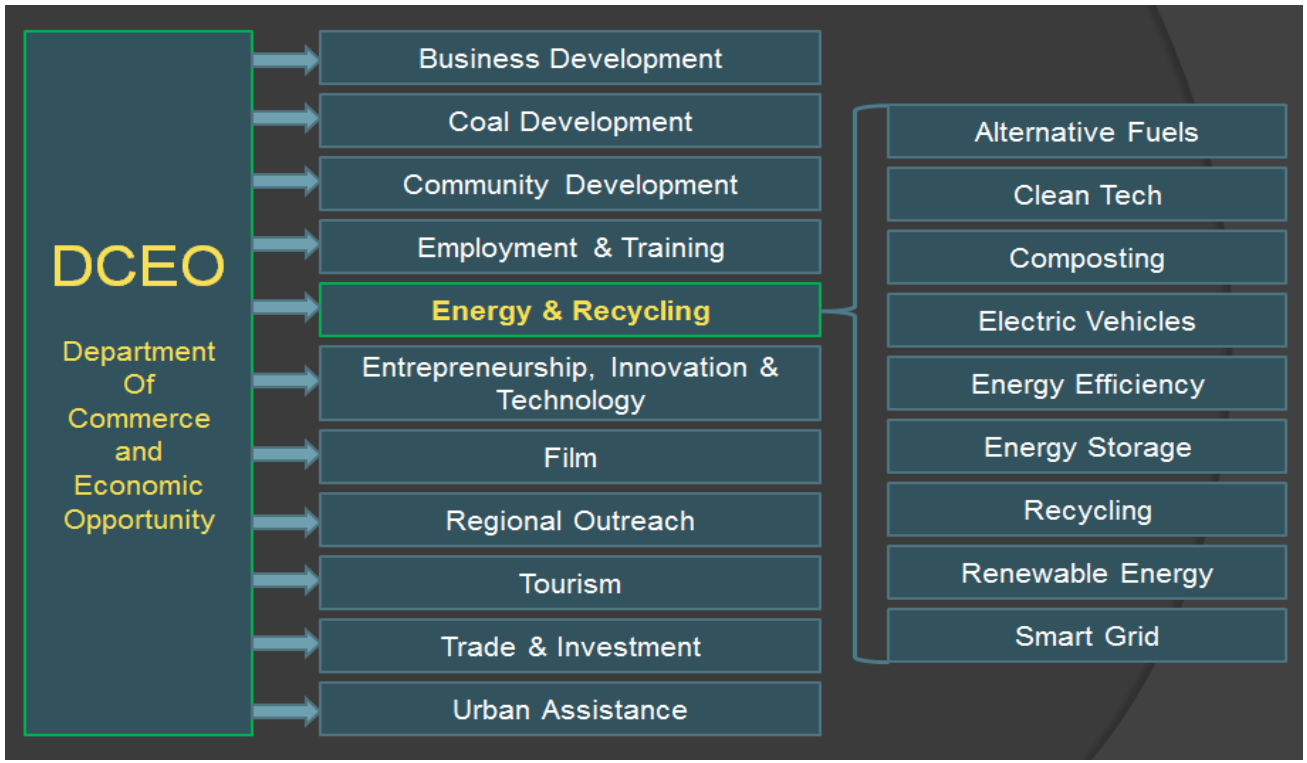
Illinois Energy Roadmap

A data-driven approach to planning energy efficiency and renewable energy policies and initiatives for the State of Illinois

Molly Lunn, Deputy Director, Office of Energy & Recycling, Illinois Department of Commerce & Economic Opportunity

Illinois
Department of Commerce
& Economic Opportunity

Illinois Office of Energy & Recycling



Energy and the Illinois Economy

- Energy is critical to a state's economy
  - Jobs
    - White collar – e.g., energy service performance contract managers, project engineers, plant operators
    - Blue collar – e.g., weatherization contractors, linesman, plant assembly workers
    - Sectoral clustering
  - Economic Development
    - Energy prices & supply → low and stable energy prices attract and retain businesses, consumer dollars not spent on energy costs can be reinvested in other things
    - Marketing & reputation
    - Effects property values
    - Indirect impacts of the energy choices we make

Illinois Energy & Recycling Office

- Bureau administers a range of clean energy and solid waste management programs and policy initiatives
- **Goal:** Stimulate economic development and create jobs, while producing a cleaner environment and more secure energy future
- All programs are self-supported, by non-General Revenue Fund sources
  - FY15 Revenue ~$100M
  - ~1445 grants and rebates
- The Office is Illinois' designated "State Energy Office"
- Key Partner Agencies: IEPA, ICC and IPA

Growing the State's Clean Energy Economy

How do you think your utility's fuel mix will change over the next 20 years?				
	Stay the same	Increase	Decrease	N/A
Natural Gas	14%	**74%**	7%	5%
Wind	17%	**72%**	4%	7%
Utility-scale solar	12%	**79%**	2%	8%
Hydro	**62%**	15%	8%	15%
Coal	9%	3%	**77%**	35%
Nuclear	**35%**	16%	21%	27%
Oil	17%	3%	**45%**	11%
Distributed energy resources	5%	**84%**	2%	9%

