

The Salience and Complexity of Building and Governing the Smart Grid: Lessons from a Statewide Public- Private Partnership

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**2013 ASPA Conference
New Orleans, LA**

The Promise of Smart Grid

- Fewer and shorter **power outages** and **grid disturbances**
- Lower system peak demands, leading to **improved asset utilization**
- **Informed consumers** who can better manage electricity consumption and costs
- Operational efficiencies, leading to **reduced costs**
- **Positive environmental impacts** such as reduced greenhouse gas emissions
- **Economic opportunities** for businesses and new jobs for workers [1]



U.S. Smart Grid Deployment



Figure 1. Headquarters Locations of SGIG Project Lead Organizations (July 2012)

Figure 2. Examples of SGIG Technologies and Systems

| Electric Transmission Systems | Electric Distribution Systems | Advanced Metering Infrastructure | Customer Systems |
|---|--|--|--|
|  |  |  |  |
| <ul style="list-style-type: none">• Synchrophaser technologies• Communications infrastructure• Wide area monitoring and visualization• Line monitors | <ul style="list-style-type: none">• Automated switches• Equipment monitoring• Automated capacitors• Communications infrastructure• Distribution management systems | <ul style="list-style-type: none">• Smart meters• Communications infrastructure• Data management systems• Back-office integration | <ul style="list-style-type: none">• In-home displays• Programmable communicating thermostats• Home area networks• Web portals• Direct load controls• Smart appliances |

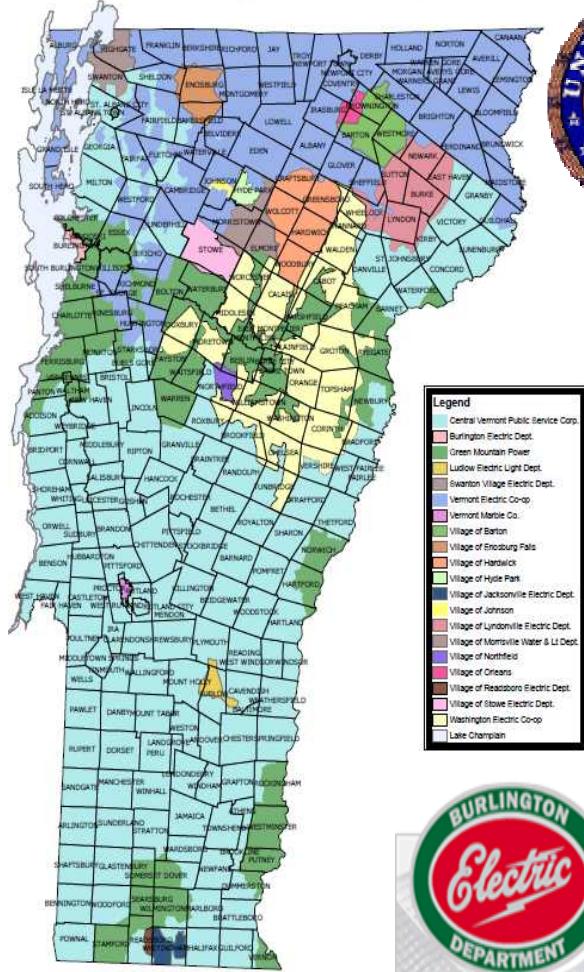
eEnergy Vermont Collaborative



- eEnergy Vermont Collaborative (eEVT) awarded \$138 million (\$69 million from ARRA SGIG funds, matched with equal investments by local utilities) to:
 - Deploy advanced metering infrastructure (AMI) to 85% of VT consumers
 - Assess time-of-use and peak-time rebate programs
 - Install automated voltage regulators and supervisory control and data acquisition (SCADA) equipment
- eEVT is an important early example of investment in smart grid infrastructure and collaborative governance

Vermont's "Patchwork Quilt"

Vermont Electric Utilities Franchise Areas



Research Questions

- Q1: How did Vermont, with its 22 different utilities and cooperatives, manage to pursue and successfully obtain the resources needed to implement a statewide smart grid infrastructure?
- Q2: What factors led to the development of the eEnergy Vermont Collaborative (eEVT), the public-private partnership designed to implement smart grid infrastructure?
- Q3: How did the issue saliency and technical complexity of smart grid technology play a role during the scoping and implementation phases of this project?

