Utility Infrastructure Efficiency Opportunities and Barriers

Stakeholder Meeting #3 Summary Report

Convened February 12, 2018

Prepared By:

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Background

The State of Minnesota requires electric and natural gas utilities to invest in energy efficiency by statute.[1] For over three decades, Minnesota utilities have developed Conservation Improvement Programs (CIP) to meet their efficiency requirements. Most utility CIPs have focused on demand-side efficiency by providing incentives to customers for installing more energy-efficient end-use equipment.

Utilities' CIP efforts have not significantly focused on improving the efficiency of Electric Utility Infrastructure (EUI), or supply-side, of the system even though EUI accounts for approximately 12-15% of total electric consumption. Minnesota statute explicitly allows EUI efficiency to count toward conservation goals, but the number of such projects in the state remains relatively small.[2] The reasons for this include technical uncertainty as well as numerous policy questions.

Meeting Purpose

On February 12 at the Minnesota History Center in St. Paul, the Department of Commerce and its project partners GDS Associates and Center for Energy and Environment hosted the third public stakeholder meeting exploring opportunities and barriers to utility infrastructure efficiency.

This third stakeholder meeting is part of a U.S. Department of Energy (DOE) funded project aimed at clarifying the existing policy landscape concerning EUI efficiency and developing a roadmap to help drive future implementation. The project includes a series of stakeholder meetings to spur discussions and solicit feedback from stakeholders on existing incentives and disincentives for utilities to achieve greater system-wide efficiency, regulatory and policy issues, as well as cost recovery mechanisms to fund EUI projects.

The focus of the third meeting was to explore EUI issues related to measuring and tracking system efficiency, with the goal of identifying potential improvements that would more effectively connect existing utility infrastructure planning and CIP energy efficiency activities in Minnesota. The meeting included presentations from:

- Joe Paladino, Senior Advisor at the U.S. Department of Energy, presented an overview of national grid modernization efforts and how they relate to EUI opportunities and challenges.
- Kevin Lawless, Principal at The Forward Curve, presented ideas for how system efficiency metrics could be defined, measured, and applied to EUI goals and performance.
- Niels Malskær, Commercial Advisor at the Royal Danish Embassy, highlighted data and tools that Denmark has used to optimize its local grid.

[1] Minnesota Statutes §216B.241, subd. 1c(b) establishes an annual savings goal of 1.5 percent of average retail sales for electric and natural gas utilities.
[2] Minnesota Statutes §216B.241 subd. 1c(d) allows a utility or association to claim energy savings resulting from EUI projects on top of a minimum energy savings goal of 1 percent from energy conservation improvements, provided the EUI projects result in energy efficiencies greater than what would occur through normal maintenance activity.

- Anthony Fryer, Program Coordinator at the Minnesota Department of Commerce, provided an overview of Commerce's proposed policy guidance for claiming EUI savings.

- Greg Anderson, Energy Efficiency Engineer at Otter Tail Power, will discuss process improvements that could help better connect EUI planning and energy efficiency activities.

Resources from the third stakeholder meeting can be accessed on the project website [here]. Stakeholder meeting #4 for this project will be held during spring/summer 2018. A formal announcement will be distributed to stakeholders who have signed up to receive email updates about this project.

Meeting Notes

I. Existing Efforts Exploring System Efficiency Opportunities

A. Meeting Kickoff, Travis Hinck, GDS Associates

- One of the goals for this meeting are to learn lessons from related efforts (e.g. Grid Modernization/Optimization) from MN, nationally, and internationally.
- Discuss policy and other metrics to drive EUI measure efficiency, theoretical, ideal tool to drive EUI efficiency.
- Overall, EUI efficiency is important because it takes up a big chunk of total electricity consumption.
- Any thoughts people have during the meeting, or after, please connect with Travis Hinck (GDS Associates) or Adam Zoet (MN Commerce Dept). This public stakeholder process is all about getting ideas and thoughts on improving EUI efficiency efforts in Minnesota.

B. Grid Modernization and the Role of Utility Infrastructure Efficiency, Joe Paladino, U.S. Department of Energy

- Talking more about energy efficiency of the system overall, $4 billion in projects across the U.S. were implemented through the 2009 American Recovery and Reinvestment Act.
- Various technologies that are all in the "Smart Grid" category:
    - AMI – what is its effect on the consumer and how it effects the grid.
    - Synchrophasors – able to send data on the grid to T&D operators and the voltage of the grid - able to help the grid when loads need to be shifted when grid becomes more complex.
    - These technologies overlap between system and operational efficiency, and will be key in having better info to optimize the grid.
- AMI 'Smart Meters' benefits:
    - Less trucks need to be send out – saving gas – no need to read meters – lots of reductions.
        - Florida – using information platform (on a tablet) improves the efficiency of restoration operations – 2-3 day reduction.

