

Technical Progress Report for the
Gas Storage Technology Consortium

Quarterly Report for the Period
10/01/2005 – 12/31/2005

By

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Work Performed Under DOE Cooperative Agreement
DE-FC26-03NT41779

Report Issued: February 27, 2006

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ABSTRACT

Gas storage is a critical element in the natural gas industry. Producers, transmission and distribution companies, marketers, and end users all benefit directly from the load balancing function of storage. The unbundling process has fundamentally changed the way storage is used and valued. As an unbundled service, the value of storage is being recovered at rates that reflect its value. Moreover, the marketplace has differentiated between various types of storage services, and has increasingly rewarded flexibility, safety, and reliability. The size of the natural gas market has increased and is projected to continue to increase towards 30 trillion cubic feet (TCF) over the next 10 to 15 years. Much of this increase is projected to come from electric generation, particularly peaking units. Gas storage, particularly the flexible services that are most suited to electric loads, is critical in meeting the needs of these new markets.

In order to address the gas storage needs of the natural gas industry, an industry-driven consortium was created – the Gas Storage Technology Consortium (GSTC). The objective of the GSTC is to provide a means to accomplish industry-driven research and development designed to enhance operational flexibility and deliverability of the Nation’s gas storage system, and provide a cost effective, safe, and reliable supply of natural gas to meet domestic demand.

This report addresses the activities for the quarterly period of October 1, 2005 through December 31, 2005. Activities during this time period were:

- Nomination and election of Executive Council members for 2006-07 term,
- Release the 2006 GSTC request-for-proposals (RFP),
- Recruit and invoice membership for FY2006,
- Improve communication efforts, and
- Continue planning the GSTC spring meeting in San Diego, CA on February 21-22, 2006.

TABLE OF CONTENTS

DISCLAIMER	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
1.0 Introduction.....	1
2.0 Experimental.....	1
3.0 Results and Discussion	1
3.1 Executive Council.....	2
3.2 Request-For-Proposals	3
3.3 Membership.....	3
3.4 Communications.....	3
4.0 Conclusions.....	4
5.0 References	4
6.0 Appendices	4
6.1 Appendix A: 2006 RFP.....	5

1.0 INTRODUCTION

Gas storage is a critical element in the natural gas industry. Producers, transmission and distribution companies, marketers, and end users all benefit directly from the load balancing function of storage. The unbundling process has fundamentally changed the way storage is used and valued. As an unbundled service, the value of storage is being recovered at rates that reflect its value. Moreover, the marketplace has differentiated between various types of storage services, and has increasingly rewarded flexibility, safety, and reliability. The size of the natural gas market has increased and is projected to continue to increase towards 30 trillion cubic feet (TCF) over the next 10 to 15 years. Much of this increase is projected to come from electric generation, particularly peaking units. Gas storage, particularly the flexible services that are most suited to electric loads, is critical in meeting the needs of these new markets.

In order to address the gas storage needs of the natural gas industry, an industry-driven consortium was created – the Gas Storage Technology Consortium (GSTC). The objective of the GSTC is to provide a means to accomplish industry-driven research and development designed to enhance operational flexibility and deliverability of the Nation’s gas storage system, and provide a cost effective, safe, and reliable supply of natural gas to meet domestic demand.

2.0 EXPERIMENTAL

This project is a consortium between industries, academia, and the U.S. Department of Energy. As a consortium, there are no experimental results to report.

3.0 RESULTS and DISCUSSION

The process of creating the GSTC began on September 30, 2003. During the first six months of its existence, the gas storage industry worked with Penn State University and the Department of Energy to develop a constitution that governs the operation of the GSTC. Part of this constitution (or by-laws) was the formation of a nine member Executive Council which was intended to be mostly comprised of individuals directly

involved in the gas storage industry. To insure this, a two-person limit was placed on the number of individuals from academia serving on the Executive Council at any given time. This was done to insure that the research direction of the consortium was inline with the current needs of the gas storage industry.

This report addresses the activities for the reporting period from October 1, 2005 through December 31, 2005. During this time period efforts were directed toward the following activities:

- Nomination and election of Executive Council members for 2006-07 term,
- Release the 2006 GSTC request-for-proposals (RFP),
- Recruit and invoice membership for FY2006,
- Improve communication efforts, and
- Continue planning the GSTC spring meeting in San Diego, CA on February 21-22, 2006.

