Breakout #1: Natural Gas/Electricity Interdependence

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Session Participants

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Observations

- Time scales short to long term
  - Short term – policy regulation
  - Medium term – model and tool development
  - Long term – technology development
- Natural gas and renewable electricity are complementary.
- Natural gas in transportation is a missed opportunity.
- Are the US, Europe and Asia on different trajectories ?
  - If so, what are the implications?
- Our discussions focused on bulk power systems
  - There may be opportunities on the distributed level.
- The topics discussed only scratch the surface of the full issue.
- We had fun

Major Challenges and Barriers

Challenges

1. Uncertainty
   - ❑ Regulatory uncertainty
     - International markets, Macroeconomics, Policymakers as technology selectors
   - ❑ Disruptive events
   - ❑ Government
     - Tax and subsidies
2. Long-term capacity adequacy (considering options in generation, transmission and pipelines). Can this be done within capacity planning markets?
3. Drivers for innovation too localized and subject to commercial restrictions, lack of standardization
4. Adaptable, resilient, technology-neutral solutions
5. Inadequate energy system forecasting and modeling – see later

Barriers

1. Education
   - ❑ Education of constituencies
   - ❑ Education of policymakers
   - ❑ Policy maker timescales are different
2. Barriers vary by location/market
   - ❑ Existing investments
   - ❑ Regulatory inertia
   - ❑ Balkanization/parochialism/NIMBY
3. Lack of scale and varying approaches, path dependency, value chain, valley of death
4. Tend to be more expensive in the short term
5. No one organization has the data and comprehensive models to address

Successful/Unsuccessful Examples

- At the macro level, most systems work well but are coming under stress when responding to uncertainty.
- At a micro level, most systems are segregated and don’t take advantage of efficiencies.
- CHP in industry is a great success and is expanding.
- Denmark is a leader in energy systems integration.

Learning From Examples

- Everything is policy-driven over the long term.
- Unintended policy consequences of short-term thinking can be harmful.
- Price matters, and money talks.
- Market structure is critical.
- Ignoring integration issues is expensive as things scale.
- Communications and coordination between sectors is essential.

Research Roadmap: Modelling

Issue: Tools that provide information regarding long-term implications of technology development, socio-political change, and policy options are inadequate; thus decisions are made with limited foresight. Integrated models that can inform users are needed.

- Develop transparent, gas-electricity models.
  - Attributes include full network representation, dynamics, operational and planning (investment), probabilistic
  - Integrate with realistic market/behavior models
  - Integrate policy impacts
  - Effectively communicate complex results with nontechnical people
- Validate different modeling approaches with appropriate data.
- Influence funding agencies worldwide to support.
- Success is measured by impact on policymakers.
- Implementation at short-, medium-, and long-term timescales

Collaboration

- Pragmatic (simple approach) sharing and understanding of existing models, data, and basic scientific underpinnings
- Modeling and tools must be developed in a coordinated fashion, in particular with industry (GE, ABB, Alstom, Schneider, Siemens, RTOs, ISOs, DONG, IEA, World Energy Council, IBM, etc.)
- Both interdisciplinary and international
- Sharing **standardized** data
- EU Horizon 2020 opportunity, with US

Top 3 agenda items for Energy Systems Integration

- International markets
  - Cross border (national, regional) transmission and gas pipes
- Generation side
  - Capacity markets
  - Ramping
- Adaptability on the demand side
  - Multifuel – electricity/gas etc.
- Or Adaptability of entire infrastructure to accommodate various futures including new central and distributed resources

Non ESI Research

- Material science questions:
  - CCGT has been successful (62% efficiency). (Can it go forward?)
  - High-temp fuel cells combined with micro turbines can potentially achieve higher efficiencies.