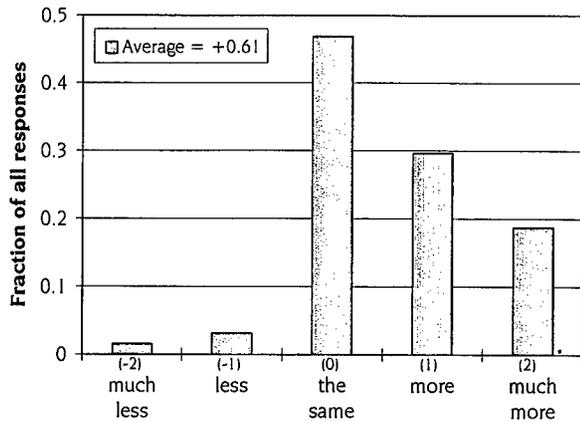


Figure 4. "I now think that industry-Sandia partnerships have _____ potential for win-win arrangements than I did before playing the game."

there was a greater potential for win-win partnering arrangements than they did before the game. All groups of players (i.e., Industry, Sandia Line, others) had similar responses to this question.

Players were asked about their knowledge of Sandia's partnering process. Figure 5 shows the pre- and post-game responses to this question by player group. At the start of the game, few players knew *little* or *very little* about the process. As might be expected, the Industry players knew the least about the Sandia process. However, the majority of them knew *something* or more. Additionally, the Industry players felt they learned more about the process than did the other teams (increase of 0.85).

The Sandia Line teams felt that the game changed their knowledge of the process by little (from 3.48 to 3.61). By contrast, the Other teams, which includes the Competitor, DOE, Sandia Agreements and Sandia Business Development teams, had the highest degree of knowledge to start the game, and felt that it increased significantly.

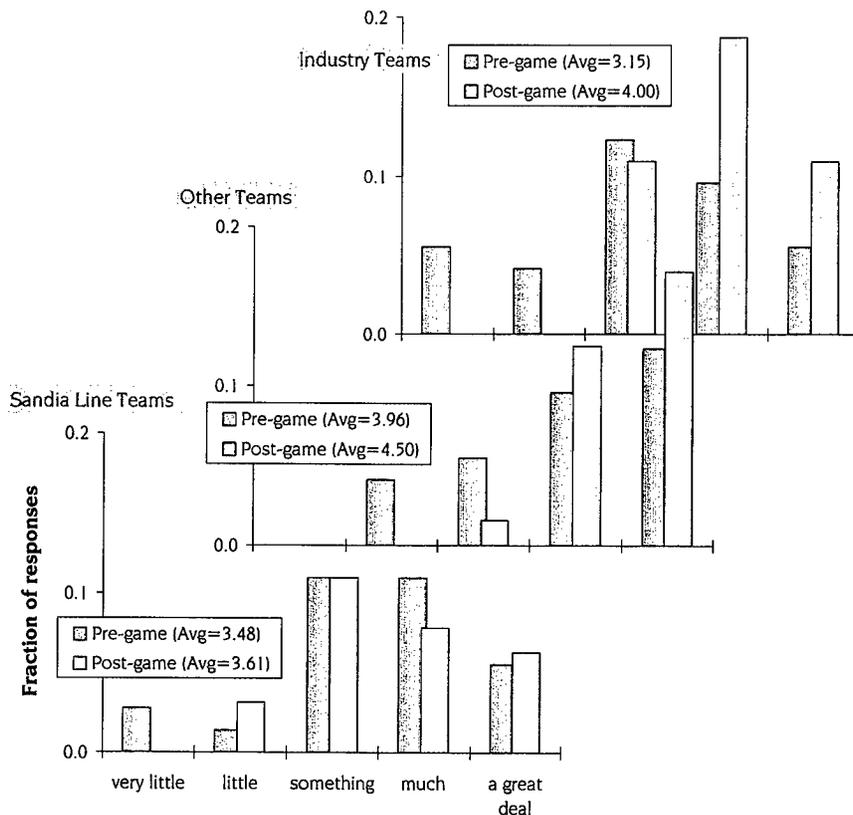


Figure 5. Pre- and post-game responses to "I know _____ about the Sandia partnering process" by player group.

These questions impact on the objectives of the game in that knowledge of the partnership process is necessary if partnerships are to increase. In the game, Industry made significant improvement in their knowledge of the process, which may indicate their desire to have more to do with Sandia in the future.

Players were also asked about the ease of forming an industry-Sandia partnership. Figure 6 shows that less than 10% of the players felt that this was a *simple* or *very easy* task, while over 50% felt that it was a *difficult* or *herculean* task. The distribution of responses did not change

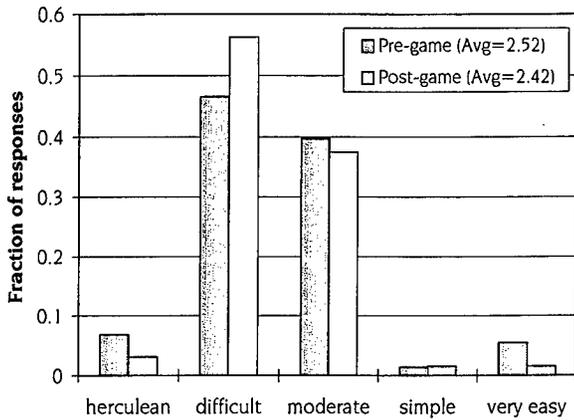


Figure 6. "I think it is a _____ task to form an industry-Sandia partnership."

appreciably over the course of the game. Figure 7 shows the pre- and post-game average response to ease of partnering by group. The Industry and Sandia Line players have similar responses with very little change from pre-to-post-game. However, the DOE team initially felt

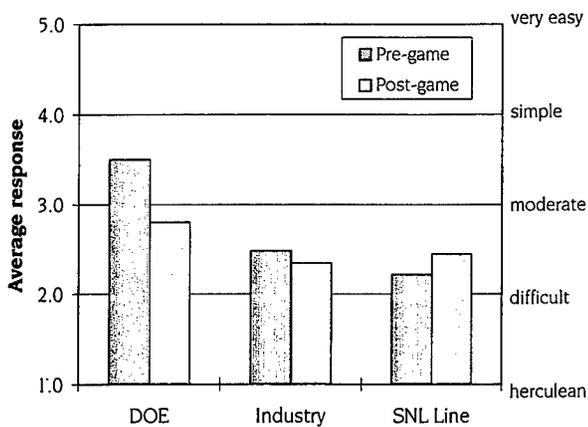


Figure 7. Change in perceived ease of partnering from beginning to the end of game by group.

that forming an Industry-Sandia partnership was much easier than did any of the other players. Yet, by the end of the game, the DOE perception of ease of partnership had decreased significantly (3.50 to 2.80) to a value more in line with that of the other players.

Although the DOE players gained some perspective on the difficulty with which others view the partnership process, it is not likely that the process requirements will change significantly as a result. The DOE players in the game were from the local agency office, and therefore are often following Headquarters directives in their enforcement of requirements.

The last three objective-oriented pre-game questions dealt with the perceived importance of business development and marketing activities at the company, organization, and personal work levels. Figure 8 shows that the players felt that business development and marketing activities were very important, with 75-80% of the players feeling that they were of large or major importance at all three levels.

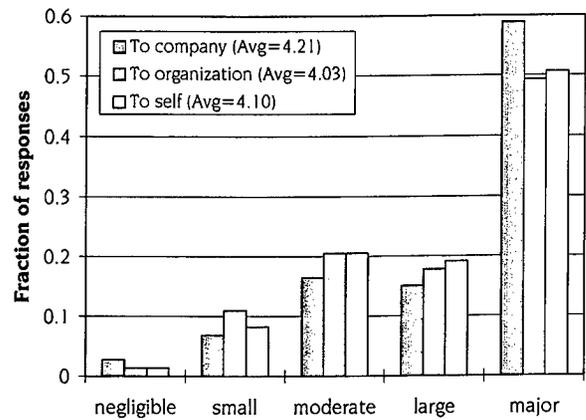


Figure 8. Pre-game: Business development and marketing activities are of _____ importance to my company / organization / self.

There was a significant difference on the importance of business development and marketing activities between the Industry and Sandia Line players, as shown in Table 3. Industry responses were greater on average by 0.5 on a scale from 1=*negligible* to 5=*major*. Although there is some indication that these activities were felt to be more important to the company as a whole than to their organization, the differences are not as large as they were for the question of importance of partnerships.

A related question was asked at the end of the game in which players were to state if they felt that business

Table 3: Importance of business development and marketing by group.

	Industry	Sandia Line
to Company	4.44	3.96
to Organization	4.22	3.57
to Self	4.15	3.74

development and marketing activities were more or less important than they had thought at the start of the game. Figure 9 shows that nearly 50% of the players felt that these activities were of *more* or *much more* importance than they had felt previously. Given that the average pre-game response was higher than 4 on a 1-5 scale, this indicates that the players feel very strongly that business development and marketing activities are critical to their success.

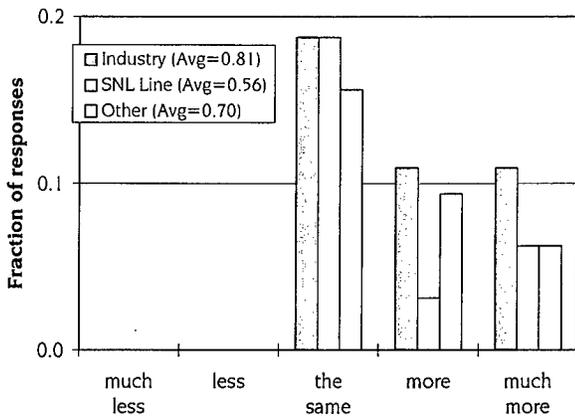


Figure 9. Post-game: "I now think that business development and marketing are of _____ importance than I did before playing the game."

GENERAL OBJECTIVES

During the course of developing and conducting Prosperity Games™, a fairly standard set of evaluation questions has been developed. These have been useful in assessing both game design and conduct, as well as the attitudes of the players. The range for all questions was a 1-5 scale from low to high. Mean responses to these questions are shown as the colored bar data in Figure 10, where they are compared against aggregate data from all previous games. The average responses for the Industrial Partnership Prosperity Game™ range from very near to significantly greater than the average response from all previous games for all questions. In addition,

this game received either the highest or second highest response ever for six of the fifteen questions (over the dozen games for which these questions have been consistently used). This game also received the highest overall average score (average of all questions) we have ever received (4.08). The previous median, high and low overall averages were 3.80, 4.08, and 3.48, respectively.

Figure 11 shows the team-by-team responses to each of these questions. One strong observable trend can be seen from these data: teams tend to vote consistently from question to question. For instance, the DOE team voted consistently low on most questions (average overall response of 3.2), while the Industry 4 team voted consistently high on most questions (average overall response of 4.6).

WRITTEN COMMENTS

In addition to the polling data, written comments and suggestions were solicited from the players. A representative sampling of these comments is provided here.

LESSONS LEARNED

Industry players:

- Sandia line organizations need to cooperate more (and compete less) with each other.
- Sandia needs a single point of contact (POC) to escort a new company through the whole [partnership] process.
- Empowerment of Sandia line organizations and establishing POC's with corporate level coordination would improve partnering.
- Sandians need to improve communication skills: fewer acronyms; better explanations of terminology.
- Sandia needs to carefully explain how different types of agreements really work. Identify steps and contacts.
- Sandia should work with DOE to simplify and speed up the partnering process.
- Some Sandians concentrated solely on their lab missions. [Ed. the inference here is that there was little customer focus.]
- Congressional and DOE restrictions are barriers.

Sandia players:

- [The game] demonstrated some of the real-world problems Sandia has when working both with industry and each other.

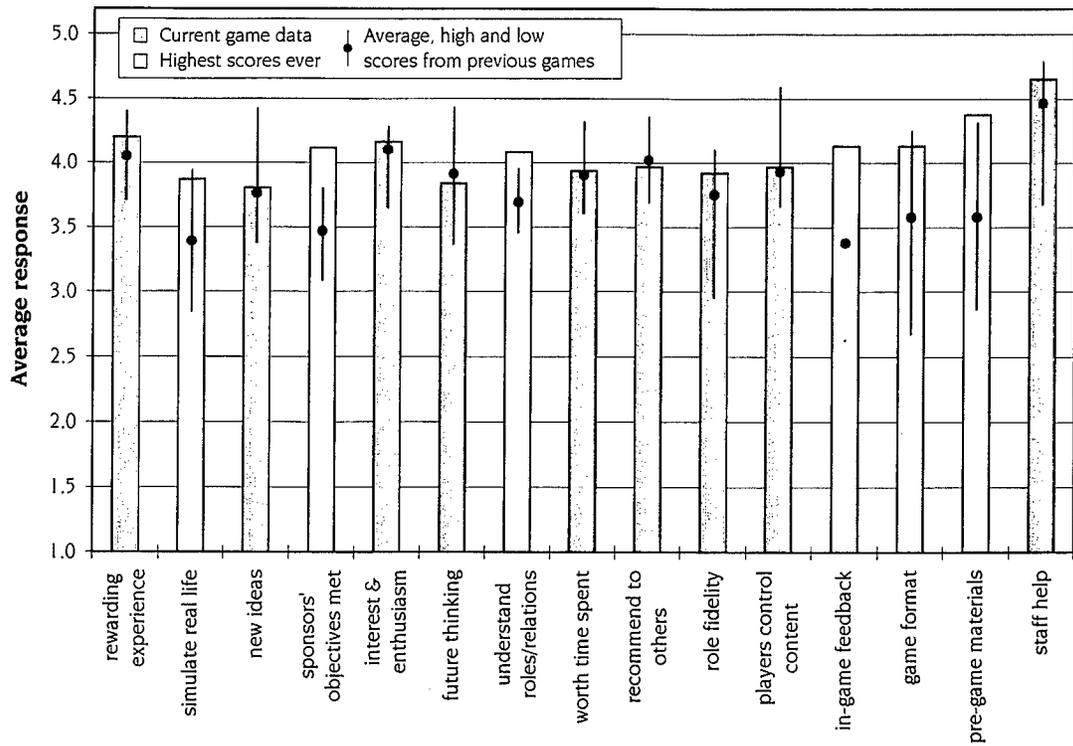


Figure 10. Industrial Partnership Prosperity Game™ exit poll average responses vs. previous games.

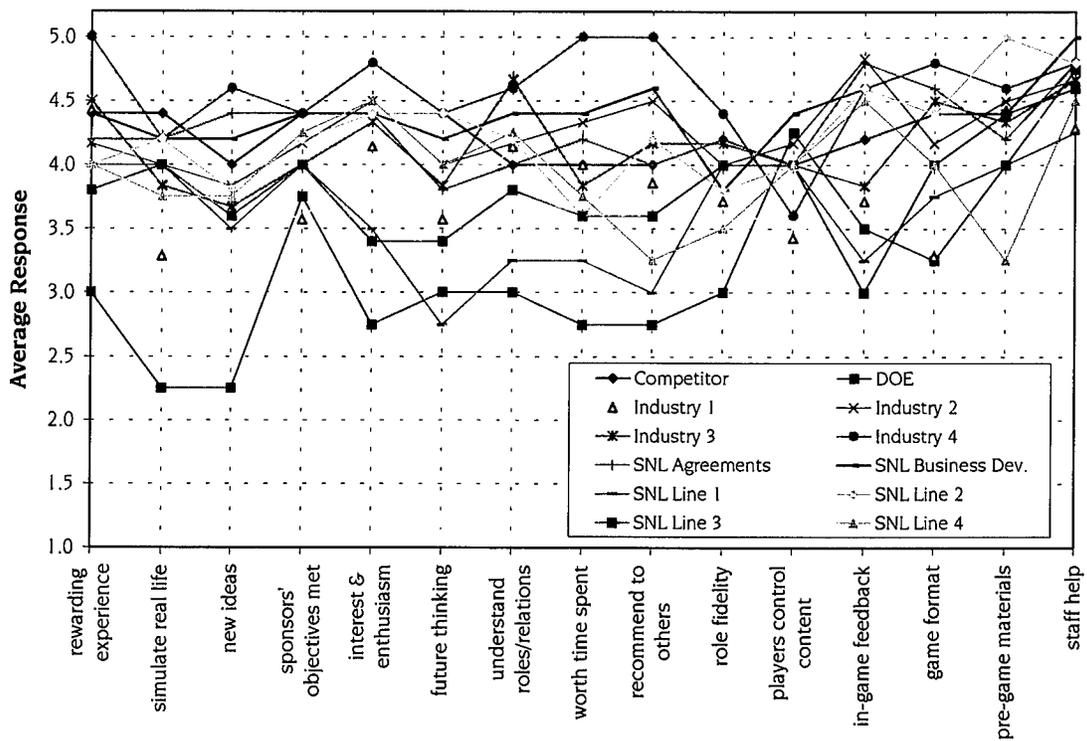


Figure 11. Industrial Partnership Prosperity Game™ exit poll average responses by team.

- Technology should be identified as a Sandia line organization because industry wants technology rather than line projects.
- Integrate some Business Development people into the line.
- Improve *Technology Partnerships & Commercialization* organization and processes.
- Improve communication among different Sandia organizations.

DOE players:

- We need to require industry to work issues such as competitiveness, product liability, depreciation and overhead, etc.
- We should identify real issues and what levels of DOE can resolve them.
- Work together with industry / labs / DOE to achieve solutions.

COMMENTS ON THE PROSPERITY GAME™

Industry players:

- Great concept for both learning and developing relationships. Really helps understanding of the roles of the many groups beyond Sandia line organizations.
- Very, very well organized - good pre-game materials, very good support (people, computers, etc.) during the game.
- Staff and participants were knowledgeable and enthusiastic.
- Excellent experience; fast paced and open-ended. Very smooth and professionally managed. Even the 'learning curve' was productive to get acquainted.
- I found the same issues and roadblocks arising in the game [as in real life].
- Most of the process and many issues experienced in real life were present.
- Good flow of events - not too fast, not too slow.
- Too many goals. Time frame must be compressed.
- Please invite me to participate in other Prosperity Games™. I'll be a much better player after going through my first.
- I was impressed by the sincerity of the participants and the issues that surfaced.
- The best part was meeting the people. The worst part was the process.
- Sandia folks modified their behaviors in response to industry which was the positive result for me.
- The game was a success in that I was able to assess the state of partnering and dealing with SNL as it currently exists and can see the direction it is heading.

Sandia players:

- Great game. Very worthwhile. Excellent format and challenges.
- Pretty realistic for a game. Very good. Lots of lessons learned.
- Participating in this game was definitely a worthwhile experience.
- Facilitators, analysts, and control people were great.
- Some good relationships developed - maybe some 'real' teaming.
- Excellent opportunity to network.
- Allow more time for strategy development. Too many milestones, too little time.
- Game ran too long.
- Needed a Science and Technology team and an Other Federal Agencies team.
- More training for support staff on PCs/printers.
- Game sponsors (especially high-level Sandians) should not play.
- Would have been more realistic to have had a reorganization every 2 to 4 years.
- Need team to represent international community.

DOE players:

- SNL / Industry did not identify real life issues.
- Goal-setting too slow [took too long]. Create scenarios before the game.
- Don't mix lab / federal employees who work together daily.

FOLLOW-ON SUGGESTIONS

The players at this Prosperity Game™ generated many ideas for follow-on activities aimed at meeting the objectives of the game.

- Reorganize the business development structure.
- Identify account executives or POC's for more of the large corporations [potential partners].
- Co-locate business development and line people.
- Merge business development, marketing and agreements.
- Organize corporate business development to communicate more easily within the organization as well as to be distributed throughout the line organizations.
- DOE and the lab should consolidate some groups (agreements, business development, etc.) - not just at the lab level - and develop a plan for what the government wants to accomplish, what Sandia can or should do alone, and then empower groups to seek ways to partner for the rest.

- Develop an internal map for SNL connecting organizations with programs / technical capabilities and share it with all Sandians.
- Present lessons learned to DOE AL and small staff.
- Educate the Sandia 'sales force' about SNL capabilities.
- Educate / expose SNL lines to all SNL businesses through open house days.
- Work on intellectual property and technology transfer agreements between SNL-Lockheed Martin and UNM.
- Have a regional economic development game, focusing on partnering.
- Conduct additional games and round-table discussions with industry.
- Conduct a game for each center at Sandia.
- Develop short version of this Prosperity Game™ to train individuals in line organizations on the process for agreements, how to evaluate alternative approaches, etc.
- Conduct a short course (3 hr.) on partnerships for all Sandians.
- Have the *Technology Partnerships & Commercialization Center* follow up on issues for improvement.
- Develop a web-based 'points-of-contact' database for the 200 or so major companies we view as strategic.
- Adopt industry 'best practices.'
- Analyze top three successes and failures.
- Hold six-month and one-year class reunions to see real-life changes.
- Develop metrics to track how the participants use this experience.

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APPENDIX B - INDIVIDUAL TEAM REPORTS

The following individual team reports consist of edited versions of the game staff reports along with the planning documents (vision, goals and milestones) submitted by the teams.

SANDIA LINE 1 (S1) - NUCLEAR WEAPONS

TEAM COMPOSITION AND PREPAREDNESS:

Players: Michael W. Callahan
A. Kathleen Hays
Paul J. Hommert
Clifford L. Renschler
Jimmie Searcy

The members of the Nuclear Weapons group were well suited to their assignment. All of them have had extensive experience in the nuclear weapons program and are presently engaged in that activity at Sandia. In addition, they are familiar with Sandia's industrial partnership efforts and most have personally participated in one or more CRADAs. While they appeared to have no more than a cursory familiarity with the pre-game materials, that did not deter them since they had their own, independent objectives relative to the game and game results.

11:00 AM (after 1st debrief): Observation: this team seems to have developed a clearer vision, more highly defined goals/milestones, than most others (except Industry 3, Advanced Manufacturing & Materials, SNL S4 Nat'l Emerging Threats?).

Team advantage: This group viewed themselves as being at the center of the SNL mission; team members work together in real life. Therefore, they made a decision to adopt the SNL goals that had been defined by executive management at the Fall Leadership Forum. They saw no need to attempt to "second guess" or redefine what the Labs are to accomplish. Their mission was clear from the outset. In contrast, from their perspective of other SNL teams, e.g. E&E, there appeared to be no specific goals that could be articulated by the end of the first debriefing session. This group was ready to go out and start interacting, making deals. However, other teams were

still coming together, less well-defined, and not ready to start negotiating.

DESCRIPTION OF PLANNING SESSION:

Structuring of the group was highly informal, there was little confirming/ summarizing. The structure was pretty well established and agreed to (at least informally) after the introductory session: First they decided on scope, vision – what will stockpile look like in 8 years? Leadership of the group was assumed by Kay Hays and not challenged by the others. Her leadership seemed to be welcomed. Leader took initiative to produce Vision Statement very quickly.

All the team members were highly involved in the discussions and appeared to feel fully empowered. The roles seemed to evolve quite naturally and individuals took on various assignments of their own volition.

During the discussion of operating procedure and strategies, the group decided to invite a member of the DOE and Business Development teams to participate and assist. However, they were not successful in getting a member from DOE to join them. The Business Development team member (Art Verardo) was welcomed and played a vital role for the group by providing information on strategies of other teams and by negotiating on behalf of the team. Discussion relative to joining with other SNL teams lead to the pragmatic view that they would do so as long as it was in the best interest of the Nuclear Weapons objectives, but they did not believe participation by the other SNL teams was essential. This group could succeed with or without the rest of the Labs teams (which appeared to reflect the real-world view to many weapons managers).

Plan formulated: Wednesday evening the team determined to establish goals quickly, then to gather information about how to work with other teams by going out and meeting with them. Jim Searcy believed it was crucial to have a CEO and Kay Hays was formally designated as such - it was already clear she was leading. Searcy simply brought about the formalization. Each team member determined to take on an area of technical specialization.

General rules established were few:

- CEO will not make deals w/o consultation/authoriza-

tion.

- Everyone can initiate activity and bring it back to the group for input and establishing consensus and cohesion to the deals.

Thursday morning the CEO wrote a description of the world expected in 2005, while the other four team members worked on objectives-related goals/milestones. (Sample conversation when a visitor from other SNL team showed up to see if they shared common goals with the group, "Can they work together?" "Don't have to spend chits on other SNL tech – can assume it's available." "Chits happen.")

TEAM PLAN

Vision: We can design major retrofits complete with required manufacturing processes in one year at 1/2 the cost and with 1/10 the defects. We have implemented model-based life cycle engineering as a way of doing business. We have developed an integrated microsystem capability with a requirement of design to manufacture in one year. We have developed methods (models and sensing technologies) to anticipate weapon failures. Early diagnosis makes up for small budgets and small production complex.

Table 4: Sandia Line 1 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Completely integrate information system of Lab & production suppliers including expert systems for design & some processes & historical databases.	Demonstrate Model & Simulation Based Life-Cycle Engineering (MSBLCE) capability on a prototype component or sub-system.	Implement direct fab to reduce part count & joints by factor of 10.	Demonstrate 1/10 defects, 3/4 cost, on complete weapon system during a 1-yr. design-to-production cycle.	Product Realization: Develop the methodologies & tools to realize future products w/ 1/10 the defects & 1/10 the part count in 3/4 the time and at 3/4 the cost using MSBLCE. Demonstrate on a prototypical product.
License basic technology optical, micromachines, sensors.	Develop standard designs: e.g., inertial sensors, optical switches, miniature lasers.	On-line design tools: high-fidelity models, standard cells, building blocks from previous designs.	Commercial source: high volume, high-yield, demonstrated reliability.	Integrated Microsystem capability: requirement to product in 12 months.
Design to Analysis: Achieve the integrated information & technology capability to reduce time from design geometry to predictive analysis to less than a week.	Product Design Objects: Deployment of several Product Design Objects (PDO) associated with key componentry. PDO implies information & simulation rich pedigree for a component.	Distributed Computing Environment: seamless from "M Flop to T Flop," seamless from "design to analysis," "design geometry to design response".	High Confidence Predictive Simulation for Certification in Complex Environments.	Modeling & Simulation Based Life-Cycle Engineering: Implement new MSBLCE.
Survey the enduring stockpile to identify most likely aging-related failure points. Rank order to impact & probability of failure.	Develop miniaturized optical componentry with timing, power & radiation hardness performance criteria to field optically-based detonation system.	Develop sensing technologies needed to monitor all important aspects of weapons' health	Develop first-principles understanding of aging mechanisms allowing high fidelity failure prediction of all components & materials types to arbitrary service life.	Develop the scientific understanding & monitoring capability to ensure the safety & reliability of the stockpile to any service life.

HOW STRATEGIES WERE IMPLEMENTED:

These individuals definitely felt empowered to go out and achieve their goals, using their agreed-upon strategies, as decided on as a team. They maintained good communication as a team, enabling them to work in concert. Their thinking, however, was not especially long term: their goals were adopted from the Fall Leadership list (so perhaps they didn't feel "empowered" sufficiently to devise more challenging ones for themselves), and when the group achieved their objectives (well within the time prescribed), they did not choose to take on anything else but appeared to rest on their laurels. However, they did determine that since their objectives had been achieved rapidly, they would pro-actively go out and help other SNL teams reach their goals. (There was substantial conversation that that reflected real life at SNL; NS sector taking responsibility for the Lab as a whole).

This team was quite competitive. They seemed to want to come out "first" in attaining their goals. On the other hand, they worked well together and were able to work with other teams.

The agreements that were developed and achieved (literally 100% of their proposed agreements were successfully negotiated and approved or incorporated into agreements from other groups) were well aligned with their strategy and focus. Indeed, it appeared to be their clearly focused objectives that allowed them to move forward so rapidly and cohesively. The links and synergy between the agreements were strong.

TEAM DYNAMICS, ETC.

This group clearly had fun. There was a strong sense of mission. In addition, the confidence and trust of the team members for each other, likely as a result of real-life working relationships, was apparent. This provided for an efficient and smooth process for developing, approving, and implementing agreements. Individuals were empowered to go out and accomplish the goals for which they were responsible. That allowed the CEO to move around, kibitzing, providing support to team members, and tracking overall progress of the various agreements. There was a clear sense of enjoying being out in front. By the end of Session I the team had achieved about half of their milestones - more than any other team as near as they could determine. They went on to meet every objective. However, when challenged to then come up with something that would be really innovative, visionary, and tough to get through, they chose to not take on that challenge. They had done what they set out

to do, they had negotiated some excellent agreements that were truly win-win, they were confident in the world environment they were creating, and they saw no particular need or value to "taking something on that is beyond our stated objectives." Rather, they were willing to "just help others out."

TEAM SELF-ASSESSMENT:

- Can't learn in this game how to do deals. The real-world negotiating environment is much more difficult.
- Can't see the difference between SNL Business Development (BD) and Agreements staff.
- Networking potential of the game is excellent. Everyone involved is in the same room.
- BD/Agreements people should be located out on line; structure needs changing, decentralizing. Line makes the deals, but then the Agreements people have to "make" the deal (or remake it) again.
- BD/Agreements staff should be consolidated.
- Need to explore ways to increase industry partnerships involvement at the Labs.
- Metrics for partnering need revision: strategic partnerships may not bring in any dollars; deals that bring in a lot of money may be, otherwise, a waste of time relative to our mission. Metrics for success in game is too simplistic.
- Desire expressed to spend some time discussing the actual deals cut during the game to see if anything can be learned about new approaches, twists, etc. (Potential area of learning, to get value from game.) Spend last negotiation session in this way, if possible.
- Game is reality-based – deals done were based on actual life needs at the Labs.
- Biggest success was closing a deal that involved 3 industry and 2 lab teams. Individual cost was low resulting in a strong win/win/win for each team.

After lunch: Debriefing session:

Reality-based – deals done were based on actual life. But Searcy said: biggest success was 3 industry, 2 lab agreement, low cost – most win/win.

What worked:

- Good team set up for this group (good players on this team)
- Roles that most played turned out to be generally realistic
- Real life well mirrored by control functions (Control, Agreements, DOE).

- Observed strong real-life behavior patterns

What didn't work:

- Computers and e-mail – how do they add value?
- Simulated time
- Briefings – only really valuable one was with DOE – elicited industry comments of interest & discussion and controversy over objectives and tactics.)
- Not realistic from the point of real-world complexity, lack of real-world constraints
- Game might be improved by requiring fewer agreements, but ones which are worked out in more detail and more substance.
- Time compression forced gaming the game at times because there was too much to do.
- Game produced an artificial incentive to partner, i.e. game objective was to partner, but the advantage of doing so in real-world is less clear.
- Need predetermined strategies and fewer goals to achieve more depth, greater challenge, and more intense negotiations.
- Could make game more real by better tracking of performance, with stronger accountability for what results from the agreements, i.e. outcome of the agreements.
- Games should be held less often – now too commonplace, not special enough – maybe there's a better way (same people shouldn't participate over & over).

SANDIA LINE 2 (S2) - NONPROLIFERATION, ETC.

TEAM COMPOSITION AND PREPAREDNESS

Players: T. J. Allard

James L. Jellison
Gordon Leifeste
A. Keith Miller
Nancy Prindle
John M. Taylor

Familiarity with Handbook and Challenges. The team seems to have read the pre-materials, for there is a fair amount of "does this fit with the rules? It says here on page 12 that so-and-so should happen." One team member, Keith Miller, particularly enjoyed the piece written by Gary Jones and commented that he "resonated with the ideas expressed there." One team member began with the challenges presented in the book for our team and suggested that we take those on as prelimi-

nary goals. The team later went off a slightly different framework, but they used the challenges to stimulate discussion.

Appropriate Expertise for Roles. All have scientific backgrounds and work in technical areas (except GL) at SNL. Many of the players are wondering why they're on this particular team, asking for folks from 9000 to represent this area. Are we qualified, and who are we? This was one of the initial questions posed, but the team settled into their roles once John Taylor came aboard. As discussion ensued, it became clear that each team member was well qualified to be on the Weapons of Mass Destruction team; they had years of experience dealing with non-proliferation issues.

DESCRIPTION OF PLANNING SESSION

Development of Ground Rules. Late in the first planning session, the team did set some ground rules. Right away, the team said they'd be empowered to act on behalf of the group, as long as their efforts helped us reach one of the milestones. We assigned each team member a role as a liaison to one or two other groups, which turned out to be very successful, given the independent work style of our team.

Role Assignments. All players gave a lot of energy to figuring out their responsibilities as a team and how to operate during the game. "How are we going to allocate our chits, for example?" was a big concern for a few minutes, but then the team determined that they needed a team leader and CFO. John Taylor was the spokesperson for the group presentation. And the team decided they needed a deal closer—Gordon L was to be negotiator, while Keith Miller was intelligence officer. Then the group tried to set our priorities for dealing with different groups, as follows:

Jim J—Industry 4;
Gordon L—Industry 1;
Keith M—Industry 2;
DOE, Biz Dev, Agreements—Gordon L
Interagency groups—Nancy P
Competitor Team—John
TJ Allard—CFO;
Negotiators—Nancy, John, Gordon (closer)

The whole team was empowered to make decisions and made an effort to look at certain groups to see whether they could partner with them—who would be good to work with—which groups does the group have "in's" with?

The assignment of roles worked well for the team because they saw each other's strengths. For a brief moment, the group had a single agenda.

Challenges (environment and problems). Lack of direction, too much direction. All are pushing an individual agenda, and communication is severely restricted.

TEAM PLAN

Vision: To be a recognized agent that applies systems that facilitate and monitor the reduction of the threat of use of weapons of mass destruction (WMD).

SWOT Analysis: Strengths - Satellites, micromachines, data processing analysis/handling, SAR, high-perfor-

mance computing, materials, integrated sensors, test and evaluation, component engineering, arms control heritage; relationships with IAEA, DOS, ACDA, Intelligence Community, DoD, NATO, Aging Reliability/Surety, microelectronics, systems integration.

Weaknesses - Lack of experience working with industry, technical arrogance, lack of expertise in biochemical sensors, not a DoD insider—seen as DOE lab, nationally viewed to have too narrow a role, high overhead perception, behind the curve in electronic information tools, lack of agility in moving resources to a critical task.

Opportunities and Threats (to be determined).