3.1 Executive Council

In compliance with the GSTC by-laws, the nomination and election of Executive Council members was completed. Five new members were elected for a two-year term (2006-2007). The members will review incoming proposals, evaluate applicant’s technical presentations, and collectively determine the proposals, which the GSTC will co-fund. The Executive Council elected members for 2006-07 are:

Company	Name	Term
Ameren Corporation	Allen Bues	2006-07
ElPaso Corporation	Douglas Elenbaas	2006-07
Equitrans	Timothy Habovick	2006-07
Texas A&M	David Burnett	2006-07
Texas Gas Transmission	Richard Stocke	2005-06
Consumers Energy	James Philo	2005-06
Natural Fuel Gas Supply Corporation	Ramon Harris	2005-06
ONEOK Gas Storage, LLC	Stephen Bergin	2005-06
University of Missouri-Rolla	Sharri Dunn-Norman	2005-06

The Executive Council standing members are:

U.S. Department of Energy	Daniel Driscoll
Pennsylvania State University	Joel Morrison
Pipeline Research Council International	Harvey Haines

3.2 Request-For-Proposals (RFP)

An RFP was released for proposals due on February 2, 2006. The RFP was provided to the GSTC membership, posted to the GSTC web site, sent to several trade organizations, and sent to a wide variety of companies on the GSTC listserv. The RFP is provided in Appendix A.

The general areas of the request are:

- mechanical
- well-bore and reservoir
- operations
- salt cavern

3.3 Membership

The GSTC membership continues to grow and broaden in its diversity. Invoices for 2006 memberships renewals were sent out in December to present members and to those who requested to become a member. Recruiting additional members throughout 2006 will continue.

3.4 Communications

To add value to the website and create a more user-friendly site, the GSTC web site was redesigned (<http://www.energy.psu.edu/gstc>). In addition, an electronic newsletter is being developed to improve communication between the spring and fall meetings. It is anticipated the newsletter will be distributed 3-5 times per year, in addition to being available on the website.

4.0 CONCLUSIONS

The GSTC continues to expand and diversify its membership. During the next reporting period, the GSTC will hold its spring meeting to review proposals and select projects for funding.

5.0 REFERENCES

There are no references associated with this reporting period.

6.0 APPENDICES

The 2006 RFP is provided in Appendix A.

Appendix A: 2006 RFP

**THE
GAS STORAGE TECHNOLOGY
CONSORTIUM**

**Request for Proposals
For 2006**

**Submission Deadline:
February 2, 2006 (4:00 pm EST)**

2006 REQUEST FOR PROPOSALS

FOR THE GAS STORAGE TECHNOLOGY CONSORTIUM

APPLICANT ELIGIBILITY

Competition is open to all current Full and University Members of the Gas Storage Technology Consortium (GSTC). The GSTC Executive Council will not review proposals without a fully executed membership agreement in place. New memberships are accepted throughout the year. Membership information and applications can be found on the GSTC website at <http://www.energy.psu.edu/gstc>. Proposals received from members whose dues are not current, or whose membership agreement is not fully executed will be returned without review.

University employees eligible to serve as principal investigators for proposals submitted to the consortium are:

- Full-time regular tenure-track or regular faculty, and;
- Persons with the title of Research Assistant, Associate, Scientist or Senior Scientist.

INSTITUTION COMMITMENT

Each proposal must be signed by an official of the company or university who is authorized to commit the company/institutional resources to the project. The name of the Applicant's authorized official shall be entered in the appropriate space shown on the cover page (Attachment B).

RESEARCH FOCUS AREAS

The mission of the GSTC is to assist in the development, demonstration and commercialization of technologies to improve the integrity, flexibility, deliverability, and cost-effectiveness of the nation's underground natural gas/hydrocarbon storage facilities. Projects selected for funding will be based on those that best accomplish the Consortium goals. Applicants are encouraged, but not limited to, submitting proposals in the following focus areas:

Mechanical

Examples include, but are not limited to, investigations that address pipe and well casing integrity, the improvement of downhole leak detection, the development of new casing evaluation tools, the development/ evaluation of advanced metallurgy/ materials for use in well casing and casing repairs, cement bonding, delta-temperature effects on casing, use of "smart pipe" concepts for well casing, corrosion mitigation and quantification, removal techniques for scales, fines, salts, asphalts, and techniques to remediate damage through stimulation/ recompletion/ workover of existing wells.

