MINNESOTA EUI STATEWIDE ENERGY EFFICIENCY POLICY REVIEW
STAKEHOLDER MEETING #3 – MEASURING SUCCESS
### TODAY’S AGENDA

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TODAY’S GOAL

- Learn about related efforts
  - In MN – Trisha DeBleekere
  - Nationally – Joe Paladino
  - Internationally – Niels Małskær

- Review newly issued EUI guidance
  - Anthony Fryer

- Discuss possible metrics for measuring EUI efficiency goals and performance
  - Kevin Lawless
  - Greg Anderson
Infrastructure is any equipment or facilities owned by a utility used to deliver electric energy to consumers.

- Generation, Transmission, Distribution
- Everything upstream of the meter
- Also called supply-side
Definition of EUI Efficiency

Projects owned by a utility that:

- Replace or modify existing infrastructure to conserve energy
- Conserve energy by recovering waste heat from infrastructure
An estimated 12-15% of the nation’s electricity production is consumed by generation auxiliary loads, transmission and distribution losses, and substation consumption.
Project Goals:
- Understand existing policies concerning EUI
- Examine (dis)incentives to improve EUI efficiency
- Recommend policy changes or clarifications to leverage EUI efficiency to meet MN goals

Conduct 4 public stakeholder meetings (Today is #3)
Develop roadmap to increase EUI efficiency
Funding from DOE grant
Minnesota is leading the country
STAKEHOLDER MEETING TOPICS

- Meeting 1 – 7/28/2017 - EUI Technologies
- Meeting 2 – 10/20/2017 – EUI Policies
- Meeting 3 – 2/12/2018 – Measuring Success
- Meeting 4 – TBD – Comprehensive EUI Landscape in Minnesota
REVIEW MEETING #1

- Held 7/28 - Focus on EUI Technologies
- Ron Schoff, EPRI
- Lisa Severson, Minnkota
- Group discussions about barriers to implementing EUI efficiency projects

Summary/materials posted to project site:
https://www.mncee.org/mnsupplystudy/project-resources/
Review Meeting #2

- National Policy Perspectives
  - Rich Sedano – RAP

- Identified Policy Barriers with Preliminary Possible Policy Recommendations

- Integrate Policy with Planning
  - Mary Santori – Xcel Energy

- Incorporate Stakeholder Feedback
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## Applications and Benefits Matrix

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<tr>
<th>Benefits</th>
<th>Smart Grid Technology Applications</th>
</tr>
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<tbody>
<tr>
<td><strong>Consumer-Based Demand Management Programs (AMI-Enabled)</strong></td>
<td><strong>Advanced Metering Infrastructure (AMI) Applied to Operations</strong></td>
</tr>
</tbody>
</table>
| • Time-based pricing  
• Customer devices (information and control systems)  
• Direct load control (does not require AMI) | • Meter services  
• Outage management  
• Volt-VAR management  
• Tamper detection  
• Back-Office systems support (e.g., billing and customer service) | • Automated feeder switching  
• Fault location  
• AMI and outage management | • Condition-based maintenance  
• Stress reduction on equipment | • Peak demand reduction  
• Conservation Voltage Reduction  
• Reactive power compensation | • Real-time and off-line applications |
| **Capital expenditure reduction – enhanced utilization of G,T & D assets** | ✓ | | ✓ | ✓ | ✓ |
| **Energy use reduction** | ✓ | ✓ | ✓ | | ✓ |
| **Reliability improvements** | | ✓ | ✓ | ✓ | | ✓ |
| **O&M cost savings** | ✓ | ✓ | ✓ | | | |
| **Reduced electricity costs to consumers** | ✓ | | | | ✓ |
| **Lower pollutant emissions** | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Enhanced system flexibility – to meet resiliency needs and accommodate all generation and demand resources** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
AMI Benefits

<table>
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<tr>
<th>Smart Meter Capabilities</th>
<th>O&amp;M Savings</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Remote meter reading</td>
<td>Meter Operations Cost</td>
<td>13-77</td>
</tr>
<tr>
<td>• Remote service</td>
<td>Vehicle Miles</td>
<td>12-59</td>
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<tr>
<td>connections/disconnections</td>
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**Talquin Electric Cooperative** - In 2011 and 2012, smart meters avoided 6,000 truck rolls for service connections and disconnections and 9,000 for non-payments saving more than $640,000