Table 5: Sandia Line 2 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Identify and control Russian special nuclear materials.	Identify and control Russian nuclear weapons.	Implement information management system.	Implement international accountancy.	Have a functioning transparency arrangement for all nuclear weapons/special nuclear materials/weapon expertise in place with Russia.
Define Sandia scope for CBW threat reduction.	Create architecture of CBW capability (with industry and DoD).	Jointly with industry, develop prototype system.	Create virtual company for manufacturing and distribution of CBW system.	Establish a unique Sandia role that uses our core capabilities for reduction of threat of use of chemical/biological weapons (CBW).
Write letters of intent with at least two industry groups to pursue common technology.	Design nonproliferation systems incorporating emerging sensors and information systems identified in letters of intent.	With industry, build systems prototypes via Weapon Support agreements to support commercial products.	Have deployment agreements with government agencies and write production orders with industry.	Establish dual-use industrial capabilities so that the private sector can support the our mission as an adjunct to a bona fide commercial mission.
Consummate arrangement with Chinese organizations involved in nuclear weapons complex and WMD.	Articulate and gain approval of prototype system to be employed in Chinese facility.	Pilot the prototype monitoring system on-site in Chinese nuclear facility.	Connect pilot system to international monitoring organization to become 'official activity.'	Apply our systems for outreach to other countries of proliferation concern.

HOW STRATEGIES WERE IMPLEMENTED

Did individuals feel empowered? Because of the confidence and knowledge level of the individuals on the team, every member was busy during the negotia-

tion sessions trying to make deals. They worked hard against high odds due to the complexity of getting deals through, and all negotiated with other teams with the energy that looked like empowerment.

Moves in Concert with Strategies? During the first negotiation session, several members of the team appeared to be very successful in securing partnerships that advanced the team's goals. We were clear on how each agreement led to a milestone.

Long-term or short-term thinking? The team was very serious about meeting its milestones and the milestones were tagged to the goals, which the team determined should be "things we can realize in the 8 years of the game timeframe." An unspoken assumption was that reaching our goals and milestones would have a longer term effect; however, the focus was still on meeting the immediate goals so we can advance our pieces in the game context.

Competition vs. Collaboration—partnering ability. During negotiation session 2, three of the team members spent at least half of the time talking with Industry 4 Team, trying to strike an alliance with them through the use of technologies that we can partner on.

Broad vs. Narrow agreements/vision. Since the team took an international focus from the start, the agreements vision was quite broad. We serve the nuclear non-proliferation WMD and CBW needs of the world, and our vision took that in.

Links between Agreements? We struggled in this area. Our agreements often involved other teams, so there was much confusion as to which ones we actually signed up for. The milestones and pink circles we got when we achieved a milestone did help us see how we were progressing between agreements, and this visual reminder of our progress made a big difference.

TEAM DYNAMICS/DECISION-MAKING PROCESS AS GAME PROGRESSED

Minority Positions/Opinions considered or squelched? The team had a very forceful way of interacting. No wimps! Each of the team members took the lead at different times, and discussion moved forward in fits and starts with people interrupting each other and trying to speak but being bumped out by a more forceful speaker. As a result, the team did not move forward in a smooth, unified manner. Discussion often resulted in folks going in different directions for the negotiations sessions, with the minority opinion going its way.

TEAM SUCCESSES, FAILURES AND OTHER HIGHLIGHTS

We have had a consistent problem with hearing each other. All talking at once and not staying on ONE concept. At times this led to some unusual connections, which is good. One big success was resolving I4's confidentiality concerns, another was sending John Taylor off to be an entrepreneur.

FOLLOW-ON IDEAS (FROM SESSION 7)

Team's Greatest Success. Three-way deal with industry and NAISTE which resulted from our ability to develop appropriate role for industry in international nonproliferation activities

Worked Best in the Game. The empowerment/participation of team individually

Didn't Work. The centralized control and keeping track of agreements at the table by one person only—resulted in confusion

Key Learnings

- The importance of speaking same vocabulary as industry
- SNL being viewed as a whole by industry
- Balancing the need for direct industry access to SNL Science and Technology (vendor) with industry access to S&T through SNL programs
- Ideas and Initiatives We Want to Implement
- Validates the Cooperative Modeling Center model
- Getting Industry involved with Sandia to gain new mission assignments

Follow-up Activities

- Develop 3 items to give to Sr. Management as action from this session
- Engage Sandia Business Development with Technology Partnerships

Other Comments

- Game too long
- A lot of learning during the second day by industry
- Too "gamey" on third day, focusing on milestones
- Great networking and bonding opportunities

SANDIA LINE 3 (S3) - ENERGY AND CRITICAL INFRASTRUCTURE

TEAM COMPOSITION AND PREPAREDNESS:

Players: Arnold B. Baker
Taz Bramlette
Laura R. Gilliom
Brian Maxwell
Kathleen M. Schulz
Marjorie Tatro

Familiarity with handbook and challenges? All team players brought with them their handbook and came prepared and had read the material beforehand. They were familiar with the game objectives and knew the "team-specific" information outlined in the handbook.

Appropriate expertise for roles? It was a good representation of the energy and environment sector being represented by Sandia Line 3. A majority of the players actually worked in Division 6000 at Sandia National Laboratories (SNL), and the remainder were linked to sector activities.

DESCRIPTION OF PLANNING SESSION

The team did not discuss ground rules, nor did they appoint specific role assignments for each team member. They did not form a process for going out and negotiating agreements, returning for consensus from the rest of the team, inputting agreements, reading e-mail, etc. Instead, they had a protracted discussion on the team's mission and the approach they should take.

Facilitator encouraged players to come up with a vision statement. Facilitator had hoped to be done with the 1-2 sentence vision statement within 15 minutes. However, the team had a quite difficult time getting started with the statement. Margie takes over facilitator's job and begins jotting down ideas for the operating principles. Within a half hour into the planning session, the team took a stab at a vision statement, but again was unsuccessful. During the vision statement session the team was interrupted by the Sandia Business Development team and this seemed to take them away from their train of thought. Immediately after that visit, they were interrupted by the Agreements team. They asked visitors to come back after they came up with their vision statement – they all agreed that the two other teams could prove to be of assistance after they had their vision statement.

All finally agreed that the statement needed to be broad and that the goals and milestones needed to be more concrete. One player only wanted, "to make a difference on the world." The team had only one hour to come up with goals and milestones – brainstorming session began.

Process: Challenges (what is the environment?

What are the problems?) The brainstorming session produced the following challenges voiced by certain team members:

- **Margie:** Electric energy power distr. & control tech.
- **Taz:** Industrial ecology and combustion
- **Kathleen:** optimization of environmental concerns in 21st century - manufacturing processes/plant design
- **Laura:** assessment of physical tokens of value and authenticity (electronic money) - banking, finance (you are who you say you are). This will be fuzzy for telecommunications. Federal operations (military functions). Aging infrastructure (thinking about aircraft). Interdependence and cross infrastructure analysis and emergency services.
- **Arnie:** Integrated transportation systems – design optimization of surface transportation systems. Fuel cells (distributed power and transportation, as well). Vulnerability of US electronic infrastructure to non-U.S. intrusion. Assurance of water quality and surety of health care systems.
- **Brian:** no comment

Summed up by facilitator, it appeared that the challenges were leading towards:

- Electrical Power and impacts
- Industrial (IE related activities)
- Combustion
- Telecommunications

Process: Goals, Milestones. During the planning session, Laura suggested that they brainstorm and then pick the top four. The goals were agreed upon; however, the team felt extremely rushed and not organized. They did finally agree that they would separate into two groups, and each group would be responsible for coming up with four milestones for each of the two goals assigned to the separate groups. Their intent was to come together after each group came up with milestones, review milestones and come to a consensus on the milestones each group came up with. However, that did not happen. Their time limit was up, so they kept the milestones each group came up with without the other team having a chance to offer input.

Fidelity to team role? The team and each member very accurately reflected the actual behavior of the energy

and critical infrastructure area. They split along the lines of that which has been exhibited in sector activities—information and everything else—and had the same questions that staff and management have stated concerning mission. There was little, if any, attempt to step outside their real roles in discussing goals and milestones.

TEAM PLAN

Vision: Sandia making a recognized, significant national impact in critical infrastructure surety, including energy supply.

Operating Principles: Industry has principal role, government has critical interest; \$\$ for program sustainability/growth; Consider industry and government constituency before committing to an agreement; Consider synergy with other labs' missions.

Table 6: Sandia Line 3 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Transfer high-speed encryption technology to broader national use.	Establish authentication center of excellence.	Develop system for network intrusion detection and response that can keep up with threat.	Facilitate development of national/international standards in information surety.	Assure that the reliability and security of the 'bit-moving' industry is not adversely affected by deregulation.
Get agreement from DOE to initiative on assessment of surety of deregulated electric power industry.	Comprehensive analysis of vulnerabilities (including interdependencies) with others' critical infrastructures.	Establish WRAPPER presence to deal with legacy SCADA systems of electric power industry.	Transfer all these technologies to industry applications.	Electric power distribution industry that is as or more robust than it is in 1998.
Select metropolitan area/partner: identify preferred concepts.	Develop small-scale system: identify sensor and information processing alternatives.	Select best alternative components: expand system for the metropolitan area.	Implement system metropolitan wide.	Develop a working technology/system to improve the on-road transportation efficiency (reduce energy and emission per passenger mile) in one large metro area by 10% in 2005 over 1997 levels.
Choose sector and finalize agreement with partners.	Identify subprocesses and where new technologies are required.	Subprocess technologies developed and demonstrated.	Design of plant and processes complete.	Develop a new process for a plant in a major manufacturing sector that would optimize the use of raw materials and energy, and produce zero discharge.

HOW STRATEGIES WERE IMPLEMENTED:

Did individuals feel empowered? Individuals did feel empowered. This proved to actually be a problem, because they didn't pull together as a team. One individual really wanted her point to be taken and acted on and didn't quite pay attention to others' views. There

was one individual who empowered herself to make a decision to reject a partnership on short notice because no other team members were around. Unfortunately, the Sandia Business Development team felt this was not a good decision and sought to have this decision reversed. However, she did empower herself and felt she

had made the correct decision when looking at the team's overall goals.

Were moves in concert with strategies, or *carpe diem*? The team did not appear to have a very solid strategy. However, agreements were negotiated to support milestones and goals. The play seemed to be a mix between *carpe diem* and "it grows as it goes."

Goals 1 and 2 produced some very strong milestones that were specific to long-term goals.

A majority of players did not wait for partners to come to them, they took the initiative and approached outside partnerships.

When asked to come up with a fifth goal, it did appear that the four members working on the goal used the *Impetus Futuro!* - Force for the Future. They did develop a robust strategy and negotiated agreements to support and develop that strategy. Synergy was the key!

Long-term or short-term thinking? The team could actually be split in half on long-term and short-term thinking. Kathleen focused on long-term thinking on environmental concerns in 21st century. Taz also focused on long-term combustion/transportation issues of the future. The first time true long-term planning was approached from a position "outside the box," was the definition of the fifth goal and corresponding milestones.

Competition vs. Collaboration; ability to partner? Overall, the team did not have a problem with their ability to partner. We only had one instance where a team member turned down an agreement with outside industry. This forced Sandia Business Development team to confront facilitator. When player was asked for reasoning, she simply informed facilitator that this was not one of their goals, and at the time, there were no other team members around to discuss the issue. On the surface, Brian was quiet and low key. However, when it came to negotiating, he proved to be quite successful in that he partnered in one agreement that met 12 milestones from Sandia and industry teams. He also proved to be quite aggressive when it came to negotiating.

Broad vs. Narrow agreements/vision? Agreements were as plain as vanilla – not considered outstanding. Facilitator gives the agreements solid B's.

One player initially wanted to focus on the financial aspect for the team's future. Facilitator had a difficult time opening the tunnel for him.

Did agreements correspond to strategies? Agreements met specific milestones of goals.

Links between agreements? The team did have one specific agreement that linked to another one, that was needed in order to meet a milestone. The initial agreement was a master license agreement that supported a second agreement with industry. Another agreement involved five partners (SNL and industry) and met 12 milestones total. A majority of the team's agreements also linked to other milestones/goals for other Sandia teams or outside industry teams.

TEAM DYNAMICS AND DECISION MAKING PROCESS AS GAME PROGRESSED

Minority positions - highlights; were they considered or squelched? Decision making was initially a problem for the team. However, on the last day, the team took a dramatic turn and they somehow pulled together and became much more organized. Decisions were made as a team vs. individually.

Kathleen really tried to get her point across on people issues, getting to know your potential partners, building relationships and understanding the needs of people – her ideas were not squelched, but were heard by players.

TEAM SUCCESSES, FAILURES, AND OTHER HIGHLIGHTS

The team finally got out of the "box" and applied creativity on the last day. The team did not do well with the time constraints of the game. The team was not organized nor did they have a good business structure. They did successfully meet their milestones.

Sandia Line 3 had a problem with team members slipping out and not returning for a good while. It was observed, on occasion, one team member on the phone for quite some time. This made it difficult for team members to communicate effectively. We had members leave early the first day and another member arriving late the final day. Negotiations made on agreements were not discussed with other team members. The first day, it appeared that each team member was doing his/her own thing when it came to agreements.

FOLLOW-ON IDEAS (COLLECTED IN SESSION 7):

Investigate setting up E/E sector POC data

SANDIA LINE 4 (S4) - EMERGING NATIONAL SECURITY THREATS

TEAM COMPOSITION AND PREPAREDNESS:

Players: Thomas J. Baca
 John R. Bode
 Jill Fahrenholtz
 Kathie L. Hiebert-Dodd
 Russell D. Skocypec
 Gordon Smith

Familiarity with handbook and challenges? The team members had read the handbook, but had not studied it in depth. They had questions about the game and what was involved and expected.

Appropriate expertise for roles? Our team was assigned the responsibility of Emerging National Security Threats. Most have had contact/business with outside industry about Sandia's capabilities and how it applies to industry's needs. The expertise for the roles is as follows: Tom Baca - analysis and testing of weapon structures for 21 years; John Bode - 30 years of work for DoD and military departments in areas involving threat assessment, modeling, simulation, and analysis; Russ Skocypec - experience as deputy for National Security Issues; Gordon Smith - manager in a center which develops security technologies and systems for the protection of nuclear weapons/materials and other extremely high-value national assets from emerging domestic and foreign threats; Jill Fahrenholtz - broad robotics and intelligent machine technologies knowledge. Jill also has knowledge of Small Smart Machines and their potential application to possible emerging threat problems.

DESCRIPTION OF PLANNING SESSION:

Ground rules, roles, challenges. During the roundtable conducted by the facilitator, each team member introduced themselves and gave background information about their current job assignment and how it would apply to emerging national security threats. Based on this information, the team made the following determination regarding each team member's experience: Jill - mitigate; Gordon - combat; Kathie - information; John - military solutions; Tom - counter proliferation; Russ - floater/general/technology integrator/coordinator. Each of these members would determine milestones for their goal, and then independently negotiate deals to meet those milestones. Goals were arrived at by the entire group. The ground rules established included discussing

what would be the most productive/beneficial move for our team and allowing each team member to negotiate the agreements which best met their background. The team member could request the help of another team member for negotiating the agreement. The team members could also confer with other team members about whether or not to pursue an agreement if it did not match the milestone. Russ was in charge of chat distribution and was also available for consultation. He was to "stay at home." The role assignments included emerging threat champions, an advisory council, and participative elective-making process.

Process: Goals, Milestones: Each team member was assigned the responsibility for determining goals and milestones based on their experiences. Five goals were established with a minimum of four milestones each.

Fidelity to team role? The team members decided they would be proactive and seek partners for their agreements. The facilitator got proactive as well -- recruiting one member to the team.

TEAM PLAN

Vision: In the year 2005, Sandia is the acknowledged pre-eminent provider of advanced technological solutions to emerging national security threats.

Threats include:

- Proliferation and weapons of mass destruction
- Information warfare
- Aging military infrastructure/systems and vulnerabilities, plus new requirements
- Terrorism and internal (domestic) dissonance

Establish Symmunizationtm, a product line that has the following characteristics:

- Sensor-rich environment to detect
- Computational techniques to rapidly simulate and provide optimal response strategies
- Information synthesis for decision making
- System evaluation and certification of full system performance

Information Warfare:

- Information System Security & Surety; Anti-terrorism (policy issues)
- Satellite vulnerability - wireless world, relay stations, fiber world
- Early detection capability
- Vulnerability detection and prioritization
- Modeling - proliferation
- Broad system analysis - distributed, connectivity and

content; system immunology

Military:

- Replace humans with machines (reduce casualties)
- High-end modeling and simulation logistics, training
- Defense contractor/system solutions
- Identify target-smart weapons

Terrorism and Internal (Domestic) Dissonance:

- Same as proliferation - weapons of mass destruction

Overall Goal: Establish SYMMUNIZATION™, a product line that has the following characteristics:

- sensor-rich detection environment
- computational engine(s) to rapidly simulate and provide rapid response strategies
- information synthesis for decision-making
- system evaluation and certification of full system performance
- open architecture, extensible, adaptive "plug and play" capabilities
- a federal agency/industry/academia collaborative effort

Table 7: Sandia Line 4 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Demonstrate motion/NBC sensor capability integrated with model simulation architecture in laboratory environment using SYM-PRO™ prototype.	Demonstrate SYM-PRO™ for remote motion/NBC sensing and information synthesis at single static target.	Demonstrate SYM-PRO™ for remote motion/NBC sensing and information synthesis at multiple co-located static targets.	Demonstrate SYM-PRO™ for remote motion/NBC sensing and information synthesis at multiple mobile targets over a city-wide area.	Proliferation - Establish SYM-PRO™ to harvest real-time sensor information on proliferation threats on a city-wide basis to identify targeting options for decision makers.
Demonstrate prototype systems for DOE complex-wide unclassified network.	Demonstrate prototype system for DOE complex-wide classified network.	Generic system, SYM-INFO™, expanded applications.	Improved system based on new networking technologies (i.e., wireless).	Information Warfare - Establish SYM-INFO™ to provide information system security and surety for the federal agency intranet.
Concept definition for SYM-MIL™. Develop sensor targeting suite for anti-mine system to be deployed on existing UAV. Concept definition of threat leader tracking system.	Final design review for SYM-MIL™. Prototype for anti-mine system. Complete component development for leader tracking system.	Initial SYM-MIL™ validation with a demonstration of the anti-mine system. Prototype leader tracking system.	Final implementation with demonstration of threat leader tracking system. Full operational capability for the anti-mine system.	Military - Establish SYM-MIL™ to replace humans in scouting and low-intensity and special operations conflict.
Develop conceptual methods of micro-sensors for the detection of physical terrorism agents. Potential methods include micro-chromatography semi-conductor sensors and miniature spectrographs.	Build prototypes of promising micro-sensors for physical agent detection.	Develop and test calibration and use procedures for micro-sensors for detection.	Develop manufacturing technologies for micro-sensors for detection.	Terrorism & Internal (Domestic) Dissonance - Establish SYM-TER™ for the rapid, portable, and inexpensive detection of physical terrorism agents (e.g., chem-bio, explosions).

HOW STRATEGIES WERE IMPLEMENTED:

Did individuals feel empowered? Each of the team members were empowered to negotiate agreements and make decisions based on their judgment and experience.

Were moves in concert with strategies, or carpe diem? The team had a solid strategy and developed relationships with partners that were of mutual interest. The team approached all potential partners.

Long-term or short-term thinking? The team discussed both long-term and short-term projects. Long-term thinking was facilitated by increased time in the third session. This resulted in less pressure.

Competition vs. collaboration; ability to partner? The team was very competitive and negotiated several million dollar agreements (CRADAs or Licenses). Collaboration was easier with some Sandia groups than others.

Broad vs. narrow agreements/vision? The agreements and vision were broad as they covered all goals and milestones and the future.

Did agreements correspond to strategies? Yes, agreements corresponded to strategies.

Link between agreements? Yes. Symmunization linked all of the goals and agreements as an umbrella product line.

TEAM DYNAMICS AND DECISION MAKING PROCESS AS GAME PROGRESSED.

Minority positions - highlights; were they considered or squelched? All information from team members was considered. After weighing the information, a decision was made by the team as to whether or not to implement it. Russ was the overall leader.

TEAM SUCCESSES, FAILURES, AND OTHER HIGHLIGHTS

Our team was successful in establishing Symmunization, Inc., a company with a product line that would enable Sandia to be the acknowledged pre-eminent provider of advanced technological solutions to emerging national security threats.

FOLLOW-ON IDEAS

The team felt that having a diverse background worked best for the team. What didn't work was everything

being commercial and not having any government agencies represented. The team also felt the Chit distribution did not work.

Kathie felt there is some potential for real teaming. The games gave her a chance to spend time with Sandians and understand what they are doing. Gordon thought we should host a conference or expo to showcase Sandia's sensor technology.

The team also felt that corporate business training should be mandatory for some organizations. We should follow the 3-M learning structure. Not all organizations want to work with Industry. The team suggested we should work with the military to see what their needs are. We also need to work with the rest of Sandia to see what they are doing. We need to be aware of what is going on at Sandia. Sandia should look at major companies that are doing well and mimic what they are doing.

SANDIA AGREEMENTS TEAM

TEAM COMPOSITION AND PREPAREDNESS:

Players: Deborah Belasich
Steven Grieco
Toni Kovarik
Kevin McMahan
Art Verardo

With the number of agreements projected for the game, it seemed that the team would be short-handed. However, this did not seem to be an issue for the team members at this point.

Team members were prepared for the game by virtue of their current work assignment in tech partnerships. All appeared very relaxed during the registration session waiting for the plenary session that would open the game.

DESCRIPTION OF PLANNING SESSION:

Other teams were busy at work preparing flip charts and guidelines for their teams. Our facilitator set a few items on chart and a couple of the team members were involved with her. Other teams were conducting introductions and bonding in some fashion, but there was no apparent need for additional bonding in our team. Several team members had participated in previous Prosperity Games™ and it was a given that all members had read the Player's Handbook. However, the objectives for the game as far as the agreements team was concerned

did not receive much discussion in the planning session. Some discussion was held as to whether we sit and wait for business or whether we go out and proactively sell our services. Team was undecided as to what approach they would take. The subject of the accelerated pace of the game and how it would be handled was not discussed much at this stage. A team member announced he was going to visit other tables and introduce ourselves.

TEAM PLAN

Develop a strong presence with our primary customer (SNL line)

- understand and assist in furthering their strategic vision
- have a flexible organization structure
- one stop shopping

Have a liaison to DOE/Sandia

- Personnel exchange
- Improve time to execute CRADAs/agreements

Industry liaison (direct to line)

- coordinate w/Business Development
- change in perception (not difficult to work with government)

We will participate as members of NAISTE when conditions of a project apply

Pursue the waiver of depreciation & overhead based on criteria established by DOE applicable to all research entities

HOW STRATEGIES WERE IMPLEMENTED

In comparison to other teams, a couple of Sandia lines were out actively meeting other people. Same with a couple of industry groups. Our business development group was all away from their table, great! Hopefully they were drumming up some business for Sandia. Some people sit and wait for business to come to them, others look for every opportunity to build bridges, maybe they don't know where to, but they may be able to use them at sometime. Where do service groups such as our Agreements Team fit in? Do we also serve who only stand and wait? Is proactiveness a requirement in the new world of business? Who are the controllers? Do the people with the bucks just get to sit and wait until somebody comes for money?

As an aside, the introductions gave me an opportunity to suggest to some industry people the idea of possibly

being able to deal with a small company formed by an entrepreneur, i.e. introduce New Ventures into the games. Discussed the issue with Marshall and he thought it would be a good idea to send out a message informing people as to the availability of the Entrepreneurial Separation to Transfer Technology (ESTT). It was intended that the ESTT guidelines would be followed, including addressing of COI issues and the writing of a brief memo to document ESTTs. As I personally sent out an email with ESTT information from my laptop, the message was received as coming from the Agreements Team. As I had not formally discussed the plan with the team but simply informed them, I was open to criticism for failing to act as a team member. No discussion took place as to who would handle ESTT issues on the team. A team member ended up with ESTT responsibility but with no guidelines as to what to do for it.

Marshall and I had briefly discussed the possibility of having lab people leave their Sandia table and join an industry table for the length of time in their ESTT request.

After the plenary session, the team started a discussion on ways to improve our processes for CRADAs. They addressed the question, What things can we do to make our job or the processing more efficient? Preapproved templates from the DOE perspective was suggested. Develop a modular CRADA that can fly through the system by giving SNL much more flexibility. Subject of proactivity once more came up and was discussed as a better approach. The need to work within the circle of influence (Sandia) as opposed to the circle of concern (other groups) left impression that team might still be in reactive mode.

Day 2: Team more ready to address scheduling of priorities. Art suggested that each one take a line org from Sandia and ask for help if needed. One agreement person will seek to align more closely with the 'whats' of the line orgs and the 5th specialist will be the liaison with the DOE. Closer work with DOE is seen as improving the situation. Examined paradigm of plenty as basis of operation and what happens if budget goes away. Will DOE see us in *Agreements* as competitors then? "DOE continues to be our customer and we need to continue to work with all of our customers."

The idea of working more closely with DOE as a means of speeding up our process was once more discussed. Deborah suggested that a DOE person be at our table all of the time and team approved the idea. What is the downside of doing this? Do we let the camel inside the fence? Team members went to introduce themselves to

customers after discussing what the key elements of their intros might be, with personal deviation allowed after those key elements were covered.

Team members came back from meetings and compared notes. One team member felt rejected by DOE as they were busy and could not see her at the moment. She arranged to visit them "following week" for a discussion meeting. DOE appears to like the idea of a closer working relationship with Sandia. As to willingness to work, a member of their team indicated that "the CRADA process was as short as it will ever be." Most felt they got a cold reception even though they were provided with info they needed. "Do we in *Agreements* add any value to the process?" Though the question was brought up by Deborah, it was not discussed by the team. This could have been a key turning point on how the *Agreements* Team played the rest of the game. Nuclear weapons group does not know if they will be producing weapons in the year 2005. They are willing to trade Intellectual Property in exchange for a critical part of their success. It is not to be viewed as a give away - but are indeed looking for a strategic partnership.

More important discussion arose with a question, "What if in the year 2006 we do not exist anymore as a department, i.e., the lines are doing their own agreements?" What would be gained by that? Should our mission be to teach the line orgs how to do their own agreements? But our mission is important and is not likely to go away. What difference is there between our jobs and a buyer in purchasing? Art felt that buyers are more as processing function and not a negotiating function as we currently do. If we ever get to a 24-hour agreement our roles will go away. A 24-hr agreement is a shrink wrap agreement. But many people cannot live with a shrink-wrap agreement and our roles will never go away. Industries are all different and a statement of work must be customized and negotiated and every party needs to come to the same understanding of an agreement. The logistics of the game did not allow for engagement in lengthy discussions as some team members had to leave to visit their Sandia lines.

This game definitely pointed out the need for spending more time in Quadrant II of the four quadrants for the *Agreements* Team. We may also need to spend a bit more time "Sharpening the Saw," and get away from the perception that we don't have time to design a more effective fire hose while we are busily trying to put out all those urgent fires.

Ca. 4:00 PM. The pressure has forced the team to appear once more as simply a group of individuals. They are dis-

heartened by external information (from Kevin Murphy) about rumors or perception of no connection between Business Development Group and *Agreements*. Team member summarized it as, "I find myself sitting at the railroad station with a ticket to my destination, but I can't read." Hard to tell whether the team is working together. Two of the senior members of the team appear to be leading the communication more often, perhaps by nature of their seniority. One member is gone most of the time and may be salvaging the time for networking - has he given up on the game? Deborah had requested additional staff from DOE and informed me that I could now perform real clerical duties as a make-believe staff and got me to prepare and contribute in part to the team's delivery at the next plenary session. (Prepared vugraph for her presentation.) At this point I chose to stop sharing my observations too freely with them because they may be perceiving them as guidance and this may be perturbing the game. Sometime toward the end of the second day, the team selected a team member as leader or spokesperson for the team.

Day 3: The team appears a bit confused as to whether the game may be reflecting reality. Their reaction to the comment on the team being perceived as working in isolation brought out the urgency of working more closely with the Business Development Group. This indicated that the team does see everyone as their customer and whatever the customer says, "the customer is always right." "But this is reality!" None of the deals we have been doing have had any element of negotiation on our part. Most are brought already made for us to initial. A team member who was told "we will find someone else to sign the agreement," commented that in real life this would never happen. Team started to discuss an approach to more effectively involve DOE, but pressures of game forced some to go help an industry partner who wanted us to "sign off on this."

Team evaluated our perception that DOE is involved at the tail end of the process in a 'go, no-go' mode and reassessed our value only to the line orgs that have no experience with the process. Is this indicative of the trend to have more of the agreement function transferred to the line orgs once some training is provided? Revisited the objective of this game but again the pressure of the game cut it short and team did not appear to be of one mind. Team agreed to split up with two to talk to Business Development Group and three to talk to DOE.

The pressures of the game in the number of agreements that had to be worked on, now with more realism requir-

ing more input from the Agreements Team, may not have allowed for closing the loop with the Business Development Group and DOE. The hectic pace has forced some team members to pinch hit for others who are tied up in other agreements. (This perhaps may be in response to perception of team as not being responsive.) The discussion is very lively and a second team member from *Agreements* joins in the discussion. There appear to be a lot of issues to resolve and the pace for agreements has stepped up. Could be also that people now have a better sense of what it takes to do an agreement. SLI member wants to go to DOE to do a license and a member of our team tells her that we can do licenses. (This SLI member was very knowledgeable when she addressed the group in the morning session and it reflects the perception that Agreements only adds value to those orgs that do not know the process.) A member of the DOE team brings in a client with an unfinished agreement for some help.

Just as one of our team members makes a comment, "I'm having fun today," as he heads out to the bathroom, DOE creates a crisis for us by dumping a bunch of CRADAs that had been processed without DOE approval. Team member returns and promptly starts working on pile to resolve the crisis. His approach to the crisis reflects ownership of the process and this inspired our facilitator to assist him in resolving the situation by reviewing the individual problem CRADAs.

After the plenary session and break, the agreements crisis had been resolved and the pace got back to hectic for the team. No meetings or time for meetings with DOE have taken place to try and prevent the problem from recurring. Industry appears to be doing an end run and getting away with it, but the mechanism for addressing the issue is not being addressed. The team has no time to "Sharpen the Saw." Finally, a team member requested an appointment board because she had trouble saying no. (Also observed taking an aspirin for a headache! Facilitator also had to take an aspirin, though she blames the lighting for it. A second team member came to look for some aspirin - she has been involved with a team in long negotiations.)

Debriefing Session:

- Greatest Success? Being able to handle the hectic pace by being aligned with the line.
- What worked best in game? Interactions between the line orgs. - line-to-line partnerships.
- What didn't work? Business Development Group does the front end of the process, we do middle, and DOE handles the end. Had problems with approval

by control. What is a chit worth? Need to include IP besides money and people when dealing with chits. Did not streamline the agreement. Lot's of home-made agreements between line orgs and others.

- Key Learnings: Need to associate some financial value, licensing revenue, etc., to keep tab on pulse of agreements. Need a single point of contact. Collocation with the line was a great move. Got to find out what their technical objectives and roles were. When called in at the end there was no way that we could participate. If done properly, agreements can become a continuous flow where one leads to another.
- What ideas & initiatives should be implemented? We should be the owners of a process to map industries and technologies to our organizations. It is not at all clear who does what. These should be found on the web, the phone book, etc. Business development group suggested a joint meeting between them and TPC so we can have an idea of what each other is doing, e.g. how does TPC work with TVC?
- Follow-up activities, who owns? Market research workshop or training on how to do own.
- Comments: One of the most delightful things that happened here was one of the line organizations came up with some very creative ideas to solve problems or do things. Get select group of people from some industry and spend the afternoon in a focus group.
- The people from line that participated in this game were all motivated. They did not have to be here, they wanted to be here.

Compression of game did not allow for adequate development of business relationships, form, costs, etc.

DOE TEAM

TEAM COMPOSITION

Players: Everet Beckner, Lockheed Martin
 Gayle Dye, DOE/AL
 Bill Hughes, DOE/AL
 David L. Katz, DOE/AL
 Jeffrey M. Lenhert, DOE/AL
 Angela E. Padilla, DOE/AL

The team as a whole seemed to have some familiarity with at least some of the members. I would say that each person on the team knew at least three other people on the team, but there was no one person who knew

everybody. I think this helped the working relationship quite a bit. Everybody seemed to have enough familiarity to have a comfort zone, but nobody appeared to have an advantage of knowing everybody. The team had a variety of preparation levels. I feel like everybody had at least looked at some of the material, but it was also obvious at least a couple of the members had read the booklet information quite thoroughly. I am not sure how well any of the team members followed what their individual perception of the booklet was. Said differently, our team direction was somewhat disconnected. If the team members were following any kind of interpretation of the book itself, it was well masked.

DESCRIPTION OF PLANNING SESSION

Development of ground rules, roles, mission statements. I believe we had a very active group of concept participants for justifying any rule or regulation, but we never developed the kind of leadership within the group to decide on a direction, therefore we had none. In the group's defense, I can honestly say, we did not suffer from lack of participation. I think one thing that may have helped would have been to have assigned roles, which our members would likely have played well. Left to decide for themselves, order of process and chain of command put us off to a really bad start.

This led to a severe lack of direction. Given just a few hints or "assignments," this group would have performed miracles. Developing strategy and goals were a little beyond the upper limits. I think the group was totally sincere in their interest to do those kinds of things, but may have been somewhat handicapped by not being able to separate everyday duties from the concept of the game.

TEAM PLAN

Vision: leverage industrial partnerships with declining DOE resources to meet the DOE mission

How: streamline the process by addressing the following issues:

- cost - DOE added factor and depreciation
- advanced payment
- indemnification
- process time
- US competitiveness (domestic impact)

Grow the mission through

- Congressional support
- Administration support

- Industry support

HOW WERE STRATEGIES IMPLEMENTED OR IMPROVED

Our group was not task-oriented which did not lend itself well to much of anything relative to the game. Our greatest victories were accomplished under deadline pressure versus gridlock breakthrough. The majority of things accomplished were conceived in a mode of management-by-crisis. This was a struggle that never was resolved. We had several sets of dynamics which continually prevailed over other authority. As an observation, I believe if we had elected and empowered an individual to be group leader and spokesperson, we would have had a much stronger showing. There was a tendency in the group to lean towards "allowing one player control of the group" but he did not lead or direct it. There was also an effort to get the group into the game, but I think this was a little out of sync with the stronger dynamics of what seemed to be the core group at the table. I do not believe anybody at the table was resistant to the intent of the game, but the collective table could not decide or agree on what to do within the game. This was borne out strongly a couple of times. Several individuals took actions upon themselves which were, in my opinion, very much what should have been happening. A particular example, there were several times one player tried to promote some cause or logic, but would not run the risk of running afoul of the group dynamics.

TEAM DYNAMICS

The team was almost instantly aligned as a real-life mirror. I did not see real arguing. I saw fairly regular disagreement, but it was more of a brainstorming kind of an environment. I did not see what I perceived as any maneuvering for any personal agenda type things. I believe each member of the group did their best to try to contribute to the group.

