



RAP

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Smart Gas Investment for a Risk Aware Transition – a.k.a: Swiss Army Knife or Meat Cleaver?

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Overview

- Inexpensive gas could be a blessing or a curse?
- Three low carbon pathways often posited
- I don't own a tool box full of Swiss Army Knives, how about you?
- Stranded investment risk
- An algorithm for limiting stranded costs

Some People Are Really Excited About Gas

- More than \$500 Billion investment in gas generation and midstream infrastructure needed by 2035
 - EIA (2014) and INGAA (2014)

Inexpensive Gas Is a Blessing But May Be a Curse

- Current low gas prices are an economic boost
- Over-commitment to long-term gas investment can become a stranded investment curse

Consider Three Common Low Carbon Pathways

- Large-scale RE, much greater grid extension and integration
- Customer resources become very cost effective
- Nuclear and fossil with CCS

Under the First Two Pathways, Large-Scale Gas Investment Will Become Stranded

- Marginal analysis based on incremental change from current conditions may indicate gas investment
- Transformational change of the path 1 or 2 variety will render those investments stranded well before end of life

Question:

Do you want to bank on incremental change or pathway 3?

- Not me, my money is on pathway 1, 2 or some combination of these two

Proposition:

Some Say Gas is Perfect for a Time of Uncertainty Because It's Flexible

- I don't own a tool box of Swiss Army Knives, do you?
- We need to engage in the harder work of being selective on the capabilities that we need gas to fulfill.

Risk Aware Resource Selection

- Explicit consideration of risk factors is necessary in evaluating portfolios, this is best done as a stakeholder process.
- Here is a sample **qualitative** assessment by Binz, Sedano and Furrey (2014):

2014 UPDATE RISK ASSESSMENT OF NEW GENERATION RESOURCES

Resource	Initial Cost Risk	Fuel Cost Risk	New Regulation Risk	Carbon Price Risk	Water Constraint Risk	Capital Shock Risk	Planning Risk
Biomass	Medium	Medium	Medium	Medium	High	Medium	Medium
Biomass w/ incentives	Medium	Medium	Medium	Medium	High	Low	Medium
Coal IGCC	High	Medium	Medium	Medium	High	Medium	Medium
Coal IGCC w/ incentives	High	Medium	Medium	Medium	High	Medium ↑	Medium
Coal IGCC-CCS	High	Medium	Medium	Low	High	High	High
Coal IGCC-CCS w/ incentives	High	Medium	Medium	Low	High	Medium ↑	High
Pulverized Coal	Medium	Medium	Very High ↑	Very High	High	Medium	Medium
Efficiency	Low	None	Low	None	None	None ↓	None
Geothermal	Medium	None	Medium	None	High	Medium	Medium
Geothermal w/ incentives	Medium	None	Medium	None	High	Low	Medium
Natural Gas CC	Medium	High	Medium	High ↑	Medium	Medium	Medium
Natural Gas CC-CCS	High	Medium	Medium	Low	High	High	Medium
Nuclear	Very High	Medium	High	None	High	Very High	High
Nuclear w/ incentives	Very High	Medium	High	None	High	High	High ↑
Solar PV Distributed	Low	None	Low	None	None	Low	Low
Solar PV Distributed w/ incentives	Low	None	Low	None	None	Low	Low
Solar PV Utility Scale	Low	None	Low	None	None	Medium	Low
Solar PV Utility Scale w/ incentives	Low	None	Low	None	None	Low	Low
Solar Thermal	Medium	None	Low	None	High	Medium	Medium
Solar Thermal w/ incentives	Medium	None	Low	None	High	Low	Medium
Wind Onshore	Low	None	Low	None	None	Low	Low
Wind Onshore w/ incentives	Low	None	Low	None	None	None	Low

Risk Aware Process

Supports Smart Gas Investment

1. ICT investment will lay the foundation for optimal choice
2. Make system needs transparent through markets, procurement and planning
3. Promote resource inclusivity
4. Procure and dispatch cleaner energy resources first
5. Effective permitting of beneficial resources

Resources

- What Lies Beyond Capacity Markets? (Hogan, Gottstein, et al (RAP)):
<http://raponline.org/document/download/id/6041>
<http://raponline.org/document/download/id/4854>
- Demand Response as a Power System Resource (Hurley, et al. (Synapse for RAP)):
www.raponline.org/document/download/id/6597
- CAISO DR/EE Roadmap: Maximizing Preferred Resources (CAISO):
<http://www.caiso.com/Documents/DR-EERoadmap.pdf>

More Resources

- Teaching the Duck to Fly (Lazar (RAP))
<http://www.raonline.org/document/download/id/6977>
- Integrating Renewables at Least Cost in the West
<http://www.raonline.org/document/download/id/5041>
- Aligning Power Markets to Deliver Value (Hogan (RAP) for APP)
<http://www.raonline.org/document/download/id/6932>
- Capacity Mechanisms for Power System Supply (Keay-Bright (RAP))
<http://www.raonline.org/document/download/id/6805>

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raonline.org

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