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<th>Additional Capabilities</th>
<th>Expected Benefits</th>
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<tr>
<td>• Tamper detection and notification</td>
<td>Enables potential recovery of ~1% of revenues that may be lost from meter tampering</td>
</tr>
<tr>
<td>• Outage detection and notification</td>
<td>Enables faster restoration (e.g., PECO avoided 6,000 truck rolls following Superstorm Sandy and accelerated restoration by 2-3 days)</td>
</tr>
<tr>
<td>• Voltage and power quality monitoring</td>
<td>Enables more effective management of voltages for conservation voltage reductions and other VVO applications</td>
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## Consumer Behavior Studies

### Scope of the Consumer Behavior Studies

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<tr>
<th>Rate Treatments</th>
<th>CEIC</th>
<th>DTE</th>
<th>GMP</th>
<th>LE</th>
<th>MMLD</th>
<th>MP</th>
<th>NVE</th>
<th>OG&amp;E</th>
<th>SMUD</th>
<th>VEC</th>
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<tr>
<th>Non-Rate Treatments</th>
<th>CEIC</th>
<th>DTE</th>
<th>GMP</th>
<th>LE</th>
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<th>OG&amp;E</th>
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<th>Recruitment Approaches</th>
<th>CEIC</th>
<th>DTE</th>
<th>GMP</th>
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<th>MMLD</th>
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<td>Opt-In</td>
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<tr>
<td>Opt-Out</td>
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Utility Abbreviations: Cleveland Electric Illuminating Company (CEIC), DTE Energy (DTE), Green Mountain Power (GMP), Lakeland Electric (LE), Marblehead Municipal Light Department (MMLD), Minnesota Power (MP), NV Energy (NVE), Oklahoma Gas and Electric (OG&E), Sacramento Municipal Utility District (SMUD), Vermont Electric Cooperative (VEC)

Demand Response Reductions

Variability of Per Customer Percent Demand Reductions for CPP Treatment Groups with and without PCTs by Treatment Group

![Graph showing variability of demand response reductions for CPP treatment groups with and without PCTs. The graph displays box plots for different treatment groups, showing the range, interquartile range, and outliers of demand reduction percentages.](image-url)
FPL Restoration Spatial View Tool

Mobile Application for Field Crews to Aid in Fault Location and Restoration

- Customer Information
- Trouble Tickets
- Truck Locations
  - FPL, Vegetation and External Crews during Storm
- Weather
  - Radar
  - Real-time lightning within 100-mile radius
  - Weather Station
  - Storm information (Tracks/Development Areas)
  - Customized weather alerts based on location
- Street View & Driving Directions
- Restoration Confirmation
- Fault Location (DMS/SynerGEE)
- Device detail, including drawings
- Real-time AMI outage activity
- Fully customizable by user

Courtesy of Florida Power and Light
Automated Feeder Switching

July 5, 2012 Derecho in Chattanooga

Avoided customer outage minutes are translated into avoided customer costs by the Interruption Cost Estimation (ICE) Calculator (www.icecalculator.com)

Automated feeder switching technology:
- Equipment cost $51 million
- In this storm, avoided $23 million in damages to customers, eliminated 500 truck rolls, and reduced restoration costs to the utility by $1.4 million by restoring 1.5 days early

Avoided customer outage minutes are translated into avoided customer costs by the Interruption Cost Estimation (ICE) Calculator (www.icecalculator.com)

Actual Response
Projected Response without Smart Grid

Courtesy of EPB Chattanooga
Voltage/VAR Optimization

Coordination of load tap changers, voltage regulators and capacitors to optimize (flatten) the voltage profile along distribution circuits to a) maintain power factor at unity and b) lower voltage levels