TEAM SUCCESS

Some of the greatest successes for the team during the game were viewed by the team as failures. When the team stepped up to the challenge of doing something for the process (waiving the Depreciation and Overhead) they viewed it as a monumental collapse. When they finally did "bow to the pressure" they felt like the absence of traffic coming to them was evidence that the Depreciation and Overhead were not encumbrances, because they were not seeing the deals. I do not believe

anybody realized (for the purpose of partnerships) taking DOE out of some loops is a major milestone. It would be interesting to know what our team would have considered a major success.

WHAT WERE THE IMPACTS OF THE PANEL DISCUSSIONS.

The group seemed fairly convinced the game did not lend itself well to their participation. The time compression was felt to be a constraint that automatically removed some of the day to day issues to which they could have brought value. I am almost in agreement. I think the group would have been far more productive under somewhat different circumstances. I think if you had given assigned scenarios for each of the other groups to have solved, with some canned parameters and criteria, our group would have had some real issues with which to work and could have likely done some interesting stuff. Leaving our group to decide the role and mission of DOE would have probably played out better in a pre-arranged scenario. That may have been too limiting to have accomplished anything for the rest of the teams. I think the panel was quite positive, they just did not feel like the game allowed them to "show their colors."

Did the group express an interest in staying in touch? Interestingly, I have had several of the team members (individually, after the game) indicate to me they have the impression there will be another game next year, involving all the same players, and they will be back to do it again. Several folks have implied they have the impression we intend to make this some kind of annual game, for a "lessons learned" kind of experience. This is not planned.

Dave recommends that for the next game (he is implying we will be doing this on a regular, if not ongoing basis) we force industries to relate to issues. He specified less time compression and more detail into the individual scenarios. He stated many of the day-to-day issues could not be duplicated under the compression of this game, so people were ignoring the issues.

SANDIA BUSINESS DEVELOPMENT TEAM

TEAM COMPOSITION AND PREPAREDNESS

Players: Marie L. Garcia
David L. Goldheim
Dan L. Hartley

Kathleen Manicke
Ann Riley
Christie Stanley
Mary Ann Zanner

Familiarity with handbook and challenges? Appropriate expertise for roles? We felt most of the players had read their handbook and came prepared to play. One of the players felt she was in the 5% that could not handle the environment. She eventually overcame her initial lack of confidence, and was actually a benefit to her team (although she never conceded she was learning and contributing to the team and game). Another player was lacking in Business Development experience, and, even though she was very eager and energetic, she didn't seem effective in her contributions in the team discussions. We were not able to observe how she interacted with the other teams in her role as an SBD representative.

DESCRIPTION OF PLANNING SESSION

Development of ground rules, role assignment. The Business Development Team did very little planning. During dinner, the team decided that if they did not take a proactive role in the game, they would not be playing at all. In fact, it seemed their primary thrust was to make the SBD team relevant, not focused on making the best partnership agreements for Sandia. In the initial planning session, they agreed any one team member could sign off on agreements and the facilitator and analyst/recorder would be "home-basers," (by default, because the team anticipated they would not be at the table throughout the game, and this is exactly what happened).

Process: Challenges (what is the environment? what are the problems?) Their main challenge was to be a viable team. If they didn't establish themselves, they felt the other teams would not seek them out. They discussed partnering with the Agreements and DOE Teams to expedite agreements and lower the barriers. They also decided they would be the "intelligence" organization, would find out what Sandia wanted to offer and what partnerships industry wanted, and be a broker. They also wanted to find out what Industry views as an impediment to doing business with the Labs, how Industry can overcome the lack of understanding, and what Sandia can do to help industry understand and to overcome the barriers that will help the teaming process.

TEAM PLAN

Vision: Support the Labs' strategic objectives by enhancing the business base through industrial partnerships.

Role: To facilitate business development relationships between industry and Sandia line organizations; providing market intelligence capability awareness and to team with the Agreements organization and DOE to expedite contractual agreements.

HOW STRATEGIES WERE IMPLEMENTED

Did individuals feel empowered? The players decided they would empower themselves as a point of contact for the Industry and Line Teams and later felt this was a major move in the game. They were concerned as to how the other teams would perceive their role. A couple of the players were hesitant to take the initial step and we felt that the lack of knowledge in the Business Development area affected their initial perceptions and role playing in the game. Realizing their team was depending on them, these two players overcame their negativity, and lack of confidence, and established themselves with the Industry and Line teams. The "intelligence" part of it didn't work as well as it should have as the SBD never had time to regroup and share what each of them had learned, intelligence sharing was on an "ad hoc" basis. The team also made an executive decision that, in addition to there being a Business Development point of contact for the Line and Industry Teams, there should also be a Science and Technology Sandia point of contact for each of these teams. They appointed one expert from each Sandia team for this role without the expert's knowledge. A comment was made by one of these appointed contacts, that "having to wear several hats in the game was making it very hard to keep commitments."

Were moves in concert with strategies, or carpe diem? We were not able to see if the players were in concert with their strategies because they spent the majority of their time supporting their assigned teams. The level of their strategy did not go beyond carpe diem. In later discussions among the players, they decided that by taking the time to regroup more frequently, or spending more time at the start, they might have determined if there were overlapping technologies among the teams. This might have helped them build opportunities. They also decided to give the Competitor team a list of problems to tie up their game playing.

Competition vs. Collaboration; ability to partner:

The players initially determined they would not partner with the Competitor Team and continued this strategy until the Competitor Team made a few agreements that forced them to rethink their position. They took a poll among the Line and Industry teams to see if they wanted to partner with the Competitor Team. None of the Sandia line or industry teams initially wanted to partner with the Competitors either and this reinforced the SBD decision. Even when the DOE team sent SBD an email message to please come to the DOE table for a meeting, SBD showed a lack of interest. SBD was excellent in helping their individual teams build partnerships.

Broad vs. Narrow agreements/vision: The team developed two agreements (note both agreements were written by Ann Riley), and only one was instituted in the game. The successful agreement established a principal Sandia contact for Small Business Development. The second agreement stated that the SBD, DOE and Agreements Teams agreed to be present at all meetings from concept to conclusion for all Sandia-Industry partnerships. Even though Control had signed off on this agreement, a few of the SBD players did not agree with this process, and the agreement became a goal. One player tried to process an agreement for her Industry Team and became very frustrated with the process. The SBD vision for playing the game was very straight forward: "Represent their assigned teams and help this team with Business Development." The vision statement distributed to the other teams stated: "Support labs strategic objectives by enhancing business base through industrial partnerships." SBD wanted to be the "one-stop-shop" for partnering.

Did agreements correspond to the strategies? SBD wanted to get agreements between Sandia Line and Industry. Thus any action that ended in a partnership met the strategy. One agreement was initiated by SBD, to get the Agreements Team (AG) to have a Small Business Development person. There was little team effort to develop agreements, goals or milestones.

Links between agreements: Each team member worked as an individual and was involved in the development of their assigned teams agreements. There was only ad-hoc interaction.

TEAM DYNAMICS AND DECISION MAKING PROCESS AS GAME PROGRESSED:

The team dynamics were excellent. Each player worked as an individual representing their assigned teams and

were well received by the majority of the players. This was not only an individual effort, but an overall team effort as well. Dan Hartley tried to schedule a couple of meetings to get up-dates from the team, but because of the commitments to the assigned teams, they only regrouped twice, and not everyone was able to attend. The up-dates did seem to validate their strategy and they felt valued.

Minority position - highlights; were they considered or squelched. Ann Riley's agreement with DOE and the Agreements Teams was squelched. The team felt this agreement was impossible to keep based on their time commitments. The players were serious about their commitments to their assigned teams and showed signs of stress and were feeling pulled in all directions. In a sense, most minority positions were approved as each team member mostly did their own thing.

TEAM SUCCESSES, FAILURES, AND OTHER HIGHLIGHTS:

SBD felt they were well received by all the players, and were very successful in helping to build partnerships with Industry and Line teams. SBD helped their assigned teams resolve policy questions and small business problems with the Agreements Team; they established science and technology contacts for the Industry Teams, and they were successful in convincing DOE to also play an OFA (other federal agencies) role. One failure was not having time to develop business practices. The SBD was short one player and, as a result, Industry 4 and Sandia Line 3 shared an SBD POC. I-4 became neutral as to whether or not they needed help from the part-time POC that was assigned to them. The work load was not divided as dynamically as it should have been. One of the players was not as active as the others, but didn't offer to help the team player that was assigned two teams. They also did not work to develop an improved business strategy nor did they progress to a higher level of thinking. This was an excellent team, and the majority of the players were very knowledgeable about Business Development. They are real "people-people," aggressive and assertive. They were willing to take risks, integrated themselves well in the game, and received positive feedback for their efforts. But, in some sense, SBD seemed overly concerned about making deals, not partnering for the strategic benefit of Sandia or the US.

The following is a list of lessons learned taken from the debriefing sessions and the players:

- Co-locate line and SBD organizations
- Combine, or eliminate 2 of 3 of SBD/Agreements/

Tech Transfer organizations. Few from Sandia, and fewer from industry, understand current Sandia arrangement or who to contact for what.

- To improve our partnerships we must meet Industry need, not Sandia objectives
- SBD should insist on DOE involvement at the beginning
- Too many Sandian's descend on one customer
- Sandia does NOT know what Sandia does
- Too many lawyers at Sandia/DOE for mid-size companies, small companies get FREE help, large companies can match our lawyers one for one.
- NO improved Business Development planning noted
- What is the role of SBD?
- SNL must team with SNL first, then look to industry
- SNL must focus on a few objectives
- Give 1 goal to 1 person, as industry does, have some ownership
- Assign 1 Sandian to 1 customer as POC, Guide, have some ownership
- Letters of intent should be used more by Sandia
- SNL needs simplified, defined, well-understood, implemented, user friendly partnership process
- Partners want to deal with a person who can say "YES" just as when buying a car
- SNL Organization is very cumbersome for potential partners
- SNL should not assume Industry will learn and follow Sandia/DOE rules.
- Remember "we are Sandians" and must develop business in Sandia's interest.
- Sandia is too focused on our programs; strategic objectives
- Fine for DOE/DOD business
- Bad for partnerships, they want results, not to know they are part of our objective X.
- Industry has trouble understanding how we "package our technology"
- Roundtable discussions between Sandia and industry might help
- Corporate BD team might act as a clearinghouse for line BD person
- Sandia is too mission oriented, is poor at sales (DOE quote).
- Sandia is hesitant to drive hard bargain, gives away too much.
- Industry does not like partnerships, especially with govt., and especially with blocks/barricades in path.
- Industry values quality of work, after hurdles cleared.
- Sandia must decide to improve the joint work of the AG and SBD teams.

INDUSTRY 1 (II) - INFORMATION TECHNOLOGY AND ADVANCED COMPUTING

TEAM COMPOSITION AND PREPAREDNESS

Players: Jim Altamirano, Sun Microsystems, Inc.
 Kenneth M. Brown, American Enterprise Inst.
 Deirdre M. Firth, Albuquerque Economic Dev.
 Earl Fuller, Novus Technologies
 Don Hossink, IBM
 James Kesterson, Texas Instruments, Inc.
 Katherine Porter, Production Data Solutions
 Scott Sibbett, Intel

Familiarity with Handbook and Challenges: All team members appeared that they had read the handbook. Two members had participated in other Prosperity Games™.

Appropriate Expertise for Roles: Members actively participated in the discussions. The discussions by team members indicated a great awareness of what they believed is needed to position Industry 1 Team for the goals in 2005. The players represented their industry segment, Information Technology and Computing, very well since the majority of the team members work in that area in their current jobs.

DESCRIPTION OF PLANNING SESSION

Development of Ground Rules: Team worked well to select a CEO who will be solely responsible for making decisions and tracking of the chits. The team subdivided into subteams according to the goals. Subteams agreed to meet back hourly to discuss status of partnership progress and to learn of new partnering opportunities. The team specifically chose to focus in a technical aspect of information technology that they knew, or at least expected, would generate great interest in partnering from the other teams in the game.

Role Assignments: Team divided up into 4 subteams, one for each of the goals. Team players self-selected for one of the major goals and elected a CEO/CFO. Two team members were assigned to each goal team except for the small business team that only had one member. Each subteam was responsible for developing partnerships to attain their goal's milestones, and the CEO remained at the home table as the overall coordinator and final signature for any agreement or funding request.

Challenges (environment and problems): The team recognized that other teams will be very interested in teaming with our team. The team anticipated that it may be difficult under the time constraints to gather information on other teams as well as be at the team table to learn of other teams capabilities. It was recognized that the goals may need to be revised as knowledge about other team capabilities is gathered.

TEAM PLAN

Vision: We provide IT solutions for the ubiquitous computing environment.

Corporate persona

- global leader
- entrepreneurial
- profitable
- leading edge technology deployment

Markets

- home diagnostics
- suggested final product=secure end user medical diagnostics (potential spin off will be environmental monitoring applications)

HOW STRATEGIES WERE IMPLEMENTED

Did individuals feel empowered? The subteams took on the challenge and went out to establish agreements after learning Sandia and other Industry capabilities and how their goals could be aligned with Industry 1. Team members went out and negotiated the appropriate agreements consistent with attaining their team goals.

Moves in Concert with Strategies? Moves were very consistent with strategies. Moves were not contemplated unless there was directed benefit to the team's goals, and the progress against goals and milestones were tracked at the home table by the CEO.

Long-term or short-term thinking? Goals and milestones were established based on the desire to position the company for the long run, and the various goals were set up to be complementary such that when accomplished they built on each other from a business perspective.

Competition vs. Collaboration—partnering ability: The agreements were collaborative in nature, and, as mentioned earlier, the team chose a technical area within their industry segment that would lend itself to partnering with other teams in the game.

Table 8: Industry 1 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	Milestone 5 (8 yr.)	GOAL
Fundamental architecture-- encryption technologies, faster bandwidth, data integrity and security	Develop prototype, validate architecture by implementing secure network across DOE sites	Validate network architecture in other industries	Establish our secure network architecture as the standard for key industries verticals such as finance, financial services, etc.	Network upgrades	Commercialize a secure IT architecture and establish as a standard by volume
Conceived "country doctor" and expert systems for home health care	Prototypes delivered to SNL for AI expert evaluation (reference I1-1-2)	Debug/enhance with NAISTE to enhance Country Doctor, train/deployment via medical students, patient record info surety	Market	Sensor enhancements	Developed diagnostic solutions for the medical market
Consult with health care professionals to ensure patient care is optimized (effective human-computer interface)	Take "country doctor" to the country (Trial patient-doctor remote system)	Lead efforts toward development of information surety system so that health care professionals and patients have confidence in records.	Lead efforts toward development of super high-end computing platform so that future work loads are support and enhanced (quality of service)	Doctor-responsive enhancement-wireless communications facilitate clinic flexibility and rural travel	Develop remote doctor-patient interface
	Identify market opportunities, develop business plan	Create prototype for environmental industry	IPO/licensing	Wafer capacity	Create a small business spin off to leverage core technologies in other industries (i.e. Environmental, etc.).

Broad vs. Narrow agreements/vision: The agreements were sufficiently narrow to meet our goals, but also provided some latitude in order to help our partner meet their goals. This was viewed as being an opportunity to penetrate other markets and diversify use of our technology. The strategy was to establish goals and supporting milestones in a well-defined area and when that was established, expand the business into synergistic areas and applications. Each of the four subteams was responsible for refining and improving their own milestones as the game progressed and as new information from their own team and other teams became available.

Links between Agreements? The milestones for each were initially established to be very broad with considerable room for interpretation. As the players learned of the other teams' capabilities, the agreements became more specific and better defined. When the initial agreements were completed, then subsequent milestones were made more specific to build on the earlier agreements. Since the team was allowed to define both the goals and milestones, this adaptive strategy could be employed quite effectively.

Minority Positions/Opinions considered or squelched? Minority positions were considered equally among the players. Typically, discussion was held until all views had been heard and then a consensus position,

at least as close as you can get in the time constraints of the game, was taken forward as the team or subteam position.

TEAM SUCCESSES, FAILURES AND OTHER HIGHLIGHTS

The teams felt they had great interaction with other players both within the team and with other team players as well. The first agreement put in place was a "mega" deal and only cost two chits, a real bargain. Industry 1 was able to complete all of the milestones and goals during the game. The agreements included partnering with all industry teams, all Sandia teams, DOE and NAISTE.

One initiative pursued early by Industry 1 was to get DOE involved as early as possible in any potential agreement. The players felt that the decision makers (approval authority) had to be involved or you were potentially wasting time and resources unknowingly.

The requirement for the team to have one small business goal was difficult to accommodate since the team had defined themselves as a large business. They did discuss generating a spin-off business that would act more like a small business, but it would still have been partially or perhaps mostly owned by the main company. The team felt it would have been better to have a "small business" team since those businesses inherently operate considerably different from larger business.

FOLLOW-ON IDEAS (FROM SESSION 7)

No specific follow-on activities were proposed, although it was suggested that another game that was broadened to be regional in nature for partnering would be both interesting and useful.

Two suggestions for Sandia to make known were:

- Sandia should publish 'a methodology' for the process of developing partnerships with industry
- How important is partnerships to the Lab (metrics, etc.)?

INDUSTRY 2 (I2) - ENERGY AND ENVIRONMENT

TEAM COMPOSITION AND PREPAREDNESS

Players: Jean Gibson, Resource Interlink
Vincent I. Henry, Ford Glass Division

James Johnson, Technology Management Adv.
Robert McClain, Nalco/Exxon Energy Chemicals
Alan S. Nanco, Strategic Technologies, Inc.
Durand M. Smith, State of New Mexico

Familiarity with handbook and challenges. All members of the team appeared to have prepared themselves well for the game by reading the handbook and doing some preliminary thinking. A few had marked up the handbook with yellow highlighting and continued to consult the handbook as the game progressed.

Appropriate expertise for roles. Remarkably, all members of this group had already been deeply involved in partnering, in one way or another. Virtually every member of the team had an extensive history in forming, helping to form, or working in partnerships between separate entities. Robert McClain, for example, is involved in a joint venture formed between two competitors—each of which spun off divisions that had been competing to form the partnership. This real-world experience in partnering perhaps accounts for the obvious enthusiasm and cooperation with which all players in the group approached the game.

Vince Henry (Ford Motor Company), who also had extensive experience in partnering domestically and internationally, startled the group somewhat before the game began by announcing with some passion that he considered Sandia the most difficult of all labs to do business with due to the inflexibility of its lawyers. Sandia California, he noted, is like an entirely different company. He specifically cited a number of other labs with which Ford had partnered with little difficulty. Jean Gibson countered that she had found Sandia easy to do business with.

Vince's opening emphasis and preoccupation with partnering problems in the real world rang in a theme that was to resurface frequently throughout the game. Discussions in this group (and others) frequently slipped out of the realm of the game environment to focus on corresponding real-world problems, usually on problems encountered in attempting to partner with Sandia (about which, more later).

PLANNING SESSION:

Development of ground rules, role assignments.

Perhaps due to this group's previous experience with partnering—and to facilitator Bill McCulloch's excellent guidance—it readily discussed and agreed to a set of ground rules and to the assignment of roles and responsibilities.

In the brainstorming session, the group engaged in an enthusiastic, knowledgeable, lively discussion that ended with a conscientiously developed set of goals, milestones, and vision statement. They frequently questioned whether they were thinking out of the box enough.

Jim Johnson and Jean Gibson consented to role-play in a field in which neither were experts, noting that it was not the purpose of the game to iron out all the nitty-gritty aspects of a partnership.

TEAM PLAN

Table 9: Industry 2 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Development of new analyte-specific, on-line sensors for use under conditions encountered during the refining of petroleum materials (~350 C, 1000 psi, hydrocarbon gas and liquid phase.)	Development of computing protocol to be used as feed-forward process control software.	Link control protocol with sensor hardware. Pilot scale demonstration.	Implement new process control technologies.	Improve the efficiency of petroleum refining by developing and implementing on-line information technologies.
Develop high strength-low weight materials (vehicle weight not to exceed 1500 lb.) for body structure and power train application.	Develop high efficiency/low polluting engine and matching power train.	Complete evaluation and testing of prototype vehicle.	Job 1 for production vehicle.	Reduce auto emissions by 90%.
Develop high fidelity non-destructive tools and techniques for structural evaluation (e.g., corrosion, micro-cracks, delamination, etc.)	Establish programs to provide test bed aircraft and engines for developing and prototyping embedded NDI/NDE technologies, techniques and tools.	Develop embedded sensors, "smart" materials and components to monitor system and sub-system health and prognostics for predictive maintenance coupled to information synthesis and decision support tools.	Productize embedded sensors combined with "smart" materials/components with integrated information synthesis decision support systems to sell to major aircraft and A/C engine manufacturers for new and aging systems.	Reduce Aircraft & A/C Engine maintenance cost and time by 50%. Assume that there is an industry driven roadmap outlining the development of embedded sensors and smart materials and components capable of reducing and ultimately replacing current and emerging NDI/NDE techniques, methods and tools.
Assess current technology for site assessment capabilities.	Have a mobile site test and analysis capability.	Have alternative hazardous material treatment processes.	Integrate mobile test capability and new treatment options.	Reduce time and expense of hazardous material clean-up.

HOW STRATEGIES WERE IMPLEMENTED

Did individuals feel empowered? During the debriefing, team members felt one of the reasons they had been so successful was that they worked well as a team

and had also been able to work independently when necessary. While one member thought this had led to a bit of "lone rangerism" toward the end of the game, he

did not feel that this was detrimental to the team's effectiveness.

Long-term or short-term thinking. The group did contingency thinking and planning during the development of their goals and milestones.

Competition Versus Collaboration; Ability to Partner. Though the group appeared very comfortable with the planning exercise, it showed some hesitancy in entering the fray for negotiations. They wanted to do too detailed planning of the follow-on activities before they had made any contacts pertaining to the first steps. However, after a slow beginning, both teams (into which the group had divided) picked up steam and waded into the fray, successfully negotiating partnerships that met all their goals and milestones.

In the last hour or so of the game, the team seemed to run out of gas. They continued to work deals, but the level of energy was noticeably reduced. They appeared tired of the game and preferred to play reality. These folks are very involved in and committed to partnering generally and with Sandia specifically. While the facilitator considered pushing for the identification of additional goals and milestones, he had no assurance that that would have helped and considered that the "slow-down" was not necessarily bad. It didn't happen earlier in the game—and may have been an expression of a feeling of completion.

Did Agreements Correspond to Strategies? The team repeatedly measured the agreements they made with the milestones they had developed.

Links Between Agreements. Working with a firm foundation of vision, goals, and milestones, the team took an integrated approach toward successfully achieving them.

TEAM DYNAMICS AND DECISION MAKING PROCESS AS GAME PROGRESSED

Minority Position Highlights; were they considered or squelched? This team worked effectively as a team, in smaller groups, and individually. Each approach was implemented in this game. There really didn't appear to be a minority position in that each player freely expressed opinions. When others disagreed, they did so forcefully but not aggressively—and the issues that did arise were finally resolved in a give-and-take discussion.

TEAM SUCCESSES, FAILURES, OTHER HIGHLIGHTS

Robert McClain: "Our greatest success was also a weakness. We subdivided our interests and activities. We really felt empowered but by the end of the game we were substantially fragmented." (Others agreed heartily.)

Jim Johnson: "By working the way we did, we were all involved in the whole process, planning, working the deals, learning new technologies, etc."

Durand Smith: "We picked good goals. This was demonstrated by our ability to partner. We had to do very little modification of our original milestones to accommodate those of others with whom we partnered."

Jean Gibson, commenting on what worked about the game: "We saw substantial growth in understanding between industry and Sandia." (The ensuing discussion extended this to include understanding among various Sandia interests.)

Jim Johnson & Alan Nanco commenting on things that didn't work so well: "The game didn't really model the competition among various industrial interests, a significant part of doing business in the real world. Industrial firms really feel a competition for such technologies as those offered by Sandia."

Several team members pointed out that costs of R&D and costs of doing business were not effectively modeled.

Very important: Vince Henry (and others) wanted to know how the insights, etc., from this game would be communicated to other Sandians, especially to line technical staff, who did not participate in the game.

FOLLOW-ON IDEAS (FROM SESSION 7)

The team generally felt that the game should ensure that industry competes for Sandia's technologies. They felt it was important to include Sandia line technical people in the game. (They didn't consider whether industry technical people should be included.)

Perhaps the most important point of discussion was that while the game is effective, real-word round table discussions involving groups like our team need to address issues that arose during the game. There are things that can be done to improve the interfaces, but simply making a list of them, they felt, is probably not sufficient.

Vince Henry (Ford Motor Company) in particular urged round-table discussions in the real world. He met (outside the environment of the game) with Warren Siemens, Dave Larson, and the DOE folks to point out that the liability issue has turned many companies away from working with Sandia through user-facility agreements. Warren and Dave are continuing to work the issue with DOE.

Throughout the game, discussions continually strayed out of the game environment into the real world. Issues in which Sandia is largely out of step were frequently identified—liability, cost, focus on marketable products/services ...

Another topic that arose frequently was the apparent separation between Sandia business development and Sandia technical groups. Sandia apparently presents a fragmented front to prospective partners. There were many calls for Sandia to identify single points of contact to make prospective partners feel that they know what and who they are dealing with. Ideally, that point of contact would be a knowledgeable technical person who also knows how to handle and incorporate all the necessary support entities.

Things to take into real life: Jean Gibson: "A lot of business contacts (smile)! Thanks!"

Robert McClain: "A better realization of the complexity of Sandia as an organization.

Also (re building an organizational capability for marketing) it is easier to train someone who knows the market in the technology than to train a technologist in the market."

INDUSTRY 3 (I3) - ADVANCED MANUFACTURING AND ADVANCED MATERIALS

DESCRIPTION OF THE PLANNING SESSION

Players: Arlan Andrews, ACES
 Thomas Brennan, Micro Optical Devices
 Nissim Calderon, Goodyear Tire & Rubber
 John Goodyear, Ford Glass Division
 Karen L. Schneider-Austin, SAIC
 Janis Tabor, Council for Chem. Research

Development of ground rules. Fairly loose ground rules were agreed to as the need arose. Our team was very competent in creative business development, and they were ready to jump into the game without the need

for much process facilitation. Four of the six players were experienced in partnering with Sandia.

What did the discussion consist of?

- Immediate recognition and acknowledgment of the need to team with information technologies.
- Immediate willingness to include Sandia, some way, into the game.
- Good brainstorming. There was inclusion, listening, feeding off each other's ideas, probing for understanding. Obvious negotiating and business development skills on this team.
- Each technical team member had at least one goal that they promoted. The team easily selected four goals for the game, with minor modifications to keep them focused on the vision.

Team role development process:

- The team discussed and accepted the role as stated in the handbook.
- A well-organized suggestion for individual roles on the team was suggested by Janis Tabor, and implemented by the team. Their roles were as follows:
 John - CEO - stayed at home, controlled chits, dealt with exceptions
 Janis - team contact for other teams, monitored email, gathered intelligence and coordinated information among the other team members
 Tom - responsible for Goal 1 - Optoelectronics
 Arlan - responsible for Goal 2 - Prototypeless and rapid manufacturing
 Nissim - responsible for Goal 3 - Intelligent, engineered materials
 Karen - responsible for Goal 4 - Control and optimization of corrosion

Fidelity to team role. Team kept itself focused on its role. When they drifted out of bounds of the team role, they brought themselves back. They also revisited the specific objectives of the game periodically.

Vision: Process Issues

- The team struggled with how specific a vision should be, and how to incorporate the eight-year time frame into the vision.
- There was some confusion between vision and goals.
- There was discussion about whether we should assume that we can influence globally in this game. Nice discussion around current activity in international competition. Their conclusion was that business both now and in the future is global.
- Originally, the team came up with a fairly lofty set of goals. As they worked through the milestones and made them more technology specific, the goals

became more focused.

TEAM PLAN

Vision: Dominate the global marketplace through advanced manufacturing and intelligent materials.

Table 10: Industry 3 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Develop novel enabling light sources.	Manufacture to use with 3.3V electronics.	Improve manufacturing throughput and yield to >90%.	Develop novel integrated advanced packaging solutions.	Dominate the world in optoelectronic devices and systems.
Define existing manufacturing processes and select several pilot projects in areas of unit fabrication, mechanical and electrical assembly and continuous processes.	Develop modeling tools for each of these pilots.	Validation of each modeling tool with TBD.	Statistical reproducibility of validation data.	Prototype-less and rapid manufacturing.
Develop responsive materials with appropriate engineering properties.	Demonstrate conductivity in elastomers with no sacrifice in performance properties.	Validate the feasibility of integrating sensors to vulcanized elastomers.	Fabricate a smart tire.	Intelligent engineering materials (Small business focus).
Technology search and collection of existing processes and subsequent analysis.	Develop corrosion simulation processes.	Create and test material options.	Verification of product reliability.	Control and optimize corrosion through advanced materials.

HOW WERE STRATEGIES IMPLEMENTED?

Each team member could work with anyone in the game to find solutions to their assigned goal. The "CEO" kept loose tabs on progress to control dispersion of chits. For the most part, he did not need to judge comparative value of milestone progress since, through partnerships, the team had enough chits for most desired moves. Each goal was given a budget for each negotiation session - if the deal was 3 chits or less, there was no need for permission from the CEO. If the deal was greater than 3 chits, the person had to go to CEO to negotiate for more chits.

Did individuals feel empowered? Yes. But, we did not have anyone disregard the overt needs of other team members. Their roles were independent enough that the team did not take advantage of potential synergies among their goals until the second day.

Long-term vs. short-term strategies? Both, as appropriate. Short term was always measured against long

term. They did advance beyond carpe diem as they progressed and were able to plan and work issues in parallel.

Competition vs collaboration; ability to partner?

Industry 3 didn't see any competitors within the game so they felt free to seek collaborations in pursuit of their goals. Excellent at partnering. All team members were successful business people, with the requisite vision and skills to partner successfully.

Broad vs. narrow agreements / vision? Broad vision and creative, focused agreements to achieve it.

Move from local, concrete issues to global, abstract issues? Global vision from the start, influenced vision, goals and agreements.

Links between agreements? All goals had manufacturing, simulation, modeling, materials, and/or sensor development needs in common. All agreements built toward those goals.

TEAM DYNAMICS AND DECISION MAKING PROCESS AS GAME PROGRESSED;

The team members worked very well together. All positions voiced were treated with respect. Open, candid discussion was the norm, leading to consensus plans for action.

SUCCESSES, HIGHLIGHTS, LEARNINGS, OTHER SUGGESTIONS

Successes

- The team accomplished all their milestones and goals. They used their extra time and money for partnerships to strengthen their goals.
- Decentralized decision-making worked well due to role structure.
- The team developed trust among themselves and the cooperation was evident in their success.
- Great progress in partnering with other teams. On Thursday, our team was proactive in going out to find partners. By Friday, everyone was coming to us to make deals!
- The Red Team was the most refreshing. They really went out to hustle work, and find out about us, our goals. They knew their business.
- Dilbert would be proud of us - we didn't use any buzz words in our vision.
- We bought the Bahamas from the profits as a corporate retreat!

Highlights (What worked best in the game?)

- The decisions that had to be made were real life decisions, e.g., priorities, investments, and budgeting of time and resources.
- The real life environment (almost).
- The mix of players on our team was ideal for this role, and they all played their roles capably.

Learnings

- The team's original goals were too broad, and the vision was too all-encompassing. The team then scaled back their milestones and goals to specific actions that could be effective in partnering.
- This team participates internationally in their every day business. It would have helped to have some international context, maybe in the form of international business rules, for this game. There was some confusion around Sandia's perspective of the international scene. Sandia tries to recognize international threats, then protect the US against those threats. Industry sees other countries as a place to partner, to manipulate the situation in favor of their

interests. Industry (as represented by our team) did not see other countries as hostile entities, as it appeared Sandia sometimes does. Comment from player: "This game was too sheltered. We did not confront the issues that arise with multi-national companies. There was not enough of a multinational tone to the game. Reality is that our industries have many activities outside the US."

- Industry is interested in technology. Sandia is program oriented (within the game).
- The announcements did not change behaviors on our team (they were "non-events").
- It was very important at the beginning to have Business Development people around. They were a good resource for information - to find the right technical person and to learn Sandia's business process.
- Waiving of D & OH greatly enhanced the process of partnering
- Our team decided early to not concentrate on the chit value. They focused on the relative contribution (percentage) for the effort. The team members suggested that instructing other teams to do this might decrease the players' need to know the absolute value of the chits.
- It was not hard for a few of our team members to get additional money from Control.
- Participants had not realized how focused Sandia is on becoming industry funded.
- The team members appreciated having a better understanding of Sandia roles and responsibilities, and of the financial challenge that Sandia is under.
- The team members found this to be a good relationship-building opportunity
- Two players said that because of Battelle culture, PNL is much easier to work with than Sandia, however Sandia has superior technology and capabilities, and therefore we are "worth it."
- Industry is "the belle of the ball" courted by the laboratory.

Other Suggestions

- Idea - let a group (industry team) go belly-up, or do a general down-sizing in an industry area.
- Work on fewer goals, but work on more detail on "how" we will accomplish the goal. Need to go one step deeper. (Devil is in the details)
- Modify the training to explain the game moves and processes.
- Booklet needed an example flow of the whole process.
- Non-Sandia participants need basic information on types and terms of agreements.

- Tell Sandia teams not to send huge packages of information at a time like this!
- Consider allowing draft agreements to be entered in the computer (on the agreement form) and printed by team members for use in their negotiations.

FOLLOW-UP ACTIVITIES

Publish any changes that results from the customer input derived from the game

Circulate detailed results of players - highlight "unusual" actions (events) taken by specific teams.

Team members will use the Business Development team more effectively.

Nissim may do follow-on work on behalf of Goodyear with the microelectronics organization at Sandia

Arlan and Tom are from Sandia and their companies currently partner with Sandia. They both spoke about new ideas from the game that they wanted to think about.

ADDITIONAL INFORMATION?

Player comment: "It is interesting to observe the relationship between Sandia and the DOE. Playful "jabbing" camouflaging serious feelings. There needs to be a better relationship here - industry wants to work with the technology organization (Sandia). Sandia should make the DOE issues invisible to industry.

There was dramatic variability in our workings with Sandia groups. One Sandia group was involved in 3/4 of our milestones because of their manufacturing and sensor capabilities. The other three Sandia groups contributed to only 2-4 milestones each, although there should have been many more opportunities explored with S4. It took significant time to hook a deal with S4, and the other team members just didn't go to them.