- State's energy mix will continue to rely on all energy sources – fossil, nuclear, and clean energy
- Opportunities for growth in clean energy
  - Utilities & investors are heading in this direction
  - This will only increase with new and emerging Federal standards

Possible Pathways

- Make our existing programs better by *managing for results*
- Get a bigger bang for the State's buck by *designing programs that leverage public dollars with private investment* through clean energy finance
  - Gap analysis
  - Pilots
- Supporting and attracting Illinois businesses by *better marketing our energy resources & planning for Illinois' long-term energy future*
  - Business outreach strategy for non-energy & energy companies
  - Illinois Energy Roadmap

Project Profile

- **Sponsor:** U.S. Department of Energy
- **Source:** State Energy Program
- **Timing:** January 2015 - December 2016
- **Goal:** Develop an *Illinois Energy Roadmap* that identifies the optimized role of energy efficiency and renewable energy to meet current and future policy requirements
- **Proposers:** Illinois Department of Commerce and Economic Opportunity
  Galvin Center (Illinois Institute of Technology)
  Energy Resources Center (University of Illinois at Chicago)
  National Association of State Energy Officials

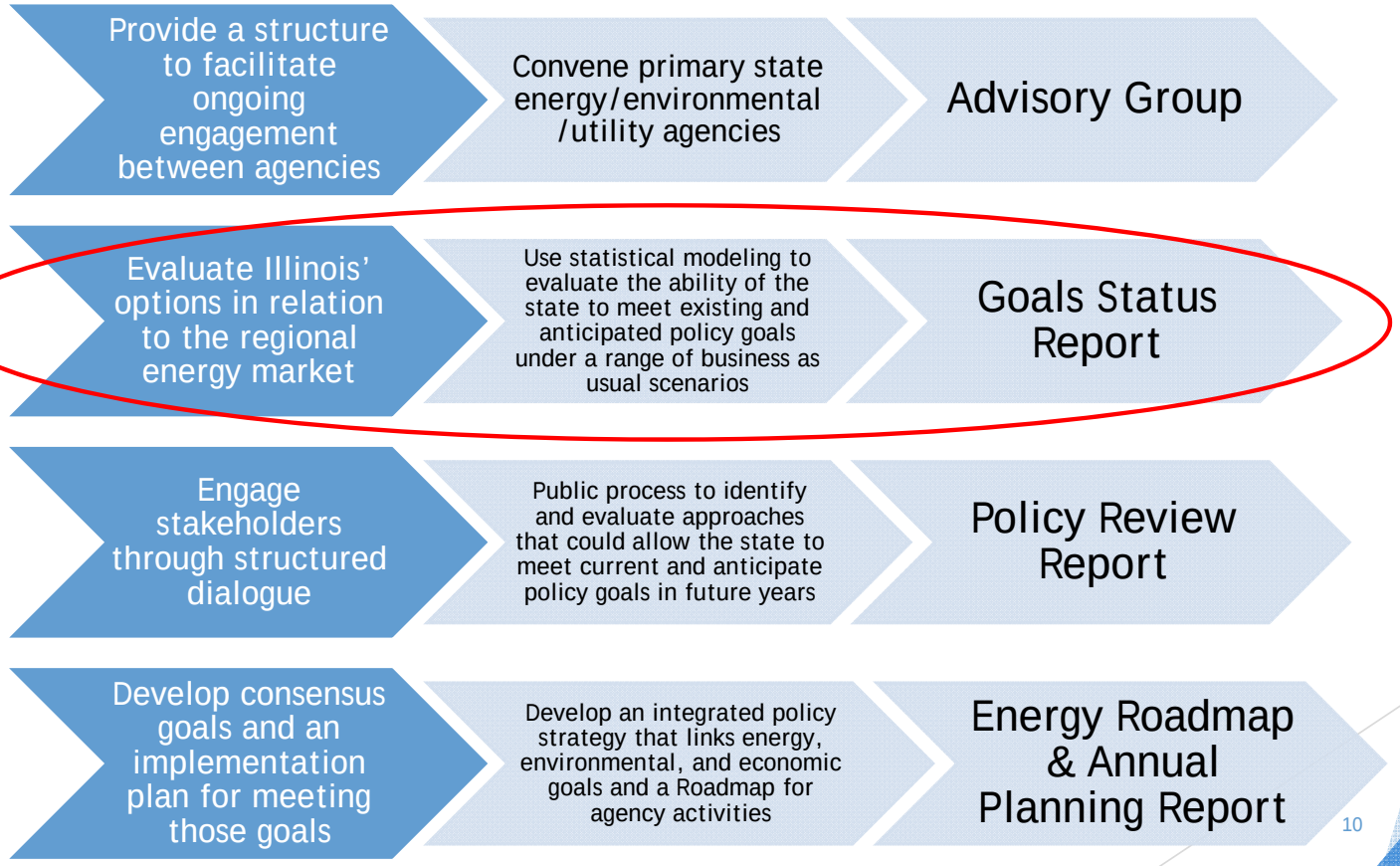
Project Context

- Illinois has not undertaken an integrated energy planning process in two decades
- The State has established a series of separate policies regarding electricity market design, renewable energy, energy efficiency, and emissions standards
- Additionally, energy policy and regulatory authority is divided among multiple state agencies and regional transmission organizations
- As a result, the State lacks a cohesive approach to meeting state, regional, and pending federal goals