<table>
<thead>
<tr>
<th>Results Averaged across 11 Circuits</th>
<th>Initial Results of CVR Tests at AEP</th>
<th>Potential Customer Savings (estimated for a 7 MW peak circuit with 53% load factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Energy Reduction</td>
<td>2.9%</td>
<td>943 MWh/year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$75,440 (at $.08/kWh)</td>
</tr>
<tr>
<td>Peak Demand Reduction</td>
<td>3%</td>
<td>210 kW</td>
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<tr>
<td></td>
<td></td>
<td>Defer construction of peaking plants</td>
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Dominion Virginia Power’s CVR Business Case

In August 2008, Dominion Virginia Power had developed a business case for its AMI solution for its 2.4 million Virginia jurisdictional customers. (Projections based on data filed in Dominion Virginia Power rate case PUE – 2009-00019)
Distribution Grid Evolution

Progression from Stage 1 to Stage 2 requires significant system upgrades. Question is how fast do we progress from Stage 1 to Stages 2 & 3.

Distribution System Platform Considerations

Core components form a foundational layer; applications sit on this foundation as additional functionality is needed

See: https://gridarchitecture.pnnl.gov/modern-grid-distribution-project.aspx
## Incremental System Value of DER

<table>
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<th>Benefits</th>
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<tr>
<td><strong>Bulk System</strong></td>
<td></td>
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<tr>
<td>Avoided Generation Capacity, including Reserve Margin</td>
<td></td>
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<tr>
<td>Avoided Energy</td>
<td></td>
</tr>
<tr>
<td>Avoided Transmission Capacity Infrastructure and related O&amp;M</td>
<td></td>
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<tr>
<td>Avoided Transmission Losses</td>
<td></td>
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<tr>
<td>Avoided Ancillary Services (e.g., regulation)</td>
<td></td>
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<tr>
<td>Wholesale Market Price Impacts</td>
<td></td>
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<tr>
<td><strong>Distribution System</strong></td>
<td></td>
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<tr>
<td>Avoided Distribution Capacity Infrastructure</td>
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<tr>
<td>Avoided O&amp;M</td>
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<td>Avoided Distribution Losses</td>
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<tr>
<td><strong>Reliability/Resilience</strong></td>
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<tr>
<td>Net Avoided Restoration Costs</td>
<td></td>
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<tr>
<td>Net Avoided Outage Costs</td>
<td></td>
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<tr>
<td><strong>External</strong></td>
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<tr>
<td>Net Avoided Greenhouse Gases</td>
<td></td>
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<tr>
<td>Net Avoided Criteria Air Pollutants</td>
<td></td>
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<tr>
<td>Avoided Water Impacts</td>
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<tr>
<td>Avoided Land Impacts</td>
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### Relevant Efforts:
- NY PSC DSIP Proceeding, 14-M-0101 (BCA Handbook)
- CPUC DRP Proceeding, R. 14-08-013

From Staff White Paper on Benefit-Cost Analysis in the NY REV Proceeding, 14-M-0101, July 2015
Contact Information

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202-586-6916
joseph.paladino@hq.doe.gov

Recovery Act Website:
https://energy.gov/oe/information-center/recovery-act

PNNL Grid Architecture Website:
http://gridarchitecture.pnnl.gov

LBNL Future Electric Utility Regulation Series Website:
https://emp.lbl.gov/future-electric-utility-regulation-series

Next-Generation Distribution System Platform:
www.doe-dspx.org
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Danish Experience on Grid Optimization
Niels Frederik Malskær
Commercial Advisor
Overview

• Brief Energy History of Denmark
  – What has spurred District Energy
• State of the grid today
  – Result of energy system transformation
• Modern District Energy Technologies
Energy Dilemma

- Catalyst: 1973-74 oil crisis. Denmark was 99% dependent on imported energy

- Oil crisis caused a severe economic crisis, unemployment - and car-free Sundays

- Danish policy makers realized something had to be done to improve energy security

- The Danish Energy Agency was as a result of this established in 1976.

Car free Sundays in Denmark as a result of the oil crisis in 1973
Decoupling Economic Growth and Energy Consumption

Strategy

- Building Codes plus strategy for energy renovation of existing buildings
- Implementation of Energy Labelling of Buildings
- Energy Efficient appliances and equipment
- Funds earmarked for residential heating efficiency

Danish GDP, energy use and emissions

Maximum allowed energy demand per m² heated floor space and per year in a new, 150 m² Danish home. From 2000 to 2010 the reduction is estimated to be 68%.

