Challenges for Capacity Markets and Capacity Planning

**New Technologies**
- energy-limited
- heterogeneous
- intertemporal shifting
- stochastic/variable
- spatially dispersed
- changing rapidly
- capital-intensive, long-term
- modular and distributed

**New Requirements**
- hourly resolution
- co-optimize transmission and generation
- multi-decade scope
  - future policies
  - future costs of fuel and equipment
  - support long-term contracts
- consider uncertainty about future costs and conditions
- incorporate demand side
  - all the way into the distribution network…
- good modeling can create fair markets or stakeholder consensus
Beyond “Capacity” Planning: Multi-Year, All-Hour Equilibrium

SWITCH power system planning model: http://switch-model.org
Regulated Utility Incentives

New Technologies
- capital-intensive, long-term
- modular and distributed
- changing rapidly

New Conditions
- above-market return on ratebase
- partial restructuring
- complex planning and prudence review processes
- complex procurement for renewables
- rate adjustment mechanisms for rapidly changing demand

“Perfect Storm”
- stronger tension between shareholder and ratepayer interests
  - **shareholder interest**: build more ratebased assets or protect existing assets from competition
    - expanding ratebase enriches dividend; shrinking ratebase dilutes dividend
    - **ratepayer interest**: third-party generation, storage and demand-response may cost less than utility-owned generation
  - possibility of unintended consequences
  - **Utility incentives**: propose ratebased assets and obstruct competition from third-party and customer-sited technologies
  - easy to fix?
    - ~$150M of misincentive in a system with $2B of sales
    - Small share of sales, but 50% of utility profits
Renewable/T&D Project Developer
Incentives

• Need secure, long-term finance
• Long-term contracts can be supported by long-term modeling
• Which would need the lowest rate of return?
  – invest 25% up front to prepare solar project with 25% chance of winning RFP
  – build solar project with 1 year contract from ISO market for “firm” portion of capacity
  – build solar project with 20-year take-or-pay contract from utility or ISO market
• Challenges
  – Who will be the counterparty to long-term contracts?
  – Can capacity markets/planning convert social certainty (“we know we want this”) into project-finance certainty?
Customer Incentives

• Too much: Net metering at bundled cost
  – may pay more than needed to obtain PV power
  – unintended transfers from other ratepayers to PV owners
  – untenable for market-based load-serving entities
  – no incentive to reschedule demand to high-sun times

• Too little: Customer self-supply
  – customers use grid as backup but avoid fixed costs
  – customers exiting grid create “spiral to mediocrity”
  – loss of competition for regulated utility or centralized renewables

• Just right: Unlimited net metering at dynamic marginal cost
  – tap into dynamic demand response (e.g., smart appliances)
  – demand-side sets prices when capacity is scarce; allows cost recovery
  – use customer-sited and utility-scale storage and generation as pooled asset
  – no cross-subsidies between customers
    • separate incentives can be used to increase renewables if needed