Project Vision

- Identify the market developments that will most likely impact Illinois' position as a pivotal energy actor within the region
- Clarify how existing and proposed energy policies improve or inhibit Illinois' ability to benefit from market developments
- Evaluate the potential economic and environmental impact of various energy policy options by applying a rigorous statistical analysis across a range of potential market scenarios
- Develop an *Illinois Energy Roadmap* that addresses the future direction of the energy sector in the state and region, particularly the role of energy efficiency and renewable energy

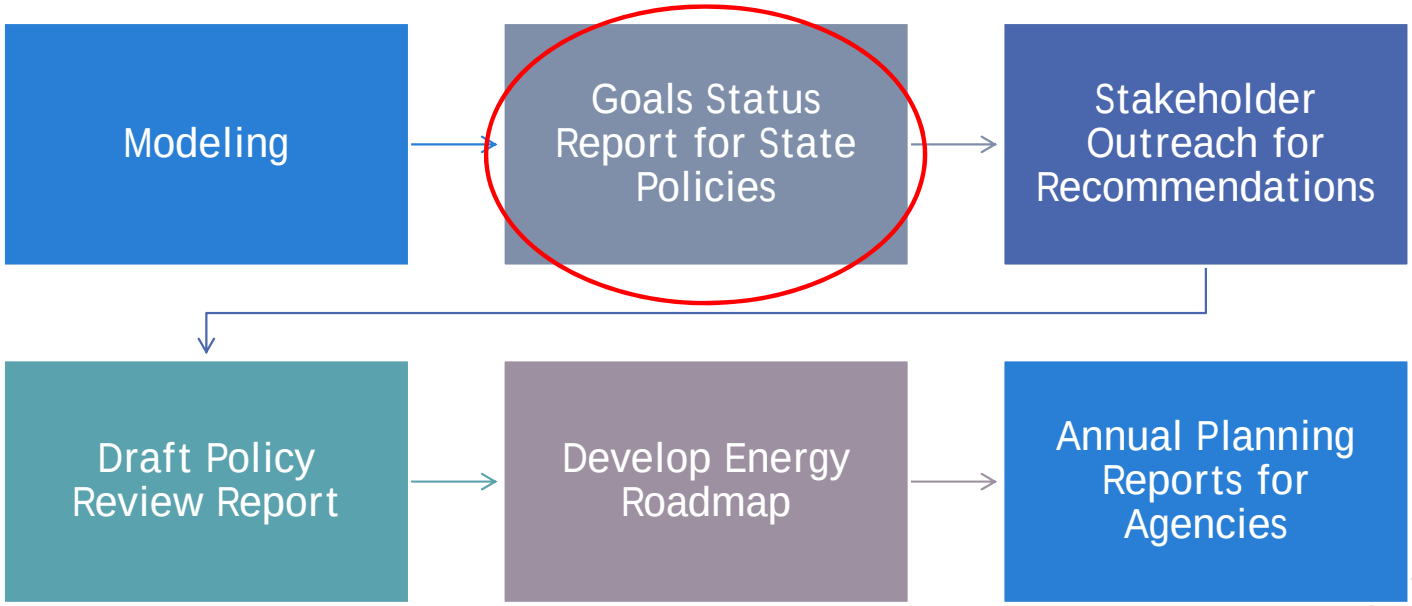
Project Objectives, Approach, & Outcomes