1 kWh/m² = 317 Btu/ft²
THE DANISH HEAT SUPPLY ACT

§ 1
• To enhance the most socio-economic use of energy for heating purposes

§ 3
• The municipalities must carry out strategic energy planning with stakeholders

§ 20
The prices charged for delivering heat must reflect the cost – all profits go back to the consumers
Key Contributors to Grid Reliability and Cost reductions

• Development of European network codes for the electricity market
  – Network codes contribute to the security of supply and market harmonisation
  – This results in better utilization of production and transmission capacity
• Development of the futures market model
  – Clear price signals ensures sufficient flexibility and capacity, especially when integrating intermittent generation resources
• Danish TSO gives higher priority to maintenance and reinvestment based on criticality and state of plant
• Reinvestment projects = 20% of the total planned grid investments, a share that is expected to increase
• All decisions on investment policies are heavily data-driven through process continuous national review process and happen in cooperation between national government, TSO and private utilities
40 years later: an energy system transformed

- Highest contribution to electricity from new renewables (non-hydro) world wide: 46.7% in 2013. 39% of Danish electricity came from wind power in 2014.
- Lowest energy consumption per GDP-unit in EU.
- Highest export share of energy technology in the EU: 10.8% of total export of goods in 2013. Export of green energy technology increased 17.6% last year (2013).
- Leader in advanced energy solutions: district heating and CHP, wind turbines, biomass plants, energy saving technologies.
- Result: high degree of energy security.
Distribution company Value stream for different customer types

- CTR supplies heat to 250,000 households. This corresponds to just under 10% of the total heating requirement in Denmark – 1-2 operators at a time 24/7/365
- Albertslund, Gladsaxe, etc. operate and control housing facilities through their SCADA system – new income stream and optimal control
- "Solutions taking prices, weather and customer behavior into account optimizing prod. and distribution – Aalborg lowered its piping loss with 3%=10,000MWh=655 household consumptions"
- "Supporting Frederiksværk in analyzing the effect of service its customer installations – they increased Δt by 20° to lower cost significantly"
- "All systems delivered with O&M facility to run distribution efficiently, effective and sustainable – no hazardous cold plugs to worry about any longer"
District Energy Since the 1980’s

- Till the 1980’s most DH was produced as a by-product from electricity around the cities.
- In the 1980’s and -90’s most new DH was a main-product. Produced as DH or CHP in towns.
- The share of DH doubled from 1980. Today 1.7 mio. houses supplied with DH.
- 450 District energy systems in Denmark
- Future: 100,000 houses with individual NG → DH.

Heating installations in all residential buildings

- 1981: 31% Oil boilers, 62% District heating, 6% Other
- 1990: 31% Oil boilers, 62% District heating, 6% Other
- 2000: 31% Oil boilers, 62% District heating, 6% Other
- 2011: 31% Oil boilers, 62% District heating, 6% Other

- 0 500 1000 1500 2000 2500 3000
- 1000 Units

- Oil boilers Natural gas boilers District heating Other
Combined Heat and Power (CHP)

- In thermal power plants, fuel efficiency is often < 40%
- CHP can increase fuel efficiency to > 90%
- CHP and district heating were the first big steps towards a green economy
- CHP saves 30% on fuel costs compared to individual power and heat production
Infrastructure 1985 – 2009
Decentralisation
Power Supply in Denmark
Energy mix with fossil, renewables and shared with Nordic Countries

Power right now

[Diagram showing power supply connections with countries and power capacities]
Evolution of District Heating Technology

Temperature:
- 200°C = 392°F
- 100°C = 212°F
- 50°C = 122°F
Energy Production

- **Large-CHP**
  - Energy from Waste
  - Biomass
  - Gas CCGT
- **Medium CHP**
  - Straw
  - Gas Turbine
- **Small CHP**
  - Gas Engine
  - Wood Chips