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Well-bore and Reservoir

Examples include, but are not limited to, investigations that address reservoir characterization, consider new approaches to modeling of gas cycling and inventory verification, develop techniques to maintain and improve injectivity and deliverability, and expand existing aquifers and reservoirs.

Operations

Examples include, but are not limited to, investigations that address handling of produced water, techniques to minimize/mitigate water encroachment, cost effective multiphase wellhead measurement systems, design criteria for facility sizing to meet variable demand, and best practices associated with product quality shipped/delivered. In addition, applied research into the development/ evaluation of low-cost salt inhibitors to mitigate salt precipitation within the reservoir, well, and pipeline systems are being sought.

Salt Cavern

Examples include, but are not limited to, investigations that address salt cavern stability and growth rates, interconnectivity and best practices techniques for management of caverns.

AWARDS

Awards will be made on an annual basis. Subcontracts will be issued from The Pennsylvania State University to the successful applicant. The period of performance for the 2006 funding cycle will be from June 1, 2006 to May 31, 2007. Members will be permitted to submit future proposals to extend the proposed work; however, this must be performed on a year-to-year basis.

If additional documentation is required prior to issuance of a subcontract, a delay in submission of the June 1 start date may occur.

SUBMISSION

The deadline for receipt of GSTC proposals is **February 2, 2006 by 4:00 PM (Eastern Standard Time)**. Proposals received after the deadline will be returned to the applicant. Two signed paper copies are required plus one electronic copy in PDF format. The full proposal and a separate copy of the public abstract should be saved in PDF format on a CD or ZIP disk and submitted with the paper copies.

In addition to the proposal, each applicant is required to provide the GSTC Membership a nominal 20-minute presentation at the GSTC spring Meeting. The GSTC will hold its spring meeting on February 21-22, 2006 in San Diego, California. The 20-minute presentation is to consist of a 15-minute presentation focused on the technical and budget

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aspects of the proposed project and 5-minute question and answer session. **The presentation is due at the time of the proposal submission.** The presentation format should be either in the form of an electronic PowerPoint presentation. The proposal packet should be submitted to the following address:

Mr. Joel L. Morrison
Director, Gas Storage Technology Consortium
The Pennsylvania State University
C-211 Coal Utilization Laboratory
University Park, PA 16802-2323

PROPOSAL FORMAT

Proposals should be formatted to fit standard 8 x 11" letter size paper with 1" margins, single-spaced, using 12 point font and be consecutively numbered at the bottom on each page.

SECTIONS OF THE PROPOSAL

The proposal shall consist of the following sections in order.

Proposal Checklist See Attachment A

The proposal checklist is required to ensure the proposal submittal is complete and that the applicant is eligible for Consortium funding consideration.

Public Cover Page See Attachment B

The cover sheet along with the public Executive Summary will be distributed to the GSTC membership as part of the proposal evaluation process.

Table of Contents One (1) page maximum

Public Executive Summary One (1) page maximum

Provide a one-page summary of the proposed research. The executive summary should not contain any propriety or business sensitive data because summary will be distributed to the GSTC membership along with the proposal cover sheet. An electronic copy of the executive summary is required. The summary will be posted to the GSTC and/or program sponsor websites if the Consortium funds the proposal. The summary should be written in the third person and include a statement of objectives and methods to be employed. It should be informative to other persons working in related fields and understandable to a scientifically or technically literate lay reader.

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Technology Overview One (1) page maximum

The technology overview section of the proposal enables the applicant to discuss how their proposed technology is different from existing technology that may be available within the industry. At a minimum the following should be discussed:

- Is the technology covered by existing patents, and if so, what are they; and
- How does the proposed technology differ from existing technology?

Project Description Five (5) page maximum

The main body of the proposal should outline the plan of work, including the broad design of activities to be undertaken. At a minimum, the following should be discussed:

- Statement of the problem;
- Has the proposed work, or a portion of the proposed work, been funded elsewhere;
- Objectives and expected significance of the research;
- Statement of the work plan;
- Relation of the proposed work to comparable work in progress;
- Description of available facilities and major items of equipment available for the work; and reference citations.