INDUSTRY 4 (I4) - CRIMINAL JUSTICE AND NATIONAL SECURITY

TEAM COMPOSITION AND PREPAREDNESS

Players: Ernest W. Culver, Hughes Aircraft Co.
George Friberg, Technology Ventures Corp.
Jack Jekowski, Allied Signal
Marshall Musgrave, Raytheon TI Systems
Tom Sciance, Sciance Consulting

Joseph F. Tinney, SAIC
Edward Ungar, Taratec Corporation

It appeared that all team members had reviewed all the materials and were ready to immediately play the game. Several of the members had extensive underlining and margin notes. One player had gone so far as to create a list of goals as he saw them. (The majority of those goals became the group goals with some modification.)

It appeared that some team members had carried their real world workload/problems into the game and constructed team goals to address those concerns; i.e., because of a previous bad experience with DOE and Tech Transfer, a team member pushed to make goals non-partnering, achievement oriented. This was somewhat rejected by the other team members, but not entirely.

Team members represented, for the most part, DOD related industries. All were or had been employed with large firms and were well adapted to the give and take of the game bureaucracy. I4 started out in a unified manner in their goal development; however, as the game progressed the team was not particularly cohesive and unified in its approaches to deal making, i.e., members or groups of members were going out on their own and doing only generally goal-related deals. This was more prevalent at the end of the games rather than at the beginning.

PLANNING SESSION, DEVELOPMENT OF GROUND RULES, ROLE ASSIGNMENTS

The team planning sessions were generally chat and war story sessions regarding various battles with DOE, Tech Transfer, other companies, and personal feelings. Until reminded by the facilitator (several times) that time was critical and a product would have to be briefed, virtually no planning or game focus was made.

The team decided early on that they were to be an internationally focused company. They chose to not set individual roles, but agreed to react as the workload presented itself. The team evolved to group-think initially and then to smaller (2 or 3 people) group-thinks at the end.

CHALLENGES AND OBJECTIVES, STRATEGIES

The I4 group spent considerable time considering if it was a single company, a conglomerate, or a trade industry. Their decision to be a company, global in scope and

broad in market, influenced how they approached deal making. Their incentive was profit driven throughout.

INDUSTRY 4 VISION: A company that is world market leader in the provision of counter-terrorist products and services to governments and commercial organizations in financial, energy, transportation, and telecom systems.

There was no strategic planning or special considerations in creating objectives or goals. This was again influenced by the team decision to focus on terrorism.

Also, their focus on specific goals tended to be project oriented (prototype concepts) rather than business oriented.

TEAM PLAN

Vision: CTPS (I4) is a high technology company that is a world market leader in the provision of counter terrorism products and services to governments and commercial organizations.

Table 11: Industry 4 Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Seek alliances for software products and security.	US based authentication for hardware and software.	Develop global standards.	Integration of monitoring and services.	Develop and deploy a globally secure financial system.
Define candidate monitoring systems.	Develop monitor infrastructure.	Develop report structure and security.	Establish user base.	Provide a means to protect energy supply, production, and distribution systems.
Develop CBEP sensors for transportation systems.	Develop CBEP portal and environmental monitoring systems.	Manufacture and deploy CBEP systems.	Operate systems and... (proprietary data).	Provide a means to non-intrusively deter and contain threats to the security of transportation systems.
Develop partnerships and define key vulnerabilities and technologies.	Identify and establish key products and solidify partnerships.	Design, prototype, test new products and services. Sell in the US.	Market globally.	Provide a means to protect telecom systems and data transmissions for command and control.

STRATEGY IMPLEMENTATION

MOVES AND CONTINGENCIES, PRIORITIES. The moves were competitive in that they were only done to get the goal and milestone checked off. There were no strategic concepts exhibited. Even after several not so subtle suggestions to merge, buy out, sell out with another industry, nothing was done outside of the envelope.

COLLABORATION. Time driven. Working with others was an exercise in getting the goals checked off. Benefit to other groups was coincidental. Deals were primarily made on a one-on-one basis with SNL line organizations. Business development and Tech Partnerships relations were generally initiated by other teams and brought to the table.

EXAMPLE: Business Development (team's first outside contact) came to the table asking what I4 wanted/ needed for meeting goals. That information was shared. However, their next contact was from a line team without any knowledge of any Business Development input or contact. I4 struck a deal with the line team asking them to create the agreement. I4 was then visited by the DOE team to conclude the license arrangement. Oft times the deal was negotiated by someone not understanding or present for the initial discussions. The process became fragmented from the operational standpoint leading to some team frustration and confusion as to who was doing what.

LEVEL OF STRATEGIC PLANNING

Level of play was sequential. Deals were generally presented and not put together by I4 but some other team.

I4 would then evaluate what milestones it could reasonably mesh into the deal. Deals were then custom tailored to the milestone.

One interesting development was when SNL 2 tried to develop IP on which I4 felt it had an agreed exclusive position; I4 "sued" for relief. A favorable deal was negotiated which provided additional revenue to I4 through licensing and prevented SNL from any further sells of the IP.

Because of the kinds of deals structured (more by default than design) I4 rapidly became a supplier to line and industry teams of technology products licensed from the line. This created a positive cash flow for the team.

TEAM DYNAMICS

Initial discussions and introduction to how to play the game were dominated by T. Scianca, who had a bad experience with DOE when he worked with DuPont. He dominated by force of conversation and was usually opinionated. J. Jekowski was the intellectual leader of the group - studied, thoughtful, wanting to add structure. J Tinney pushed the direction for all the goals. His thrust was terrorism. E. Ungar was the administrative team manager. G. Friberg and M. Musgrave were doers as was E. Culver who was in and out throughout the game.

There really were not minority positions except for establishing what and where I4's market was. This market position, however, overrode all the goals and how I4 approached business deals. The market was determined through the overriding (and vocal) suggestion by a single member. It was adopted by the remaining team members in order to "move on" and meet time constraints of the game. This position ultimately narrowly defined the I4 opportunities and limited and precluded the group from considering other attractive offers.

TEAM SUCCESSES AND FAILURES

The team as mentioned above never "gelled." Though they all felt they had done well (because they got all the milestones checked off) they never acted as a single unit. They broke into ones, twos groups. Because the I4 team had a good cash income through license arrangements, they had more than enough chits and, therefore, were not forced to compromise and "bring it back to the table" for strategic discussions.

The team managed to meet all goals, even when an additional goal was added. They did in fact think through "milestone linking" which maximized their achievements per agreement and ultimately created income/return to the group.

The group successfully brought suit against a line organization that violated I4's negotiated IP position.

SUGGESTIONS (REAL WORLD)

Need 1-800 type number for initial contact to lab (like Battelle). The contact point needs training to be able to understand callers needs and line organization capabilities. - can't be just a telephone operator.

SNL needs an account manager (equivalent level contact person as caller) until question is answered. Note that different types of questions would be handled differently.

SNL needs to clearly define processing and contact procedures to client at start of process (license, agreement) until SNL/DOE decide what they want (don't change players; don't change rules of engagement; who's in charge of making the deal).

Lots of confusion about which lab does what. Needs to be clearly articulated and in industry's language not lab-ese.

COMPETITOR (RED) TEAM

TEAM COMPOSITION AND PREPAREDNESS:

Players: Michael D. DeWitte, Sandia
 Louise B. Dunlap, Oak Ridge National Lab
 Paul Fleury, UNM School of Engineering
 Warren D. Siemens, Sandia
 Frank J. Zanner, Sandia

This team did not ask any questions about or refer to the handbook. In the team's discussion on their strengths and limitations, they agreed that they had both a large amount of technical experience and a large amount of partnership experience. It was difficult to understand the team's role in the game and whether they could/would partner with SNL or only compete with them.

DESCRIPTION OF PLANNING SESSION:

The beginning conversations focused on becoming a virtual laboratory and marketing themselves to industry. Very early in the discussion, they wanted to rename themselves; they felt that "competitors" was too intimidating. Instead, they wanted to be called "cooperators." It was noted that work-force development was the key to the future. An advantage that they saw for themselves was to market their university students as inexpensive and diverse labor force. They also realized that they needed to capture and build the computer science area. A lot of the discussion focused on "revolutionizing engineering" but they felt they couldn't use that term since SNL already does. They wanted to focus on being an information intensive laboratory and wanted to create a consortia for revolutionizing engineering. We also wanted to capitalize on the education aspect and partner with industry to build the education system.

It was difficult to hold on to the objective "compete with SNL for partnerships" -- they were inclined to encourage SNL to join the Alliance. They initially wanted to partner with SNL on security (Red Goal 4), but soon were discussing them as a full partner. A main point that was brought up repeatedly was that we didn't want to compete with labs, we wanted to partner with them.

It was determined that this team would represent both labs (Berkeley, Oak Ridge, LLNL, and LANL) and universities (MIT, San Diego, Ill, UNM) and become the National Alliance for Information Sciences, Technology and Education (NAISTE). What we brought to the table with the labs was the best in innovative computer technology, high performance computing, and modeling, simulation, and validation. Through the universities, we provided access to education and training (both staff and students) and research in basic underlying science including computer science. By forming this Alliance, we gave DOE a framework to make the "systems of labs" a reality.

While discussing how to start the process, Frank Zanner commented: "Go to business development team if you want to delay the decision and buy time. If we really want to stall Sandia, go to the line. They'll feel threatened and set up road blocks. By that time, we'll already have agreements in place with industry."

The first plan was to get a DOE agreement. We wanted an umbrella agreement so that "quick and dirty" agreements were possible. The terms and conditions would be agreed to up front; only the statement of work and funds would change with each agreement. We wanted a streamlined process. Louise commented that "it will

take them (DOE) forever to understand anything new" such as a streamlined process, but agreed it was worth pursuing. A request would also be made for a waiver of the 25% overhead fee and the advance payment terms lowered to 30 days. It would be nice to have some of the funds be covered by the management fee, but it was felt that it would be asking for too much.

On intellectual property rights, the Alliance would own what we generated and would share royalties internally; industry would own what they generated and get non-exclusive access to our research; and it would all be proportional to the quantity of the investment made. (NAISTE is a non-profit organization to avoid the tax burdens.)

We realized that we were most vulnerable in infancy and needed to write the membership agreement so that SNL couldn't subvert it. We knew that in order to effectively negotiate with industry, we had to make sure our long-term goals were attractive. The universities would benefit by feeding revenue back into research and development; the labs would benefit by partnering internally. We needed to set ourselves up so that it was easier to come to us than go to SNL.

We believe that we could be the national leader for information, sciences, technology and education applications. We would be the "preferred" provider of information technology; we would do all that SNL does plus front-end work. We would be more cost effective than SNL, therefore, giving industry more for less. We also provide industry with a quick pay off with mature products; due to our diverse work force, industry immediately gets people and can develop long term relationships with universities with easy access to students.

We decided to look at the industry teams and determine which teams, 10 years from now, would be the most dynamic and plan to partner with them.

TEAM PLAN

Vision: We are the National Alliance for Information Sciences, Technology and Education (NAISTE). Our intent is to partner with industry to shorten the 'concept-to-market' cycle.

Table 12: Competitor (Red) Team Goals and Milestones

Milestone 1 (2 yr.)	Milestone 2 (4 yr.)	Milestone 3 (6 yr.)	Milestone 4 (8 yr.)	GOAL
Develop system for accurate national patient records database.	Develop human computer interface/visualization technology for diagnostic information.	Trial patient/doctor remote system involving university medical schools.	Integrate into nationwide system and market it.	Utilize computing and communication capacity for network patient information diagnostic system.
Develop a partnership team to integrate 1) feature-based solid modeling, numerical simulation and agile manufacturing, 2) testbed system into a web-based architecture.	Develop algorithms to enhance simulation.	Create a business to sell software and algorithm systems in partnership with industry.	Use industry and lab capability to validate models.	Modeling, simulation, validation.
Develop virtual education/industry process to match student capabilities with industry needs in information sciences and technology.				High technology human resource.
Develop a working relationship with others to address information security.	Develop secure information technology architecture plan utilizing encryption technology, modeling and validation.	Develop secure financial system based on our computer information surety and data reduction technologies.	Develop plan/proposal to partner for protection of sensitive information and data transmission.	Information security.

HOW STRATEGIES WERE IMPLEMENTED:

Plan development was accomplished through a process of incorporating industry interests first and fleshing them out to meet our goals. This process helped us meet our vision of partnering with industry and helping industry meet its needs.

A main strategy to keep SNL quiet was to partner with them on our Goal 4 (security) since they (SNL) are the undisputed leader in security. We assumed that SNL would be satisfied that we were negotiating with them and they would not know that we were negotiating with industry on Goals 1, 2, and 3. What we didn't expect was that SNL kept approaching us and used all of our time. We had to push ourselves out the door to make contact with other teams. Even though we explicitly agreed to compete against SNL, we always entertained their interruptions.

Our initial report back from DOE was not a resounding OK; since the labs use DOE funding, DOE wanted to be

able to separate out the funding. DOE also couldn't see letting the Alliance sign the agreement. We continued to work the issue. It was very important that we made the first contact with DOE (bought them coffee, got an early start on agreements, etc.). We did get the agreement passed through DOE and after the fact, DOE wanted more information on which they had agreed.

TEAM DYNAMICS AND DECISION MAKING PROCESS AS GAME PROGRESSED:

The team didn't seem to mind that one team completely shut us off (Industry 3, who partnered with SNL for free). We just let those milestones go without further pursuing them (manufacturing).

The DOE agreement umbrella gave us a jump start, but it got neutralized quickly. Although we had the quick advantage, we didn't jump on industry fast enough. If we could do it over, we'd have a number of agreements ready to capitalize on immediately.

We felt that the other teams were far behind – they were not ready to talk or make agreements when we were. Therefore, we felt confident that we were on the right track and ahead of the game. However, in planning for session 3, we still had all our chits and noticed the low level of agreements even though we (as well as other teams) had lofty goals. In response, we decided to develop a technology push (as opposed to pull). We decided that the world needed a breakthrough in information technology. We announced that in a joint project between MIT and LBL, a new switch that was optically driven, ultra high speed, and multi-wavelength was being developed. We felt this new technology would be needed in many of the other teams' goals. We were frustrated that no interest was shown from any of the other teams. The optical switch idea was a major breakthrough but no one understood the potential; we didn't have enough teeth behind the announcement. We discussed using Control to play Siemens or Lucent to leave the Industry 1 team in the dust. We've walked away from 50K to 200K projects because they were too small.

Much of our time was taken up by low-scope, low-cost projects. Our potential was so much larger, but no takers were willing to negotiate on that level. Frank Zanner noted that this also was very much the case at SNL. "SNL is too enamored about making a deal, whether it's a good deal or bad deal -- we (SNL) don't know when to walk away." We also noted that we were involved in more businesses (industry teams) than we thought we were initially interested in. This also is very reflective of "real" work with industry.

Although we complained amongst ourselves many times that our team did not have enough people, we still had time to talk to everybody that approached us and also pursue our goals. We felt that we didn't have enough people to go out and market our services. When we received a "loaned executive" in the final session, we immediately put him to work on an agreement we already laid the groundwork on -- no new ideas were generated from this person. We also assumed he knew who/what we were -- there was no briefing on what his specific job would be; he was just given some chits and went to negotiate the Center of Excellence with DOE.

Moves discussed to side track SNL included: 1) Taking Industry 1 up on their offer to recast their business and team with NAISTE (with our intellectual property). We would take an equity stake in their business. We hoped this would make them rescind their agreements with Sandia. 2) We also pushed to have the SNL agreements

looked at for validating they made the time frame required for the DOE waiver.

As session 3 continued, it became increasingly difficult to provide competition to SNL. We were focused on partnering with industry and rarely saw or heard from SNL. They stopped approaching us concerning membership in NAISTE.

TEAM SUCCESSES, FAILURES, OTHER HIGHLIGHTS:

Our goals and milestones continued to evolve in response to the needs of industry. We focused on their "large-scale" needs providing the basic research and technology.

By forming NAISTE, we helped SNL/industry to think out of the box. We had the DOE waiver in place first to make industry partner with us. We gave a wake-up call to SNL. We also formed our milestones after reviewing industries' and incorporating their goals into ours.

OBSERVATION: Almost all of our visits/requests were from industry teams – we had built trust with them in the beginning sessions and they were eager to partner. We were the first to respond to the need for human resources for science and engineers. We went to DOE and proposed the "Center of Excellence" and rapidly developed it. SNL was not involved and showed no interest.

Team Successes: We felt that the alliance was a good complication for Sandia. We also thought that the Center of Excellence idea was a good one. We also adapted easily to industries' needs.

Worked Best: Our small size enabled us to be single points of contact to our customers. We used industry input early to develop our plans. This team was easy to reach consensus; no conflict. The deliberate long-term planning worked well, but became frustrating as others were "seize the day" and behind.

What Didn't Work: It was difficult to determine how to have an impact on the system. There was no focused competition between us and SNL (except on corrosion and information security issues). The game could have used non-linear time (slow to start and then increase). **CHIT CONSISTANCY!** No emphasis on return on investment; accumulation of wealth; no way to measure the value of activities/deals. Where were the risks? Need to factor in more real risks.

Key Learnings: If you don't understand entity's decision making process, there is little chance of success. Industry is interested in universities for much more than engineering (e.g., medicine, law, political science).

FOLLOW-ON IDEAS:

Ideas to Try in Real Life: Business development and agreements should be together in the SNL line. What is the value in labs partnering (with each other and with universities on very specific thrusts)? Target industry groups with key points of contact. SNL needs to encourage/reward partnering champions. Put pressure and opportunities to change. Allow Warren to spread out partnership goals -- incorporate (carefully) into performance review.

Coordination (re: development and protection) of IP between labs and universities -- specifically TP and STP (Paul Fleury/Warren Siemens)

Update "Core Competency In-Reach Project Report" report generated ~5 years ago by Marie Garcia (possibly in less detail). Use as a map/key to plan and let different parts of SNL know what others at SNL are doing.

General Observations/Quotes From the Team

Members: Paul: "We've seen a clear added value, since we come to them (industry) as partners as one group (universities and labs); we have expertise in both areas. SNL should be looking for ways to do something like this. Not much interest from industry in what SNL had to say. Didn't say anything about packaging what they had for industry, rather just these are our missions (never mentioned DOE, either). It's a dilemma in trying to work with industry to make it fit into mission, but still bring in outside work."

Louise: "Labs are there for their own capabilities, not so much trying to figure out what industry wants or needs."

APPENDIX C - SUMMARY OF MOVES

For all moves listed below, the time is the time the emailed copy of the move was sent to the Control Team. In many cases the move was made and approved minutes or hours before the timestamp shown. If no time is given, there was no email copy sent.

SESSIONS 2 AND 3

Move #1: Red-P-01 (9/4 10:04am)

Both email and hard copy

Agreement type: Policy

Additional milestones: none

Details: Create an umbrella CRADA agreement with a virtual system of DOE Labs (LLNL, LANL, LBL, ORNL) and group of universities (MIT, UCSD, UI, UNM) to be a National Resource for information sciences, technology, and education. Our intent is to partner with industry to shorten "concept-to-market" cycle. Focus will be on building capacity, model/simulation capability, information management, and information security. Individual projects will be scoped and costed with industry within umbrella scope. DOE has given advanced approval through:

- Standard terms and conditions from master CRADA
- DOE waives depreciation and added factor

Cost: 0 chits

Move #2: S2-01-01 (9/4 12:54pm)

Email copy only

Agreement type: Policy

Additional milestones: none

Details: Obtain agreement on control of SNM and nuclear weapons with Russian Federation. No cost.

Copy of signed treaty available.

Treaty written between US and Russia

PROPOSED AGREEMENT BETWEEN THE UNITED STATES AND THE RUSSIAN FEDERATION on the Identification and Control of their Special Nuclear Material and Nuclear Weapons. In recognition of their mutual national security goal of eliminating the threat of nuclear weapon proliferation, the United States of America and the Russian Federation agree to the following provisions to identify and control their respective stockpiles of special nuclear materials and nuclear weapons:

- Both countries will declare their stockpiles (amount and locations) of all special nuclear materials (UO₂, PuO₂, U₃O₈, and other materials);
- Declared stockpiles will be monitored using technology systems to be specified in a technical addendum;
- Either country may withdraw materials for commercial use subject to full IAEA safeguards;
- Both countries have declared their respective stockpiles under existing and/or proposed bilateral arms control agreements (e.g., START I, START II, START III);
- Each country will declare a set of sites where nuclear weapons may be present—there is no requirement for a detailed accounting of weapons at specific sites. However, nuclear weapons may not be present at other locations;
- Each declared nuclear weapon site is subject to perimeter monitoring to ensure that undeclared weapons do not enter or leave the site without declaration;
- Each country reserves the right to withdraw from this agreement under conditions of supreme national interest;
- Each country will have a quota of challenge inspections to confirm that nuclear weapons are not present at undeclared facilities.

Move #3: S1-04-01 (9/4 1:22pm)

Both email and hard copy

Agreement type: Internal

Additional milestones: none

Details: For the first time weapons are being kept in stockpile beyond design life. Data from Stockpile evaluation program does not exist for weapons of this age. We must survey all component and subsystem engineering orgs for seven weapon types and 100's. Classified information precludes partnering of major components to rank the risk (safety, security, and reliability) associated with component failure. The materials organization and engineering analysis orgs must use known material degradation mechanisms and stockpile evaluation data to rank order the likelihood of failure. This must be done for all weapon systems and modifications. Cost and schedule: 1 year and \$1M. Internal SNL. Classified information precludes partnering.

Cost: 2 chits

Move #4: S2-01-02 (9/4 1:30pm)

Email copy only

Agreement type: Policy

Additional milestones: none

Details: Obtain agreement on control of SNM and nuclear weapons with Russian Federation. No cost.

Copy of signed treaty available.

Cost: 0 chits

Move #5: S4-01 (9/4 1:44pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S4-04-01, S4-03-01, I2-01-01, I2-04-01, I4-03-01, I4-03-02, S2-03-01

Details: Identification, test and evaluation of microsensors for the rapid, accurate, mobile and inexpensive detection of chemicals including explosives, chemical wastes and pollutants and chemical toxins. Cost and schedule: \$300K from I2 over 2 years. \$300K from I4 over 2 years. \$150K from S2 over 2 years. \$150K from S4 over 2 years. Exclusive license to I2 for environmental clean-up uses. Exclusive license to I4 for private security uses. Nonexclusive license to Sandia for its own uses.

Cost: 4 chits

Move #6: Red-03-01 (9/4 1:46pm)

Both email and hard copy

Agreement type: Technology

Additional milestones: S1-04-02

Details: To produce a Q-switched laser to satisfy requirements as specified by Sandia resulting in delivery to Sandia of the working tested and validated devices. Cost and Schedule: \$1M over 2 years, work to be performed by NAISTE member MIT (2 yr. agreement). Nonexclusive, royalty-free license, 100% funds-in-agreement.

Cost: 2 chits

Move #7: I3-02-01 (9/4 1:52pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S1-03-02

Details: Define a generalized software package that facilitates the "virtual assembly" of electrical, mechanical and electromechanical databases that derive from CAD, CAM, and CAE. The goal is to assemble, on a computer, parts that are provided by sub-contractors using different software and platforms. Cost and schedule: \$10M over 2 years - includes on-floor demo (60% SNL and 40% industry). 40% funds in to S-1 to develop software capability. IP - license for field of use to I3 CRADA.

Cost: 5 chits

Move #8: I1-04-03 (9/4 2:13pm)

Both email and hard copy

Agreement type: Private CRADA

Additional milestones: I1-04-01, I1-04-02, S1-02-02

Details: The objective of this agreement is to initiate and launch into the public sector a small business that sells medical products based on Sandia technology in micro-systems. This agreement provides the DoE with a cost-effective means of prototyping and producing microsystems for weapons monitoring. In specific, the objectives are: (1) Design the mask set for prototyping an inertial sensing micro-system that is capable of detecting the fall of a human body, e.g., for use in monitoring an at-home elderly person. (2) Manufacture the prototype at the MDL. (3) Debug the prototype, i.e., evaluate design flaws and inadequacies relative to performance, robustness, manufacturability and/or packaging. Cost and schedule:

Objective	Due	Funds-in	DoE	Total Cost
1	Q1 99	100	0	100
2	Q3 99	200	0	200
3	Q3 00	400	0	400
4	Q4 00	500	0	500

100% Funds-In CRADA. Agreement to License including non-exclusive rights to Sandia Background Intellectual Property, and exclusive rights in a pre-negotiated Field of Use for Sandia Rights in CRADA generated Intellectual Property.

Cost: 2 chits

Move #9: S3-02-01 (9/4 2:21pm)

Both email and hard copy

Agreement type: MOA

Additional milestones: none

Details: Write a memorandum of agreement to collaboratively develop a DOE/Industry/Laboratories initiative in the area of assessing the surety of the deregulated electric power industry. Cost and schedule: Write the memorandum by 10/1/2000 and draft the initiative by 10/1/01. Existing energy area funds (approx. 1/2 chit) will be used to develop this initiative.

Cost: 0 chits

Move #10: I3-04-01 (9/4 2:28pm)

Both email and hard copy

Agreement type: UF

Additional milestones: none

Details: (1) Obtain scientific study results from corrosion studies and technical consulting expertise from Sandia. (2) Possible technical assistance in testing validation phase. Cost and schedule: User facility agreement: \$20K for 6 months plus consulting. Disposition of DP - Rights to reuse and resale technology.

Cost: 1 chit

Move #11: I4-01-01 (9/4 2:35pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S3-01-03

Details: This is a 3-year, \$12 MM CRADA between Industry Team 4 and Sandia Line 3 on technology for security of electronic financial transactions. (1) Sandia will provide existing technology under an exclusive license in the banking and finance field of use (fee). Cost and schedule: 8 people each from Sandia and I4 Corp., for 3 years, to develop technology. Total cost estimated to be \$12 million. From S to I on both existing technology and future jointly-developed technology in the field of use. CRADA could not bar eventual global use, although initially both manufacturing and sales will be primarily in the U.S. Parties have the right to renegotiate in the future as technology and market conditions change.

Cost: 5 chits

Move #12: S1-01-02 (9/4 2:50pm)

Both email and hard copy

Agreement type: Cost-shared procurement

Additional milestones: I3-02-03

Details: I-3 delivers 10 units of Component Z, using MSBLCE tools, and qualified to QC-1. This qualifies I-3 as an MDE supplier. S-1 pays I-3 one-half cost of 10 prototype units. Cost and schedule: (1) Ten components delivered by Year 4 by I-3. Total cost = \$200K. (2) Sandia provides 0.5 FTEs, evaluating product, verifying and validating. \$100K (1/2 of cost) provided by S-1.

Cost: 2 chits

Move #13: S2-02-03 (9/4; email 9/5 12:03pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S2-03-01, I3-03-01, S1-04-02

Details: Based on Sandia's intrinsically conducting polymers, modify engineered material to achieve conductivity materials (1/1000 the conductivity of copper) that will survive dynamic stressing (60 Hz @ 1-10% deformation for 1e6-1e8 cycles). I3 performs testing; Sandia develops and provides materials. This project supports sensors systems for reduction of weapons of mass destruction. Sandia to provide materials in 18 mo. Industry to complete tests within 2 years. Sandia effort 3/4 MY (\$150K), Industry effort 1/2 MY (\$50K). I3 receives royalty-free license to IP rights. Team 3 to pay for Sandia effort, contingent on availability of funds. Will renegotiate if narrow enough to be only US opportunities are limited.

Cost: 2 chits

Move #14: S4-01-01 (9/4 3:02 pm)

Email copy only

Agreement type: Funds-in CRADA

Additional milestones: I4-03-01

Details: Develop vulnerability assessment and threats for NBC agents. Cost and schedule: One chit - deliverance, Four FTEs - \$1M. Five-year CRADA protection agreement to license for IP developed in CRADA. DOE lead waived.

Cost: 2 chits

Move #15: I2-04-01 (9/4 3:20pm)

Email copy only

Agreement type: ESTT

Additional milestones: none

Details: To have a member of the Sandia Technical Staff take an Entrepreneurial Separation to Transfer Technology (ESTT). SNL employee: David Sandison. Length of ESTT: 24 months with possible 1-yr. extension. Effective date: June 1999. Licenses involved: None

Cost: 0 chits

Move #16: S3-01-03 (9/4 3:21pm)

Email copy only

Agreement type: CRADA

Additional milestones: S4-03-02

Details: 1. Sandia will provide surety assessment and mitigation recommendations for systems as provided by customer (Industry 4). 2. Development of network monitoring and response and protecting/mitigating technologies for databases. Cost and schedule: Sandia to industry on both existing technology and that to be jointly developed in field of use (finance and banking). Schedule is three (3) years. Cost is 16 FTEs. License exclusive banking and finance filed of use-fee plus royalty. CRADA could not bar eventual, global use although U. S. could be market for first Xyears, have right to renegotiate re the future.

Cost: 5 chits

Move #17: S2-02-01 (9/4 3:34pm)

Both email and hard copy

Agreement type: ?

Additional milestones: S2-01-02, S2-01-03, S1-02-01, S4-03-02

Details: Spin-off company to manufacture security ID location system. Provided sensors to SL-1. Cost and schedule: \$1M venture capital from control, \$500K each from SL-1. Entrepreneurial business. Sold business. \$500K to SL-1, SL-2, SL-4 in year three (no year money). \$500K in year one, money to control. \$7.5M from I-4 to JMT

Cost: ?

Move #18: S4-01-03 (9/4 3:49pm)

Both email and hard copy

Agreement type: CRADA, agreement to license

Additional milestones: S1-03-03, I1-03-04

Details: Develop high-end simulation capability functioning on secure IT network to provide tera class capability on demand using autonomous computing agents. Cost and schedule: Year 1 - Hardware development and prototype. Year 3 - Beta testing for medical demonstrations. Year 4 - Beta testing for threat and nuclear weapons needs. In-kind contributions (\$500K), CRADA plus agreement to license. \$500K funds-in. ASCI contributions

Cost: 4 chits

Move #19: S2-03-01 (9/4 3:53pm)

Both email and hard copy

Agreement type: ?

Additional milestones: I4-03-01

Details: Informal agreement with counterpart in situations in sensitive countries (China, India, Israel) to implement DOE charter to pilot prototype monitoring systems on-site in nuclear facilities that will contribute to international monitoring agencies to prevent the threat of use and/or spread of Weapons of Mass Destruction. This agreement is backed by existing agreements between SNL and industry and within SNL to participate in this program. Cost and schedule: 1/2 chit per year for sensor development (S2) (S1 contributing 1/2 chit per year). Work with telecommunications industry will come under the umbrella agreement worked between SNL and I1. Work with microelectronics industry will be performed under umbrella agreement with I4. Letters of intent with I4 will be used to share info needs and resources and commercial development plans. Government use of LANL and other DOE lab technologies will be implemented by SNL.

Cost: 2 chits

Move #20: S2-01-04 (9/4 3:54pm)

Email copy only

Agreement type: treaty

Additional milestones: none

Details: Establish agreement for international SNM and nuclear weapon accountancy: An agreement to establish an international organization to monitor accountancy of SNM and nuclear weapons. The United States of America and the Russian Federation, in recognition of their earlier agreement to monitor and control SNM and nuclear weapons, do hereby establish an international organization to accomplish the goals previously established on a bilateral basis.

- This system will be under the auspices of (and be funded by) the First Committee of the UNGA.

- The new organization will be referred to as the International Nuclear Weapon Control Agency (INNWCA).
- INWCA would consist of a centralized monitoring repeater which will display and archive information from the SNM and weapon monitoring systems in member states.
- INWCA will be staffed by international civil servants under the direct control of a Board of governors elected by representatives of the member states.
- New states may enter this agreement by signing an agreement similar to the bilateral agreement currently in force between the US and the Russian Federation.

Cost: 0 chits

Move #21: S3-03-02 (9/4 3:55pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: I4-03-01

Details: Joint development of sensors for monitoring explosives, biological hazards, environmental pollutants and personnel access for application with integrated information and verification systems. For application in transportation and other critical infrastructure protection. Cost and schedule:

Proof of principle: Yr. 2 2 FTE

Prototype development: Yr. 4 2 FTE

Systems Integration/installation: Yr. 6 TBD

35-65 cost share, labs-industry. (15% funds-in cash to SNL for some SNL labor.

Cost: 5 chits

Move #22: Red-01-02 (9/4 3:56pm)

Email copy only

Agreement type: Private CRADA

Additional milestones: I1-02-03, I1-03-01

Details: Enhance our existing expert system for the requirements of the medical marketplace. Assure that the human interface is doctor friendly so that they will use it and patient friendly so that it will be embraced in the home. Cost and schedule: 2 year development schedule, total cost estimated at 10 doctor years. Funds in. Company has exclusive use of IP.

Cost: ?

Move #23: Red-01-03 (9/4 3:59pm)

Email copy only

Agreement type: Private CRADA

Additional milestones: I1-03-02, I1-02-03

Details: Conduct beta site testing utilizing university medical resources. Includes debugging of hardware/software system. Also develop university training programs for doctors. Cost and schedule: 1 year schedule. Total of

20 medical student years. Funds in.
Cost: ?

Move #24: I3-03-02 (9/4 4:03pm)

Both email and hard copy
Agreement type: Purchase
Additional milestones: none

Details: Elastomeric materials of high conductivity were developed in milestone #1. In order to fabricate useful products with these materials we need to develop process technology such as: extrusion, injection molding, vulcanization, etc. and demonstrate that the material does not lose its electric as well as its engineering properties during this essential processing step. Cost and schedule: 1. Secure volume quantities of conductive elastomers for process development studies (100 lb. - 10 tons) (\$30K). 2. Carry out process development studies (done). 3. Confirm no attrition under long-term service (\$150K). I-3 bears the cost of material (item 1) and performance confirmation (item 3). Outside equipment manufacturer (Control) bears cost of item 2.

Cost: 2 chits

Move #25: I2-02-02 (9/4 4:19pm)

Both email and hard copy
Agreement type: CRADA
Additional milestones: S3-03-03

Details: Simulation of combustion process of air/gas flow during development of high efficiency internal combustion engine. Statement of Work attached. Industry/Sandia cost share. Use of existing modeling capability. Project duration 27 months. 2FTEs. 5 yr. IP protection. 100% industry /Sandia

Cost: 2 chits

Move #26: I3-01-02 (9/4 4:34pm)

Both email and hard copy
Agreement type: CRADA
Additional milestones: I2-03-01, S4-03-03

Details: Develop and manufacture a portable, miniature, low power and low cost optical sensor for the continuous or periodic sensing of a surface for various morphological changes, including delaminations, phase changes, and other changes in surface structure. I3 will manufacture the optical sensor and sell and support the sensor integration into I2 and SNL1 applications. In addition to this I3 will sell to I2 previously acquired corrosion data. Cost and schedule: \$2M over 2 years split equally between the three parties. 50% Price break to I2 and SNL1 on subsequent purchase orders. I2 to Pay I3 0.5 chits for previously acquired data. I2 to buy off the shelf sensor to improve resolution for 0.5 chits. Intellectual property generated by the consortium to be jointly

held, with first right of refusal going limited exclusive to I2 and I3. SNL1 will get an unlimited non-exclusive right to manufacture and use all technology associated with this consortium in their DP systems. Royalty rate to be 5% on anticipated sales of \$10M two years after the CRADA is over.