- **Solar thermal**
- **Heat Pump**
  - Heat recovery chillers
  - Waste heat recovery
  - Geothermal – ATES
- **Biogas - AD**
- **Thermal Storage**
  - Daily: Heat accumulator
  - Seasonal: Pit storage
New city quarter sets green standards

- A whole new city quarter, called HafenCity, has been built in the heart of Hamburg, Germany
- technologies keep consumption of power, heating and cooling to a minimum. For example, all buildings are supplied with district heating generated by combined heat and power plants

Results

- Saves approx. 3.7 million euros in fuel costs and 14,000 tons of CO₂ every year (compared to a conventional fossil heat supply)
Conclusion

- Linking of thermal and electrical systems have been crucial in the Danish case
- Data driven energy savings schemes – using latest smart metering technology
- Stable, clean grid has helped Denmark differentiate itself from our neighbours
- We hope to help other societies avoid the pitfalls we fell into – overregulation and policy before data
Thank you for your time

Niels Frederik Malskær
Commercial Advisor, District Energy
niemal@um.dk
Cell +1 202 285 3363
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Proposed Decision filed December 11, 2017 (CIP-17-856) provides utilities detailed guidance with respect to:

1. **Electric Utility Infrastructure Projects** - Claiming energy savings through EUI CIP projects.

2. **Carry Forward Savings** - Use and parameters of the energy savings carry forward provision contained in 216B.241 subdivision 1c(b).

*Final decision expected by February 19.*
A utility or association may include in its energy conservation plan energy savings from electric utility infrastructure projects . . . that may count as energy savings in addition to a minimum energy-savings goal of at least one percent for energy conservation improvements.
Current Guidance
1% threshold for DSM savings must first be exceeded before EUI project savings can be claimed

Proposed Guidance
EUI project savings should be counted toward energy savings goals based on their inclusion in utility’s CIP plans, not the actual results of those plans
A utility or association may elect to carry forward energy savings in excess of 1.5 percent for a year to the succeeding three calendar years, except:

1. Savings from electric utility infrastructure projects allowed under paragraph (d) may be carried forward for five years.

2. A particular energy savings can be used only for one year's goal.
Current Guidance
When achieving energy savings greater than 1.5%, utility requests approval to carry forward savings to a subsequent year

Proposed Guidance
Utilities elect to carry forward savings to the current reporting year when submitting annual CIP energy savings results
Carry Forward – 216B.241 subd. 1c(b)
Questions?

Anthony Fryer
Coordinator – Conservation Improvement Program
Minnesota Commerce Department
anthony.fryer@state.mn.us – 651.539.1858
## Today’s Agenda

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<tr>
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<th>Speaker/Presenter</th>
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<tbody>
<tr>
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Establishing Goals for EUI in MN

Date: 02-12-2018
Why Do We Need a Goal?

- **Issues with Current CIP EUI Process**
  - Utilities differ in approaches and focus for infrastructure improvement
  - EUI projects can be included in CIP, but not a requirement
  - Bottom-up, equipment focus vs. broader, system-wide opportunities
  - Difficulty in establishing key variables like baseline equipment
  - Scale of opportunity compared to customer-side focus of CIP

- **Upcoming Changes – potential opportunities for EUI improvement investment?**
  - Geo-targeting of T&D investments
  - DER growth
T&D Losses

• Losses vary across numerous dimensions
  • No two utilities have the same loss characteristics
  • Loading characteristics based on customer demand patterns

• Magnitude of Losses: 5-10%
  • It is likely that EUI potential study will show limited improvement potential, possibly improving by 1-2 percentage points
  • Roughly equivalent to 1-2 years of utility CIP goals
### Potential Goals

| Measure Based | Prone to measurement issues whether setting prescriptive savings or custom projects  
|              | Limits on amounts that can be considered  
|              | Optional as to how much is spent, saved, or undertaken  
|              | Similar to CIP today  
| Expenditure Based | Require utilities to spend a % of revenue or capital budget on improvements that lead to more efficient infrastructure  
|                  | Sets a specific standard for how large an effort should go into reducing losses  
| Performance Based | Set a specific loss reduction goal for a future year  
|                  | Example: Reduce T&D losses from 7% to 6% within 10 years  
|                  | Example: Reduce T%D losses by .1 percentage point per year for 10 years  