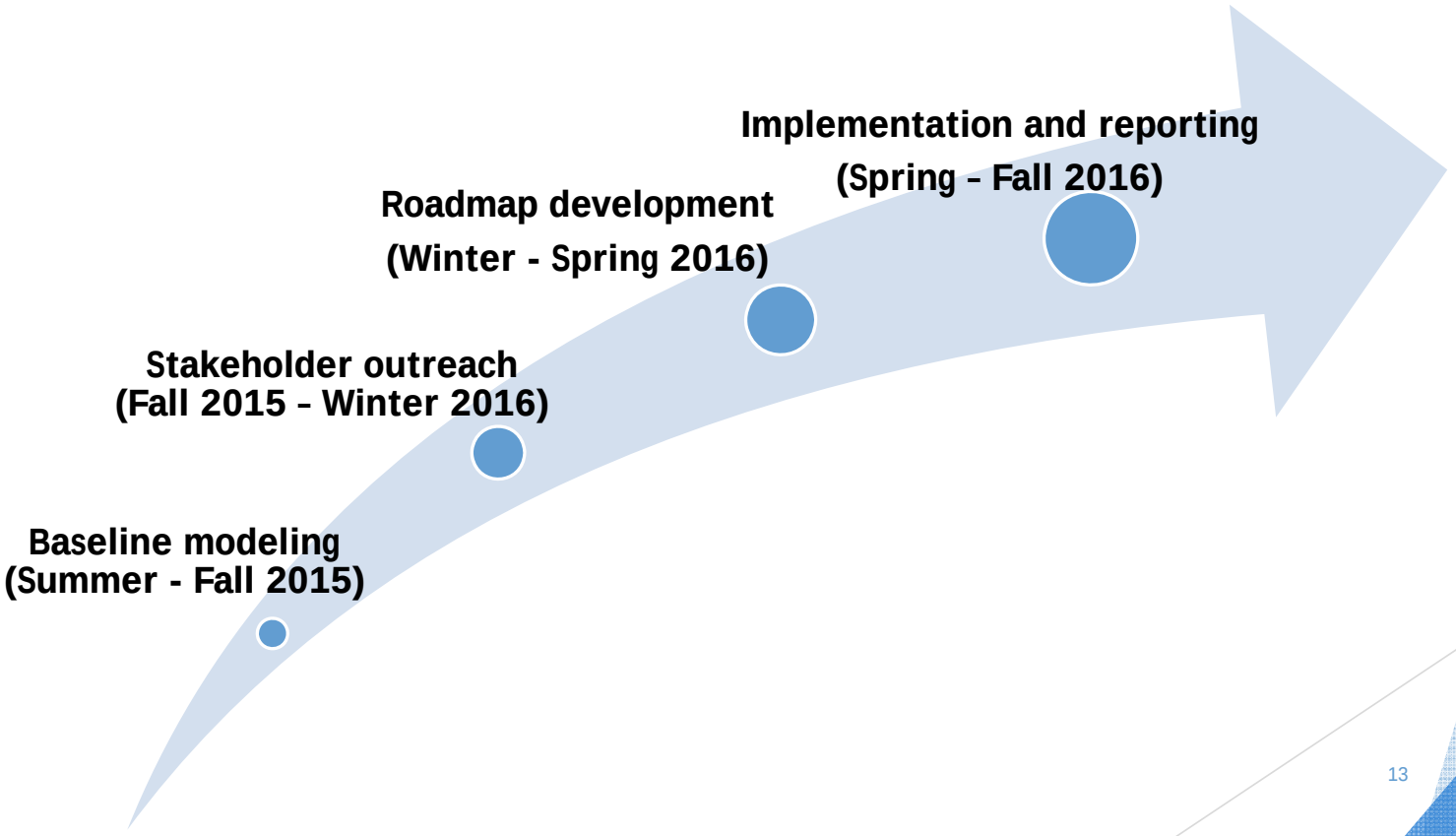
Project Team

- Project Manager & Technical Partners
  - Illinois Department of Commerce and Economic Opportunity's Office of Energy & Recycling
  - Galvin Center for Electricity Innovation at Illinois Institute of Technology
  - Energy Resources Center at University of Illinois at Chicago
  - National Association of State Energy Officials
- Advisory Board
  - Illinois Environmental Protection Agency
  - Illinois Commerce Commission
  - Illinois Pollution Control Board
  - Illinois Power Agency
  - Governor's Office
- Stakeholders

Process Review



Project Timeline



Thank You! Questions?

Molly Lunn
marion.lunn@illinois.gov
(312) 814-2354

Modeling Addendum

Slides by Mark Pruitt, Galvin Center for Electricity Innovation at the Illinois Institute of Technology

Modeling Platform: Basic Questions

What will be needed?

- General Energy Demand
  - Fuel
  - Peak Demand
  - Supply
- Policy Requirements
  - Renewable Energy
  - Efficiency
  - Demand Response
  - Emissions

Under a range of assumptions?

- Fuel costs
- Generation capacity
- Transmission capacity
- Demand for resources
- Market rules

Modeling Platform: Key Variables

- Business as usual variables
  - Fuel Costs (EIA forecasts, specialized)
  - Fuel Availability (Natural Gas pipeline access)
  - Power Plant Changes (Retirement, Repower, New Build)
  - Transmission Projects (Upgrades, New Build)
  - Demand (Flat, Regional Adjusted, Sector Adjusted)

