Synapse
Energy Economics, Inc.

The Changing Face of Electric Resource Planning

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Webinar Logistics

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Who we are

Synapse Energy Economics

- Research and consulting firm specializing in energy, economic, and environmental topics
- Services include economic and technical analyses, regulatory support, research and report writing, policy analysis and development, representation in stakeholder committees, facilitation, trainings, and expert witness services for public interest and government clients
- Synapse reviews and critiques electric utility plans in IRP and pre-approval proceedings. We routinely use electricity production-cost and capacity expansion models in these cases to investigate utility assumptions, analyses, and preferred resource options. We also evaluate alternatives that may provide greater benefits at less or equal cost to consumers.

Agenda

- What is IRP?
- The evolution of IRP
- Changing issues in IRP
  - Flat load, declining demand due to EE/DG
  - Environmental policies
  - Existing generation value
  - Competitive energy efficiency
  - Renewable integration & distributed generation
- Next generation of resource planning

What is IRP?

What is IRP?

An IRP is a plan that seeks to find an optimal combination of resources to satisfy future energy service demands in an economic and reliable manner

- Variously includes requirement to examine both demand-side and supply-side resources on a "fair and consistent basis."
- Subject to constraints such as reliability, regulatory, environmental and operational requirements.

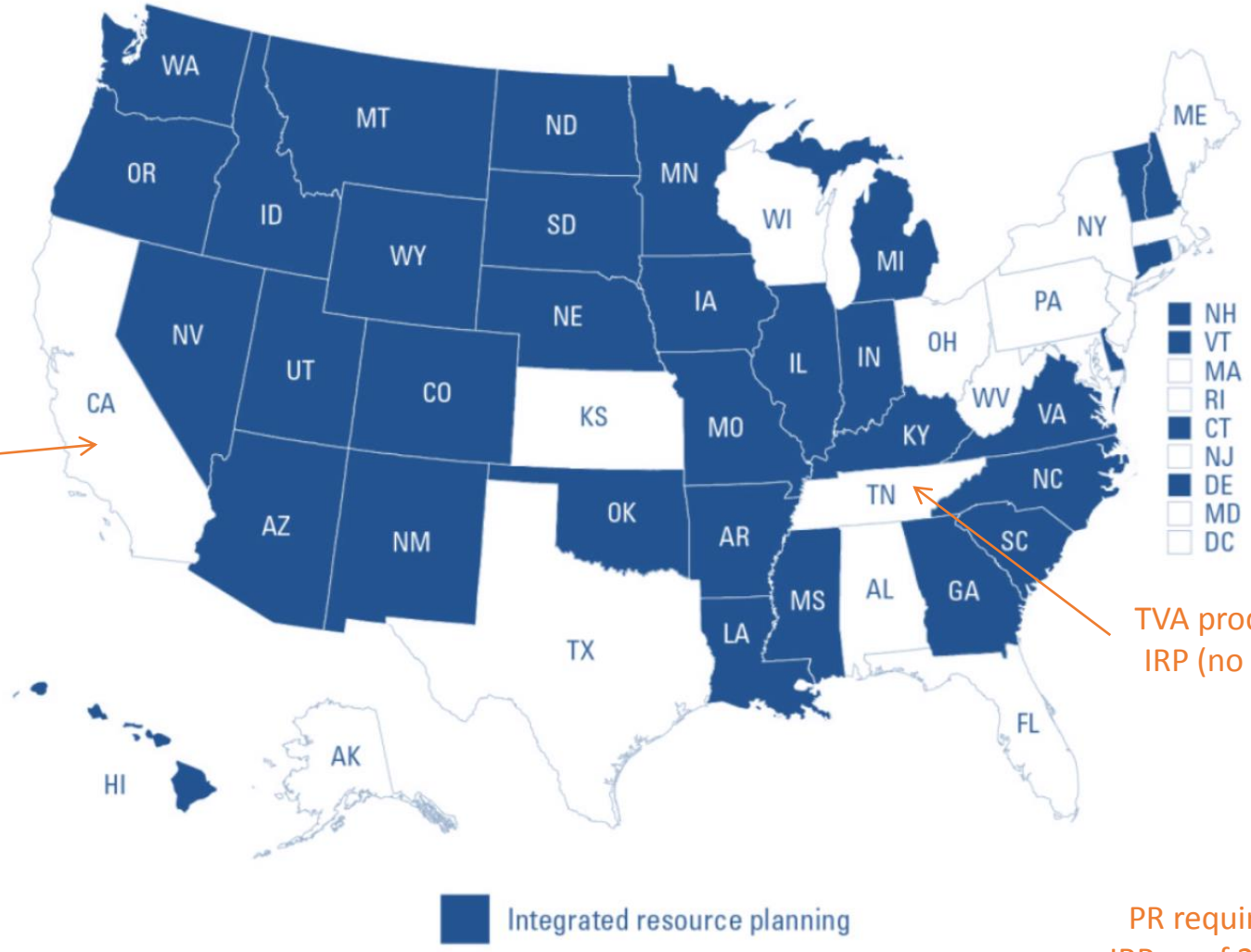
Meant to engage regulators and stakeholders in long-term planning decisions