    - They can measure voltage – utility better able to manage voltage.
    - 'Smart Meters' – help with load forecasting.
        - Requires a robust communication system.
    - Consumer Behavior Studies – regarding Time of Use pilots:
        - Thousands of customers, 10 utilities across the country.
        - Critical Peak Price – hottest/coldest days of the year – you get a notification – and when you reduce load – you get a rebate from the utility.
            - 2:1 Price for CPP – 6 % demand reduction
            - 4:1 Price for CPP – 18% demand reduction
- Data from smart meters can be used to show the value of rate structures or conservation programs by measuring effects over time.
    - Programmable thermostat – is key – technology works well for demand reduction – more predictable demand response reductions.
    - Opt-Out programs work better in terms of total amount of people participating in the pilot.
    - Oklahoma Gas and Electric – able to defer 100 MW gas peaking plant due to this work.
    - Sacramento PU – California by 2019 default to these types of programs.
        - Benefits are greater than cost.
- Automated Feeder Switching
    - Able to reconfigure the switch controls – i.e. when one line goes down, able to reduce number of people who lose power.
        - Chattanooga Tennessee – big storm did a lot of damage – the Automated Feeder Switching was able to bring power back to 40,000 customers almost immediately.
- Voltage/VAR Optimization
    - Ability to manage voltage – keep it as low as possible all the way to the customer – energy savings seen by the customer.
    - Not very easy to apply this technology and is expensive – one needs to look at the unique situation. Duke Energy is implementing this.
    - Good option for residential customers, but may not be the best for Commercial/Industrial customers because it can damage equipment. Also, can be expensive to maintain system.
    - Utilities need cost-recovery because they are fixed costs and lower revenue.
- Distributed Energy Resources
    - The more DER on the grid the more technology upgrades the grid will need.
    - Most utilities in USA are in Stage One – low DER that do not have material effects on operations.
    - Stage 2 – more DER need to determine methods for need to plan to optimize energy coming into the grid.
    - Stage 3 – not there yet but stage 2 will help guide this stage.
- Distribution System Platform Considerations

    - There are core components of the system that need to build out in a planned and rationale way to deal with a variety of factors to modernize the electric grid.
- Incremental System Value of DER
    - Looking at all the values and benefits of DER and integrate them into their resource plans and distributed energy plans.
        - Total MW in DER is very small – when compared to total energy.

Travis Hinck: Our EUI efficiency efforts parallel the Grid Modernization efforts nicely. In the DOE projection for development toward a distributed energy future, EUI efficiency can play a major role as we move toward stages 2 and 3 (increasing DERs and eventually a distributed energy market). The graphic on slide 11 of Joe's presentation illustrates the complexity of grid developments and shows how EUI efficiency can fit in both as upgraded, efficient components and optimized control strategies.

C. Denmark's Experience on the Data and Tools Needed for Grid Optimization, Niels Malskær, Royal Danish Embassy

- 1970s Energy Crisis – hurt Danish economy and spurred Energy Policy and transformation as a national priority.
- Important to grow economy while reducing overall energy consumption.
    - Building Codes – homes have been 80% more efficient from 1960 – 2000s.
    - Energy Labeling (getting the market involved –transparency when buying homes going to a building) /efficient appliances.
    - Funds earmarked for energy efficiency.
- Key Contributions to Grid Reliability and Cost Reductions:
    - European Standards – helped the grid connect, leading to better utilization and efficiency in markets.
    - Danish TSO invests lots into maintenance and grid investments – data driven – 80% AMI penetrations. Helps drive policy decisions for energy in Denmark.
- Transformed Energy System
    - Lowest energy consumption per GDP unit in European Union.
    - Key energy technologies export market – green energy technologies / consultant.
        - Very large market – software is an important component showing the value of improved energy technology.
- District Energy
    - Oil Boilers – district energy (larger plant – uses insulated pipes to deliver heat to residential and commercial/some industrial customers).
    - 60% of consumers on district heat.
    - Combined Heat and Power – more efficient way to utilize fuel – power and heat.
    - System is much more decentralized – more DER and smaller CHP and District heating and offshore wind.
        - Bringing the energy usage temp lower to the customer distribution temp – and more green energy production is the way things are going.

        - Example cities are popping up around Europe – bringing together international stakeholders – that reduce energy uses and lowers CO2.
- Conclusions:
    - Danish are here to share their experiences and help MN avoid some of the pitfalls that they ran into as they were transforming their energy system
    - Investments into efficiency of the existing system have been more cost effective than new expansion.
    - Main point is to let data speak for itself when making decisions – or, more directly, do not make decisions without the data.