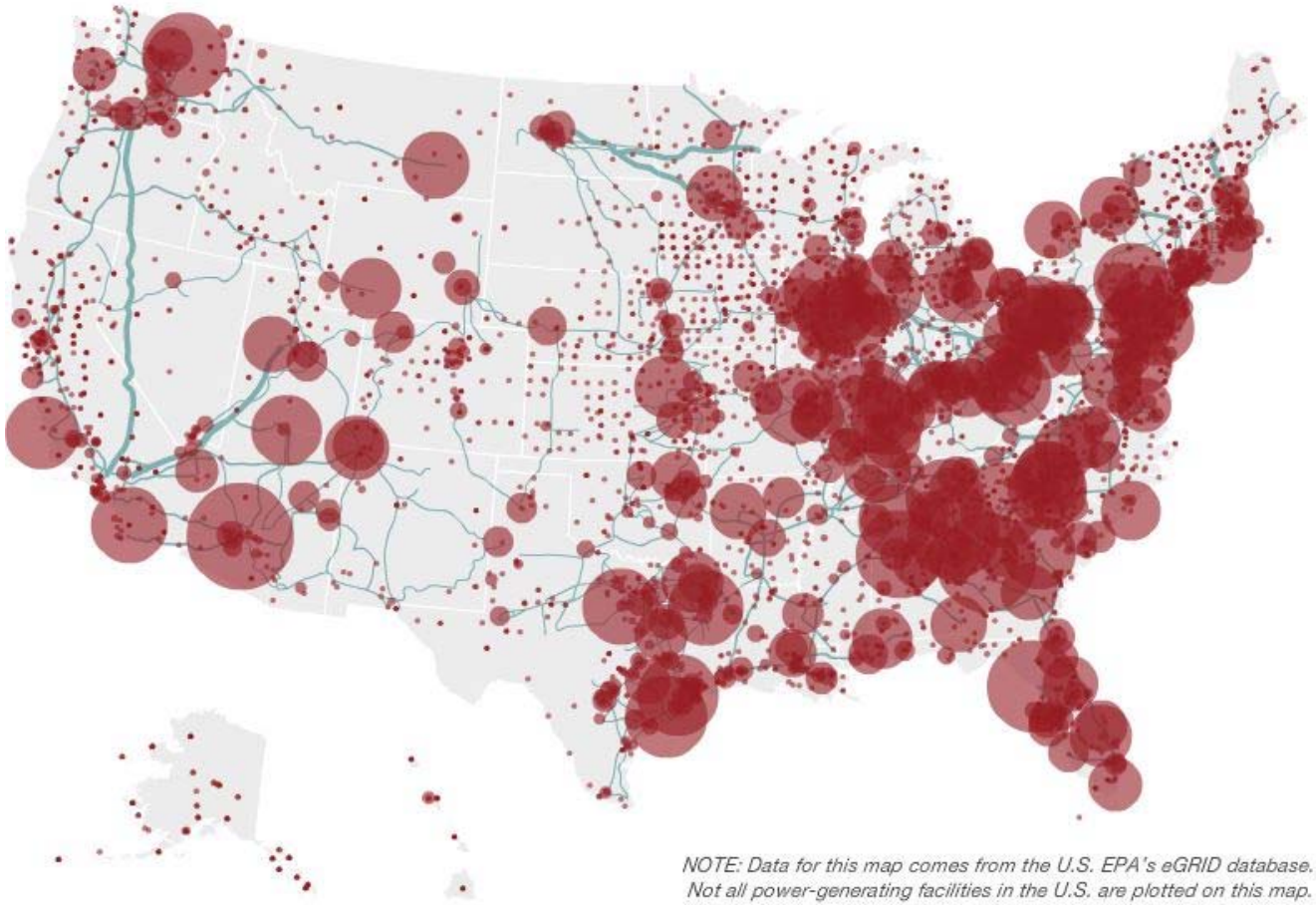
Modeling Platform: Statistical Tool

- **Market Price Simulator (MarSi)**
  - Software platform developed at IIT
  - Used to evaluate how policy options related to generation, transmission, and efficiency operate within the complex set of rules and constraints of the regional grid
  - Utilizes scenario analysis based on a range of user-defined inputs
- **MarSi Aspects**
  - Eastern Interconnection focus
  - Maps generation units, transmission assets, and natural gas constraints
  - Models the dispatch of generating assets based on market rules and regulations
  - Identifies the local results of both local and regional energy decisions