Cost: 4 chits

Move #27: S3-03-01 (9/4 4:37pm)

Both email and hard copy
Agreement type: MOU
Additional milestones: none

Details: The LA area has been selected as the site for the full-scale implementation of the metropolitan road transportation efficiency propriety to develop working technology/systems to improve the on road transportation efficiency (reduce energy and emissions per passenger mile traveled) in large metro area. They (LA) will participate as an in-trial contributor in the preferred concept definition. I2 has agreed to participate as the industrial partner providing transportation vehicles. Sandia will work with I2 is the design definition of the complete transportation system and vehicles. In kind contribution by LAMA (Los Angeles Metro Authority). Infrastructure to support demonstration.

Cost: 0 chits

Move #28: I2-04-03 (9/4 4:40pm)

Both email and hard copy
Agreement type: Internal R
Additional milestones: none

Details: Research patented technology on process for treating contaminated solids/fluids to reduce the contamination level to environmentally acceptable levels. \$100,000 - in house - Sandia too busy. NAISTE not interested in this specific area. No IP being developed. Obtaining license on pre-existing technology which will meet our needs or be adapted to meet our needs.

Cost: 1 chit

Move #29: Red-02-02 (9/4 4:45pm)

Both email and hard copy
Agreement type: ?
Additional milestones: I2-01-02, I2-01-03

Details: Develop computing protocol to be used as a feed-forward process control.

- Develop predictive algorithms and ladder logic.
- Simulate the process stream.
- Link control protocol, including ladder logic with sensors.
- Conduct validation experiments at industrial site.

Cost and schedule: Year 1 -- algorithms and simulation. Year 2 -- validation, link control. Funds in \$250K. Agree-

ment to license -- no fees
Cost: 3 chits

Move #30: Red-02-04 (9/4 4:49pm)

Both email and hard copy

Agreement type: ?

Additional milestones: I3-03-04

Details: The fabrication of elastomeric materials of high conductivity has been demonstrated. Computer modeling. Cost and schedule: \$1.5M -- 18 mos. 50/50 split of costs to develop

Cost: 5 chits

Move #31: I3-04-03 (9/4 4:55pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: I3-04-02, S4-04-03, S1-04-04

Details: Sandia to perform TFlop calculations for prediction of varieties of materials under different corrosion conditions and to provide optimal solution for materials to use for oil/gas pipeline (external coatings and base materials) and sensor applications. I3 to conduct the validation efforts and share the data with Sandia. Cost and schedule: \$500K / year for 3 years (\$1.5M total) funds in. Agreement to license IP.

Cost: 3 chits

Move #32: S4-04-02 (9/4 4:59pm)

Both email and hard copy

Agreement type: License

Additional milestones: none?

Details: Create prototypes of top microsensor technology and test it to develop data on its analytical performance, cost, manufacturability and cycle-times. Cost and schedule: \$1,250K over two years. \$500K from I2 over two years.

Cost: 5 chits

Move #33: I4-03-03 (9/4 5:07pm)

Both email and hard copy

Agreement type: Internal

Additional milestones: none

Details: We will begin mass manufacturing Invest to breakeven is estimated at 1/2 chit. Time to development is 3 months. Internal effort.

Cost: 1 chit

Move #34: S1-01-01 (9/4 5:22pm)

Both email and hard copy

Agreement type: CRADA?

Additional milestones: I1-01-01, I1-01-02, I1-02-01, I1-02-02, I3-01-01, S3-01-01, S4-01-02

Details: SNL Milestone 1 is to have an integrated Inf. system in place for the entire DOE complex that

includes expert systems for design, processes, and historical databases. In teaming with industry we will acquire an integrated IT system (from I1) and a prototype device from I3 that will be able to handle the increased bandwidth. Sandia will provide testing of the developed system, DOE wide. SNL will verify the system. We will verify and validate the available architecture and system, and eventually add an encryption element to the system. Cost and schedule: The cost of the development of the system will be accomplished through in-kind contributions. The initial time frame for the completion of the work is two years. Within 1 year we will be able to tell industry if the integrated IT system is working. S1-2 FTE for 2 years. S2- contributing funds but no FTEs. S4- 1 FTE for 2 years. S3- 1FTE for 2 years. Total cost = \$3M. Cost: 6 chits

Move #35: I4-01-03 (9/4 5:23pm)

Both email and hard copy

Agreement type: CRADA

Additional milestones: I4-02-02, I4-04-03, I1-01-03, I1-01-04, S3-01-02, S3-01-03, S3-01-04, S3-02-02, S4-02-02, S4-01-01, S4-01-02

Details: I1 has developed an infrastructure component -- an ultra-secure electronic network. This project will extend this and make global standard technology available for the following I4 goals (and others as listed below): G1 (Financial Security) M3 -- secure databases and interacting systems; G2 (Energy Security) M2 -- monitoring infrastructure for global energy; production, transportation and distribution; G3 (Telecommunications Security) M3 -- Prototype products and services to ensure telecommunications continuity and rapid restoration of service. Cost and schedule: The total is 26 people for 2 years (about \$13 million): I1 will do network effort for all three goals: 3 people. I4 will develop proprietary products and services: 12 people. S3 will develop technology for the authentication and verification of point-to-point data: 6 people. S4 will develop techniques to monitor network, detect intrusions, and mitigate attacks: 3 people. S4 will assist with intrusion analysis on specific applications in progress (3 people). I4 agrees to use I1's network exclusively (for this purpose) for 2 years. Renegotiate beyond that. Government parties would sign non-disclosure agreements. Appropriate technology license agreements will be executed. (In return for satisfying so many of the milestones from the four teams, each team promised to add a goal tomorrow.

Cost: 9 chits

Move #36: I2-03-02 (9/4)

Hard copy only

Agreement type: MOU

Additional milestones: none

Details: I2 will provide the aircraft and A/C engine test bed for the embedded. Use available surplus/prototype aircraft and engine test articles - immediately available. Test bed provided to consortium. Full access to results. I3 will provide sensors as a service. S1 will provide sensors through previous agreement.

Cost: 1 chit

Move #37: S1-01-03 (9/4; email 9/5 10:02am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S1-01-04, I3-02-04, S3-04-01, S3-04-02, S3-04-03

Details: Sandia will transfer direct fab technologies. Cost and schedule: (1) Value technology at \$30M. (2) Value of fabricated parts = \$30M. (3) Additional work at SNL and Pantex = \$10M. 5-year Exclusive Rights in license.

Cost: 9 chits

Move #38: S1-03-01 (9/4; email 9/5 10:38am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S1-03-04, I2-02-01

Details: Develop and apply FEA-based simulation capabilities for analysis of lightweight vehicles dynamic response including large deformation through failure. Technology developed is also applicable to weapon system response in abnormal environments. Cost and schedule: Three-year program: Year 1 -- complete Design to Analysis automated meshing (I2 -- 50%. Transfer of software for non-exclusive internal-only use. Total Costs: S1 -- \$3.3M + I2 -- \$1.7M = \$5.0M. Total = \$5.0M.

Cost: 7 chits

Move #39: S2-04-02 (9/4; email 9/5 11:35am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S2-03-02, I4-04-03

Details: Cooperative research for detector components and delivery of pilot system to directly benefit DOE activity in International Arms Control. Cost and schedule: Two year schedule: 2 chits/yr. (expending FTEs) for SNL. That which SNL invents, SNL owns. That which company invents, company owns. Company agrees to negotiate on fair terms and royalty-bearing licenses on field-of-use to SNL IP.

Cost: 6 chits

Move #40: I4-04-02 (9/5 9:37am)

Both email and hard copy

Agreement type: ?

Additional milestones: Red-04-02

Details: Using the existing proprietary data base, we will develop codes and supporting systems to protect critical energy, financial, transportation, and telecom information. We will test the protection systems against threats. Cost and schedule: 2 year project, project data base in first year. \$2.5 M for code and testing. \$250 K for each annual vulnerability assessment Encrypt data, analyze threats, develop proprietary code, simulate operation and threats, execute black hat tests, (vulnerability assessment) annually. IP in field of use, exclusively, royalty free.

Cost: 3 chits

Move #41: S4-03-03 (9/5 9:40am)

Email copy only

Agreement type: License

Additional milestones: I4-04-03

Details: Need clandestine, wireless, secure, low probability of intercept communications for tracking "bad guy" (leader tracker system). It has developed technology, which primarily meets need for prototype. Purchase license technology from I4 for five years, with option to renew.

Cost: ?

Move #42: I3-03-03 (9/5 9:41am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S1-04-03

Details: Integrate sensors to conductive polymers: specifically, these sensors are able to monitor temperature, pressure, cyclic deformation etc. and links to a central processor. The polymers may be conductive rubbers, composites, or thermoplastics. Cyclic deformations may be monitors by alternate route if feasible. Cost and schedule: I-3 to pay up to \$500K (2 1/2 mon-years) for the cost of development. IP licensed to I-3 cost-free for limited usage in smart tires. Project to be completed in one year. CRADA, waiver of depreciation.

Cost: 1.5 chits

Move #43: I3-04-04 (9/5 10:34am)

Both email and hard copy

Agreement type: Subcontract

Additional milestones: Red-05-01

Details: Develop candidate application technology for use in the field in varied environmental conditions (sub-zero, desert, etc.). NAISTE to conduct study, provide modeling support, develop prototype and do concurrent

engineering with candidate production company. Cost and schedule: \$350k. NAISTE will deliver prototype and study results by June 2004. Disposition of IP to I-3. I-3 to provide coatings materials and sections of pipeline to NAISTE. I-3 owns the IP.

Cost: 2 chits

Move #44: S4-04-04 (9/5 10:43am)

Both email and hard copy

Agreement type: Purchase agreement

Additional milestones: S2-03-03

Details: Demonstrate an accurate, portable and inexpensive anti-personnel land mine detection system using commercially manufactured chemical sensors. Three months to purchase land mine sensors and execute demo project for a land mine detection system at a cost of \$300K. \$100K from S4 for purchase of 20 land mine chemical sensors from I4. \$100K from DOE for supplier development. \$100K from S2 for sensor system demo preparation and execution.

Cost: 3 chits

Move #45: Red-03-02 (9/5 10:46am)

Both email and hard copy

Agreement type: ?

Additional milestones: none

Details: Create National Center for Computation and Information Science and Engineering Research and Education. Purpose is to create skilled labor in computing and information area by providing research. Cost and schedule: Total cost \$10M/yr for 2 years with DOE funding half and industry funding half. For each chit invested, will return 2 chits in next session.

Cost: ?

Move #46: S1-03-04 (9/5 10:52am)

Both email and hard copy

Agreement type: NFE

Additional milestones: I3-03-04

Details: Develop and deploy a "smart tire" predictive durability and performance assessment object. Task entirely consistent with modeling and simulation-based predictive aging for weapons. Cost and schedule: Complete reduce physic set algorithms validated by large scale full physics algorithms. Year 1 -- \$1.5M. Implement algorithms in data processing, storage, write reporting system for prototype testing on offroad vehicle. Year 2 -- \$2.0M. Funds-in. Algorithm licensed to industry. Sandia maintain use for DOE programs. No further compensation to SNL after funds-in.

Cost: 2 chits

Move #47: I1-02-05 (9/5 10:52am)

Both email and hard copy

Agreement type: Commercial license

Additional milestones: S2-03-03, Red-01-03

Details: Industry team I will make and sell a system that deploys new sensor technologies. Cost and schedule: 1% of gross sales. I1 is granted rights to make or have made, use, and sell patented sensors. Rights are exclusive in the field of use of diagnosis of health of humans (ebola, anthrax, botulinum toxin).

Cost: 0.5 chits

Move #48: S4-02-04 (9/5 10:57am)

Both email and hard copy

Agreement type: License

Additional milestones: S3-02-03, I1-01-05

Details: 1. Improve security techniques (i.e., wrapper)
2. Better network monitoring techniques/devices
3. New network capabilities (i.e., wireless)
4. Upgraded DOE complex

Cost and schedule: three-way resource: I1 - five FTEs/year for three years; S1, S3, S4, - five FTEs/year for three years; DOE - five FTEs/year for three years. \$1.25M in-kind contribution per year for I1. \$1.25M in dollars.

Terms: Sandia retain Intellectual Property for field of use in Power Supply. SNL: \$2.5M.

Cost: 5 chits

Move #49: I3-03-02 (9/5 11:01am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S1-04-04

Details: S1 to provide mechanistic understanding and modeling of polymer materials (structure / property relationships). I3 to conduct testing to validate model. Overall objective to develop polymers with customized properties and long life. Cost and schedule: \$500K total in kind by each partner over two years. In kind CRADA Royalty free, exclusive rights to I3 in field of use. May be of value to numerous polymer-related businesses - including Small Businesses

Cost: 2 chits

Move #50: I1-03-05 (9/5 11:07am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S4-05-04

Details: Develop sym-med modules secure wireless network necessary to symmunization capabilities for remote medical operations using wireless communication capabilities of Sym-Info. Cost and schedule: Year 1 and 2: develop medical synthesis and wireless modules. Year 3: Demonstrate capability for remote medicine. Extension of existing CRADA relationship (Vendor capability development). In kind development costs of

\$300k/yr. Funds-in costs of \$300k/yr.
Cost: 2 chits

Move #51: S4-01-04 (9/5)

Hard copy only

Agreement type: WFO

Additional milestones: none?

Details: Demonstrate SYM-PRO for multiple mobile targets over a city wide area - NBC detection from airborne platform. Cost: \$20M over 4 years completed 2008. \$20M additional production costs by 2006. Terms: foreign entity involved, information will be shared with Israel, platforms controlled by DOD/DOE, SNL retains license ownership.

Cost: 7 chits

Move #52: S3-05-01 (9/5 11:32am)

Both email and hard copy

Agreement type: ?

Additional milestones: I2-02

Details: 1. Industry to manufacture fuel cells, batteries and related distributed power sources with DPT Technology. 2. Joint R&D to improve technology and manufacture last of these technologies. Cost and schedule: 1. DPT to purchase and distribute power modules for I2. 2. I2 / DPT joint venture to improve efficiency/mfg. cost. Funds out. JV: 51 DPT: 49. I(2) - share IP on same basis. Cost: 3 chits

Move #53: I4-01-04 (9/5 11:33am)

Both email and hard copy

Agreement type: CRADA

Additional milestones: S4-03-01, S4-03-02, S4-03-03, I4-03-03

Details: (1) S4 will license technology developed to prototype stage (software) that will address I4-G1-04: integration of monitoring services and hardware/software capabilities -- complex structure analysis. (2) A field-capable prototype will be developed to the prototype stage, used to detect explosives, that I4 will market into anti-terrorist markets worldwide. This relates to Goal I4-G3-03: manufacture and deploy CBE systems. Cost and schedule: Non-exclusive use of software, exclusive field of use for robot (general anti-terrorism field). (It must incorporate I4 hardware for software use to be in exclusive area.) I4 will pay license fee and royalties to S4. Prototype \$1 million, one year Royalty rate to be negotiated based on sales.

Cost: 1 chit?

Move #54: I2-01-04 (9/5 11:36am)

Both email and hard copy

Agreement type: Purchase order

Additional milestones: none

Details: Purchase 100 manufactured sensors from I4 for petroleum processing. Satisfy milestone I2-1-4. Cost and schedule: \$100,000 for 100 sensors over 1 year. Agreement is a purchase order. IP is owned by purchaser (I2) in field of use. Technology previously developed by I2, I4, and S2. I2 paid for development at Sandia. Cost: 1 chit

Move #55: I2-02-04 (9/5 11:37am)

Both email and hard copy

Agreement type: Internal

Additional milestones: none

Details: Based on analysis of milestones, 1, 2, and 3 make minor refinements to vehicle performance and begin mass production. \$1 to be spent over 18 months to modify existing manufacturing facility and to begin production. No IP being developed. All actions based on pre-existing technology.

Cost: 6 chits

Move #56: I3-01-03 (9/5 11:43am)

Both email and hard copy

Agreement type: CRADA/SBIR

Additional milestones: I2-03-04

Details: Productize optical devices by improving yields >90% Integrate into sensors that are used in I2's aircraft maintenance cost reduction goals. Supports viability of SNL's packaging technical base. (Technology will work its way into Sandia's packaged components). Cost and schedule: Year 1: Sandia microelectronics needs \$350K. Year 2: Sandia microelectronics needs \$350K. I3 provides 1 FTE \$250K. I2 provides 1/2 FTE \$125K. Sum = \$1075K. Year 1: I2 + I3 + SBIRs = \$350K to Sandia microelectronics. Year 2: I2 + I3 + SBIRs = \$350K to Sandia microelectronics. I3 = \$250K. I2 = \$125K. Outyears: Sandia receives royalty-free licenses. Sandia receives all microelectronic rights I3 receives optoelectronic license with royalties = 1% of net sales I3 sells products to I2

Cost: 3 chits

Move #57: S3-05-01a (9/5 11:46am)

Both email and hard copy

Agreement type: ?

Additional milestones: none

Details: Master License Agreement with Distributed Power Technologies on fuel cell #1 and battery #1 and control software #1. Cost and schedule: Year 1-3: no payment or reports and due diligence required or termination. Year 3: 10K for 8 years and \$150K royalty fee for years 3 and 4. Year 5: renegotiate based on last five years tax returns and financial statements market report CPA certified. Year 5-10: new schedule based on what we have renegotiated in year 5. Year 10: renegotiate with

new schedule

Cost: 2 chits

Move #58: S2-04-03 (9/5 11:50am)

Both email and hard copy

Agreement type: Purchase order

Additional milestones: S2-02-03

Details: Purchase order with industry 4 for prototype optical, thermal and process sensors in nuclear facilities in China, India and Israel for nonproliferation application demonstration. Cost and schedule: 2 chits, 2 years.

All equipment shipping to foreign countries are now commercially available off-the-shelf with suitable software that passes export control laws.

Cost: 2 chits

Move #59: S1-02-04 (9/5 11:56am)

Both email and hard copy

Agreement type: Purchase/license

Additional milestones: I4-03-04

Details: Sell chip manufacturing capacity (excess from Goal 3-3) to S1 for microsensors (1 Year) for 5 chips. Cost and schedule: 5 chips for 1 year delivery (1/3 of 3-3 capacity). Limited non-exclusive license (1 other existing manufacturer). Paid-up royalty free license to manufacture and use. Excluded field of use: medical sensors.

Cost: 4 chits

Move #60: I4-05-03 (9/5 12:14pm)

Both email and hard copy

Agreement type: CRADA/License

Additional milestones: I4-05-01, I4-05-02, Red-04-01

Details: I4 wishes to market equipment and services for the detection and suppression of drugs. NAISTE has existing technology which they will license for milestones 1 and 2 (intrusive and non-intrusive close inspection) and will engage in a joint development effort with I4 to meet milestone 3: remote (up to 10 meters) detection. I4 will provide 2 people for 3 years and marketing, etc. NAISTE will provide technology license and 6 people for 3 years on technology and prototype development. I4 will receive an exclusive license in the field of use. NAISTE will receive royalties (rate negotiable) based on sales. I4 will manage IP for jointly-developed technology.

Cost: 5 chits

Move #61: S2-04-04 (9/5 12:16)

Both email and hard copy

Agreement type: Between lines

Additional milestones: S4-01-04, S2-03-03, S4-04-05, I4-03-04, I4-02-02, I4-04-04

Details: Task order to SNL line 4 to work with SNL Line 2 and IND 4 partner to modify SYM-PRO in backbone to

connect to and process data from prototype monitoring systems for specific requirements of facilities in sensitive countries (China, Israel, India) to create SYM-PRO 2 for transmitting data to International Monitoring network for nonproliferation. All hardware and software to be placed on foreign soils will be provided by Ind. 1 as commercially available.

Cost: 8 chits

Move #62: Red-04-04 (9/5 12:22pm)

Both email and hard copy

Agreement type: ?

Additional milestones: I4-04-04

Details: Move palm (fingerprint) reader technology to complete operating prototype and integrate into registration/validation systems utilizing our computer (info security/pattern recognition). This system can be used to verify voter registration, citizenship, financial transactions, etc. for global market. Cost and schedule: \$1Million - 15 months - 50/50. Prototype Deliverable. 50/50 split development cost (\$500K/each). Exclusive license from NAISTE. In return NAISTE will receive running royalty of 10%.

Cost: 3 chits

Move #63: I1-04-05 (9/5 12:25pm)

Both email and hard copy

Agreement type: Private supplier support grant

Additional milestones: none

Details: The specific objective is to secure wafer start capacity for production of microsystem products to be sold by I1, I3 and S1. The capacity will be procured through construction of a free standing wholly owned minifab. Cost and schedule: 07Q1: begin minifab construction, \$10MM. 08Q1: begin qualification and mfr, \$0. The minifab will be operated as a partnership between I1 and I3. Initial outlay for 1/3 of construction cost will be made by I1. I3 has signed a letter of intent to provide the next 1/3 of outlay on or before 07Q3. As part of a supplier support program and an SBI program, DOE will grant to I1 1/3 of the initial reqd outlay for construction of the minifab in exchange they will receive up to 1/3 of start activity and split operating expenses 3 way with I1 and I3.

Cost: 3 chits

Move #64: S1-02-03 (9/5 12:28pm)

Both email and hard copy

Agreement type: NA

Additional milestones: none

Details: Develop expert system for 1 MEMS design. \$1M, 3 FTEs. Done internally by SNL indirect LNEB designers.

Cost: 3 chits

Move #65: I1-02-06 (9/5 12:30pm)

Both email and hard copy

Agreement type: Private license

Additional milestones:

Details: Obtain exclusive use with health industry of I2's chemistry analysis on a chip sensor IP. 1 chit plus 4% royalty to I2. Field of use license, medical healthcare use only, to industry I1 for 1 chit and 4% royalty.

Cost: 1 chit

Move #66: S2-02-01 (9/5 12:37pm)

Email copy only

Agreement type: ?

Additional milestones: S2-02-02, I1-02-04

Details: Package and integrate system to process information from sensors, collect data and transmit to health care professional in a meaningful form. Application is medical diagnostics. Cost and schedule: \$500K, 1 year.

Standard terms.

Cost: 3.5 chits

Move #67: S2-02-03 (9/5 12:48pm)

Both email and hard copy

Agreement type: ?

Additional milestones: S2-02-04

Details: Purchase order to commercialize Sandia prototype to chem/bio sensor monitoring team. Cost and schedule: \$1M deliver in 9 months. Sandia to provide IP.

Cost: ?

Move #68: I4-05-01 (9/5)

Hard copy only

Agreement type: ?

Additional milestones: none

Details: Develop sensor for detection of illegal drugs. \$140K funds-in from I4 and license to Sandia background with minimums exclusive to field of use.

Cost: 2 chits

Move #69: I2-03-04 (9/5)

Hard copy only

Agreement type: License

Additional milestones: S4-06-04

Details: Productize SYM-AIR to accomplish the information synthesis/analysis for the integrated suite of sensors, smart materials for the aircraft industry.

Maintenance cost and time reductions for both new and aging aircraft. I3 is a small business providing the sensor suite needed for our system, and has already invested in a consortium. I2 is investing \$10M in the information synthesis piece of system to integrate and analyze sensor and smart materials information. Sandia waives all rights and assigns them to SYM group.

Cost: 2 chits

Move #70: Red-03-03 (9/5)

Hard copy only

Agreement type: ?

Additional milestones:

Details: NAISTE has developed a major advance in distributed computing. The SYM products of S4 form a good testbed for this technology. S4 will provide 1 chit and 10% or royalty stream. Sandia retains rights to use SYMmunization for all f.o.u.

Cost: 1 chit

Move #71: S3-02-04 (9/5)

Hard copy only

Agreement type: License

Additional milestones: I4-02-03

Details: License SNL rights reserved on wrapper technology (S3-02-03) for electric power field use to I1. Minimal payment linked to sales, no front-end costs. Intended use is I1 delivers to I4 for electric power use. If not implemented in electric power applications within 2 years, rights revert to SNL.

Cost: 1 chit

Move #72: S3-05-01b (9/5)

Hard copy only

Agreement type: NFE funds-in

Additional milestones: Red-03-03

Details: NAISTE does verification and testing of DPT technology and provides the test data back to DPT and Cal EPA. Provides a third-party assessment of the technology for eventual certification by EPA. Fuel cell and battery technology will be tested. Will use student interns for testing. Cost will be split 50/50 between S3 and I2. No IP involved.

Cost: 1 chit

Move #73: Red-04-03 (9/5)

Hard copy only

Agreement type: ?

Additional milestones: none

Details: A recent breakthrough in DNA sampling, recognition, 'real-time analysis' has enabled NAISTE to make headway in protection of 'people info.' We need to move toward reducing process time. We need access to issues needs, market, manufacturing, engineering. 24 month project with \$500K from I4 and \$5M from NAISTE. I4 money funds-in CRADA. Agreement to license in airport security field of use. NAISTE to receive royalty stream.

Cost: 5 chits

Move #74: Red-05-03 (9/5)

Hard copy only

Agreement type: ?

Additional milestones: I2-04-05

Details: Joint start-up company to develop, manufacture and market optical switching devices - Photonix Corp. Based on proprietary NAISTE invention (MIT+LBL). Initial capitalization \$4M, investment I1 - 70%, Red - 30%. Potential market of \$2B annually. Develop and prototype at CHTM in UNM research park in year 1-2. Transfer to compound seismic foundry for mfg in year 2-3. Scale up or sell to larger entity in year 4. I1 gets exclusive license from NAISTE. NAISTE has 49% equity position in lieu of fees and royalties. I1 develops product, markets, and sells. NAISTE retains IP.

Cost: 6 chits

Move #75: I1-02-04 (9/5)

Hard copy only

Agreement type: Internal

Additional milestones: none

Details: Based on results of MS1-3, make minor refinements to vehicle performance and begin mass production. \$10M to be spent over 18 months to modify existing mfg facility and begin production. No IP being developed.

Cost: 6 chits

Move #76: Red-01-01 (9/5)

Hard copy only

Agreement type: CRADA

Additional milestones: Red-04-01, I1-03-03

Details: Implement patient record validation system and develop database surety program that accommodates both interrogation and the need for anonymity during transmission and data mining. 2 year schedule with 10 FTEs, 5 for I1, 5 for Red. IP goes to inventor.

Cost: 5 chits

Move #77: I2-04-04 (9/5 1:17pm)

Both email and hard copy

Agreement type: IND/DOE

Additional milestones: none

Details: DOE site cleanups - prove process. NAISTE contributes 2 chits, DOE 1 chit. COMNAST formed with NAISTE holding 25% equity.

Cost: 9 chits

Move #78: S4-07-04 (9/5)

Hard copy only - never formalized?

Agreement type: ?

Additional milestones: none

Details: Formation of SIM-X Inc. for the commercial development and marketing of the Symmunization backbone for all world-wide fields of use not currently under licensing approval. Encumbered areas include SYM-TER and SYM-MED. Capitalization \$3M FY2005, \$4M FY2006. Market value of the products that will be

released within nine months are \$10M or more annually.

Cost: 2 chits

Move #: Untitled (9/5)

Hard copy only

Agreement type: ?

Additional milestones: none

Details: Umbrella purchasing agreement for three-drug detection system to be provided to I4 by S2. 6 year time frame. Addition detectors may be developed under new tasks with simple scope/cost estimate.

Cost: 2 chits

APPENDIX D - PLENARY SESSION TRANSCRIPTS

TEAM DEBRIEFINGS

SANDIA BUSINESS DEVELOPMENT TEAM

One of the things I'd like to say is, even though this is supposed to be overall impressions of what each of our team members have viewed by working with all of you, the first thing I wanted to do was talk about our team itself. We knew when we started the game last night that we had to demonstrate our value to you, not just to Sandia teams, but even to industry. We thought we could show them what we could do also. And so we spread out, assigned people to each of the teams, and tried to determine first what their needs were before we started saying "Hey, this is what we can do for you." And we believe that was a good strategy. What we found is, in many cases, it even got us in a little bit of trouble, because we have some of the same requirements placed on us as you do, in trying to respond with a vision statement, milestones, goals, etc. So although we're out trying to meet your needs, we're also supposed to back at our own table doing our own work. So that posed a little bit of a problem, and I know some frustration on your part, because you wanted us to stay with you at your table.

What we have viewed is that there has been good overall acceptance of this team and it's members, both from Sandia teams and the industry teams. A couple of other points, just jumping into overall observations, is that - One of the big things, of course, that happened today was the Competitor team coming up with the NAISTE consortia, and trying to get participation on the part of the laboratories. What happened was the BD Team met with the NAISTE representatives and some of the laboratory representatives, and made a determination as to how we would or would not participate. And the decision is that we would participate on a one-to-one basis. What has occurred so far is that we have not found the appropriate situation where we really do want to partner with that consortium.

Question from the floor: "What motivated you to talk with them?"

What happened was when Warren made his announcement about the creation of that group, and also the DOE agreement that was being negotiated, we felt like

we didn't get enough information to make a determination as to whether it was worthwhile for us to join. And so we thought it would be easiest to get all the laboratory representatives together with the NAISTE representative and the BD people.

Something that happened, and this is very typical, Sandia runs into it all the time, and maybe you do in industry, but we talk in terms of our strategic objectives, we sell in terms of our strategic objectives. We're organized, in many cases, according to those. But that's not how industry thinks. They don't come to us and say "We want to talk strategic objectives." They want to know what our capabilities are, what our technologies are, who's in charge of those, who are the points of contact. So what we did first thing this morning is identify who within the Sandia teams should be the points of contact for what we view as the major Sandia technology areas. And we got information out to all the teams about that, and it's my understanding that some additional technology or capability information has been added to that sheet. Just to make it easy to glance at and you know immediately who you can talk to. So it's just a little bit more to make doing business with the laboratories easier.

Something that is apparent, and Marshall alluded to it, is that the processes are a little confusing. Even though I would assume that most of us have read the directions in the workbook, when you get down to really working through this process, things are not as clear as we'd like them to be. How to actually do the agreements. How to get them approved. How the chits work. All those things appear to be pretty confusing.

Another point, and I've been a part of this, and the rest of my team members have witnessed this, when the Sandia teams have approached the industry teams, we've gone in and said, "Hi, we're from the such-and-such team, and this is what we're doing, and this is what we want to do." We have not made a good attempt to show or demonstrate that we understand what industry's needs are, what their goals are, and how what we have to offer can help them meet their needs. And so we need to do a little bit better job of that.

Another things that's happening is that the Sandia teams appear to have a problem prioritizing and focusing. Part of it is the structure of the game where things happen so quickly. But there are all these goals and all

these milestones, and many of us are trying to meet them all at once. The reality is that you can't do that. So there needs to be an attempt to focus in a little bit better.

Another thing that's happened, I know that when I've been involved in some of the negotiations for the agreements, is that we've gone in, and we're not sure when we're there what we're really there to partner on. Are we there to sell our intellectual property? Are we there to get some dollars to do joint R&D? Are we there to get a product commercialized? It's not always apparent. We just show up at these industry tables and say "Hi, we're here. Let's do business." So a little more thinking around that would be better.

There's also a lot of confusion around the roles and responsibilities between the BD team and the Agreements team. One of the major mistakes that we made, although we talked last night about approaching the Agreements team, we didn't do it. And many of us went out to each of our assigned teams, and lo and behold, an Agreements person showed up. And we had had no discussion, there was no coordination of who really is responsible for what part of the business development process. So, for those of you who saw that happen, it was probably very confusing for you; it was embarrassing for us. And it's typical of what happens within our company.

Another thing that hasn't happened with all the teams, or at least it's not apparent, is that they have not themselves delegated roles and responsibilities. And because the game happens so quickly, you have to really split up and each person be able to handle a couple of different things, and become points of contact for different things. I know there are some tables that are handling agreements or negotiations all as one team. And that bottlenecks the process if everybody is waiting in line. Now maybe that happens within some companies; that's fine. That's just an observation as something I see holding up the process. Then on our part, the Sandia Labs part, we haven't done a good job of deciding who should talk to whom. In some cases, we've got a couple people from the same team talking to the same customer, and selling the same product. And that happens a lot. We hear about that.

There have been a lot of questions about how do you value these agreements. What are they worth. How many chits. And in the book you talk about low risk, high risk, high cost, low cost, and use that matrix to make the determination. I've heard a lot of recommendations

from people that it would have been easier if they had been valued with a dollar amount.

I've already touched on the next one, as far as the business development customers needs make it a little hard to do our own planning in our group. So as a consequence we're being reactive, we're not providing the best services that we could provide to you, because we haven't had a chance to do the planning we should, and look at the full picture. We only understand what our role is versus what the Agreements team's role is.

On a positive note, there is tremendous cooperation going on among everybody, there's lots of energy in the room. I'm sure some people are frustrated because this is a little bit different for them. But I don't feel any negative energy at all. The industry groups particularly have very good focus. They have good focus around what their goals are, what their business objectives are, what their technology needs are. And there is, as far as I can tell, a general acceptance that partnering involves give and take, that we're trying not to make anyone be a loser. And finally, that there is a real desire and drive on the part of Sandia to partner. It's obvious by how everything's working in the game that we're really trying to partner.

SANDIA AGREEMENTS TEAM

These are in no particular priority or order. They are just observations or impressions. The first is we have a waiver of depreciation and overhead for one year from the DOE for all CRADAs for all reasons. We thought that that was really spectacular. And I think it goes to show how the DOE here, as I often tell industry partners when I deal with them every day, trusts us. And that in many instances that I can describe to you, they have trusted us in allowing us some freedom and mobility to make some decisions, and then report back to them, which is essentially what we agreed to try on a demonstration program for a year. But this represents a significant cost of doing business. As you all know, you have to be able to give your partner a firm cost. And this really helps in that way. So that was the first and most important thing. Starting with the early announcement, with the particular CRADA, and then the more general announcement that we negotiated a little later on.

The other point that I thought was illuminating is the dynamic nature of agreements process when all parties are in one room. This really works very well, because you can be a facilitator, you can answer questions right away, and you can also make suggestions and nudge the pro-

cess along. It's interesting that you can actually conclude something in fifteen minutes, and in many cases, I went back to one individual and I said, because he was discussing a real life agreement, "Can we do in two or three hours what we did [today] in fifteen minutes?" He said, "Yes." So I hope I have a CRADA next week. We'll see.