## Pros and Cons

<table>
<thead>
<tr>
<th>Type of Goal</th>
<th>Pro</th>
<th>Con</th>
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<tbody>
<tr>
<td>Measure Based</td>
<td>• Methodology exists today</td>
<td>▪ Achievements are minor relative to CIP goals (some exceptions)</td>
</tr>
<tr>
<td></td>
<td>• Known administrative and tracking process</td>
<td></td>
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<tr>
<td>Expenditure Based</td>
<td>• Eliminates ‘optional’ effort level of today’s process</td>
<td>▪ Difficult to establish rules for allowable expenditures</td>
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<td></td>
<td>• Financial focus for utilities</td>
<td>▪ Review process for allowable expenditures</td>
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<tr>
<td>Performance Based</td>
<td>• Simpler to administer</td>
<td>▪ Contentious goal setting process (?)</td>
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<td>• Provides long-term policy to utilities</td>
<td>▪ Need for consistent loss studies each year</td>
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<td>• More incentive to operate/build system efficiently</td>
<td>▪ Progress tracking more difficult due to reduced focus on specific activities</td>
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<td>• Eliminates need for ‘standard practice’ determinations</td>
<td>▪ Needs an incentive to make it work</td>
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## Metrics and Information Needs by Type of Goal

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<th>Metrics</th>
<th>Information Needs</th>
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<td><strong>Measure Based</strong></td>
<td>kW and KWh Saved</td>
<td>▪ TRM manual for prescriptive measures</td>
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<td></td>
<td>▪ Custom Projects: Detailed description of each measure installed, baseline equipment, load characteristics of measure</td>
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<tr>
<td><strong>Expenditure Based</strong></td>
<td>Expenditures as % of revenues or capital budget</td>
<td>▪ Detailed expenditure data proving that is was spent on allowable activity</td>
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<td>▪ Annual revenue or capital budgets for setting goals,</td>
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<tr>
<td><strong>Performance Based</strong></td>
<td>Total Losses as % of Baseline Losses</td>
<td>▪ Annual loss study using agreed upon methodology or</td>
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<td></td>
<td>▪ Metering of all losses relative to generation/purchases and sales both retail and wholesale</td>
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Benefits of a Performance-Based Goal

• Establish a multi-year focus which allows utility to strategize, modify planning processes, and establish realistic action plans to meet the goal

• Can be integrated with other policy objectives, like rapid DER growth or geo-targeting

• Allows upstream partnerships to help attain goals (equipment suppliers)

• Forces an alignment of T&D system planning with EUI policy

• Should force maintenance practices, purchasing standards, and capital decisions to better support this goal
Other Factors to Consider

- Is an incentive needed to make a high level goal?
  - Higher ROI on T&D capital base if standards are met?
- Is a legislative change required or an MPUC ruling?
- Magnitude of potential savings may raise the issue of whether EUI should be priority
- Integration of EUI goals with other T&D initiatives
- The size and age of the existing T&D infrastructure base may vary substantially across utilities
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Growth and success—for our company and the rural communities we serve. We collaborate and prosper through responsible, resourceful action. We balance community, economic, and environmental commitments. **Always.**
To produce and deliver electricity as reliably, economically, and environmentally responsibly as possible to the balanced benefit of customers, shareholders, and employees and to improve the quality of life in the areas in which we do business.
OUR VALUES

INTEGRITY
We conduct business responsibly and honestly.

SAFETY
We provide safe workplaces and require safe work practices.

CUSTOMER FOCUS
We provide reliable electricity and timely, courteous customer service.

COMMUNITY
We care about the people and places we serve and improve the quality of life in the areas in which we do business.