Modeling Platform: Approach

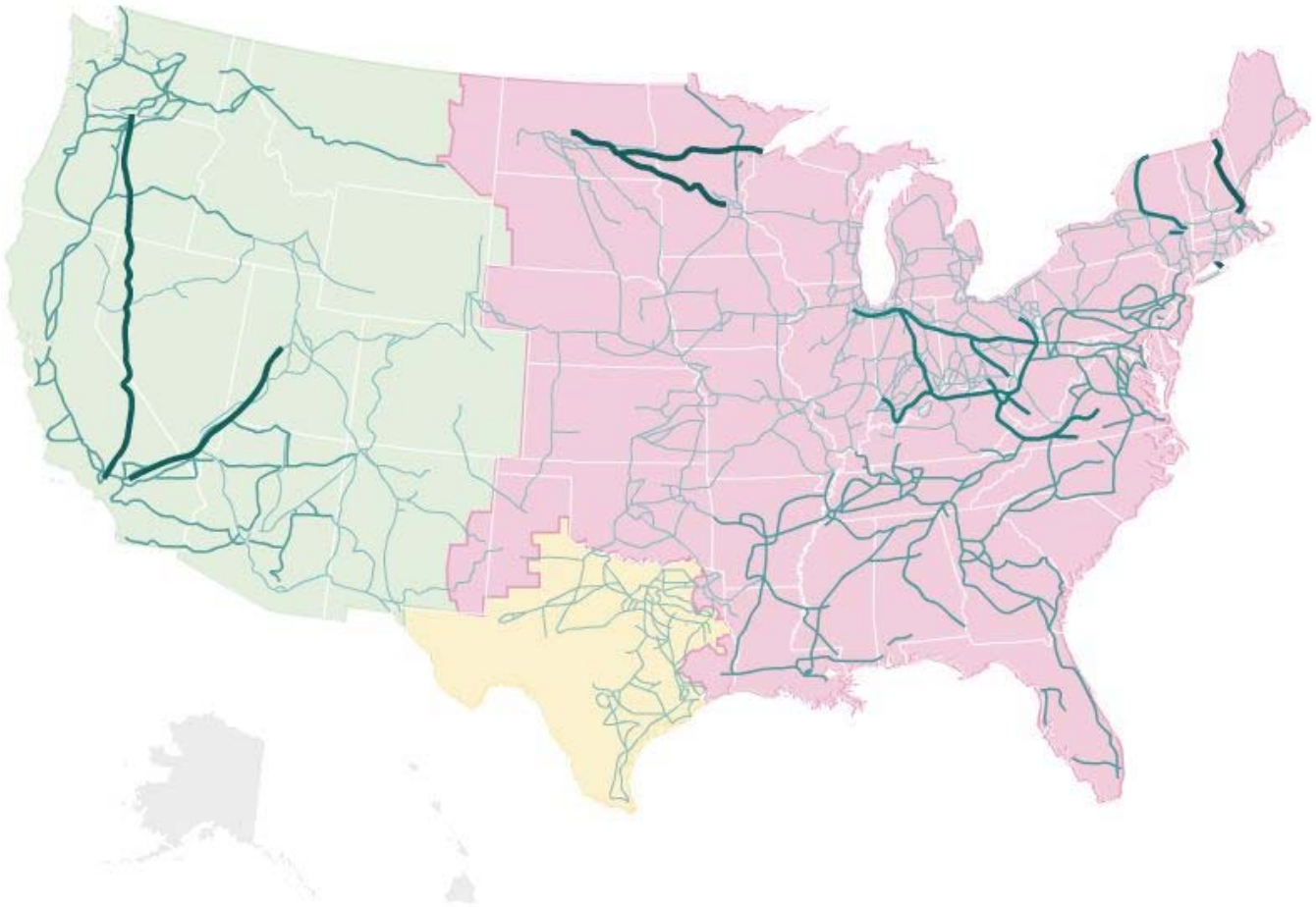
- **Aggregate all Operating Data Points**
  - Generation – All operating assets plus announced new-build and closures
  - Transmission – All operating and announced transmission system expansions
  - Demand – Historical hourly demand at hundreds of regional hubs correlated for weather
  - Fuel – Historical and projected fuel prices (and constraints)
- **Apply Market Rules**
  - Market Day-Ahead and Real-Time auctions dictate dispatch order
  - Observe transmission and generation constraints to identify least cost scheduling
  - Calculate clearing prices, emissions, reliability from dispatch model
- **Change the Operating Assumptions**
  - Add or remove generation and/or transmission assets
  - Increase or decrease electricity demand based on load growth or efficiency
  - Alter assumptions concerning fuel costs and availability