- Generally presented before regulatory commission, may be litigated
- Stakeholder process varies across states and utilities
- Seeks to make robust short-term decisions in light of long-term uncertainty

A Short History of IRP

- 1970s: Rising fuel prices, increasing capital construction costs, and recognition of environmental costs drive new understanding of *least-cost planning*
- 1980: Pacific Northwest Electric Power Planning and Conservation Act
  - Addressed concerns about plateau in hydro construction and increasing demand
  - Sought to ensure orderly power acquisition by Bonneville
- Early 1990s: States begin promulgating IRP rules
  - Response to nuclear costs and massive stranded investments from cancelled projects
- Tools for least-cost long-term planning emerge to examine tradeoffs between capital investments vs. fuel and variable costs
  - Primarily examine requirement for new resources to meet demand, do not revisit existing resources
- Late 1990s: Electricity restructuring wipes out long-term resource planning in competitive access states
- Late 2000s: States begin re-visiting "procurement" planning

States with IRP Requirements (2015)



CA moving to implement IRP

TVA produces IRP (no req.)

PR requires IRP as of 2015

Source: US EPA. 2015. Energy and Environment Guide to Action, Chapter 7.1

Changing Issues in IRP

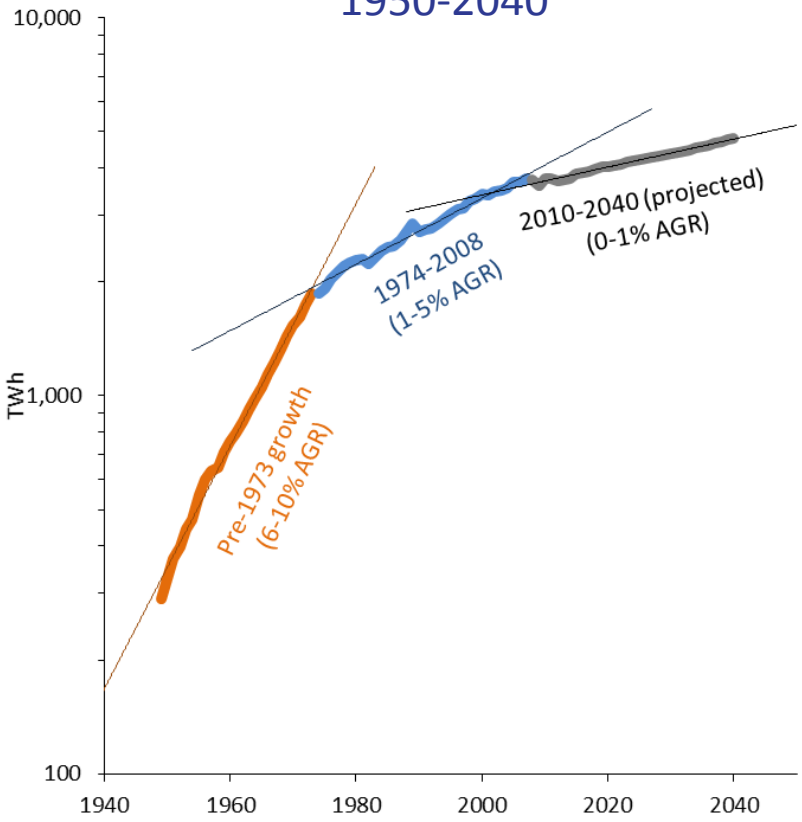
Flat and Declining Load

- Traditionally, IRP addressed one key question:

  What is the optimal set of additional resources to meet increasing demand?

- IRP tools were designed to determine optimal capacity expansion
- But, recent years have seen flat or declining load in many regions
  - Impact of DG, EE, and changing economic conditions
- IRP must now evaluate cost-effectiveness of *existing* resources
- Planning must determine what units should be removed (retired) or modified (retrofit) in addition to considering unit additions

US Electricity Consumption
1950-2040



Source: US EIA, historical sales to 2015. AEO 2016 ER to 2040. Please note log scale.

Environmental Policies

Pre-2010: Sector-wide blind spot

- Little practice in examining value of existing units
- NERC study (and contentious regulatory cases) catalyzed industry

2010-2014: Serious uncertainty

- IRPs variously included / neglected impending regulations and asset valuation
- Seeking clarity on probability, timing, cost, and risk

2014-2016: Standardization of practice

- Recognition of capital / operational impact of regulations & price changes
- Most high impact regulations settled except CO_2

Existing generation value

A plan cannot be least cost without having evaluated the cost-effectiveness of existing supply-side resources

Short-term (operational) challenges

- Solid-fuel units dispatching less today
  - Falling gas and electricity prices
  - Emissions control costs
  - Emissions prices
  - Increasing fuel costs
- Utilities historically gave little attention to short-term variable costs of "baseload" units in IRPs - no longer.
  - MISO CPP study (May 2016) finds coal units de-commit due to high variable price

Less competitive over long-term (planning)

- **2010 - 2014**: utilities (slowly) start testing economic viability of individual units that require capital investments
- **2014 - now**: long-term revenue deficit for high fixed cost units (nuclear, coal) make these units less economically viable

Long-term fuel forecast is critical: will energy prices increase enough?