One of the things that's just like reality is the pace of the activity. And many people have commented to me that this is beyond their psyche today. This is very much what we live day-in and day-out. This is real life in many cases.

Deals are really between the line and industry. And I would like to emphasize that at least three times. *Partnerships* [TPC] facilitate and do many things, and BD is an active part of that role. We are all part of that. But technology transfer and partnerships are done between those two entities, and I think it's very obvious here, particularly as we're getting moving this afternoon. And the other aspect of that is that the statement of work, the objectives that you are all developing, at least in the line teams, are just the beginning. And then bringing those objectives, those concepts and principles that you're developing into a statement of work, into a specific project that is then executed, takes work, thoughtful work.

The other thing that we have noticed that is very good is that intellectual property is an increasingly important issue. But more so that the implications of intellectual property disposition are increasingly important. Like the discussion of a non-exclusive paid up right to use versus an exclusive right, and other aspects of the recently amended law. These kinds of things are being discussed in a much more forthright and intense manner, at least from where we sit.

One of the things that we also noticed is the coordination between the Sandia organization of the technologies and 'what we do,' if you will, and the way industry is organized. And this is always a problem, it always has been a problem. We are trying to reorganize and match over time. But I think we all have to remember that there are no perfect lines about how to be matched with industry and vice versa. In fact, what you really have to do in many cases with Sandia, and I'm speaking to the industry representatives in the room, is don't ask what is the industry, but ask what is the nature of the technology that underlies this application. We were talking about energy and environment projects this morning, but when we got down to that point, the answer was sensors and software. That was the technology. The application was the energy application.

I'm also looking at this as an opportunity, and I hope it's working, I see from the reaction of some people that it is, for me to be educated and for me to inform and educate other people in particular about some very subtle issues.

This is one point that everyone on the team asked that I convey to you, and that is that, in many cases, we have some very savvy and experienced people in this room that are accustomed to doing deals, and so they're moving right through the process, or they're not concerned about some of the aspects of the actual agreement. And so what's happening is, those individuals will come over and ask me to sign, or another member of the team will review the project quickly, and ask a few key questions, and off we go. In other cases, I've been there, and others on the team have been there from the very beginning. One of the things is in real life we would have to take a little bit more time, and all the team members asked, because there are very important implications, particularly when you start looking at the relationship of the statement of work to the intellectual property and how it will flow and what are the concerns of industry. And I believe it's the compressed time of the game that we're all reacting to in that situation.

DOE TEAM

We want to address two things, one is our observations on the processing of the agreements, and the agreements themselves thus far; secondarily, we want to address our observations on the partnerships and the interchange that we've observed.

One of the things we noticed was that the deals are too perfect. There are no issues arising. In the real world we have lots of issues arising in these agreements, and that's one of the reasons we've been able to process them so quickly and efficiently.

We're concerned because there are some real issues that we see are there that are being ignored. The issue of multinationals and US preference. They're just marking the box and saying "Yes, we'll manufacture in the US." And not dealing with all of the issues associated with licensing agreements and all of those things.

One thing we found out is that DOE review is being bypassed. Seven agreements did not come through us. It may be inadvertent or systematic, we're not really sure, but being the suspicious folks we are, we're suspecting it's systematic, at least as far as the Red Team is concerned. And this is interesting because we've rapidly approved every agreement. Nothing has been held up

for longer than, what, 15 minutes in our review, and yet... It takes at least a minimal time to read and understand them.

One of the things we've noticed is that the labs have generally played fast and loose with the rules of interpretation, taking the most liberal interpretation that they could. We understood that, in one case, the approval of an umbrella agreement, which we specifically said each task had to be approved under that umbrella agreement, somehow those bypassed our review. But we understand that it was the view of the players that they were pre-approved.

One thing that I've noticed is that there's a lot of emphasis, particularly in regard to our team and the Sandia [Agreements] team, to speed that process, make it faster, and again, it summarizes a lot of the things we've raised here, that the quality of the partnership, and what its goal and objectives are, and how it meets those things are somehow lost in "let's move the process faster ..."

Time is a major factor, but if you're just dealing with processing time, and the agreement, particularly in this type of an exercise, where everything's accelerated, doesn't really serve your mutual interest, it's just to get a deal, in some cases your deal may be your criteria for success. And if that's the case, a bad deal still meets the criteria.

Question from the floor: "Who decides the quality of the deal, the participants who have to live with it, or DOE who has to approve it?" Answer: I'm just saying it's an observation that you may want to consider. We're not deciding those things. But we are deciding if it serves DOE interests and the lab participation is relevant.

Comment from the floor: "Sandia has given a lot of stuff away." Response: I don't know if I want to take that up right now, but thanks for sharing that.

One of the things that was obvious from the comments and the interaction is that the Sandia line organizations presented themselves to industry in a mission-oriented light. I think this is overstated, we push that mission orientation too much. It's poor salesmanship because industry doesn't care. And it results in the need to negotiate the harmonization of the two organizations' goals when that shouldn't have to take place. Mission-orientation is the way we present ourselves to our sponsoring organization in DOE and others. And that's appropriate in that light. But because we're so mission-oriented, what we've observed or what the comments seem to be, was that we would come over and say, "This is our mission. How can you, industry, help us to achieve our mis-

sion?" As opposed, when they don't have that interest, to how can we accomplish our missions and involve leveraging.

When DOE approached how we did this, we focused on how industrial partnerships could further DOE's goals. Those goals were to reduce DOE costs to meet our missions. Now that's through leveraging or even getting industry to pay for some work that we need done too. Potentially, that could happen. And to sustain our core competencies, that is our capabilities, our people, and our facilities. We took actions that streamlined the process, which is what our requirements were, but that furthered those goals. We eliminated overhead charges provided that they gave direct mission benefits. We even accelerated the process through an advanced waiver of that, and then even when that was rescinded because of politics that we had no control over, we induced management to come up with funds to support our supplier base, consistent supporting of that mission requirement. But it was transparent to all of you, or should have been fairly transparent to all of you.

So what I'm suggesting is that Sandia should establish their programmatic leveraging requirements. You know what you've got to achieve, you know what resources (chits) you have to achieve it with, you find out what the limitations are, and where you need the resources, the brainpower, the expertise of industry. And then identify those industries that could benefit from the capabilities and technologies that we have, and then transparently project to them, this is what we have in our capabilities, this is how it addresses your product lines, and we'd like to know more about how it achieves your strategic objectives, and then come to some closure as to how it meets their needs. This way the DOE mission is accomplished, but it's transparent to industry, who doesn't really care about meeting your objectives.

On the industry side, though, it's apparent that industry wants to harvest technology or stuff that can improve their products, and not partner. There are exceptions, but there was a strong statement from industry that "we want to harvest your technology or capability so that we can get product lines, etc., but we're not really interested in partnering with you" is the message. Because partnerships need to recognize it has to be win-win for all organizations involved in the partnership, even when they're dissimilar organizations with dissimilar objectives. Secondly, industry should recognize that just because there's a dissimilarity in the organizations' objectives, that good technical work that supports what they are trying to accomplish shouldn't be abandoned

because of the lack of agreement on goals between the organizations.

Industry has a lot more experience partnering than the government or the DOE labs has. But generally what they do is partner with other industries to achieve similar objectives, that is market share and profit. And everybody understands that. But when you want something in a partnership as opposed to a licensing agreement ... a partnership, you've got to recognize that if you want the buy-in of the other entity, because they have something that you want, that you have to accommodate their goals. It's got to be win-win or there's no partnership, that's the point.

SANDIA LINE 4

We've seen progress; we're 11 milestones into our 21 milestones. We are working on the emerging threats area. The Simmunization Tool is the main product line that we've been developing. That is an area that is progressing in terms of our detection and sensor work. In terms of our teaming, we think that has been successful with Industry and other Sandia organizations. From the standpoint of getting our computer network capabilities going, that is progressing. What we are looking for in the future is some additional opportunity to enhance that. In the context of what we are describing here, I would say we have success in some of our partnerships. In terms of internal Sandia, we still see that there is duplication of our strategic goals; for example, when we are working with weapons of mass destruction folks. So we think there is definite need to improve our internal process of trying to coordinate how we move forward.

In terms of our working with Industry, we see that there is progress there in terms of there is a need for our technology and we're being asked to team and add value to their process. There is a definite opportunity there for us. From the SBD partnerships, we're seeing a better experience than we've seen in real life. Maybe because it's real time and we're all in one room, we have their captive attention and are not spread so thin. We think there is some question of the SBD team being able to understand exactly what we are doing. There are some unrealistic aspects of the situation we're in right now in that the time frame is such that we are not really able to communicate with Sandia Business and they are not able to communicate with Industry. And, that's something we want to enhance in the future. In long term, we feel in the last 5 years we have made progress and demonstrated that we can partner with Industry in trying to

look at the critical area of emerging threats. This indicates a national problem that Sandia can participate in and we are making the right moves. At 9 o'clock we are going to have a needs assessment workshop to talk to different, potential partners in Industry because we are at that juncture now where Simmunization has matured to the point where we can demonstrate our capabilities and would like to look at some of the application areas from Industry.

INDUSTRY 4

National Security and Criminal Justice. Our focus is counter terrorism products and services, with four primary areas: energy, transportation, financial, and telecommunications. Our efforts turned starkly realistic when we learned about the terrorism in Jerusalem yesterday. Our successes to date include partnerships formed with Sandia, NAISTE, and Industry. We've had very good cooperation with DOE and Sandia Agreements. We are beginning to make a profit and actually sell some of our capacity back to Industry and the Labs. And the positive response we have is, it's great to work with the Sandia line organizations.

The issues, however, are that the Sandia line organizations here are turned on to making deals. What we've discovered in that process is that we are inundated by many different people, many in the same areas. We have a suggestion on that later. It's still not quite clear who the right person is to talk to and what expertise actually exists. And, it's unclear right now as to what the real role and effectiveness of the SBD organization is, but we think that is becoming clearer as time goes on. The Industry focus is, "how to make money quickly," the Lab focus is "great science and engineering." Sometimes those two don't quite jibe well.

Suggestions we have are, greater empowerment for decisions to lower levels. What that means, of course, is that those lower levels need have to have a full understanding of the legal ramifications and who the right people are to talk to. So much more training needs to go on if that is to occur. We'd like to see more flexible boundaries. And, what happens as time goes on, even though a deal has been struck, and we'd like to make some minor changes to it, we find we have to go back through the entire system again. And that's not very effective. We'd like to have better communication on how to actually work with Sandia for medium-size companies. The small companies have an advantage because they get everything free, the big companies have lots of lawyers

to do the negotiations, the in-between companies are on their own.

We'd also like to see improved methods for telling Industry what the Labs do. And, who to contact. There still seems to be a lot of confusion as to what expertise exists at the various labs. We'd also like to see better perspective on the importance of time and the need to make money by private Industry. There has been some fear continuing to be expressed as to 'what is Lockheed Martin doing with all this information that Sandia has?'

SANDIA LINE 3

Energy and Environment. As to the three questions that we were asked to consider. First, we discovered that, unlike the real world, if Sandia would only team with Sandia, we would be a lot stronger in approaching Industry. We discovered there were multiple strengths, and in order for us to strike some deals, we really benefited from partnering with other Sandia lines. We had more effective conversations with Industry, and we got more done. Second, we learned something about the process here, but the timing and compactness of the process has limited how much we are able to learn from it and take away from it. Third, like the real world, we noticed there were a lot of other Sandia lines knocking on the same Industry doors at the same time, frequently for the same appointment. Obviously there's some lesson we can learn there as well. In a couple of instances we felt that major cultural barriers within Sandia sort of get in the way of partnering. We're not really representative. Partly there wasn't time, partly we may not be the right mix of people.

Next, in terms of the creativity of new vehicles, we did do CRADAs and we had one MOU, but we weren't that creative in coming up with new forms of agreements to work with each other and work with Industry. So, the bottom line is that we've explored ways to increase our partnering with Industry, but we have not been excessively creative.

As to objective two, we found that the SBD group was very helpful to us in helping bring business to us. This occurred toward the latter part of yesterday as the team, perhaps, had more information about the needs. And, we also found some usefulness of having a BD team as well as a partnership team member, assigned to us and working with us as we went forward. It's not clear to us so far that BD and marketing strategies were really improved by the process. There wasn't sufficient time

for us to form our own marketing strategies in a good integrated way to really take advantage of BD.

Second, it wasn't clear to us that there was adequate time, from our perspective,—Marie touched on that yesterday—for feedback from what we're doing to get to BD so they could incorporate that into their own strategies and improve their own business development process. Perhaps a function of the speed of the game. We really didn't have time to address marketing strategy nearly as much as we would have in real life. In real life, we don't think we would have knocked on doors until we really had our strategies down and were well prepared. We found we were trying, yesterday, to get out and knock on doors to achieve some partnerships. Also for us, we discovered that in terms of the Sandia lines, or teams, or sectors, an overlap of responsibilities, particularly in our area of critical infrastructure and sort of infotech. There was some overlap with both Sandia Line 4 and Sandia Line 1; in some cases in developing sensors, in other cases, really trying to develop high tech systems that would prevent intrusion, largely geared toward the military but with obvious civilian applications. And in the critical infrastructure side, we were trying to apply that to civilian applications.

Third, in terms of improving the process by which Sandia develops long-term strategic alliances, we felt that the game seemed to mirror our perception of the existing past. The big winner for us is that it's really shown the value of Sandia communicating and partnering with Sandia in an Industry approach. Also, we feel we've missed an opportunity for a better strategic focus. We had to act before we had a strategy that we had a chance to vet and felt was totally integrated. For us, this process has also shown some weakness in our own sector's three- to five-year goals, in our point of view, in terms of the kind of businesses we wanted to target, making these goals concrete enough, etc. Lastly, there clearly was pressure to partner, although it was not clear to us, given the time limits, that these were strategic, and that feeds into the part about having an integrated strategy that we felt comfortable with.

Goals and milestones. We've been very successful so far. Of our four goals, we've completed one fully, completed three of the four milestones in two, and in the remaining one we have two milestones to go. We were so successful yesterday, either inadvertently, or vertently—to coin a phrase—, we get to come up with a brand new objective and set of milestones which we will dutifully execute today.

INDUSTRY 3

This is a review of what our original vision and goals were. When you start out with "Dominate the Globe" it's pretty broad, and so one of the first things in our learning experience was that we think our original goals were pretty broad. We became more effective as we began to focus those down to being a little more specific as we worked toward the agreements and that it was a big help to us. We're well ahead of the game in a sense, in that of the four goals and four milestones for each of the 16 agreements, we have 13 completed to date.

The second thing is, we think we made great progress because of our organization and we decided within our team we would sort of deploy the objectives one per person. They would be empowered to go out and cut the deals and there was very minimal coming back, so as a company or an Industry group reviewing that, that's what helped us make good progress. As far as general learning, we found it true, too, that Sandia seems to be oriented more around their programs; and since Industry is interested in trying to match the technologies, we found it somewhat difficult to know exactly where to go or where to match up with that. The BD group has taken some rap from some groups, but we give them a plus as they were a help to us. We went to them first and said "help us find out where those technologies are." The last point we want to make is, we found the waiving of the overhead and depreciation greatly enhanced the process of partnering, both in cost and in time.

SANDIA LINE 2

Nonproliferation group. We have actually had a fair amount of success. We are about half way through with our milestones, but that's exactly where we should be at this time in the game. We believe that our vision has been validated. We haven't seen anything in the changes that Control has so dutifully brought into the game that has changed the international environment to the point that we have any significant change in focus. We have essentially validated our vision and milestones, although we may focus in a little more detailed area in a couple parts of the chemical and biological world.

In terms of addressing the game objectives—in terms of Objective 1, we feel like we have been successfully able to partner with other groups. We did spend quite a bit of time up front looking for ways to work helpfully and trying to find some good matches. And the people in the BD and Agreements teams were helpful in doing that. We

didn't find much pressure—the money pressure or the chit pressure hasn't seemed to affect us. At the outset of the game, one might have concluded from what Marshall said that you would have to partner because you wouldn't have enough money to do your job, but that doesn't seem to have been an issue. And, we've confronted the same issue of the value of chits and how you do the negotiating.

We believe that the BD team has been very helpful and we've used them extensively. We've essentially taken them with us as we've gone around to meet Industry and we feel that's a validation of what they're doing. We also used them early on to try to identify suitable partners. And remember, our technologies didn't fit very well. That led to an interesting excursion where we had an entrepreneurial spin-off, and that was good from the point of view of meeting objectives, but it was bad from the point of view of the way it affected the team. While we thought for a while it might have been a game artifact, in point of fact, I think that's what happens in the real world. What it does is leave a gap. All of a sudden, a person who has been working on something as a core part of the team is no longer able to, either by virtue of legal restrictions, OCI, etc., or the fact that he or she just isn't there. That is a real-world lesson that we really did learn, and I think it actually is a true one.

In terms of the objective three issues, we have had three different types of strategic alliances which have been very successful. We have one with an Industry group that's kind of supplying umbrella technology, and we've got one which is supplying very specific technology in connection with academia and the other national labs, where that technology was not available in Industry. So we feel like we've had success in demonstrating that those relationships can at least exist.

We really extended Sandia's capabilities in that Sandia negotiated three international agreements and signed two treaties. Actually, that's just an extension of our concept of empowerment (and T.J.'s very good at it). And for those of you in the FBI who are out there looking, if you do sign the treaty, it does supersede export control laws. So there you are.

We found one of the things that did work well with Industry was the concept of a preliminary letter of intent. It seems you jump right into the deal making early and that can confuse people. Some of the comments from the Industry people were that we were just in there to make deals and so forth. The letter of intent worked for us because it got us talking. What we found was that you can find Industry willing to contribute to

the national interest (international security things). Not that they don't look at the profit margin, but it perhaps puts a different spin on it, so we feel that the letter of intent helps us to construct that model in which we were working.

One thing we did find is that Sandia doesn't know what Sandia does. This may be just another focus on the comments that others have made. Sandia is a hugely complicated place and frequently Sandia with Sandia as a partnership doesn't work simply because we don't know what people are doing. It was suggested, not in the game context but in the real world, that some kind of internal training, particularly for people within Centers or Sectors who are doing outreach work, about what else goes on in the Laboratories would be good, because right now that's something that doesn't exist.

INDUSTRY I

We are the information technology and computing group. We had a rather lively discussion this morning taking a look at the game in terms of our experience and how it related to the game objectives. Regarding the first goal, we felt we weren't here to meet Sandia's goals. We were here to meet Industry's goals. We did work in areas of overlap and we had a lot of successful partnerships. We're about half to two-thirds of the way through our milestones. We did find several win-win situations. Although we set specific milestones we thought might have partnership potential, it was not our goal to meet Sandia's goals. That was one of the things we looked at.

Objective 2: We urged Sandia to have a more user friendly or simplified process and we found we had some success in that regard. One example was that we asked to have DOE present early in the negotiating process so that we didn't have to go all the way through the Sandia process and then go through the DOE process. We wanted DOE involved early on and had a very responsive situation in that regard. We wanted to negotiate directly with the decision makers. One of the rules of negotiation is: find the person who can say 'yes.' We've had discussions in our group that the problem sometimes in working with Sandia is you're dealing with a lot of people who, although enthusiastic in a sense, they can either only pass it on or say 'no.' They are not in a position where they have the authority to make the final 'yes, bless it, sign off. 'So then, let's bring the people who can in early in the process.

It was interesting that one-quarter of the game's milestones were supposed to be directed toward a small

business objective, and yet there was nothing specifically set up from the BD or Agreements that was specifically focused on small business. So we asked for it, and they gave it to us within minutes. It was an extremely responsive process. I know that in the real Sandia world there are specific small business points of contact. But it was interesting, in the game at least, that one-quarter of what we're doing was supposed to be small business, but there was nothing set up specifically to address those special needs.

Sandia players were extremely responsive. We give high points to our BD team and we give high points to the people we partnered with. We even got them to write up the agreements so that Industry didn't have to take its time to draft those agreements. It's still an organization that is rather cumbersome. It's been brought up there are a lot of different organizations to work with. Our business development people would go out and look for Sandia contacts for us and bring them to us, so that was helpful. One idea that came up in our discussion was that Sandia might, from a process point of view, look at emulating some of the world-class consulting firms, in that you have a point of contact and that person takes you through every step of the Sandia process. You don't have to find or make 17 different contacts with 17 different organizations. You have your ombudsperson who is there to take care of your needs all the way through.

Objective 3. We did see some progress. Actually we had an interesting disagreement within our group as to how much progress had been made. But we did feel that Sandia began to ask what Industry needed. Initially it was "hi, we're from Sandia; here is our bag of goodies." And, "we really need to partner because our money runs out at the end of the session." One of the other things we came up with was that, and this is a real-world situation, in dealing with any large organization you have to know the rules and how to play. But it seemed to us it was up to Industry to learn what Sandia's rules were in order to partner. There was sort of a "take it or leave it"—fill out our form the way we want it or it will be rejected—sort of approach to things. Again, with any large bureaucracy, you have to have accountability; you have to have a certain set of processes, but sometimes that was also a frustrating experience.

We did find the Sandia players from line organizations, AG, and BD tried to be very pro-active and very enthusiastic. Sometimes there were a lot of different players and, for some people, their own real-world experience in trying to do partnerships with Sandia may have colored their approach to trying to partner here in the game and

they may have looked for alternate methods rather than Sandia partnerships. That sums up our review.

INDUSTRY 2

We are energy, environment and transportation. The first goal we feel is being met within the context of the game and what we're saying is that we're making headway toward that goal. It's obvious that representative problems are surfacing, some of which were well laid out by Marie Garcia yesterday. I think that Team 4 very well summed up many of our issues and Team 3 certainly pointed out something that we felt which was that Sandia is the equivalent of Programs, Industry is Technology. Time drives Industry and cost drives Industry. The cost portion of the game we found to be less than totally effective in the way we dealt the value of the chips. I think that's a discussion that I don't have to belabor, but I think that was a point that was of importance to us.

Something that came out of our discussion that I think is of real value that revolves around goals two and three, and that is that we felt there needs to be follow-up from this game—whether it be additional games regarding the furtherance of the achievement of goals two and three, or round-table discussions between Industry and Sandia that will foster the development of those goals from the groundwork that has been laid within the context of this game. And, I think that was an important part of our discussion which we hope will carry on. I think basically that covers it because the other Industry teams have certainly brought out many of the points we were interested in making.

Floor: Regarding the point that Industry is interested in technology—Industry is interested in technology as a means to achieve a product. They are not interested in the development of technology itself. I don't want you to go away misunderstanding the point here. Sandia seemed to be focused on their technology development programs regardless of what the end-product desires were by Industry—at least in our experience. I wanted to make sure that that point was clear to everybody. I hope that will help the Sandians understand that wanting to achieve their goal of further developing more technology and maintaining their technical prowess with their programs—that's important to you, but not necessarily to Industry in that respect. We found that driving a number of Sandia teams as we spoke to them.

SANDIA LINE 1

What we noticed was that the game mirrored the role that we play, that nuclear weapons plays at Sandia. We had the advantage in our team—we're almost two milestones of being done—that our group has been working together for years so there was no time spent bonding. We just went about the business that we normally do at Sandia and so that was definitely an advantage. For that reason, we looked at how the game would improve our marketing or business strategy, how it would improve the process, how it might enhance our Industry partnerships. Basically, since we were just mimicking what we do at Sandia—let's take a look at goal one: the nuclear weapons defense program sponsors the technology partnership program and six of our players have been big-time players in that program since the inception of the program, so they already had that going for them.

In goal two—we had the advantage of having two Directors who are probably two of the best marketers in the Company—Paul Hommert and Jim Searcy. So, instead of improving that strategy—it's more like trying to hold them back. In fact, we're thinking in the last round, of loaning them out because they're are done with their milestones.

On goal three, as it turns out we did have some thoughts in this area. And one of them that struck us, and that is true in real life, is that when we had the Agreements and the BD teams we thought it would be very helpful to co-locate the BD team with the line organizations. As it turns out we've been exploring co-locating our financial organization members. We have, at the NS sector business office, finance people. It's been extremely helpful. Maybe that would be a thought that would grow out of the processes that we've seen in the game. There was also the one-stop shopping that was brought up in this area that maybe—not the Agreements people who did the final agreement—but the BD people were the front and would be co-located in your organization and they intimately know the whole agreement process as well as an Agreement person. Those are some thoughts that came to us during the game. Oh—one announcement: If we close all our deals in this next round, we will do what the NS sector has done traditionally and that is, we will give all of our chits in the 4th round to other Sandia organizations, starting with NN, and working outward from there to help them close their deals. And this is real life at Sandia.

Floor: As an Industry person, I would take your process one step further. I think that you also need a Corporate

BD office to act as a clearing house. It should be the focal point for Industry to come in.

Sandian: Could I have somebody from Corporate BD speak to that, because I think we have Corporate BD people. Is that not correct?

Answer by Marie Garcia, Sandia Business Development (could not hear).

Comment from floor:

Our team (non-proliferation): We're really finding it a stretch meeting some of our milestones with Industry partners. Traditionally, this is not a field that lends itself to Industry partnership—it's not a money-making field, has political sensitivities, and constrained by international agreements, by export controls, classified information, intelligence community, by what we can do openly. There's so many nuances, there are a lot of constraints.

We want to explore ways that Industry could work within that context. However, it's become clear that Industry is saying, if I partner with you, where's my profit. Can you promise me that somebody's going to buy my product? I can't do that. That's too sensitive. That's just my observation.

Comment: you might consider partnering with your vendors.

Answer: Sometimes there isn't profit in these projects.

NAISTE ALLIANCE:

Objective 1. As you know, we had our own goals, but in this, the purpose was to help. And, so we formed NAISTE. We thought this was an excellent way to demonstrate there are different ways to approach the issues, problems, etc. Putting some national labs and universities together seemed to make sense for us. Second of all, we immediately got the DOE umbrella in the waiver of depreciation and overhead, which made a big difference and gave us a brief window of opportunity. Probably, in thinking back, if we would have waited to do that we would have cut some deals really on the verge of being dependent on that agreement. We tried to do this in good faith. One note on that, I think the waiver that was given to Sandia expired a couple of years ago, but ours didn't. The other thing, we talk about the research enterprise, and I think what we demonstrated in NAISTE that we put a real partnership together with four universities and four laboratories tied to Industry.

In goal two, the key there was that we went to Industry, tried to match their needs, learn what their needs are, and see what our capabilities were. We tried to incorporate or match the possibilities into our goals and milestones. And it wasn't coincident that we did that. When we found out that different industries had different goals and milestones, we wanted to make sure some of ours matched theirs. The only penalty we experienced there, when we did that and tracked the milestones, was that it took a long time to negotiate an agreement which really took care of three milestones, but we only got credit for one. That was a difficult things for us to work on.

Some other observations relative to some issues and some NAISTE thoughts: It took a while to come up with all the seeds as I was trying to combine some stuff. Creativity, thinking out of the box is incredibly important; communication, improve our listening skills on all sides, consistency of purpose, vision, mission, coordination, and cost effective. Again, cost-effectiveness is hard to work out the way we do the chits, but it's the best we can do in this situation. Last, but not least, improve the process by which Sandia develops long-term strategic alliances. As you know by our name of NAISTE, all I can say to you is, "that is none of your business, yet."

Announcement from DOE player: (no sound)

MB: We've run a little over what we've planned, but I think it was a very useful exchange. Let me encourage you to do whatever planning you feel is necessary. Although, the next session will begin and it is a negotiating session, you are in control of your life and your world. If you feel that you want to immediately seize the day and begin negotiating, go forth and do that. If you feel you want to consolidate and re-think, do that. This is your game and your learning opportunity. So it's now February in the year 2002. Thanks.

TOWN HALL

Lab spokesperson: I guess I was asked, what does that mean to me, what is the impression that I have that industry is not interested in the missions of the laboratories, but in the technologies. Within our group we talked about what would have happened if we had had a Sandia technology team. When, in fact, if the lines of business teams had been out of the loop in a lot of the deals. I think that's very true in real life at the labs as well. We're talking about partnering with industry in our missions, but where the real partnering comes in is at the technologies. So if we are going to develop new mis-

sion areas and somehow we are going to have industry partners in those mission areas, we are going to have find some way of showing value of our missions to industry.

Industry spokesperson: As someone from industry, the part of this game that was impressive was when Dan from the BD team came to our industry himself and said, "hey, this is what we might have to offer, what can I do for you?" In our industry, we haven't seen anyone that pro-active in real life. If it did happen, I think our companies would take that a lot more serious as opposed to being just some announcement or some written thing, or on the internet, or whatever, if you thought of yourselves as having some salesmen, being in the sales business, like our companies. Send people who would fly to Houston, come down to Sugar Land, and meet with our people and say, "we're here to show some stuff to you, are you guys interested in partnering?" You might get a little different response from industry when you're wanting to partner and maybe you would see less "cherry-picking," as some people call it. I was real impressed with that aspect of the game and I would encourage you as the way it was played out here—maybe a little bit more.

DOE: One of the things that happens as the result of these kinds of partnerships that occur, there is more opportunity that develops as result of an understanding about Sandia's missions and that starts permeating the industrial partners' viewpoints. They say, "we find things that we want to do and things that we need from Sandia and by understanding their missions, we can identify and hone in on those things that will get program dollars invested in things we're interested in too." So it's a two-way street.

Industry: From an industry perspective, there were Sandia teams coming to visit us, but they seemed to be overlapping, at times seemed to be competing with each other. At one time we decided you didn't need a Red team, you had your own competition internally. One thought is that somewhere in the process of going out and talking to industry, you need more of a Corporate persona. You need to be representing the Corporation, because when a company is dealing with Sandia it doesn't really care where in the organization it is, they just want to know they are dealing with the people that can solve it's problem.

Industry: There have been a number of good suggestions made throughout the Prosperity Game over the last couple of days. The thing we were just talking about in our group, we were curious as to how the information that's been gleaned out of this session will be communi-

cated to the Sandians at all levels, with Sandia being a client of ours, and seeing in the business development world that the vice presidents and directors are getting very fired up and getting their ducks in a row with respect to business development and what not. When you get down to the manager and staff level, they're not clued in as much. There are exceptions in all cases, but I think it would be very valuable to Sandia as a whole to communicate what happened in this particular session. I don't know how you might do that, but that's a suggestion out of our group.

MB: What will happen is that we will take the enormous amount of information that has been generated, including your debriefing sessions, we will write a report on it—it will be a large report, of course, and executive management won't read it—but we will try to write the best possible executive summary and get wide distribution. But also what is important, is not just simply the documentation of what transpired, but how it's put into practice. I hope there were lots of lessons learned that people will take back—certainly for our Agreements people and Business Development.

Dan Hartley (VP-Laboratory Development): One of the messages going back will be delivered Monday. Monday we have our Senior Management Council meeting, and I'm going to be reporting to them, to my peers and bosses, the other Vice Presidents, about what happened here. I'm probably one of the biggest benefactors of the results of this whole exercise. We've been growing a small and energetic business development team in my organization. But it is small, it's new, the whole idea is new to Sandia. We're a culture of 70 independent businesses at Sandia. If you look at each center, each director, largely our culture has been one of each of them owning a certain area of responsibility, or business, or product, or capability, and protecting it, naturally. We're trying to go to a higher-order way of thinking. That first construct is mission oriented, which tends to blind you, now, to the technologies. So we're trying to work, in our new construct or how we do business, there are six entry points now to the company, which are the four lines of business, and then science and technology and industry partnerships. Those two have to be managed, as this group keeps saying, it has to be managed strategically, with customer contact management, with investment, just like you do anything else. And we will be doing that.

I had a great fear that the laboratory wasn't ready yet for us to initiate a corporate central program development operation, on a big scale, and even then we're thinking about it being a network where the program develop-

ment people that already exist in the line are just networked in for information's sake. From what I heard here, I think we're ready for it. Not only do I hear a lot of people in the line talk about 'This is a very useful function,' but even the people we have that are starting to work in that area have some talents that they've shown are useful. So some things are going to change. I have most of the resources you talk about here, whether it's the agreements people, the tech transfer people, all the investment people, the LDRD, everything's in my organization. So I have an opportunity, a challenge, whether I can succeed or not, in aligning all that in a way that makes this come out right. So I thank you all a great deal.

Sandian: I feel that I was effective because I teamed with another Sandia line and we made some very strong deals so, in effect, we were negotiating our technologies, even though we were from two different mission areas. I think something we need to think about is as we break down the 90 sub-Sandians is "how do we find out who we can team with, who else is doing similar technologies so we can build strong teams and we're not competing among each other, but working together."

APPENDIX E - HANDBOOK MATERIALS

PARTNERING AT SANDIA

Sandia's strategy for participating in collaborative research and development agreements with private-sector partners has been evolving since 1991 when we began implementing the National Competitiveness Technology Transfer Act of 1989. Guided by that legislation, Sandia's initial strategy for partnering was to seek cooperative research and development agreements with individual companies. Such alliances target major national technology goals by focusing on generic, pre-competitive research that can be broadly useful to an entire industry. Under the new legislation, Sandia's primary goal was to make measurable contributions to the global technology leadership of US industry by transferring Sandia-developed technologies to industry. As Sandia subsequently developed the largest portfolio of partnerships of any federally sponsored institution, our partnering strategy evolved beyond the simple transfer of technology to individual companies. We found that alliances involving industry, universities, and other laboratories were an excellent mechanism for advancing the technology of our mission requirements.²

Sandia has successfully conducted research in areas supporting national missions for almost 50 years. Having established a successful record in obtaining dual benefits, Sandia will move increasingly to partner, where appropriate, in these areas rather than do the work alone. To help us achieve continued success in our partnering activities during the next few years, the Technology Partnerships and Commercialization organization has established three important thrust areas: strategic partnerships, licensing and intellectual property, and regional economic development.²

The strategic partnerships thrust emphasizes long-term collaborations with industry, universities, state and local agencies, and foreign entities. Strategic partnerships are intended to support Sandia's traditional mission requirements by:²

- leveraging government funding in critical areas,
- sustaining and strengthening Sandia's scientific and technical excellence,

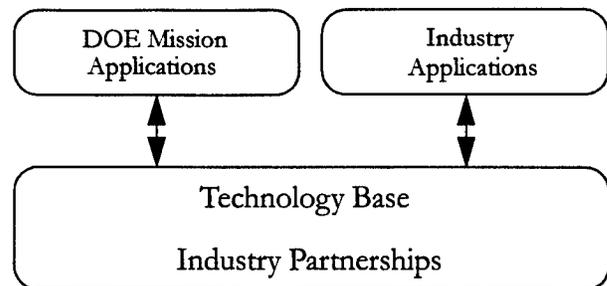


Figure 12. Sandia Forms Partnerships with Industry for Mutual Benefit.