Modeling Platform: Generation

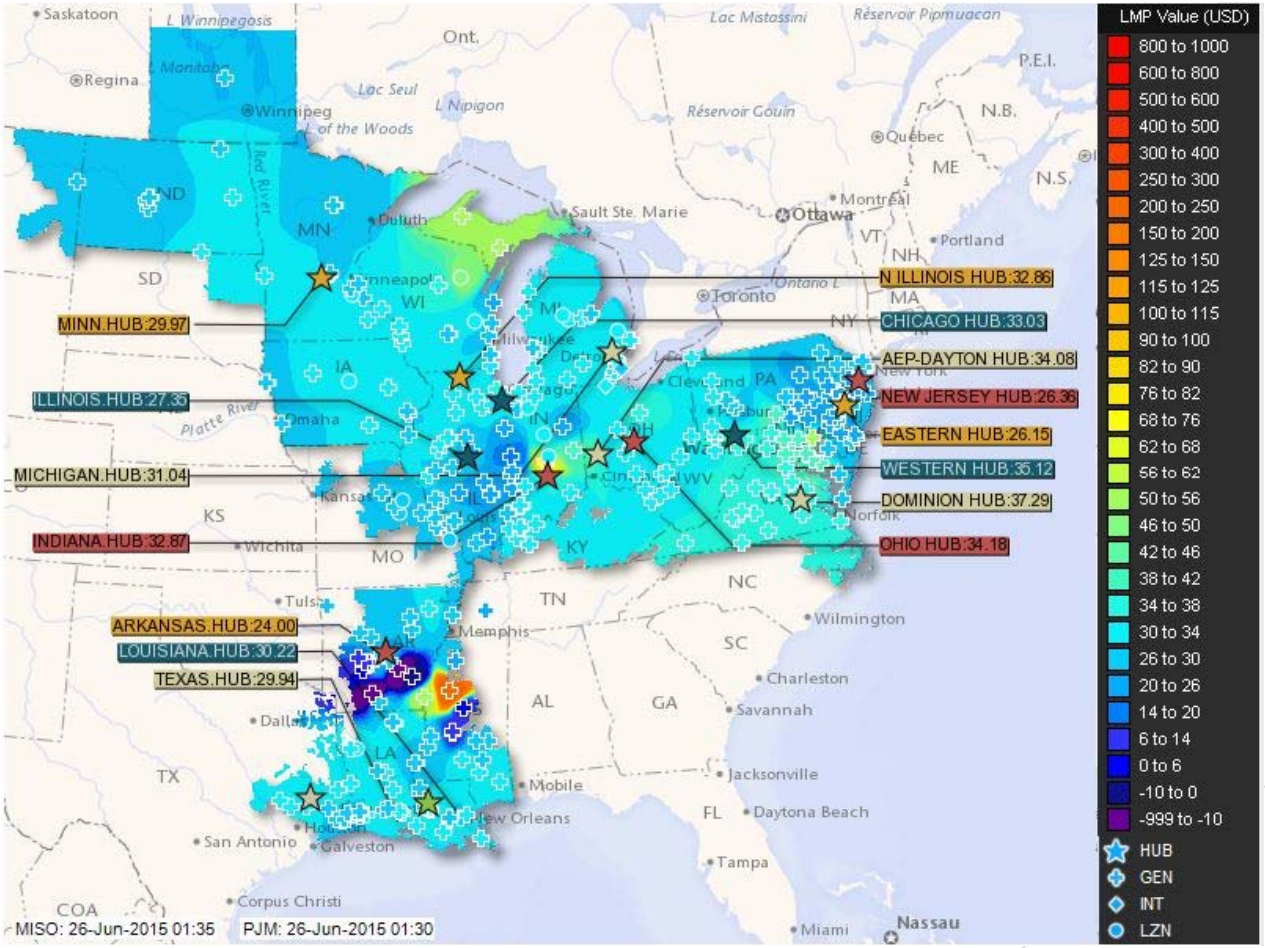


NOTE: Data for this map comes from the U.S. EPA's eGRID database.
Not all power-generating facilities in the U.S. are plotted on this map.

Modeling Platform: Transmission



Modeling Platform: Market Dispatch



Modeling Platform: Outputs

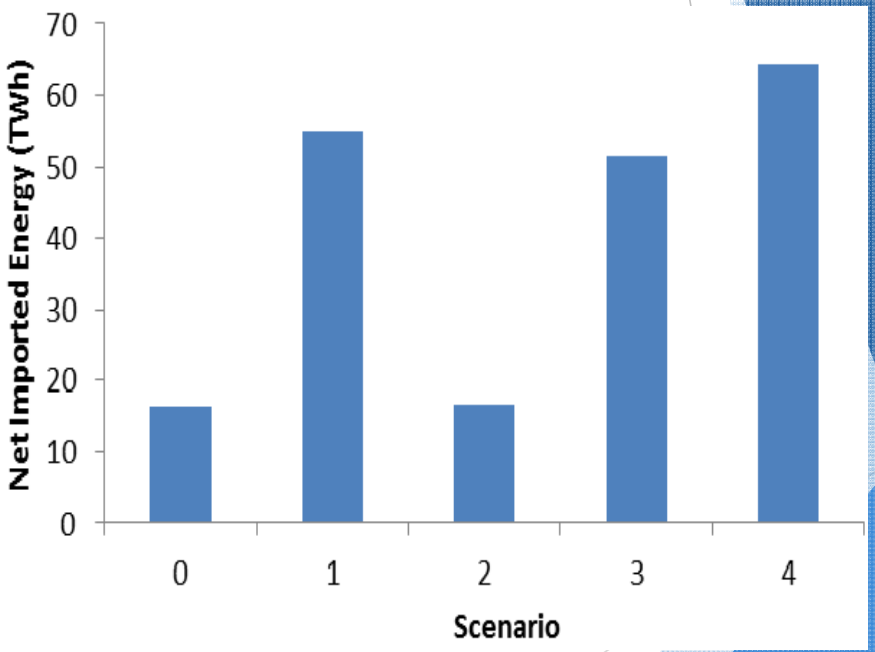
- **Goals Status Report**
  - Serve as benchmark information to be used in stakeholder engagement through comment process in later stages
- **Scenario results**
  - Test potential impacts of partially/completely fulfilling existing energy efficiency and renewable energy policy goals
  - Identify the maximum potential value of energy efficiency and renewable energy policy goals to meet current and proposed policy goals
- **Policy Review Report**
  - Scenario analyses serve as the basis of for selection of highest value blend of achievable energy efficiency and renewable energy options for Illinois
  - Best range of options will be presented in a Policy Review Report which will serve as the starting point for comments by stakeholders

Modeling Platform: Sample Outputs

Potential Scenarios

- **Scenario 0: Benchmark Scenario**
  - EIA fuel price projections | Flat load growth |No plant closures or new plants
- **Scenario 1: Simple Scenario**
  - EIA fuel price projections | Flat load growth | Close 3 Illinois nuclear stations
- **Scenario 2: Likely Scenario w/out Illinois nuclear power plant closures**
  - EIA fuel price projections | Flat load growth | Add 119 new generators
- **Scenario 3: Likely Scenario w/Illinois nuclear power plant closures**
  - EIA fuel price projections | Flat load growth | Close 3 Illinois nuclear stations | Add 119 new generators
- **Scenario 4: Aggressive Scenario**
  - 4% annual increase in fuel prices | 3% annual load growth | Close 3 Illinois nuclear generators | Add 119 new generators | Retire any existing plants with heat rates greater than 14,000