Competitive Energy Efficiency

EE as Load Reduction	Supply-Side EE
• Traditional mechanism	• Emerging mechanism
• Assumes that set amount of EE happens regardless of economics	• EE can compete with new and existing resources as with any other supply-side resource

• Simple implementation
  • Reduce load with EE profile
  • Assign cost per kWh
	• Complicated implementation
	  • Model individual programs?
	  • What is the cost of a future program?
	  • Can today's savings levels persist @ cost?

• Difficult to evaluate EE as a dynamic element of emissions compliance or portfolio buildout	• Readily adapted to changing economic conditions
• Requires multiple runs with various EE levels to determine system benefit	• Single model run could (theoretically) estimate correct EE level

Renewable Integration & Distributed Generation

Renewable energy in resource planning

- Historically, renewable energy played minor role in overall generation mix for most utilities = simplified representation
- Dropping costs + renewable policies = important to capture operational impacts, capacity contribution, and integration costs
- Simplified representations may be inadequate
- Emerging technology and mechanisms to model renewable energy and storage

Distributed generation

- Behind-the-meter generation previously regarded as small reduction to load (no longer)
- Difficulties:
  - Cost of resource plan may influence expected DG buildout
  - Distribution-level analysis may be required to determine local area needs and balancing

Source: Google Project Sunroof

Questions?

webinar@synapse-energy.com

Next Generation of Resource Planning

Recent developments in planning models

Long term planning with hourly dispatch

- Simply meeting seasonal peak demands is not enough
- Operation details matter – ramping, starts and startup times
- Computational power can still be limiting

Cloud based platforms

- Scalable computing capacity without persistent investment
- Reliability!

Gas supply integration

- Limits on peak day pipeline capacity are important – different than peak power day

Emerging planning issues present modeling challenges

How does distribution planning overlap with long term system planning?

- Rooftop PV can stress circuit level infrastructure, but provides broad system benefits (see California and New York)

Storage operation is tricky to model, particularly in long term models

- Key value can be peak hour operation, or intermediate ramping needs. Or ancillary services.

Inclusive stakeholder processes remain important

- Continued need for detailed publicly available datasets
- Must provide value and avoid protracted processes where data becomes stale

State energy planning to complement utility planning

States are increasingly influencing energy planning via policy – this should be done in an economic framework similar to IRP

- Historically energy efficiency and renewable portfolio standards
- Long term contract requirements (see Massachusetts)
- Nuclear incentives (New York, Illinois)
- Distributed generation incentives (and how they factor into system load forecasts)
- Clean Power Plan Planning

Examples include:

- New Jersey Energy Master Plan
- Connecticut IRP
- California Long Term Procurement Planning

Want to team up with us?

Synapse provides:

- Economic and technical analysis
- Research and report writing
- Policy analysis and development
- Representation in voting and stakeholder committees
- Economic and power system modeling
- Expert witness services
- Regulatory support
- Facilitation and trainings
- Development of analytical tools

Related Resources

Synapse Resource Planning Homepage
http://www.synapse-energy.com/capabilities/resource-planning

Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans (*Synapse/RAP)*
http://www.synapse-energy.com/sites/default/files/SynapseReport.2013-06.RAP_.Best-Practices-in-IRP.13-038.pdf

A Guide to Clean Power Plan Modeling Tools: Analytical Approaches for State Plan CO_2 Performance Projections (*Synapse/Argonne)*
http://www.synapse-energy.com/sites/default/files/Guide-to-Clean-Power-Plan-Modeling-Tools.pdf

Practicing Risk-Aware Electricity Regulation: What Every State Regulator Needs to Know *(Ceres)*
http://www.ceres.org/resources/reports/practicing-risk-aware-electricity-regulation

Energy and Environment Guide to Action: State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Heat and Power – Chapter 7.1, Electricity Resource Planning and Procurement (*EPA/Synapse)*
https://www.epa.gov/sites/production/files/2015-08/documents/guide_action_full.pdf

Upcoming Webinars

New Renewable Generation Capacity – Why Here and Not There?

Wednesday, June 22, 2016| 2:00-3:00pm

Register at http://www.synapse-energy.com/webinars

Did you miss last week's webinar, *Clean Power Plan – New Policy or New Normal*? Watch the recording at http://www.synapse-energy.com/project/clean-power-plan-new-policy-or-new-normal.

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