Outline

• ATC Introduction
• Elements and Central Question of Transmission Planning Framework
• Current Transmission Planning Framework
• Do We Need a New Transmission Planning Framework?
• What Would New Transmission Planning Framework Look Like?
• Clarifying Questions
Introducing ATC

- Began operations in 2001 as first multi-state, transmission-only utility in U.S.
- Headquartered in Pewaukee, Wis.
- Grew from $550 million in assets in 2001 to $3.3 billion today
- Projecting $3.0-$3.6 billion investment over next 10 years
- Operating 9,480 miles of lines and 529 substations in Wisconsin, Michigan, Minnesota, Illinois
- Built first economic project in MISO; 35-mile line between Wisconsin and Illinois
- Instrumental in developing Multi-Value Projects in MISO
  - Built first MVP project in MISO; Pleasant Prairie-Zion connection between Wisconsin and Illinois
  - Developing two more MVP projects totaling $1 billion
- Joint venture with Duke – DATC
  - Own Path 15 and rights to Zephyr 3,000MW HVDC line from Wyoming to California
Elements and Central Question of Transmission Planning Framework

- Benefits
- Planning Region Size
- Tools & Methodologies
- Time Frame
- Types of Projects Considered

Enabler or Competitor?
Current Transmission Planning Framework

**Benefits:**
Reliability, generation & distribution interconnection

**Planning Region:**
Individual utilities, occasionally RTO, single state

**Tools & Methodologies:**
Power Flow Models, Stability Analysis
Summer, Shoulder Peak

**Time Frame:**
1, 5, 10 years

**Projects Considered:**
Individual, to solve one or a few local issues

**Uncertainties:**
If dealt with, deterministically or in ad hoc fashion
- Only consequences are considered (not probabilities), with both the single contingencies and higher order contingencies
Do We Need a New Transmission Planning Framework?

- **What has changed? Benefits:**
  - Markets have enabled monetization of congestion costs, ancillary services, “insurance costs”, etc.
  - With markets, the benefits are much more wide-spread
  - Order 890 and Order 1000: must perform economic analysis, i.e., calculate benefits and consider public policy
  - Cost allocation must be “commensurate with” benefits

- **Renewable integration, “Renewable Investment Benefits”**
- **Need for greater resiliency**
- **Need for greater flexibility**
- **Computing power and algorithms enable calculation of many more benefits than previously**
Do We Need a New Transmission Planning Framework?

• What has changed? Uncertainties:
  – Markets, moving power in different directions
  – Renewable, intermittent generation (wind and solar)
  – Renewables built at resource, not near loads
  – EPA regulations creating uncertainty in generation mix
  – Shale gas, natural gas prices changing dispatch and generation mix
  – Unexpected retirements due to market conditions
  – Demand side resources, SmartGrid
  – Distributed generation
  – Electric vehicles
  – Storage
Typical Quotes

• Transmission Hub – January 31, 2014*
  – “The ERCOT transmission grid is in a state of flux and transmission developers can no longer conduct transmission planning as they have done historically, panelists at TransForum Texas said on Jan. 29.”
  – “Due in part to the increasing penetration of renewable generation and energy storage, the panelists concurred that transmission planning of the future must take a global, rather than a local, view.”

• Utility Dive – February 11, 2014^*
  – “[Jim] Rogers believes “the Internet of everything will transform the use of electricity in the United States…The simple fact that Google acquired Nest tells you where it’s going.”
  – Ron Binz: “…two key features…the grid will be low carbon…connected in much the same way that the Internet is”
  – Mike Chesser: “…the power grid’s ongoing transformation ‘from a one-way system to a two-way integrated network’”


New Transmission Planning Framework - Benefits

Challenge: Wide-spread Benefits

Wide-spread nature of transmission benefits creates both planning and cost allocation challenges

<table>
<thead>
<tr>
<th><strong>Challenge</strong></th>
<th>Benefits</th>
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<tbody>
<tr>
<td><strong>Broad in scope</strong></td>
<td>- Increased reliability and operational flexibility</td>
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<td>- Reduced congestion, dispatch costs, and losses</td>
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<td>- Lower capacity needs and generation costs</td>
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<td>- Increased competition and market liquidity</td>
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<td>- Renewables integration and environmental benefits</td>
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<td>- Insurance and risk mitigation benefits</td>
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<td>- Fuel diversification and fuel market benefits</td>
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<td>- Economic development from G&amp;T investments</td>
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<td><strong>Wide-spread geographically</strong></td>
<td>- Multiple transmission service areas</td>
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<td></td>
<td>- <strong>Multiple states</strong> or regions</td>
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<td><strong>Diverse in their effects on market participants</strong></td>
<td>- Customers, generators, transmission owners in regulated and/or deregulated markets</td>
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<td></td>
<td>- Individual market participants may capture one set of benefits but not others</td>
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<td><strong>Occur and change over long periods of time</strong></td>
<td>- Several decades</td>
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<td>- Changing with system conditions and future generation and transmission additions</td>
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<td>- Individual market participants may capture different types of benefits at different times</td>
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- Currently planning focused on reliability projects, few “economic” or “congestion relief” projects
  - Often attempts to achieve specific goals at lowest costs as opposed to looking for the best value
- Only starting to learn how to plan for “public policy” projects
New Transmission Planning Framework

- **Tools and methodologies:**
  - Production cost analysis is a good start but falls very short of assessing all the benefits.
  - Deterministic planning for reliability is not as reliable as it once was.
- **Planning region size:** Individual utility service territories or states are not sufficient—benefits are wide spread.
- **Time frame:** Need to look beyond 10 years—benefits are long lasting.
- **Projects considered:** Looking at individual projects to meet specific needs will miss benefits that are larger and more uniformly distributed for portfolios or regional plans.
- **Uncertainties:** Unprecedented increase in uncertainty in the electric sector; planners need tools and methodologies to address the uncertainties, whether they are planning for reliability, economics, and/or public policy (or all of the above).
## New Transmission Planning Framework

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<thead>
<tr>
<th>Elements</th>
<th>Strategic</th>
<th>Keep the Lights On</th>
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<tbody>
<tr>
<td>Tools &amp; Methodologies</td>
<td>Production cost; economic analysis tools</td>
<td>Probabilistic planning models</td>
</tr>
<tr>
<td>Planning Region Size</td>
<td>Regional and inter-regional</td>
<td>Local utility, regional</td>
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<tr>
<td>Projects Considered</td>
<td>Portfolio of Projects</td>
<td>Single Projects</td>
</tr>
<tr>
<td>Time Frame</td>
<td>10-20 years</td>
<td>1, 5, 10 years</td>
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<tr>
<td>Benefits Calculated</td>
<td>Calculate full range of benefits and beneficiaries</td>
<td>Reliability, lowest cost alternative, also considering more strategic solution</td>
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<td>Uncertainties</td>
<td>Considered with range of plausible futures</td>
<td>Considered with probabilistic planning</td>
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Summary

• Many future uncertainties that impact Transmission Planning, both short term and long term
• Traditional transmission planning may be masking real risks and creating suboptimal plans
  – Value of recognizing uncertainty and risks can no longer be ignored
• Reliability must be priority one, but there are many other benefits that must be considered in planning
• Considering all the benefits for portfolios of projects is very resource intensive but needed to make appropriate investment decisions
• New transmission planning framework is needed to build a grid that will capture more of the value of transmission and be more resilient
CLARIFYING QUESTIONS