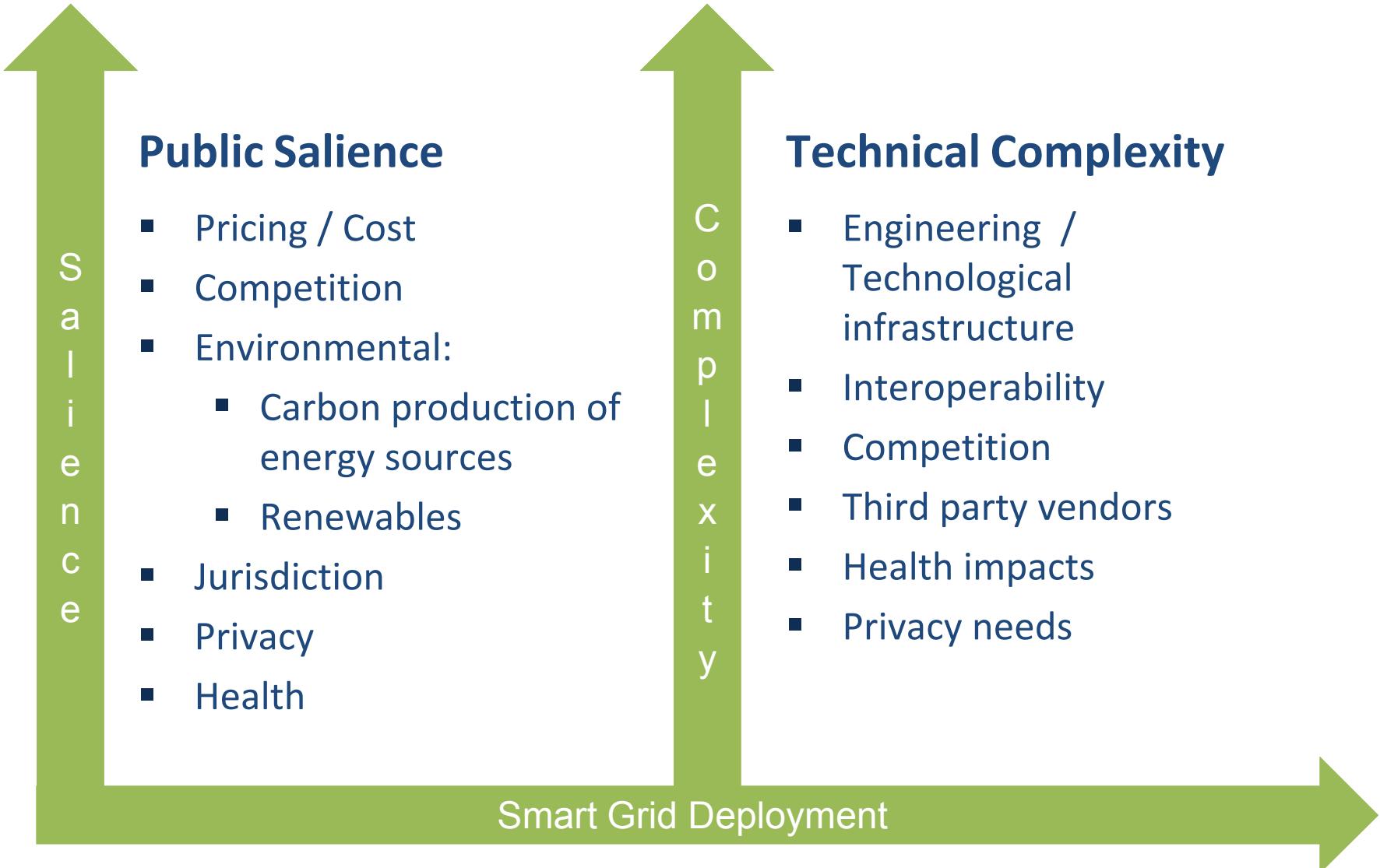
Key Findings in the Vermont Case

- Built on Federal Priorities
 - The Federal Energy Policy Act (EPACT) of 2005
 - The Energy Independence and Security Act (EISA) of 2007
 - The American Recovery and Reinvestment Act (ARRA) of 2009
- Coupled State Policy Streams
 - Energy efficiency
 - Renewables
 - Telecommunications infrastructure
- Innovative Regulatory Environment
 - Stakeholder communication and collaboration
 - Successful use of the “operating room” to anticipate needs
- Collaborative Utility Industry and Project Management Framework
 - Effective collaborative management/collaborative governance practices
 - Policy entrepreneurs