- accelerating technology development and deployment, and
- fostering closer relationships with industries critical to our primary missions.

Although Sandia recognizes that partnerships with all of the entities listed above are of great importance, this Prosperity Game™ is focused on industrial partnerships. Sandia partners with industry to develop a strong technology base for mutual benefit as shown in Figure 12. Such partnerships are structured to provide reciprocal benefits.

Benefits received by industry from the labs include:³

- validated computational modeling,
- materials and processing technology,
- major experimental facilities and diagnostics,
- highly educated, multidisciplinary staff working in a systems-engineering environment, and
- ability to protect proprietary information and to manage intellectual property.

Benefits received by the labs from industry include:³

- additional leading-edge technologies,
- identification of important technical problems by industry,
- expanded validation of computational modeling,
- enhanced relevance of the lab's science base,
- exciting new challenges to the lab staff, and
- building a broader constituency.

Technology partnerships and commercialization at Sandia, whether in the form of a partnership, license, entrepreneurial separation or a small business initiative, or

2. Sandia National Laboratories Institutional Plan, Section 4.3, Future Thrusts. <http://www.sandia.gov/ip/ch400001.htm>

3. New Technology Week, Tuesday, Feb. 18, 1997, p. 9,11.

regional action, operates under several guiding principles. These include providing for fairness of opportunity, ensuring that the action contributes to US competitiveness and to DOE mission impact, managing conflict of interest, protecting national security, and avoiding of competition with the private sector.

PARTNERSHIP PROCESS

The sharing of Sandia's technologies with the private sector is accomplished through formal agreements negotiated between Sandia and the individual partner. Some agreements have nonnegotiable terms and conditions, but even these agreements have a negotiated Statement of Work for each project. Developing partnerships requires discussion and negotiation. Deciding on the best agreement requires discussion among representatives from the Technology Partnerships and Commercialization Center (TPC), the line organization, and the industry partner.

The process for forming and executing a partnership varies somewhat with each individual agreement. However, a generalized picture of the process is shown in Figure 13. The idea for the partnership can originate in a variety of ways, and not all parts of the pictured process apply in all cases, but, in general, the flow of events is as shown. Negotiation and execution of an agreement include issues such as disposition of intellectual property, patent rights, etc.

One of the responsibilities of TPC is to determine which agreement type is appropriate for a given partnership. The pattern for this decision is shown in Figure 14.

Many times the discussions which ultimately lead to the development of other partnering activities (licenses, CRADA, NFE, WFO, and User facility agreements) are brought about as a direct result of the dialog established within the Technical Assistance program. The Small Business Initiative (SBI) technical assistance program is therefore a valuable tool to enhance the relationships necessary to foster the partnership environment.

There are many possible problems that could derail the partnership process. These can occur at any step along the way and include:

- the line organization is not clear about what they want to accomplish through the partnership,
- the line is clear about their expectations but has not communicated this effectively to the negotiators,
- the intellectual property (IP) is not owned by the line organization desiring the partnership,
- the IP is not owned by Sandia,
- the IP is encumbered by other agreements,
- the potential partner has already been selected outside of the required process,
- commitments have been made to a potential partner outside of the negotiation process,
- political relationships may encumber the process, and
- holding back information for potential personal gain, particularly with regard to entrepreneurial leave situations.

Many of these situations can be avoided if both the line and the TPC staff carry out their responsibilities. Line managers and staff have a responsibility to bring TPC into the process prior to any negotiation of business or legal terms and conditions. The line organizations are also responsible to avoid conflicts of interest (real or perceived) in all technology transfer activities. TPC is responsible for coordinating interactions, negotiation, ensuring that all requirements (legal and DOE) are met, and administering agreements once they are completed.

LICENSING

While Sandia actively seeks industry partnerships to do joint research on common areas of interest, there are occasions where Sandia has intellectual property that can be used by industry without requiring further research. Licensing of technology permits Sandia to utilize its intellectual property to leverage industry participation in strategic alliances, to commercialize useful technology, and to generate revenue for new research.

TPC is responsible for all licensing negotiations. The licensing process includes the strategic review of intellectual property in conjunction with technical organizations and the licensing and patents organization. TPC is also responsible for identifying potential commercial applications, developing marketing and licensing strategies, and ensuring that Sandia's strategic partnering needs are included in negotiated license agreements.

The licensing process at Sandia is as follows:

- the line organization identifies an interested partner, or a customer (industry) defines the technology they wish to license,
- additional information on the interested partner is gathered,
- status of the IP is determined,
- an intellectual property strategy is determined,
- a marketing and licensing strategy is determined,
- requestor(s) are qualified based on ability to commercialize or other factors,

- a draft agreement is negotiated and written,
- legal review and DOE review, if necessary,
- final agreement is signed.

USER FACILITIES

Many of Sandia National Laboratories' unique research facilities have been opened for use by private sector companies. Facilities open for public use are identified as Technology Deployment Centers or User Facilities. These consist of interrelated physical facilities, equip-

ment, instrumentation, scientific expertise and necessary operational personnel. These facilities are available to US industry, universities, academia, other laboratories, state and local governments, and the scientific community in general. User Facilities are a unique set of scientific research capabilities and resources whose primary function is to satisfy Department of Energy (DOE) programmatic needs, while being accessible to outside users.

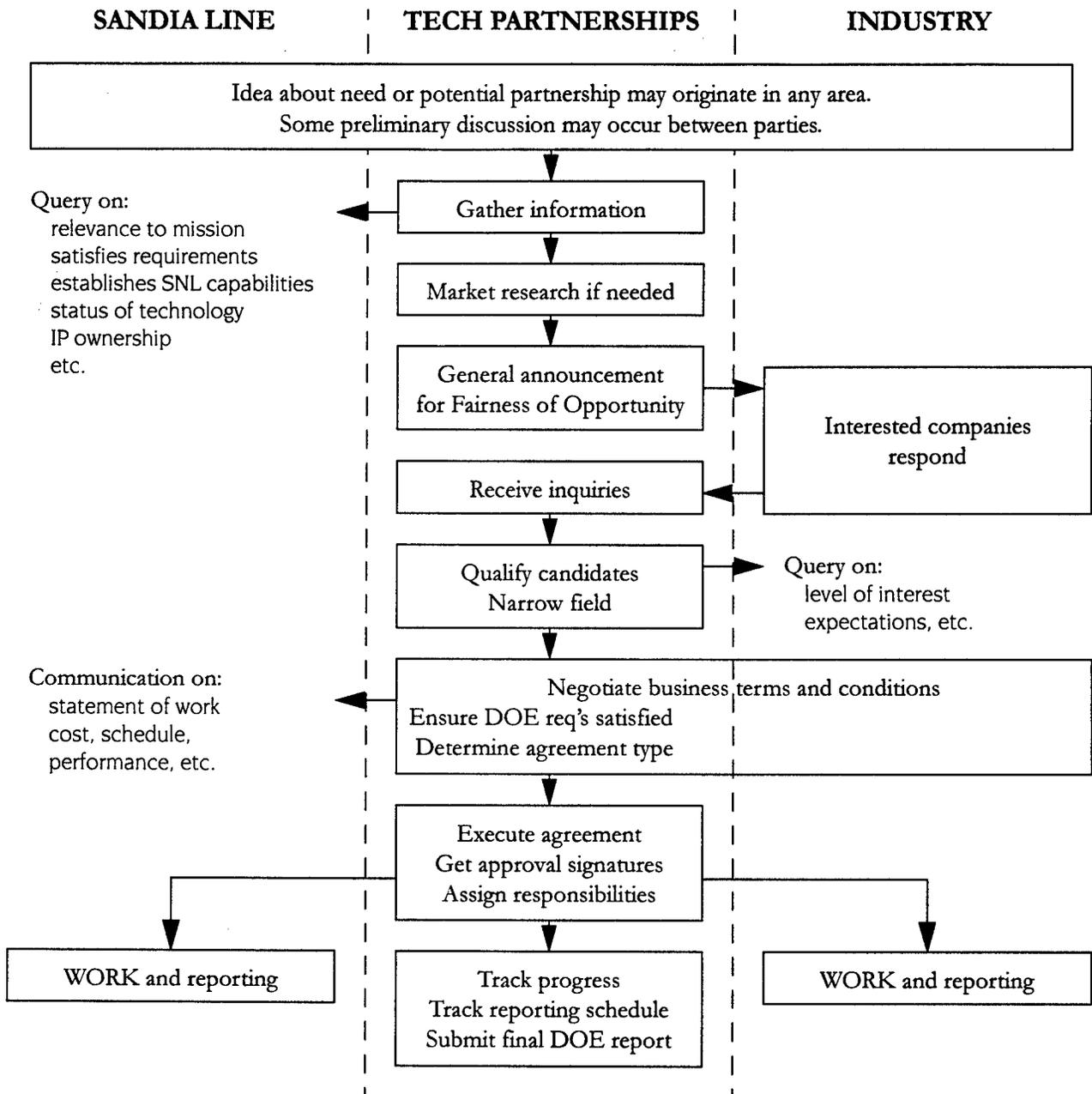


Figure 13. Partnership Process (not all parts apply to all partnerships).

The current list of User Facilities that Sandia maintains includes:

- Advanced Battery Engineering Facility
- Center for Security Systems
- Combustion Research Facility
- Component Modeling and Characterization Facility
- Design, Evaluation and Test Technology Facility
- Electronic Technologies User Facility
- Electronics Quality/Reliability Center
- Engineering Sciences Experimental Facilities (ESEF)
- Explosive Components Facility
 - Shock Technology / Applied Research Facility (STAR)
- Flow Visualization and Processes Laboratory
- Geomechanics Laboratory
- Intelligent Systems and Robotics Center
- Ion Beam Materials Research Laboratory
- Manufacturing Technologies Center
- Materials and Process Diagnostics Facility
- Mechanical Test and Evaluation Facility
- National Solar Thermal Test Facility (NSTTF)
- NUFAC Nuclear Facilities Resource Center
- Photovoltaic Laboratories
- Plasma Materials Test Facility

- Primary Standards Laboratory
- Pulsed Power and Systems Validation Facility
- Radiant Heat Facility
- Radiation Detector Analysis Laboratory
- Sandia's Orpheus Site
- TIE-In / The Technology Information Environment for Industry
- Virtual Laboratory Testbed

BUSINESS DEVELOPMENT AND MARKETING

Business development and marketing are critical activities in these days of changing missions and shrinking resources. Business development is a strategically planned and tactically executed deployment of resources to maintain or win new business. The business development process should be an integrated lab-wide effort to generate the results that are necessary to support Sandia's strategic objectives. Proper business development and marketing can reduce the risk of partnering activities.

The business development and marketing groups can provide line organizations with many different types of

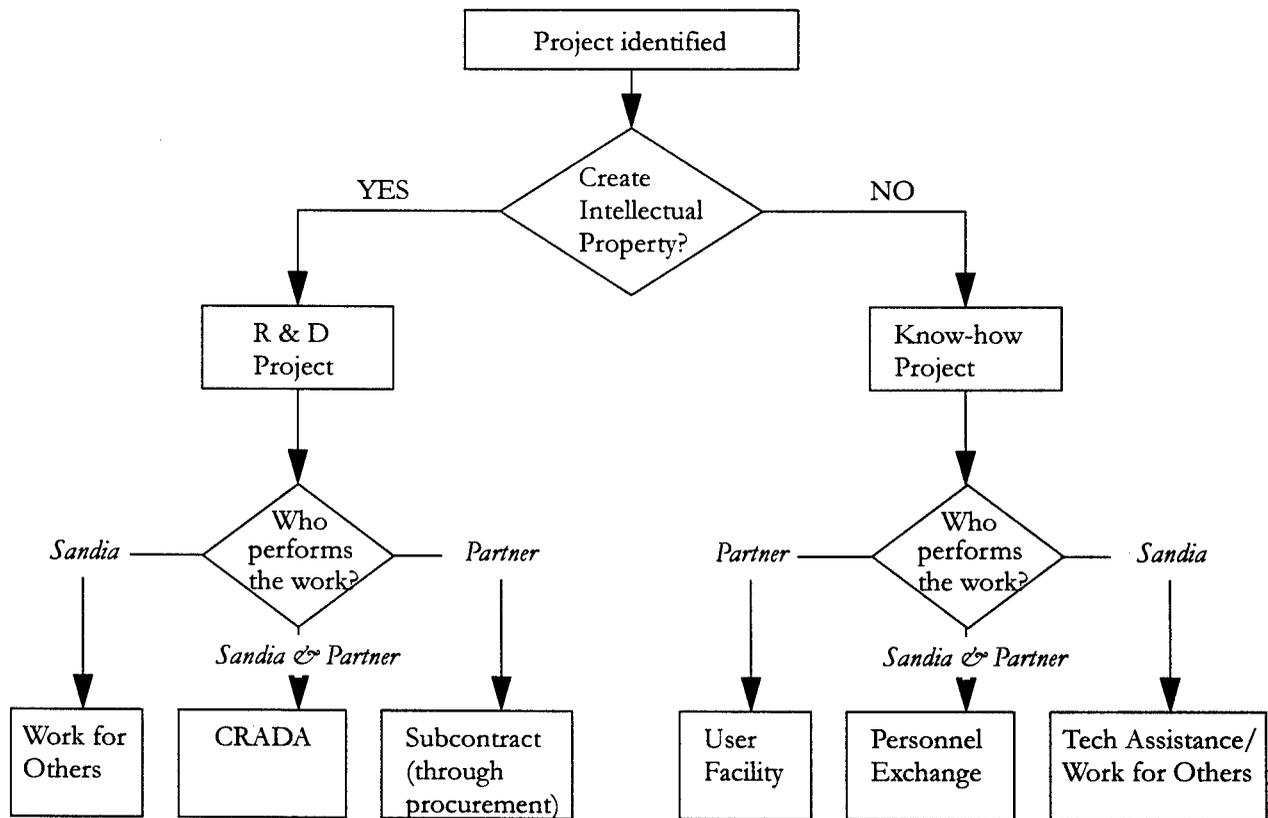


Figure 14. Pattern to Determine the Appropriate Agreement Type.

information to help them make decisions regarding potential partnering relationships. These services include:

- technology assessments (internal and external),
- company profiles (competition),
- industry evaluations (needs and opportunities assessment),
- aid in selecting promotional techniques,
- development of technology roadmaps,
- creation of business plans,
- preparation of marketing plans, and
- strategic marketing.

Some of the Sandia line organizations are very active in business development, having appointed staff to specialize in that area. These people interact with the corporate business development and marketing staff, and with the agreement specialists to look for and create win-win opportunities.

Each Sandia business unit should develop a business plan identifying steps for exploiting intellectual property. The goals of the business unit determine when and how IP should be identified and protected. Investments in IP (patents, etc.) should be based on maximizing their value to Sandia. Business development and marketing tools aid in making such decisions.

TEAM-SPECIFIC INFORMATION

Teams represent functional areas of stakeholder groups. No equivalency in terms of resources or power is intended. The use in the game of four Sandia staff teams and four industry teams does not imply that Sandia is equally important to all of industry's R&D effort. It is simply an artifact of the need to have adequate representation from all of these stakeholders to meet the objectives of the game.

SANDIA STAFF TEAMS

Sandia National Laboratories' strategic plan has eight strategic objectives, four that focus on **what** will be accomplished, and four that focus on **how** the work will be done. The Sandia staff is represented by five teams in this game, four that are aligned with the four 'whats' of Sandia's strategic plan, and one that has business development and marketing as its focus. The four 'whats' teams represent the line organizations (and management structure) that perform work related to the four mission areas, respectively. The business development team represents those organizations for which

business development, marketing, or external alliance forming are the primary functions.

All five teams operate with some overriding challenges. In an era of decreasing federal budgets, Sandia must have sufficient resources (funding, people, facilities) to meet its national missions. The number of CRADAs at Sandia has been decreasing for several years. The Sandia line organizations sometimes feel that the TPC, Business Development, and DOE groups stand in their way of getting things done. By contrast, those groups sometimes feel that the Sandia line organizations would give away Sandia's intellectual property without receiving any value in return, or that they ignore opportunities to help fund basic research that helps to maintain capability.

In addition, each team has specific challenges relevant to the mission areas for which it has responsibility. Sandia's strategic plan for each of the four mission areas is quoted below.

SANDIA STAFF 1 (S1): NUCLEAR WEAPONS

Our primary mission is to **ensure that the Nuclear Weapons Stockpile is safe, secure, and reliable and fully capable of supporting our Nation's deterrence policy**. We bear a singular accountability with Los Alamos and Lawrence Livermore national laboratories for two critical elements of nuclear deterrence: the nuclear weapons stockpile and the expertise that ensures the stockpile remains safe, secure and reliable. We honor that accountability. We will:

- be the systems integrator for our DOE and DoD customers** and our laboratory and production facility partners in planning and executing the work of sustaining the stockpile.
- maintain the vitality and effectiveness of our scientific and engineering capability and the expertise we need to perform our nuclear weapons mission.**
- provide leadership for the nation in setting and meeting the highest standards for surety (safety, security and reliability) of the nuclear weapon stockpile.**
- provide our customers with technical options to assess and respond to changes in the global nuclear threat.**

SANDIA STAFF 2 (S2): WEAPONS OF MASS DESTRUCTION & OTHER NUCLEAR INCIDENTS

We will **reduce the vulnerability of our nation to proliferation, threat, or use of weapons of mass destruction and other nuclear incidents**. This mis-

sion is synergistic with our nuclear weapon mission. We will:

- use technology and analysis in pursuit of stable international nuclear relationships** to secure special nuclear materials, especially in the former Soviet Union; developing means to monitor nuclear weapons activities effectively and affordably; and supporting regional security initiatives.
- extend and apply our technology and analysis to threats involving chemical and biological weapons.**
- advance realistic solutions to our nation's legacy of nuclear weapons waste and related nuclear waste problems.**
- apply the approaches we develop for weapons and nuclear weapons surety to other systems whose failure would have highly adverse consequences for our national security.**
- be a significant provider of science and technology solutions to assess evolving national threats.**

SANDIA STAFF 3 (S3): ENERGY AND CRITICAL INFRASTRUCTURES

We will **enhance the surety (safety, security and reliability) of critical infrastructures**, focusing on implications for the security of our nation relative to the increasing interdependency of global infrastructures. We will protect against threats to the supply and distribution of energy and other critical commodities, information infrastructures (including telecommunications and finance), and environmental quality. We will "wage peace" by identifying these threats, developing technologies to mitigate them, and proposing alternative solutions. We will support DOE and other agencies in responding to these threats. We will:

- enhance our nation's ability to **identify and assess risks and manage vulnerabilities of global infrastructures.**
- improve the reliability and reduce the vulnerability of energy generation, conversion and distribution infrastructures.**
- leverage our environmental technologies and systems **to prevent or solve serious environmental problems that might lead to conflict between nations.**
- develop rigorous analytic tools for policy makers** to better anticipate the complex dynamics of energy, the environment and national security.
- deepen our scientific understanding** and enhance our science and technology programs that play an essential role in developing solutions to threats

against energy, information, environmental quality, and other critical infrastructures.

SANDIA STAFF 4 (S4): EMERGING NATIONAL SECURITY THREATS

We will **develop high impact responses to emerging national security threats.** We will apply our differentiating scientific and technological strengths to provide our nation with advanced technologies and systems solutions. We will:

combat terrorism.

support counter proliferation by deterring and, if necessary, defeating production, storage and delivery of weapons of mass destruction and mitigating their effects.

deter and respond to attacks on US information resources and infrastructure.

mitigate the war-fighting capability and the enduring deadly legacies of mines, unexploded ordnance, residual biological and chemical warfare agents, and leftover ordnance of all types.

contribute to DoD military solutions that are technologically superior. We will apply our scientific and technological capabilities to **create system-level innovations that provide advantages over adversaries** in critical areas such as advanced sensor systems, advanced conventional weapons, military space and ballistic missile defense.

SPECIFIC INSTRUCTIONS FOR SANDIA STAFF TEAMS

Planning: Your team missions are given by the strategic plan, which will be assumed to remain constant for planning purposes. There are several things you should accomplish during the planning session. First, you must establish ground rules by which to operate as a team. Second, you should make a list of the core capabilities or competencies that are owned by the line organizations whose primary focus is support of your mission area. This is not intended to be an exclusive or all-inclusive list, but should include those core competencies that allow you to achieve your mission goals, as well as some technology assets that may be of value to industry. This list should be prioritized in terms of which competencies you feel are the most important to maintain and protect over the next ten years.

Next, using the strategic plan as a guide, envision the state of your mission area in the year 2005, and identify a set of four specific technological goals that you must meet by then to reach your desired state. These four

goals do not necessarily need to cover the entire space your mission occupies - they just need to be four goals that can be pursued in the game context. Then, for each of the four technology goals, set four intermediate milestones, again technology oriented, that are on the critical path to achieving each goal. The resulting matrix of goals and milestones should resemble that shown in Figure 15. Milestones that require new 'know-how' rather than a simple extension of existing capabilities are most desirable. You may wish to define these milestones in such a way that you maintain those capabilities that you consider essential to your future.

Please note that during the game your technology goals should be fixed, but the strategy as to how to reach the goals (i.e., the specific milestones) may change with changing information. Your ability to stay abreast of the changing information in the game will in some measure determine your success. You may wish to enlist the Business Development Team to support you in that effort.

In addition to defining specific technology goals and milestones, you should also identify any other changes (e.g., policy, regulation, structure, etc.) that are needed for you to achieve your desired state in 2005. Any desired changes should be pursued in the game with those teams that have the authority to implement such changes. For additional information on how to document these moves, see the section on "Goals, Milestones, and Moves." If no team has responsibility for the area in which you desire changes, please see the Control Team.

Resources and Moves: You will be given some resources (chits) during each negotiation session with which to make moves to meet your milestones. These resources will not be enough to meet your milestones on your own. Therefore, you should look for opportunities in which your milestones have something in common with milestones from other teams. It is unlikely that any of your milestones will match any of those from other teams. However, it is likely that at the underlying technology or competency level, you will have much in common with other teams. You may wish to partner on that basis.

SANDIA BUSINESS DEVELOPMENT (SBD)

The Sandia Business Development Team represents the corporate business development and marketing organizations, and has primary responsibility for conducting and facilitating business development, marketing, and other related efforts. Many of this team's functions are listed in the "Partnering at Sandia" section of the handbook.

This team has several potential challenges related to their primary functions. Many in the line do not see the need for a business development or marketing role in the labs' work. Many resist the changes that are required in these times of budget reductions. Many do not have a customer orientation. Many do not see the need or the value (to themselves, their employer, or the country) of transferring useful technology. Still other challenges exist in the integration of business development with laboratory mission planning functions, and in coordina-

Milestone 1 (2yr)	Milestone 2 (4yr)	Milestone 3 (6yr)	Milestone 4 (8yr)	GOAL

Figure 15. Example Matrix of Goals and Milestones (applies to Sandia Staff, Industry, and Competitor Teams).

tion of the activities of this group with those doing business development in the line organizations.

Planning: Your team should initially meet to define your team goals and metrics to track your progress, and to develop approaches and responsibilities to help you meet those goals. You may then wish to spread out and spend much of your planning time interfacing with the SNL staff and industry teams. Your roles may include information gathering and facilitation of interactions between Sandia staff and industry teams.

Resources and Moves: Your team will be given very few resources, as your need for chits to do research is small. You may charge others for your services if you wish, yet remember that the game resources are scarce. Your greatest assets are likely to be the timely collection and dissemination of critical information, and your ability to facilitate the building of relationships between other parties.

Twice during the game your team will be called upon to report your observations to the rest of the participants. This will occur at the ends of sessions 2 and 5. Since you will have more collective knowledge about what is happening in the game than most other teams, you should take this time to relay the information that you feel will help all teams meet their goals more effectively.

AGREEMENTS/ADMINISTRATION

SANDIA AGREEMENTS (AG)

The Sandia Agreements Team represents the agreement negotiation and processing, legal, and intellectual property-related functions of the Technology Partnerships & Commercialization organization at Sandia. This team is staffed with people who perform these functions every day, and who understand the specifics of the partnership process in detail. Your role in the game is to do what you do in life, but on a time-compressed basis. All of the details and legal wording of agreements are of less importance in the game than the process by which an agreement is made.

Your potential challenges are related to being the middleman in a process. Many in the line do not understand your function. Many have no knowledge of the requirements under which you operate. Many have no understanding of what they can and cannot do with respect to interactions with industry. On the other end, you have to satisfy the people at DOE and their requirements, which can change frequently.

Planning: You should spend some time working to develop a statement about the status quo of the partnering mechanics and define a desired future state. This may include changes in process, policy, regulations, or anything else that will allow you to reach the desired state. The DOE Team will be doing much the same thing during this session. After defining the status quo independently, you should meet with the DOE Team to reconcile your perceptions of the status quo, and to define joint approaches to meeting desired future states.

Resources and Moves: Your team will be given no resources (chits). However, for Small Business Initiatives or other issues overlooked by the game, see the Control Team for resources.

Your roles during the negotiation sessions will be to negotiate and process agreements between industry and the Sandia staff teams, and to pursue any changes you wish, based on your planning, to bring about the desired state.

In addition, for any agreements made between industry and the *Competitor Team* in their 'other Federal Labs' role, you should function as their Technology Partnerships organization. You may wish to designate one or two people from your team to function in that role when it arises.

DOE ADMINISTRATION (DOE)

The DOE Administration Team represents that part of DOE, both locally and at headquarters, whose function is to manage and interface with the technology transfer program at Sandia. This team is staffed with people who perform these functions every day, and who understand the specifics of the partnership process in detail. Your role in the game is to do what you do in life, but on a time-compressed basis. All of the details and legal wording of agreements are of less importance in the game than the process by which an agreement is made.

You have several potential challenges. DOE has been under fire for many years, and some fear that the department may be dismantled in the future. Budgets are continually shrinking, both for mission-related activities, and for oversight functions. A reduction in force is a possibility for the future. Missions are changing along with interpretations of how certain work relates to missions. Some of you worry that Federal labs aren't making agreements that are good for DOE or the government.

Planning: You should spend some time working to develop a statement about the current status of the

partnering mechanics and define a desired future state. This may include changes in process, policy, regulations, or anything else that will allow you to reach the desired state. The Sandia Agreements Team will be doing much the same thing during this session. After defining the status quo independently, you should meet with them to reconcile your perceptions of the current status, and to define joint approaches to meeting desired future states. Other things you may wish to do during the planning session are determine a strategy toward industry partnerships, or assume a higher level role and define changes in DOE's mission, especially in how those changes would relate to partnerships. If you have ideas of changes you would like to make that seem to be outside of the game, please see the Control Team. The game is flexible and can accommodate many changes.

Resources and Moves: Your team will be given no resources (chits). However, for issues outside those stated here, see the Control Team for resources.

Your roles during the negotiation sessions will be to interact with the Sandia Agreements Team on agreements between industry and Sandia, and to pursue any changes you wish, based on your planning, to bring about the desired state.

In addition, for any agreements made between industry and the *Competitor Team* in their 'other Federal Labs' role, you should function as their DOE oversight organization. You may wish to designate one person from your team to function in that role when it arises.

INDUSTRY

Your four teams represent the R&D business units of corporate America. You are interested in technical development which will result in enhancing your position in the marketplace. In fact, your overriding challenge is to either remain or become internationally competitive within the next decade. In many cases, this means that you must acquire or develop appropriate technologies before your competitors. You are willing to enter into collaborative agreements with appropriate organizations for the research, development, or licensing of technologies which you believe your company can commercialize. However, any such agreement must promise a certain minimum return on investment with sufficiently low or acceptable risk. With respect to federal laboratories, you are concerned about directives which govern (or limit) their ability to enter into collaborative and joint venture agreements. You would like to simplify and expedite the CRADA process. You are also concerned about

competition from the laboratories as an R&D entity, and issues concerning ownership of intellectual property.

Each of your teams has a focus on a different sector of the economy. Specific examples of the industry functions that are comprised in your team description are given below. There is a certain amount of overlap between teams on some functions, just as there is in real life. Due to the scope of the game, many fields are not covered. If you wish to add a specific focus to your team, please check with the Control Team so that this can be coordinated with the other industry teams.

INDUSTRY 1 (I1): INFORMATION TECHNOLOGY AND COMPUTING

The Information Technology and Computing team is comprised of the following minimum list of industrial functions:

- chip design and manufacturing,
- computer design and assembly (this may cover the spectrum from personal data assistants to super-computers),
- software development,
- networking technologies,
- internet applications,
- information surety,
- telecommunications, and
- any large-scale, information-related areas from other fields (e.g., telemedicine).

INDUSTRY 2 (I2): ENERGY, ENVIRONMENT AND TRANSPORTATION

The Energy, Environment and Transportation team is comprised of the following minimum list of industrial functions:

- energy resource extraction,
- fuel production,
- power generation,
- environmental restoration and remediation technologies,
- pollution prevention and reduction technologies, and
- transportation infrastructure (personal vehicles, highways, bridges, etc., but not aerospace).

INDUSTRY 3 (I3): ADVANCED MANUFACTURING AND ADVANCED MATERIALS

The Advanced Manufacturing and Advanced Materials team is comprised of the following minimum list of industrial functions:

- robotics,
- packaging and assembly,
- chemicals,
- high-tech plastics, ceramics, rubbers, glasses, metals, and composites, and
- materials-related processes (e.g., casting, forming, deposition, lithography, etc.).

INDUSTRY 4 (I4): NATIONAL SECURITY AND CRIMINAL JUSTICE

The National Security and Criminal Justice team is comprised of the following minimum list of industrial functions:

- traditional military contractors,
- aerospace (aircraft, space, missiles, etc.) and similar structures,
- secure communications and encryption,
- information surety,
- sensors and detection technology, and
- chemical and biological agent technology.

SPECIFIC INSTRUCTIONS FOR INDUSTRY TEAMS

Planning: There are several things you should accomplish during the planning session. First, you must establish ground rules by which to operate as a team. You may make decisions and use resources as a team in all regards, or you may choose to operate as separate functional units, each with a portion of the resources and authority to use them. You may choose a different mode of operation altogether. Second, you should choose the functional areas in which you will concentrate your actions. You may wish to spend a few minutes to list the core capabilities or competencies that are basic to these functions. This is not intended to be an exclusive list, but should include those core competencies that you feel are critical to staying competitive in your industries over the next ten years.

Next, envision the state of your functional areas in the year 2005, and identify a set of four specific technological goals that you must meet by then to reach your desired state. These four goals do not necessarily need to cover the entire space your team occupies - they just need to be four goals that can be pursued in the game context. However, *one of these goals must be appropriate for a small business concern*. Then, for each of the four technology goals, set four intermediate milestones, again technology oriented, that are on the critical path to achieving each goal. The resulting matrix of goals and milestones should resemble that shown in Figure 15. Milestones that require new 'know-how' rather than a

simple extension of existing capabilities are most desirable. You may wish to define these milestones in such a way that you maintain those capabilities that you consider essential to your future.

Please note that during the game your technology goals should be fixed, but the strategy as to how to reach the goals (i.e., the specific milestones) may change with changing information. Your ability to stay abreast of the changing information in the game will in some measure determine your success. You may wish to communicate with the Sandia Business Development and Agreements Team to support you in that effort. You may also wish to find other ways to scan for this type of information.

In addition to defining specific technology goals and milestones, you should also identify any other changes (e.g., policy, regulation, structure, etc.) that are needed for you to achieve your desired state in 2005. Any desired changes should be pursued in the game with those teams that have the authority to implement such changes. For additional information on how to document these moves, see the section on "Goals, Milestones, and Moves." If no team has responsibility for the area in which you desire changes, please see the Control Team (e.g., for Congressional action).

Resources and Moves: You will be given some resources (chits) during each negotiation session with which to make moves to meet your milestones. These resources will not be enough to meet your milestones on your own. Therefore, you should look for opportunities in which your milestones have something in common with milestones from other teams. It is unlikely that any of your milestones will match any of those from other teams. However, it is likely that at the underlying technology or competency level, you will have much in common with other teams. You may wish to partner on that basis.

COMPETITOR TEAM (RED)

You represent universities and federal laboratories other than Sandia. You have a dual role, and in any of your actions, you must specify whether you are wearing your 'university hat' or your 'laboratory hat.' You also have a dual role in terms of team goals. You should be loyal to the constituency you represent in the game (universities and other federal laboratories). You face challenges of shrinking funding, reduced numbers of graduate students who can perform technical work, and greater oversight. Your actions should also provide positive

incentives and feedback to help the Sandia teams to improve their partnering processes.

You should assume that you have the technological capabilities of your constituency. In the university role, this means that you have the ability to perform basic science in nearly all fields, often at the lowest possible cost because of the availability of graduate students. However, due to relative inexperience, you often may not be able to do the job as quickly as others would. You also have few of the large-scale facilities that are often available at industrial or federal laboratories.

To maintain fairness in the game, your team cannot operate without restriction. Any time you are wearing your 'laboratory hat,' you will have to satisfy the same requirements that a Sandia team would. In a partnering arrangement, the Sandia Agreements Team will act as your negotiating, legal, licensing, etc., agent. Any government agency approvals you require will be handled by the DOE Team.

Planning: There are several things you should accomplish during the planning session. First, you must establish ground rules by which to operate as a team. You may make decisions and use resources as a team in all regards, or you may choose to operate as universities and laboratories, each with a portion of the resources and authority to use them. You may choose a different mode of operation altogether. In any case, you must set operating rules and inform the Control Team of what they are.

Next, envision the state of the world in the year 2005, and identify a set of four specific technological goals that you would like to meet by then that you feel are particularly fruitful in terms of potential partnerships. These four goals do not necessarily need to cover the entire space your team occupies - they just need to be four goals that can be pursued in the game context. These may take the form of responses to grand challenges, or may be reactive to the needs of industry. Then, for each of the four technology goals, set four intermediate milestones, again technology oriented, that are on the critical path to achieving each goal. The resulting matrix of goals and milestones should resemble that shown in Figure 15. Milestones that require new 'know-how' rather than a simple extension of existing capabilities are most desirable.

Please make every effort to maintain your technology goals throughout the game. However, we realize the breadth of technology capabilities on your team. If the focus of game play moves into new areas in which you

have significant capabilities, you may alter your goals and milestones accordingly.

In addition to defining specific technology goals and milestones, you should also identify any other changes (e.g., policy, regulation, structure, etc.) that are needed for you to achieve your desired state in 2005. Any desired changes should be pursued in the game with those teams that have the authority to implement such changes. For additional information on how to document these moves, see the section on "Goals, Milestones, and Moves." If no team has responsibility for the area in which you desire changes, please see the Control Team.