Net imported energy



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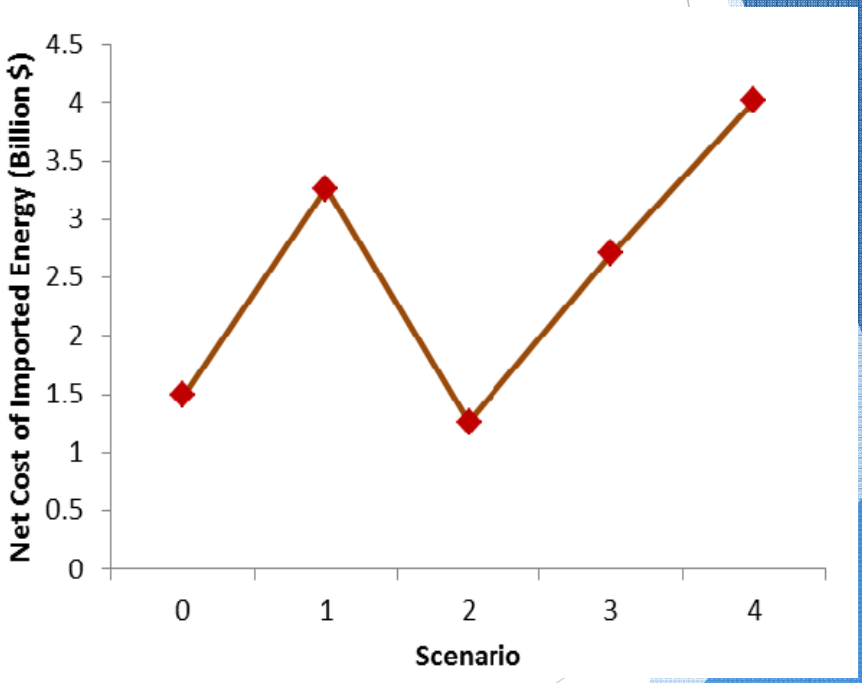
Cost of imported energy



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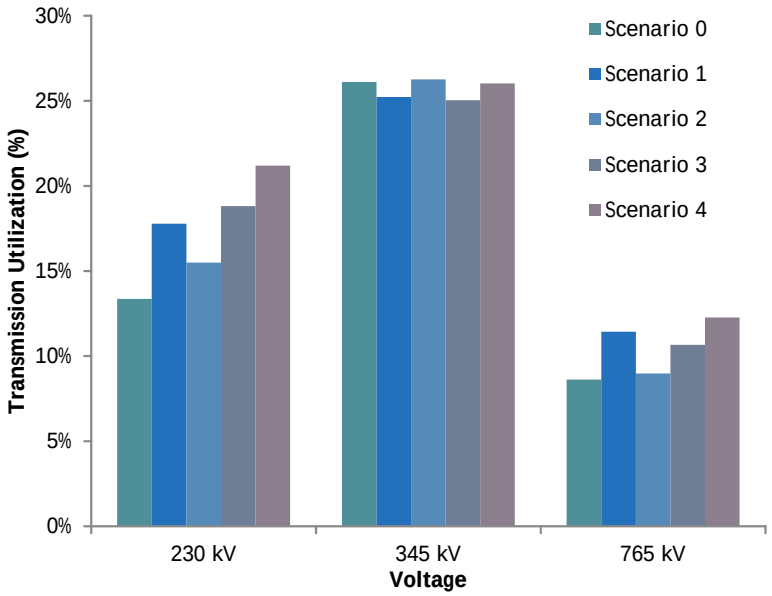
Reliability



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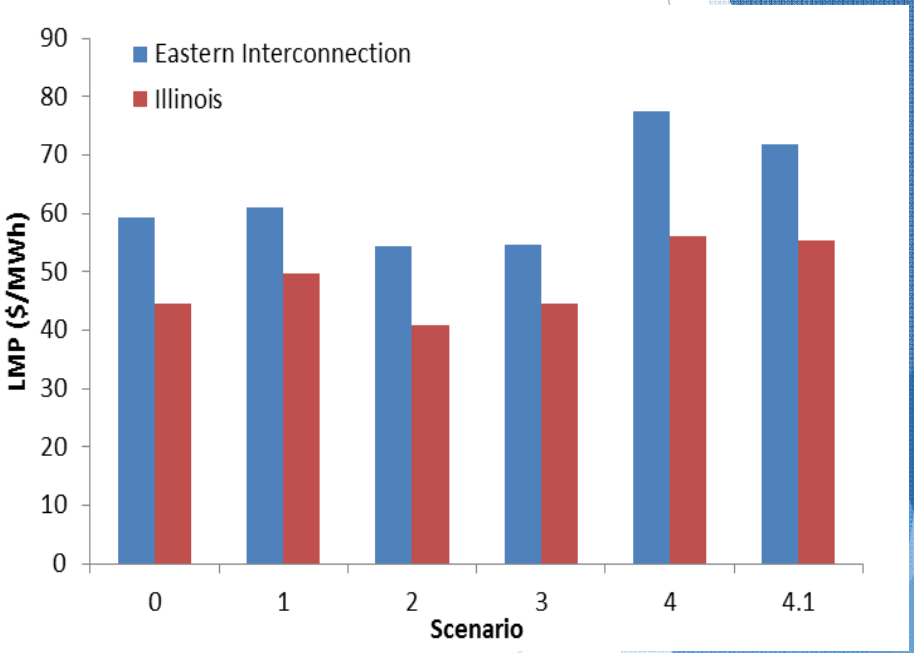
Power Prices



Sample Outputs