Gormley's Salience-Complexity Model of Regulatory Regimes

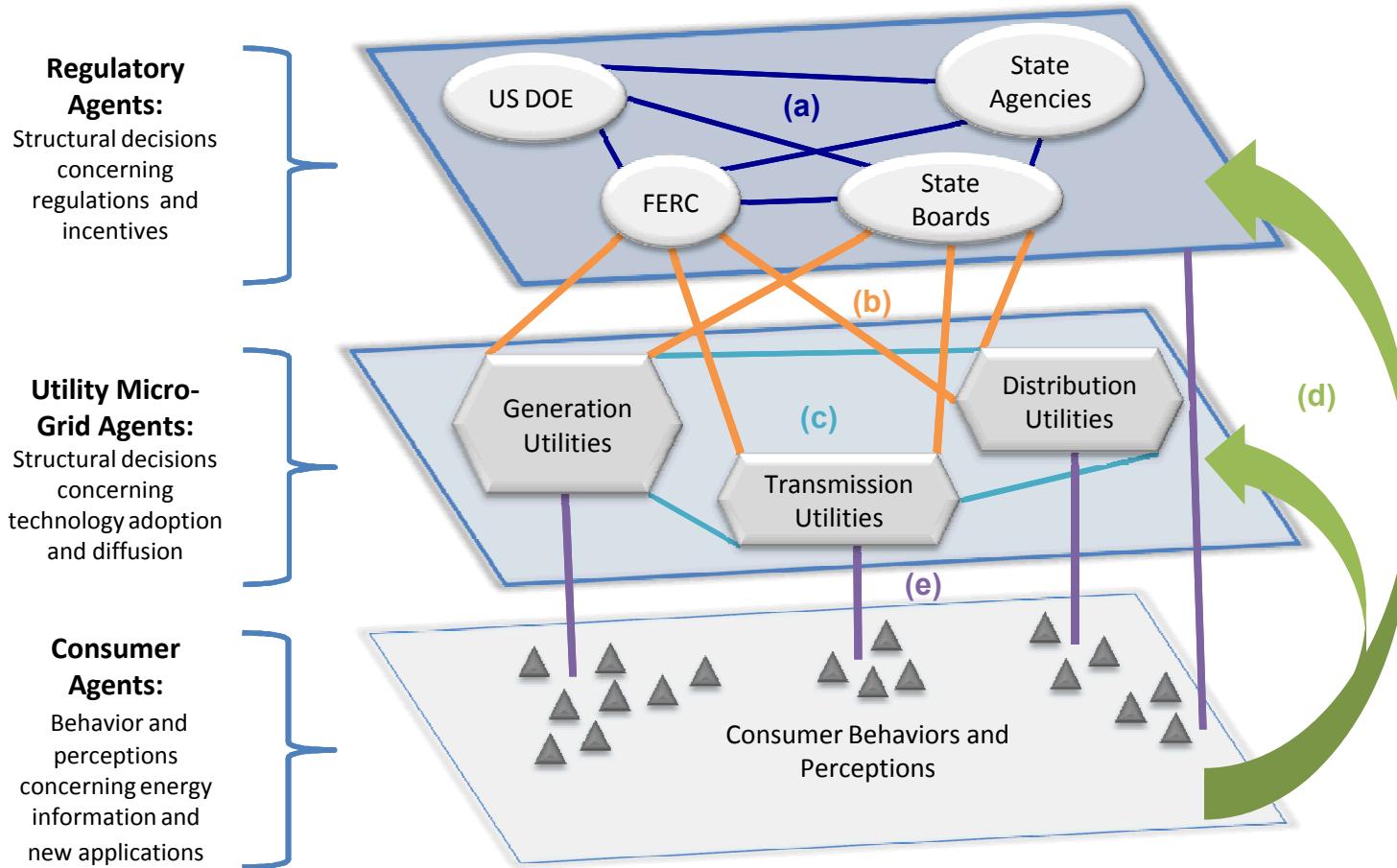
| | | Technical Complexity | |
|-----------------|------|--|--|
| | | Low | High |
| Public Salience | Low | STREET LEVEL BUREAUCRATS <i>Standard operating procedures</i> <ul style="list-style-type: none">• Building inspections• Billboard regulations• Food service inspections• Motor vehicle inspections• Election regulations | BOARD ROOM <i>Economic motives</i> <ul style="list-style-type: none">• Cable television regulation• Antitrust regulation• Securities regulation• Banking regulation• Transportation regulation |
| | High | HEARING ROOM <i>Electoral incentives and legal precedence</i> <ul style="list-style-type: none">• Land use zoning regulation• Affirmative action regulation• Immigration regulation• Gun control• Abortion | OPERATING ROOM <i>Professional norms and industry standards</i> <ul style="list-style-type: none">• <u>Electric utility regulation</u>• Water and air quality regulation• Health care regulation• Hazardous waste regulation• Power plant siting |