Project Schedule One (1) page maximum

A plan that establishes the time schedule for accomplishing the work. The plan should include major milestones of the project in bar chart format and should cover the complete period of performance.

Anticipated Results Two (2) page maximum

Discuss how the project will improve the integrity, flexibility, deliverability, and cost-effectiveness of the nation's underground natural gas/hydrocarbon storage facilities. Discuss the commercial viability of the proposed project. Identify specific groups in the commercial sector that may use the project results.

Budget See Attachment C

The submission of a reasonable budget is an important part of the proposal. Your budget may request funds under any of the categories listed on Attachment C, as long as the item and amount are considered necessary to perform the work. Proposed equipment expenditures are permitted; but their purchase must be justified. Ownership of the equipment vests with the Pennsylvania State University and is reported to DOE on an annual basis. It is expected that the participants will already have most of the necessary permanent equipment to conduct the research. The majority of the funding is intended to support research activities. Permanent equipment purchases are discouraged and will be considered during the proposal evaluation. After approval by the Executive Council, but prior to purchase, written approval must be obtained by the Department of Energy for purchase of equipment items that have a life of 2-years or more and a cost of \$5,000 or more.

Cost-Share Commitments

A minimum of 40% cost-share is required for each project that is selected by the GSTC for funding. The 40% cost-share is calculated as 40% of the proposed project (i.e. the sum of the recipient's allowable cost-share and the GSTC share equals the total allowable costs of the project). Cost-share, which may be in the form of cash and third party in-kind, is acceptable as part of the match provided it meets the following criteria:

- Are verifiable, necessary and reasonable for proper and efficient accomplishment of the project;
- Are incurred within the project performance period. Previously expended research development, or exploration costs are unallowable.
- Are not included as contributions for any other federal project, are not paid by the Federal Government under another award, and otherwise allowable in accordance with Federal cost principles and DOE regulations governing cost sharing.
- The value of patents and data contributed to the project is unallowable as cost sharing.
- The value of salaries or wages of 1st party personnel directly involved in the project are allowed as cost share.

All cost-share commitments must be supported by appropriate documentation. Third parties proposing to provide all or part of the required cost share must include a letter from the third party stating its commitment to provide a specific minimum dollar amount of cost-share. The letter should also identify the type of proposed cost share (e.g., cash, services) to be contributed. Letters must be signed by the person authorized to commit the expenditure of funds and be provided in PDF format. Failure to provide appropriate documentation can result in the proposal being returned without review.

Biographical Sketches

One (1) page per person maximum Vitae of key personnel involved in the project must be included and should include educational background, professional experience, research interest, honors, professional activities and relevant publications.

Collaborative Work

All collaborations with individuals not included in the budget should be described and documented with a letter from each collaborator.

Other

Letters of support from outside sources are encouraged, but not mandatory.

TREATMENT OF PROPRIETARY INFORMATION

Privileged or confidential commercial or financial information that the applicant does not want disclosed to the public or used by the Government for any purpose other than

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application evaluation, should be specifically identified by page on the proposal cover sheet.

PROPOSAL EVALUATION PROCESS

The GSTC Executive Council will review and recommend projects for GSTC funding. The GSTC Director will notify all applicants within thirty (30) days of the GSTC Executive Council meeting, by letter, of the final decision regarding their proposals. The decision of the GSTC is final and not subject to reconsideration or appeal.

ADDITIONAL INFORMATION

Additional questions should be forwarded to the GSTC Director. Questions should be submitted via e-mail to gstc@ems.psu.edu or contact Mr. Joel Morrison at (814) 865-4802.

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ATTACHMENT A – PROPOSAL PACKET CHECKLIST

I certify that:

- I am a current Full member of the GSTC
- I am a current University member of the GSTC

Project Title: _____

Principal Investigator (PI): _____

To assure that your application is complete, please complete and paperclip (one copy only) the proposal packet checklist to the cover sheet of the original (signed) copy of the proposal. Be sure the following items are included in the following order.