RESOURCEFULNESS
We draw on the ingenuity and expertise of various resources to create strategic, balanced, practical plans.
• Energy conservation through electric utility infrastructure projects
  • Replace or modify existing utility infrastructure
  • Conserve or use energy more efficiently utilizing waste heat for generation

• Counts toward goal when conservation savings reach 1%

• Benefits must exceed costs

• Must result in increased energy efficiency greater than that which would have occurred through normal maintenance activity.
• Safety and reliability are paramount
  • Must meet or exceed Otter Tail Power (OTP) standards and customer expectations

• In the best interest of our customers
  • Is economically justifiable
  • Beneficial system wide – all three states
  • No negative impacts
  • Saves customers money

• Predictable
  • Impacts to system operation must be known prior to consideration

• OTP has never claimed credit for an EUI project
  • OTP has implemented EUI projects
EUI CHALLENGES AT OTTER TAIL POWER?

• EUI competes for internal resources and with other utility initiatives
  • Does not directly support customer satisfaction
  • Does not integrate easily with ‘customer-centric’ mission
• Different project timelines
• Projects lack definition and are inherently unique
• Limited interdepartmental connection
• EUI is an additional cost
  • Impacts all budgets
  • Competition for capital – needs for reliability are endless
• Efficiency measured by avoided cost of fuel and maintenance
• Incorporated into Integrated Resource Plan
• Big Stone Plant and Coyote Station are co-owned facilities with OTP as Operating Agent
• Primary focus is reliability and safety
• Efficiency = heat rate
  • Monitored constantly, reported monthly, evaluated annually
  • Significant deviations investigated and addressed as they arise
  • Real-time performance monitoring since early 90’s
• Most impactful upgrades largely implemented
• Efficiency incorporated into all procurement activities
• Process Improvements
  • Dissimilar facilities
    – Limits knowledge gain between facilities
  • Efficiency projects balanced with reliability
    – Any gains in efficiency must justify the additional cost

• Capital Improvements
  • Justification by all owners
  • Resources are finite
    – Evaluated against projects impacting reliability and maintenance
  • Longer design cycles, 2+ years
    – Almost every project is unique
  • Limited options
    – Reduction in market (generators) for which new products are developed
    – Less attractive for OEM to pursue
  • Timing is critical
    – Most successful projects are rare
    – Coincide with fuel contract negotiations
• Efficiency is measured by total cost of ownership
• OTP goal to meet or exceed Department of Energy’s efficiency requirements.
• Distribution studies ongoing
  • End of life
  • Service intensity
  • Incorporate efficiency
• OTP goal to meet or exceed Department of Energy’s efficiency requirements.
• Minor annual standards review, major reviews every 3-5 years
OTTER TAIL’S T&D EFFICIENCY CONSIDERATIONS

• Process Improvements
  • Incorporate capital component
    – Ex. Conservation voltage reduction
  • Near term plans for implementation

• Capital Improvements
  • Most beneficial in constrained areas
  • Geographically difficult to implement and maintain if any deviation from standard
  • Efficiency gains do not make up for incremental cost
    – ex. amorphous core transformers
  • Best opportunity for implementation when negotiating procurement contracts
  • Needs to have reliability or safety component in addition to efficiency gain
• Comprehensive analysis is critical
  • Any evaluation should consider each utility individually
• Identify opportunities with positive impacts
  • Safety
  • Reliability
  • Efficiency
• Make it predictable
  • EUI TRM
• Any EUI integration plan should consider resources required for necessary analysis
• Recovery of some EUI opportunities already exists in other riders or recovery mechanisms: transmission, environmental, rate cases.
• Identify opportunities in parallel initiatives
  • Grid Modernization
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Panel Discussion

EUI metrics for success and lessons learned from related efforts

Tricia DeBleekere – MN PUC
Kevin Lawless – Forward Curve
Greg Anderson – Otter Tail Power
Joe Paladino – Department of Energy
Niels Malskær – Royal Danish Embassy
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Next Stakeholder Meeting

Date TBD – Spring 2018 – Watch your inbox

Topic: EUI Efficiency Action Plan

More national and local expert speakers

Summarize policy discussions
Draft outline of final recommendations
Continue the conversation about EUI efficiency at your organization

Think about the ideas presented today

- How will your organization respond?
- Will these ideas help drive EUI efficiency?
- Do you have better ideas to drive EUI efficiency?

Contact us with feedback
All materials from all stakeholder meetings are posted to the project website: https://www.mncee.org/mnsupplystudy/home/