Traditional Energy Grid Issues



Smart Grid Implementation Networks

Agent Layers and Ties for Strategic Decision Making



The “Operating Room”

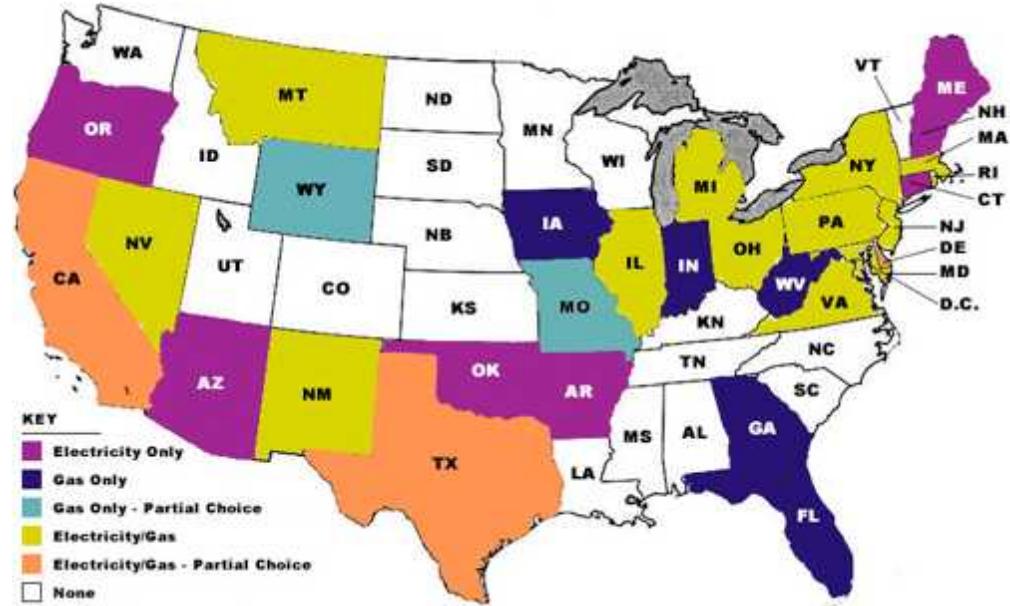
- High public salience and high technical complexity issues
- Simultaneous pressure for accountability and expertise
- Interface between state bureaucrats and technical experts from industry and government
- Vermont’s “operating room” occurred in different arenas as regulatory, advocacy, and partnership agents mobilized around smart grid issues
 - Public Service Board hearings and closed-door deliberations
 - ARRA working group
 - eEVT steering committee

| | Federal | | State | |
|------------------------|-------------------------|--|-------------------------------------|---|
| | Agent | Function | Agent | Function |
| Regulatory | FERC | Sets regulations and standards; does some dispute resolution | State Boards of Public Service | Set rates; manage competition; site transmission and distribution lines |
| | | | | |
| Advocacy & Partnership | US Department of Energy | Provides incentives; sponsors research; partners with industry | State Departments of Public Service | Serve as public advocate; partner with local industry |

Looking Ahead

- Difficult to generalize the Vermont case
- However, the smart grid clearly brings on higher salience and higher complexity
- Need for more case studies
- Opportunity to test a hypothesis:

U.S. Energy Deregulation by State



Smart grid deployment enfolds within existing regulatory subsystems, rather than signals new governance configurations.

[We] “... will realize the full benefit of smart grid pilots if they ensure that a strong and adaptable governance process, with clear roles and responsibilities, is agreed across all consortium members early in the planning stage...” – World Economic Forum, 2012

QUESTIONS?