“Extreme IRP”
Resource Planning Challenges Of The Coming Decade

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IRP has become as much a question of regulatory philosophy as an analytic problem (though also that, and very difficult):

- Not just least-cost planning under cost-of-service, but also:
  - Competitive procurement/fostering wholesale (& retail) markets
  - Risk management – to limit customer bill volatility
  - Credit protection – to help developers & protect the utility
- Likely obsolescence of conventional technologies
- Overlapping/incomplete jurisdictions
- New possibilities, and old ones that need to work better
  - Some alternatives don’t affect all customers - - DSM
  - Some alternatives only work if we also change pricing and service delivery model – AMI, Smart Grid
- And, there is extreme uncertainty surrounding all the major elements
  - Regulatory & environmental policies
  - Macroeconomic crisis
The resource planning problem has become an iterative one, not amenable to the traditional “court room” model:

♦ Series of shorter and nested horizons (3 yr, 10 yr, 40 yr)

♦ Not just resource selection, but complementary pricing, performance standards, service design

♦ Need “exit ramps” and flexibility to adjust while utility held harmless

♦ Need to “wait and see” on some alternatives/circumstances
  • Recovery of economy
  • Technology evolution
  • New regulations
  • Fuel & construction costs
Markets vs. (Re) regulation

Are wholesale markets working well enough? Retail? Should utility procurement be altered to improve or work around the problem(s)?

♦ If utilities reintegrate upstream, (gradually or partially), how will they alter market conditions?
  • Buy baseload units under very long-term contracts? Cost of Service?
  • Wholesale market just for “topping off?”

♦ Long-term contracts for securing development financing tend to exacerbate customer-switching risk

♦ Does public input improve resource decisions, or put more cost and risk on customers?
Credit Constraints Shaping Procurement

Developers increasingly claim to need a long-term PPA (or feed-in tariffs) to obtain financing.

♦ Is this a market failure, or a market warning?
♦ Effectively saying customers should bear risks that unregulated shareholders won’t (despite diversification and liquidity of their positions)

♦ If utility-security needed, should utility just build/buy assets outright?

How much risk can utilities absorb for suppliers and customers, before their own health is jeopardized?

♦ Imputed debt from PPAs
♦ Mark-to-market and collateral obligations
♦ Counter-party risk if push exposure upstream

Should customers bear more cost-risk, in exchange for lower risk-premiums?
Risk Diagnostics

Utilities and regulators need formal tools for supply portfolio risk analysis.

- Simulate risk consistent with market forwards and volatility
- Mix of wholesale contracts with different durations and procurement schedules
- Incorporate conventional and renewable resources
- Also evaluate credit exposure
CO₂ Cost Risk

CO₂ prices are likely to be as or more volatile than natural gas, and potentially a large portion of electricity prices.

- Annual volatility of 40-50%/yr plausible
- +/- $10/ton CO₂ changes wholesale energy prices by about +/- $6/MWh
- Need high CO₂ prices to shutdown existing fossil plants
Least-cost resource depends on CO₂ and relative fuel prices.

Level Real New Generation Cost Estimates

- SC Coal @$2/MMBtu
- SC Coal @$4/MMBtu
- Gas CC @$7/MMBtu
- Gas CC @$12/MMBtu
- IGCC w/ Seq @$2/MMBtu
- IGCC w/ Seq @$4/MMBtu
- Nuclear @$4,000/KW
- Nuclear @$7,000/KW
- Wind @ 25% + Repl CT
- Wind @ 35% + Repl CT
- Solar PT @ 34% + Repl CT
- Solar PT @ 45% + Repl CT

2008 $/MWh

- CO₂ at $100/ton
- CO₂ at $40/ton
- CO₂ at $10/ton

Replacement Energy (CT)
Replacement Capacity (CT)
Fuel
O&M
CO₂ Trans & Storage
Capital

The Brattle Group
In several areas, regulatory policy is fostering a new paradigm:

♦ Conventional fossil gen ➔ clean gen ➔ distgen
  • We are probably embarking on a path to zero net carbon emissions
  • CO₂ prices by 2030s should materially penalize coal and gas use, absent CCS
  • RPS standards promote new techs – but often more political basis than economic, and overlap between externality penalties

♦ Load growth and gen expansion
  ➔ conservation, DR, and decoupling

♦ AMI ➔ Smart Grid ➔ even Smarter Grid

We are in the transition phase, when old techs still need to be used, knowing they could become unattractive, and new techs are emerging.
Traditional utility planning has been top-down, engineering-driven: *We buy what is good for customers, and they pay its prudent costs.*

♦ With Smart Grid, DR and conservation, distgen and CHP, possibility of a new business model:
  - Decentralized
  - Customer-driven
  - Adaptive
  - Customized

♦ Can the utility participate in value-added from improving customers’ energy use?
  - Have to really know customers to make it work
  - Many new systems and capabilities needed: AMI, smart appliances, RTP, micro-grid controls, educated customers, new billing capabilities, incentives and performance metrics

♦ What is the boundary of utility services vs. ESCO, SEU, or deregulated subsidiary?
What to do?

- **Maintain/manage realistic expectations** – no one can get this complex problem “just right”

- **Minimize conflict** – e.g., with collaborative, exploratory and information sessions, in lieu of formal hearings

- **Get educated** – in the techniques of economic and engineering analysis that will be needed

- **Specify problems explicitly** – don’t explore solutions without knowing what they are supposed to cure (e.g. “diversity”)

- **Pursue flexibility** – modular, adjustable plans that don’t require placing large, long-term bets
What to do, continued?

- **Recognize inconsistencies** – between goals and policies that are in opposition (e.g., customer choice and long-term fixed pricing)

- **Specify performance standards in advance** – that are related to what is controllable, and knowable; hold harmless for uncontrollable outcomes

- **Value long-term, but evaluate short-term impacts**

- **Preserve/respect the market** – it is telling you something useful, even if you don’t quite believe it
## Appendix: BusBar Cost Assumptions

### Current Year 2010

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### 2008$/MWh

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