Resources and Moves: You will be given some resources (chits) during each negotiation session with which to make moves to meet your milestones. These resources will not be enough to meet your milestones on your own. Therefore, you should look for opportunities in which your milestones have something in common with milestones from other teams. It is unlikely that any of your milestones will match any of those from other teams. However, it is likely that at the underlying technology or competency level, you will have much in common with other teams. You may wish to partner on that basis.

GOALS, MILESTONES, AND MOVES

GOALS AND MILESTONES

The purpose of this section is to give the Sandia staff, industry, and competitor teams more guidance on the scope and focus of their planning. Each of your teams has been directed to develop four technology or product-oriented goals that you would like to achieve for your technology/product portfolios over the next 8-10 years. For each of those goals, you are to define four separate technology milestones that are on the critical path to achieving the goals. Table 13 gives an example of the technology focus and level of detail that we feel are appropriate for the goal and milestones.

We realize that, for product development, the pattern shown in Table 13 does not follow the pattern often followed by industry of:

- technology development
- characterization
- prototype production
- full-scale production

Table 13: Example of Goal and Corresponding Milestones (scope and technology focus).

Milestone 1	Milestone 2	Milestone 3	Milestone 4	GOAL
Develop high-efficiency engine capable of 70-80 mpg. Some possibilities include gas, gas-electric hybrid, or fuel cell engines.	Create power train technologies for each of the options considered in milestone 1.	Develop and test new ceramic, alloy, and/or composite materials to reduce vehicle weight.	Develop, test, and implement new manufacturing techniques to ensure milestone 1, 2, and 3 goals are achievable in production (e.g., composite molding technology)	New generation vehicle getting ~80 mpg becomes available for production.

Although the implementation of production lines are an integral part of industrial activities, in the context of this game, production issues are unlikely to help the game meet its objectives. Thus, we ask you to define all of your milestones to be technology-related rather than production-related.

MOVES

In real life, the partnership process can require many steps, as summarized in Figure 13, and take many months of research and negotiation. In this Prosperity Game™, the purpose of making agreements is not to make perfect agreements, but rather to test and improve the partnership process, the business development and marketing functions, and the way in which people form relationships and interact. Thus, the agreement process will be abbreviated for game purposes.

All negotiation sessions (2, 3, 5, 6) will begin with the distribution of chits to the teams. These chits are meant to be spent on those moves by which teams achieve their goals and objectives. Moves can take several forms including:

- internal R&D (provided the team has the necessary monetary and technical resources to accomplish the desired objective),
- an agreement to license a technology or process from another team,
- any of the partnership agreement types shown in Figure 14 (e.g., CRADA),
- a partnership between industries not categorized in Figure 14, and
- a policy, regulation, or process change that will allow a team to more readily achieve its objectives.

This list is not intended to be comprehensive, but rather to give examples of the ways in which a team can accomplish its goals during the game.

Each move should support completion of one milestone. For example, it is unlikely that any two teams will have a specific milestone in common. However, the underlying competencies or basic scientific fields to milestones may have much in common. For game purposes, a move based on an underlying competency will count as fulfilling the milestone to which it pertains. Thus, partnerships based on these competencies will satisfy milestones for all parties to an agreement.

All moves must be submitted to the Control Team on an *Agreement Form* (see Table 14 for an example agreement that would satisfy milestone 3 from Table 13) to be valid. The Agreement Form requires certain information: the **specific objective** of the move, proposed **cost and schedule**, and business **terms and conditions**. The form should be filled out as follows:

- ❶ For the Sandia, industry, and competitor teams, if the move is technology-oriented, the specific objective should support fulfillment of one of the milestones from your planning session. If the move is policy, regulation, or process-oriented, the objective should state the desired results.
- ❷ The agreement number should be assigned by the originating team based on the following formula - team name, goal number, milestone number (TTT-G-M). For example, an agreement originated by the Industry 2 Team for goal 3, milestone 1 would be tagged as I2-3-1.
- ❸ If there are cost and schedule requirements related to the specific objective, they should be stated here.
- ❹ Terms and conditions of the move should be explicitly stated. If this is an internal R&D move or a policy move, justification for the move should be written here. For a partnership or licensing arrangement, this section should include a statement of work (who does what) as well as payment terms and legal issues such as disposition of intellectual property developed under the agreement. The Sandia

Agreements Team should help in this area of the agreement.

Table 14: Game Move/Agreement Form.

<p>1 Specific Objective: Develop composite materials to replace existing automobile structural members and body that reduce weight by 50% and fabrication costs by 50%. This includes some basic materials characterization, but not the full suite of characterization necessary for use in manufacturing.</p> <p>2 Move Number: I2-01-03</p> <p>3 Cost and Schedule: \$30M from I2 to SNL/LANL over 6 years (1998-2003)</p> <p>4 Terms and Conditions (disposition of IP, etc.): IP will be owned by inventing party, and will be licensed to partners. DOE/Lab funding - \$3M/yr. for 6 years. USCAR funding - \$5M/yr. for 6 years and \$10M/yr. of in-kind R&D, testing, and production technology upgrades.</p> <p>5 Agreement Type: CRADA</p> <p>Initial if used SBD Team: Business Development (XYZ) SBD Team: Marketing AG Team: Legal (ABC) AG Team: IP review (DEF) DOE Team (NML) Other</p> <p>Other deliverables satisfied by move: S2-03-02</p> <p>6 Agreement Matrix: Low Med. High COST Low risk Medium risk XX High risk</p> <p>7 Control Approval and Cost: MB, 6 chits</p> <p>8 Participating Teams: I2, 4 chits S2, 2 chits</p>

- **5** If a specific agreement type (e.g., CRADA, Work for Others, etc.) is required, it must be noted in the first box on the left of the form. NOTE: All industry-Sandia agreements require *Agreements Team* involvement. If a new agreement type is created in the game, it must be noted here as well. Any additional approvals needed for a specific agreement should also be noted here along with proper approval signatures.
- **6** For a technology-oriented move, the originating team should rate the move in terms of cost and risk in the Agreement Matrix (bottom left box).
- **7** The Agreement Form should now be submitted to the Control Team for review and pricing. The price of a move is based primarily on the Agreement Matrix. Higher risk or higher cost will both be reflected in a

greater number of chits being required to consummate the agreement. The Control Team will finalize the price (number of chits) in consultation with the originating team.

- **8** Once the move has been priced, the originating team should finalize the agreement with any partners, collect the necessary chits, note the participating team along with the number of chits each pays, and bring them back to the Control Team.

When a technical move is accepted by the Control Team, a certificate will be issued to the originating team denoting that the milestone that the move was based on has been met. If a move simultaneously meets milestones of more than one team through a partnering arrangement, this should be noted on the agreement form, and certificates will be issued to all parties.

Please keep in mind when making moves and forming partnerships that the game is very flexible. Creativity (as opposed to fantasy) in making moves is rewarded.

Policy, regulation, and process moves should also be submitted to the Control Team for final approval. These moves should be made on the "Game Move" form and should contain the information from blocks **1**, **2**, **4**, **7**, and **8**. The terms and conditions from block **4** here should state the new policy or regulation. Block **1** should give the projected results of the change. the Move number in block **2** should use the following format: TTT-P-xx, where TTT is the originating team, the P stands for policy, and xx is sequential numbering. If the move is such that it would require the aid or approval of another team in real life, the Control Team will require it as well. Any of these types of moves will be implemented into the game immediately. For example, changes in DOE policy may change the types of approval necessary for certain types of agreements. These changes would be broadcast to the group, and implemented immediately through the DOE and Sandia Agreements Teams.

TECHNOLOGY BRIEFS

THE NEXUS OF INFORMATION TECHNOLOGY AND BIOTECHNOLOGY

Description: We are in the middle of surges in both information technology and biotechnology. In the information technology area, enormous steps in the use of databases, imaging, and modeling are taking place while we are enjoying quantum steps in both capability and

performance of the technology. Breakthroughs of equal impact are occurring in biotechnology and its closely related fields. Genomics, structural biology and health care technology all are each at the threshold of major change. The intersection of these technologies provide an enormous opportunity to impact quality of life issues with each of these branches of science pushing the other.

Threats: Health care costs have risen much faster than the national GDP. Costs have become such an issue that our university, industry and laboratory biotechnology research will ultimately impact our lives only to the extent that it can be used and delivered in a cost-effective manner.

Opportunities: Information technologies have highly impacted a large number of fields ranging from communications, to business transactions, to optimizing the performance of our automobiles. Routine activities have lower cost by orders-of-magnitude while providing greatly improved capability. We are on the threshold of a similar level of impact upon our quality of life issues.

Genomics - The human genome with $\sim 3 \times 10^9$ base pairs will be fully sequenced in about five years. Sequencing will be enabled by TeraBytes of memory and TeraFLOPS of performance. This is the first step toward functional genomics where the individual parts of the genome are correlated to disease susceptibility which will, in turn, lead to revolutionary treatment approaches.

Structural Biology - Ubiquitous and TeraFLOP computing will allow simulations of multi-hundred atom quantum chemistry problems from first principles, the study of microsecond time-scale molecular dynamics and the broad study of molecular biology problems. We will be able to understand how proteins function/malfunction in causing disease and assess the risk of adverse exposure.

Health Care Technology - We are approaching the ability to accurately model much of the complexity of the human body. Insights provided by such modeling will allow the development of entirely new treatment approaches, optimized therapies and the expectation of reduced and contained costs. Telemedicine offers the prospect of improved diagnostics and monitoring, and even limited forms of critical care.

A Coalition: This topic can forge a strong partnership among the three parts of the R&D triad (industry, universities, laboratories). Strong university programs are

impacting the underlying science; industry maintains the strong customer focus and exhibits significant entrepreneurial investment; and the laboratories are pioneering advanced genomics and TeraFLOP computing. It will inevitably impact the quality of our lives.

ENERGY SUPPLY AND SECURITY

Description: Energy supply, economic and environmental security are inexorably intertwined. The nation's policy direction and the subsequent role of technology, in supporting a safe and environmentally sound future, are key national issues. Universities, national laboratories, and industry can collaborate to deliver safe, environmentally sound energy supply and security solutions to the nation.

Threats: Energy security remains a major public policy goal for the United States. Though the threats are not as pervasive as during the Cold War, the United States still lives in a world full of risks.

The growing dependence on imported oil, particularly from the Persian Gulf, has significant implications for the Nation's economic and national security. The United States will import well over 50 percent of its oil in five years and will approach 60 percent in ten years. Should these forecasts prove to be accurate, the Persian Gulf nations' oil revenues may triple from \$80 billion to nearly \$250 billion a year in 2010 which translates to a potential inflow of more than \$1 trillion over this 15-year span. The weaponry, influence, and mischief that money could buy in this chronically unstable region is a security threat that the Department of Energy is working to reduce.⁴

DOE's current energy R&D budget has dropped by about 74% (in constant dollars) from its 1978 budget. In 1995 the total federal investment in energy R&D was only about 0.5% of the total U.S. energy expenditure.⁵

Opportunities: Energy supply and efficiency R&D is needed to help mitigate the economic risks of disruption to the Nation's energy supplies. Energy and environmental science can help our nation reduce dependence on foreign oil and support innovative energy and environmental policy. Here are some of the areas where universities, industries, and national labora-

4. Statement of Charles B. Curtis, Deputy Secretary, US Department of Energy Before the United States Senate Committee on Energy and Natural Resources, September 4, 1996

5. *Industrial Ecology Prosperity Game™ Players' Handbook*, May 20-22, 1997

tories can collaborate to create solutions to energy and environmental problems:

- Enhance our energy security and develop clean energy.
- Develop alternative energy sources such as solar, geo-thermal, nuclear, hydrogen, and fission energy.
- Understand global warming issues and contribute to the reduction of greenhouse gases.
- Develop an alternative to the internal combustion engine.

A Coalition: This topic can forge a strong partnership among the three parts of the R&D triad. Strong university programs are contributing the underlying science; industry maintains the strong customer focus and exhibits significant entrepreneurial investment; and the laboratories are pioneering advanced energy and environmental science. It also will inevitably impact the quality of our lives.

INDUSTRIAL ECOLOGY

Description: Industrial ecology (IE) is an emerging scientific field that views industrial activities and the environment as an interactive whole. The IE approach simultaneously optimizes activities with respect to cost, performance, and environmental impact. The IE approach provides a dynamic systems-based framework that enables management of human activities on a sustainable basis by: minimizing energy and materials usage; insuring acceptable quality of life for people; reducing the ecological impact of human activity to levels that natural systems can sustain; and maintaining the economic viability of systems for industry, trade, commerce, and government.

The current suite of IE tools includes: industrial metabolism; dynamic input-output modeling; design for the environment; product life extension; and industrial ecosystems.

Threats: At current usage, oil reserves may be depleted in 40 years. Fossil fuels are the mainstay of the energy economy. Their use produces air quality concerns and potential environmental damage. Although the impact is highly uncertain, burning fossil fuels does increase the concentration of CO₂ and other gases.

In many places, water supplies are marginal, and water is being pumped from aquifers faster than it is being replaced. Loss of agricultural land can be attributed to greater urbanization, overproduction and soil erosion.

The current regulatory environment is compliance-based and extremely expensive. Environmental regulations are estimated to cost the nation about \$500 billion per year, and to consume 5 billion hours of paperwork per year.

Opportunities: IE treats industrial processes and the environment as an ecosystem. Waste materials and energy from one process might profitably be used as raw materials and inputs to a different process. IE seeks to simultaneously enhance profitability and reduce environmental impact. To succeed, it needs to apply systems engineering concepts across industry and government sectors. By its nature, it encourages multi-sector, multi-company partnerships. It allows for competition in markets, but cooperation in reducing costs and increasing efficiency.

IE can help satisfy the government's needs for reducing problems associated with waste generation and disposal, for lowering costs of government services, and for protecting the environment. Universities can help develop IE science and train new practitioners. Industry can profit by reducing the costs of resources and energy, and help move the nation to performance-based environmental regulations rather than compliance-based.

A Coalition: Because waste in one area can be a valuable input in another, IE naturally requires a partnership among users. The IE skills and research required include large-scale facilities, systems engineering, supercomputing capabilities, education and training, expertise in many scientific fields, and expertise in advanced manufacturing and applications. Hence, all three members of the R&D triad can both contribute to generate the required knowledge and use it to help meet their own private needs as well as the nation's requirements.

SOME THOUGHTS ON BUILDING STRATEGIC PARTNERSHIPS

BY GARY J. JONES

Strategic partnerships are an integral tool in supporting our missions and enhancing our ability to meet the nation's needs while helping to broaden our understanding, capabilities, and competencies. Partnerships help the laboratory to leverage resources to provide the finest product and services at a lower cost. These views have been reinforced in the Laboratories' strategic plan and in numerous publications and presentations.

While we speak extensively about strategic partnerships, there are still questions about the definition of "strategic," and the entire process for developing partnerships. Much of this misunderstanding results from the failure to clearly distinguish **mission** plans from **partnering** plans within organizations. The mission plans and the partnering plans must be interlinked, but they do not have the same customers, products, or objectives. This note examines this situation by looking at an analogue in the commercial world and analyzing how this could be applied at Sandia.

DEFINING "STRATEGIC"

In this discussion we are not talking about our partnerships with other DOE labs or production sites, or other projects that are directly part of our mission activities. Instead we are speaking of those partnerships typically with non-federal entities. Such a partnership is considered to be strategic if it helps the laboratory fulfill its missions—now and in the future—by enhancing our capabilities, facilities, and understanding. This enhancement can be direct, such as providing the Laboratories with new and broadened technologies, or indirect, such as increasing our understanding of existing technologies by exercising them on new problems. Determining the strategic value of a partnership requires that we have a concise statement of our missions and a plan for enhancing our abilities and assets through partnerships over time.

THE COMMERCIAL ANALOG

In the commercial world, companies frequently undertake new ventures to strengthen their main product line. Often this comes in the form of vertical or horizontal integration, such as a soft drink company buying a fast food chain, or Disney buying a cruise line. We will refer to this as the development of an "ancillary line-of-business"—a line-of-business that derives from the main business path and helps support that path either directly or indirectly, but is not part of the main business. The ancillary lines-of-business in the commercial world fulfill the same function as the strategic partnerships do for Sandia—supporting the mission but not directly part of the mission.

To establish a successful ancillary business, industry utilizes a four-step process. First, the company or organization must define how it wants its main lines-of-business to evolve. The company then determines if this evolution can be enhanced by the development of supporting

business lines based on its existing assets—expertise or product. If a new venture would enhance the main lines-of-business, the third step is defining the new ancillary product or service, and determining whether there is a sufficient potential market demand to support its development. Finally, the industry must plan how this product will be presented to the potential customer and the sale finalized.

STRATEGIC PARTNERSHIPS AT SANDIA

The Laboratories need to follow a similar four-step path in developing strategic partnerships. These steps are summarized in Figure 16.

1. Plotting the Evolution of Technology Areas:

The first step is to develop a plan outlining the desired evolution of the given laboratory mission-related technology area. This plan addresses technology and capabilities development in the near- and mid-term, going beyond the typical strategic plan and including elements of a more detailed business plan focusing on the mission sponsors. This step is critical—without an understanding of the desired mission-related development path for the Laboratories' technology areas, it is impossible to determine the strategic value of a partnership.

2. Defining the Role of Partnering:

Once the desired future direction has been determined, the role of partnerships in pursuing that direction needs to be addressed. For each of the technology areas in step one, this will require an examination of Sandia's assets in the light of other entities' assets. The assets represent the facilities and capabilities that make an organization uniquely qualified to pursue their mission, and the intellectual property (patents, copyrights, and commercially valuable information) that represent past accomplishments. Such an analysis will help define the degree to which the Laboratories can improve its assets to enhance mission performance through partnering. Since strategic partnerships can provide both direct (expertise) and indirect (application) support of Sandia's mission, it is important that this assessment recognize both potential benefits.

3. Developing the Value Proposition:

Knowledge of the Laboratories' mission-related development goals, the assets in each technology area and the way these assets can be enhanced through partnerships, plus information about the

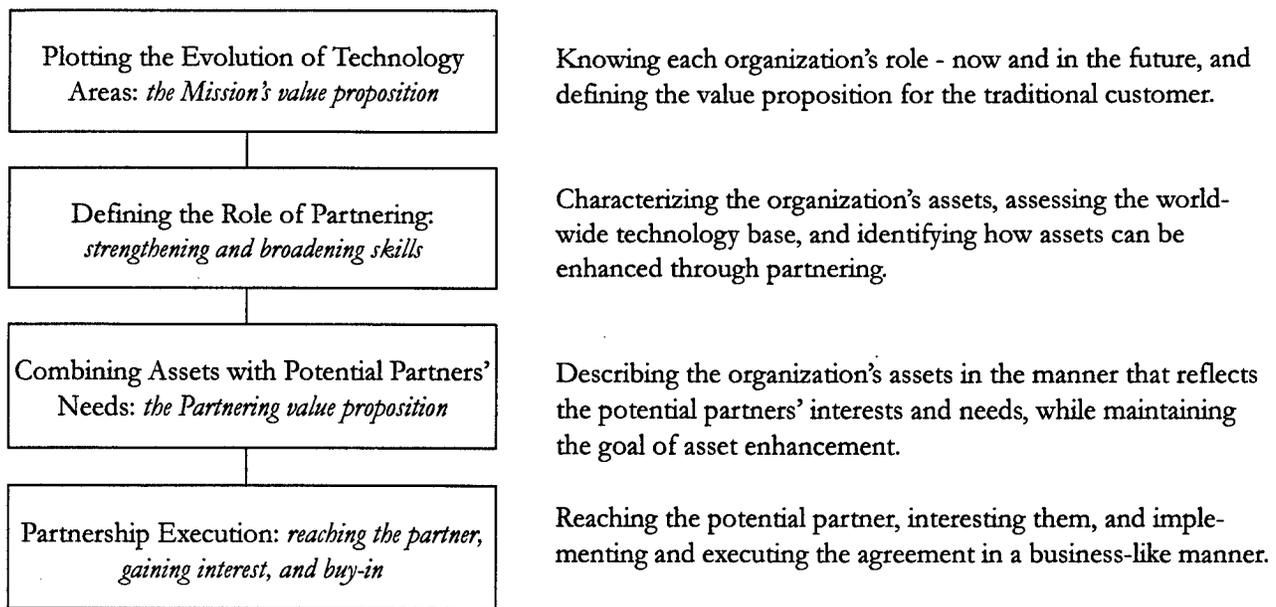


Figure 16. Four Steps to Defining and Developing Strategic Partnerships.

interests of potential partners, are the materials needed to define the new ancillary business. Not only must the Laboratories' environment be understood, it is necessary to develop an understanding of the market environment for each ancillary business. The latter includes knowledge of the potential customer, their needs and how our assets address those needs. The result is a "Superior Value Proposition" (as defined by Lynn Phillips' course on *Building Market-Focused Organizations*) for each of the proposed ancillary lines (partnerships areas). These value propositions will differ from the Laboratories' mission-related value proposition that focuses on traditional sponsors.

4. Partnership Execution:

The final step includes reaching the potential partner, interesting them, and instigating the partnership. Reaching the potential partner and interesting them in the partnership requires the development of a "communications" (read "advertising") strategy. The strategy will have details unique to the technology area and the desired partner, and will include utilization of existing contacts, attending and displaying at selected conferences, web-site development, and targeted publications. Once a preliminary agreement to pursue the partnership has been reached, the final step is to negotiate and implement the agreement in a timely manner. Of course, related to this is the continued monitoring of the agreement and assurance

of customer satisfaction necessary for continued success.

THE SERVICES TO BUILD PARTNERSHIPS

For the technical organizations to follow this four-step process, services are needed that are typically not a part of the technical groups expertise. Therefore, if the Laboratories are to fulfill their objective in strategic partnerships, the technical organizations must have access to the tools and services necessary to successfully complete these four steps. The necessary services can be identified by looking at each step in more detail.

1. Services for *Plotting the Evolution of Technology Areas*:

This step looks inward at the Laboratories, examining why an organization exists in terms of the Laboratories' mission, its current status and the evolution of its role over time. Completion of this step should result in a business plan (BMFO-type) that shows the organization's direction for the future in the context of the Laboratories strategic goals and objectives—aided by the "Line of Sight" activity now underway throughout Sandia. The services useful for completing this step are:

- business planning facilitation,
- technology roadmapping, and
- future analysis through Prosperity Games.

2. Services for *Defining the Role of Partnering*:

This step has two facets—the audit of the unique assets of the organization and the characterization of the equivalent assets of outside organizations. This step also begins the assessment of existing intellectual property. This step looks both inward and outward, and requires expertise not typically found in the technical organization. The tools and services necessary in this step include:

- Partnership experts to assist in the definition and evaluation of unique assets,
- Marketing and partnership development resources to facilitate the organizational audit including the characterization of outside “competitors,”
- Licensing specialists to work with the line to identify existing intellectual property and establish awareness for the protection of future IP.

3. *Services for Developing The Value Proposition:*

This step requires that the technical organization define the partnering product that will provide the desired strengthening of Sandia’s mission-related capabilities, and that the interests of the potential partner be understood. During this step, capabilities and facilities will need to be characterized from the viewpoint of a product or service that can be provided to a potential partner, rather than from a mission technological advancement viewpoint. Obviously it is necessary to identify and determine the interest and needs of the potential partner. Based on the outcome of these analyses, the intellectual property strategy will decide between promoting licensing directly or using intellectual property as an enticement for partnering. Market surveys are typically required to determine the value of Sandia intellectual property and the best path for its development. Finally, all of this information needs to be combined, resulting in a clear, concise statement of the ancillary business line—the “Superior Value Proposition” mentioned above. These value propositions define not only the partnership direction, but also help determine how the potential partner will be reached. There should be a separate, but related, value proposition for each major product or group of customers from a given organization. Since the Value Proposition is the culmination of Sandia’s product definition phase, it is important that the line organization verify the result by seeking input from partnership development organizations. Fulfilling these needs will require that the line receive support from a partnering **team** comprising partnership development specialists, licensing specialists and marketing resource personnel:

- Partnership and business development specialists to help define the value proposition,
- Marketing resource personnel to refine this definition and obtain the information needed to characterize the potential customer,
- Licensing specialists to define and implement a strategy for utilizing the intellectual property to maximize its value to the line and the Laboratories. Even if the organization determines that partnering is not valuable, there needs to be an intellectual property licensing strategy.

4. *Services for Partnership Execution:*

Having defined the product and the potential partner or group of partners, the actual partnership development begins. This phase starts with an “advertising strategy” to make potential partners aware of Sandia’s capabilities and value propositions. This strategy identifies target groups and mechanisms for accessing them, appropriate publications, and key process owners. The potential partners are contacted and a dialogue ensues, hopefully leading to a preliminary agreement to discuss partnering. The next activities are the individual potential partner interactions, drafting of work plans, and negotiation of the partnership arrangement. This phase requires two primary sets of services:

- marketing and communication resource personnel to develop and implement the activities targeting the potential customer,
- licensing and agreement specialists, and agreement analysts to negotiate and implement partnerships in a timely manner.

IMPLICATIONS OF THIS MODEL

Viewing partnerships as ancillary business activities reinforces the definition of strategic partnerships and implicitly links all partnerships to a main line-of-business. In addition, several other observations can be drawn from the model. These are listed in no particular order.

- This model separates the strategic planning related to the mission from the planning related to ancillary business, or partnership, development. Unfortunately, some organizations combine the first three steps into one strategic planning exercise. The result is a partnering plan that appears to be driven by “commercial” logic (funds-in) rather than by mission enhancement.
- If there is confusion in the technical organizations between the value propositions in Step 1 and the

type to be developed in Step 3 for the ancillary business lines, the strategic linkage may be difficult to describe. This leads to arguments that ask "Why are we doing this? This isn't what DOE wants."

- The traditional partnership services set is focused on step 4. While these services are important and rapid partnering must remain a priority, a truly effective partnership development program must address all four steps.
- Marketing and business/partnership development expertise is the only service present in all steps. This is certainly in contrast to the view that marketing is a "bolt-on" or luxury service. A partnerships development center needs strong market and business expertise to effectively meet all of these needs.
- Licensing expertise and the development of a licensing strategy is a key element of the effort to identify assets and maximize their value. However, licensing is also the only activity that can operate even if no partnerships are sought. This gives the licensing team a unique outward focus while requiring that they stay grounded in the line organization's strategic planning.
- The services necessary for Step 1 are currently available, but not widely recognized or utilized. This, and some of the other services, would need to be extensively socialized to be effective.
- The role of the partnership development manager could be to market these services and take part in the line's use of them. This involvement is probably most important in Step 2 and Step 3—although few organizations are involved in these types of activities.
- Information about progress against a strategy is valuable to the line, but not if the line does not have a strategy to judge the data against. Data systems, such as PartnerWorks must be integrated into early steps of the process as a strategic planning tool, or it will become primarily a tracking system for Step 4.
- Almost all of the services needed in this process, with the possible exception of the marketing and communication to reach customers in Step 4, can be characterized as "part-time." This implies that it would be most efficient to centralize the business and market expertise needed in Steps 1-3. The net result might be distributing "product marketing" but centralizing the planning assistance marketing function.
- Since each technology area will have unique assets and directions, the assignment of specific teams that work with the responsible organizations would seem appropriate. The teams would appear to be com-

posed of marketing, licensing, business, and partnership development representatives.

Table 15: Industrial Partnership Prosperity Game™ Session Summary

TERMS OF PLAY	SESSION 1: PLANNING	SESSIONS 2-3 (1998-2001): NEGOTIATION	SESSION 4: DEBRIEF	SESSIONS 5-6 (2002-2005): NEGOTIATION	SESSION 7: DEBRIEF
TIME	Tuesday, 8:00-11:30 am	Thursday, 12:30-4:45 pm	Friday, 8:00-9:30 am	Friday, 9:45 am - 12:30 pm	Friday, 1:45-3:30 pm
Definitions and staging information	<ul style="list-style-type: none"> • Players come prepared, having read handbook • Players' expertise and knowledge, along with assigned stakeholder roles set the stage for planning 	<ul style="list-style-type: none"> • Teams make moves to accomplish goals • Resources are limited; moves require resources • Moves must be recorded on an Agreement Form 	<ul style="list-style-type: none"> • After one day's play and a night's sleep, players reflect on game status 	<ul style="list-style-type: none"> • As in sessions 2-3 	<ul style="list-style-type: none"> • Composite outcome of all teams' plans and moves is important for final assessment
Team actions	<ul style="list-style-type: none"> • Form vision, define constituent interests, and posture vs. other teams • Develop rules, decision-making processes, define individual roles and responsibilities • Use handbook and expertise to define goals and milestones • Report on plans in initial briefing • Update plans based on information from briefing • Submit plans to Control 	<ul style="list-style-type: none"> • Control Team distributes resources • Teams make moves to satisfy milestones. Generally, one move for one milestone: <ul style="list-style-type: none"> - Solo move - Partnership - License - Process or policy change - Other • Continuous scan for information from other teams 	<ul style="list-style-type: none"> • Players individually answer poll on internal game web • Teams meet and answer specific questions posed by Control Team • Spokesperson reports to full group 	<ul style="list-style-type: none"> • Control Team distributes resources • Teams may choose to update plans • Teams make moves to satisfy milestones. Generally, one move for one milestone: <ul style="list-style-type: none"> - Solo move - Partnership - License - Process or policy change - Other • Continuous scan for information from other teams 	<ul style="list-style-type: none"> • Players individually answer poll on internal game web • Teams meet and answer specific questions posed by Control Team • Debriefing captured by game staff • Town meeting where any player can respond to questions posed by the Control Team
Relationship to other teams	<ul style="list-style-type: none"> • Strategies and objectives may be synergistic or antagonistic. 	<ul style="list-style-type: none"> • Teams may partner or make solo moves • Teams may have influence over processes other teams must follow 	<ul style="list-style-type: none"> • Report may reflect favorably or unfavorably on other teams 	<ul style="list-style-type: none"> • As in sessions 2-3 	<ul style="list-style-type: none"> • Reflection on relationships formed
Impact on game	<ul style="list-style-type: none"> • Play in pursuit of team goals and milestones determines outcome • Initial briefing allows teams to update planning based on current information. 	<ul style="list-style-type: none"> • Moves determine the extent to which team goals are met by the players 	<ul style="list-style-type: none"> • Composite snapshot of entire game results, feelings, rationales, etc. can cause major shifts in patterns of play 	<ul style="list-style-type: none"> • As in sessions 2-3 	<ul style="list-style-type: none"> • Points to follow-on activities to implement successes and address issues

Table 16: Industrial Partnership Prosperity Game™ Schedule

Friday, September 5, 1997	
7:30 am	Breakfast buffet
8:00 am	SESSION 4 (Jan. 2002): DEBRIEF Internal team debrief on specific questions; select spokesperson
8:30 am	Team briefings in plenary session
9:30 am	SESSION 5 (Jan. 2002): NEGOTIATION Chits distributed; update planning if necessary, submit planning changes to Control Team ; continue activities from Session 3
10:30 am	Break
10:45 am	DOE team assessment of key observations in plenary session
11:00 am	SESSION 6 (Jan. 2004): NEGOTIATION Chits distributed; continue activities from Session 5
12:30 pm	Lunch buffet; post-game polling at team tables (web-based) between now and 2:30
1:30 pm	SESSION 7 (Jan. 2006): DEBRIEF Internal team debrief; teams digest game results and document best ideas and practices
2:30 pm	Town meeting in plenary session; open comment on specific questions
3:30 pm	Adjourn

Thursday, September 4, 1997	
7:30 am	Breakfast buffet
8:00 am	SESSION 1 (Sept. 1997): PLANNING Set team ground rules; review challenges and technology areas; define technology goals and milestones
9:45 am	Team briefings in plenary session
10:45 am	Update planning; submit planning document to Control Team by 11:30
11:30 am	Lunch buffet
12:30 pm	SESSION 2 (Jan. 1998): NEGOTIATION Chits distributed; seek to accomplish goals through technology development, partnering; pursue desired changes in policy, process, and regulation
2:15 pm	SBD team assessment of key observations in plenary session
2:30 pm	Break
3:00 pm	SESSION 3 (Jan. 2000): NEGOTIATION Chits distributed; continue activities from Session 2
4:45 pm	AG team assessment of key observations in plenary session
5:00 pm	Formal meeting adjourned. Cash bar in pre-function area
5:30 pm	Dinner (open seating)
6:30 pm	End of day's activities Staff meeting

Wednesday, September 3, 1997	
4:00 pm	Participant registration and badging; collect materials; pre-game polling at team tables (web-based)
5:00 pm	Plenary Session: gather in Ballroom theater seating Welcome: Warren Siemens, Dan Hartley, John Crawford
5:30 pm	Prosperity Game briefing/overview with questions and answers (Marshall Berman - game director)
6:30 pm	Cash bar in pre-function area
7:00 pm	Dinner with team members and staff; get answers to questions
8:30 pm	Formal meeting adjourned. Private team meetings and discussions may continue

GLOSSARY

AG	Sandia Agreements Team	NCRD	National Coalition for Research and Development - The National Coalition for R&D was created to foster industry, university, and federal lab alliances that will optimize the nation's R&D return. The NCRD focuses on facilitating three-way partnerships. The coalition was a spontaneous outgrowth from the Future of the DOE Labs Prosperity Game.
BD, SBD	Business Development, Sandia BD	NFE	Non-federal entity
CRADA	Cooperative Research and Development Agreement - An agreement between one or more federal laboratories and one or more non-federal parties under which the government, through its laboratories, provides personnel, facilities, or other resources with or without reimbursement (but not funds to nonfederal parties). The nonfederal parties provide funds, personnel, services, facilities, equipment, or other resources to conduct specific research or development efforts that are consistent with the laboratory's mission.	NS	National security
Chit	A unit of resources used in the game in place of money.	POC	Point-of-contact
DoD	Department of Defense	R&D	Research and Development
DOE	Department of Energy (DOE/AL - DOE Albuquerque office)	SBI	Small Business Initiative. SBIR - Small Business Innovation Research - A federally funded program to promote small business participation in government programs.
E/E	Energy and Environment	SNL	Sandia National Laboratories
GDP	Gross Domestic Product	TA	Technical Assistance
Goal	A specific technology or product that you seek to develop and have available at a certain time in the future	TeraFLOP	10^{12} floating point operations per second
IE	Industrial Ecology	TPC	Technology Partnerships and Commercialization Center at Sandia
IP	Intellectual property	UNM	University of New Mexico
LDRD	Laboratory directed research and development	WFO	Work for Others - Work performed by a laboratory or DOE facility for a non-DOE entity that is fully funded by the non-DOE entity.
Milestone	A technology-related subset of the goal; one of the critical path components required to achieve the goal.		
NAISTE	National Alliance for Information Sciences, Technology and Education, a game entity created by the Red team.		

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