_____ Public Cover page completed and signed by PI and authorized representative

_____ Public Executive Summary (one page maximum)

_____ Technology Overview (one page maximum)

_____ Project Description (five page maximum)

_____ Project Schedule (one page maximum)

_____ Anticipated Results (two page maximum)

_____ Budget (Using Attachment C budget template)

_____ Cost-Share Commitments

_____ Biographical Sketches (one page/ person maximum)

_____ Project Team (one page maximum)

_____ Letters of Support

_____ Two signed originals and one electronic copy of the proposal in PDF Format are due to the GSTC Consortium no later than 4:00 PM (EST) on February 2, 2006

_____ One electronic copy of the Public Executive Summary in PDF Format

_____ Proposal presentation (20 minute presentation, PowerPoint encouraged)

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ATTACHMENT B – PROPOSAL COVER SHEET

Proposal Submitted to: Mr. Joel Morrison
Director, Gas Storage Technology Consortium
The Pennsylvania State University
C-211 Coal Utilization Laboratory
University Park, PA 16802-2308

Proposal Deadline: February 2, 2006 (4:00 PM EST)

Date of Submission _____

Title of Proposal: _____

Company Name: _____

Principal Investigator: _____

Phone: _____ Fax: _____ Email _____

Address: _____

Other Participants: _____

Amount Requested from GSTC \$ _____

Cost Share Commitments Cash \$ _____
(Minimum 30% Required)

In-Kind \$ _____

Total Project Costs \$ _____

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PROPRIETARY INFORMATION: Does this proposal contain Proprietary or Confidential Information?

_____ NO _____ YES (if yes, complete box below)

Notice of Restrictions on Disclosure and Use of Data

The data contained on pages _____ of this proposal are submitted in confidence and contain privileged or confidential commercial and/or financial information. Such data may be used or disclosed only for evaluation purposes. If funded, the Government would have the right to use or disclose data from this project to the extent provided the DOE/PSU Cooperative Agreement. This restriction does not limit the Government's right to use or disclose data obtained without restrictions from any source, including the proposer.

Submitted by:

Approved by:

Signature of PI

Authorized Representative

ATTACHMENT C – BUDGET

Name of PI: _____

	<u>REQUESTED GSTC</u>	<u>COST-SHARE</u>
<u>Salaries and Wages</u> List individually all personnel identified in the proposal. Include title and percent of effort NOTE: The use of undergraduate and graduate students is encouraged, and appropriate. The basis for proposed percent of effort or labor hours should be identified (historical hours, engineering estimates).	\$ _____	\$ _____
<u>Fringe Benefits</u>	\$ _____	\$ _____
<u>Materials and Supplies</u> List types required and estimated costs. NOTE: State whether amounts proposed are based on catalog prices or other cost estimating.	\$ _____	\$ _____
<u>Equipment</u> Items exceeding \$5,000 and 1 year's useful life are defined as permanent equipment. List item and dollar amount for each amount. Justify and/or provide quotation.	\$ _____	\$ _____
<u>Travel (see Note 4)</u> State the type and extent of travel and its relation to the project. Itemize by destination and estimated costs.	\$ _____	\$ _____
<u>Publication/Information Dissemination</u> Estimate costs of documenting, preparing, publishing and sharing research findings. Show estimates.	\$ _____	\$ _____
<u>Other Direct Costs</u> Itemize and justify. (*See note below) _____ _____	\$ _____ \$ _____ \$ _____	\$ _____ \$ _____ \$ _____
<u>Facilities and Administration (F&A)</u> Specify current rate(s) and base. Note: A copy of the negotiated agreement should be included with the proposal. If none exists, a disclosure of the contents of the rate should be made.	\$ _____	\$ _____
TOTALS	\$ _____	\$ _____

Attach up to two additional pages of justification covering all items.

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***NOTES:**

- 1) If more than 5% of project cost is from GSTC funding the contracting organization must be a Full or University Member of the GSTC.
- 2) Subcontracts included in proposal (third party agreements) to current consortium members must be less than 50% of the requested GSTC funding. Budgets and work statements from each subcontractor, in the format above, must be included in proposal.
- 3) Fees or profits will not be paid on any award resulting from this solicitation. Nor can fee or profit be considered as cost-sharing.
- 4) The GSTC will host up to two technology transfer workshops. Recipients of GSTC funding are required to provide a presentation on the status of their project at these meetings. The costs of attending these GSTC technology transfer meeting are to be included in the travel budget. For the purpose of budgetary planning applicants should be prepared, if requested, to attend a one-day meeting in the San Francisco, CA region and a one-day meeting in the Pittsburgh, PA region. These meeting locations are in the presently in the planning stage and are subject to change.

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