II. Department of Commerce's Recent EUI Policy Guidance

A. Overview of Proposed EUI and Carry Forward Guidance, Anthony Fryer, Minnesota Department of Commerce

- On December 11, 2017, the Department issued a Proposed Decision on EUI Savings and Carry Forward Savings Guidance (docket # 17-856). February 20, 2018 is the expected Final Decision date.
    - **UPDATE (2/21/18): The Final Decision has been posted** [here].
- EUI Savings based on one line of statute 216B.241 subd. 1c(d).
- Historical and Proposed EUI Savings Guidance:
    - Department's historical guidance on claiming EUI savings:
        - 1% threshold for DSM savings must first be exceeded before EUI project savings can be claimed. This caused uncertainty for utilities because they do not know if their savings will count.
    - Department's proposed guidance on claiming EUI savings:
        - 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. So if the plans are approved then the EUI savings will count regardless of actual DSM performance.
- Carry-forward savings guidance
    - Department's historical guidance: When achieving energy savings greater than 1.5%, utility requests approval to carry forward savings to a subsequent year.
    - Department's proposed guidance: Utilities elect to carry forward savings to the current reporting year when submitting annual CIP energy savings results.
    - New proposed guidance ensures consistency and allows utilities to look back when they are short to bring them up to 1.5% savings compliance.
        - More details contained in the Proposed Decision regarding the How, When, and what savings are applicable for carry-forward, under MN eDockets 17-856.
- Q: Does the new guidance infer that the EUI project needs to be in the plan for it to count?
        - CIP modification can be requested during the reporting year if an EUI project comes up.
    - Does the planned savings override the actual savings?

        - No, utilities will always report the actual savings during the reporting year.

III. System Efficiency Metrics and How They Could Apply to CIP

A. Establishing Goals for EUI in MN, Kevin Lawless, The Forward Curve

- This idea grew out of comments made in the last stakeholder meeting.
- Current CIP EUI Process: Voluntary, equipment based (not system wide), scale of opportunity in statewide is relatively small.
- T&D losses vary across numerous dimensions – likely all the measures may add up to 1-2% of T&D, which could represent 1-2 years' worth of meeting CIP goals.
- 3 Potential Different Types of Goals for EUI efficiency. Policy driven.
    - 1) Currently, have a Measure-Based EUI Process.
        - Process is known – we can track savings.
        - This process leaves some EUI energy savings potential on the table.
    - 2) Expenditure Based Goal – how CIP developed in 1980s-90s where would have a % of revenue that must be spent in these upgrades.
        - Non-optional/voluntary – forces utilities to focus on this process.
        - May be difficult to establish rules for these expenditures.
    - 3) Performance Based Goal – How CIP has development – looking at specific % reduction for the future - established as a policy metric looking for a policy metric.
        - Easier to administer – more long term policy objective – eliminates standard practice.
        - Biggest current weakness of the current process is that the distribution and T&D planners don't participate in the CIP EUI process. A performance-based goal could help solve this.
        - May be tough to get this policy started – agreement will be needed – consistent tracking of losses – incentives are a possibility.
        - Performance –Based goals also has many other benefits – including T&D system planners would be integrated with EUI policy.
- Overall, ROI on investment – and size and T&D losses and potential to upgrade are important considerations.

B. EUI Efficiency Process Integration, Greg Anderson, Otter Tail Power

- Rural Customer base – large service territory only 3 cities >10,000.
- EUI – Ben-Cost is a must, safety and reliability are paramount.
- Predictability is also a very important consideration.
- OTP has never claimed credit for an EUI project, in the EUI rider.
    - Relatively small investment- compared to the regulatory burden.
- EUI Challenges:
    - CIP DSM programs allows OTP to interact with customers.
        - Hard to justify taking DSM money away from customer for EUI upgrades.

    - CIP 3 Year Triennial Plan – EUI could take 5-15 years.
    - Projects are very unique – departments are separated.
    - Cost and competition for capital.
- Current Generation – co-owned with 3/4 different utilities.
    - Process improvements are tough because dissimilar locations.
    - Coal plants do not have new efficient technologies – because there is less and less of them – long term design cycle.
- T&D – meets or exceeds DOE standards requirements – total cost of ownership.
    - Get ahead of the process to identify improvements and change system altogether
    - Must have reliability safety component in order for capital projects to get ahead.
- EUI Integration –
    - Analysis is key, safety reliability and predictability (TRM calculations), coordinate with grid modernization.
- Barriers identified – Capital competition, EUI isn't customer-facing, inter-department communication, multiple owners of assets, older facilities don't have efficient options from OEMs, risk aversion has been a good policy for a long time.

IV. Panel Discussion – EUI Process Improvements and Policy Levers

Tricia DeBleeckere, MN Public Utilities Commission

- MN State Context – State Grid modernization effort – how to advance this effort – furthering distribution system planning.
- Investments are ongoing and will occur for a long time. Huge gap of where are systems are now and what the grid of the future will be going.
- What are the different steps we can take many decisions utilities, regulators and stakeholders will be answering throughout the year? Looking at the cost-benefit analysis to connect with grid modernization and IRP process.
- Looking at every state – and there is a lot that is being done from scratch (i.e. not many detailed state plans currently available regarding grid mod).

Kevin Lawless, The Forward Curve

- Value of efficiency – based on conditions of a given year – i.e. outlier events (storms) – outlining the differences between standard measures and the EUI measures where benefits differ overtime.
    - Performance based goal over a certain period of time may help average out the benefits of the upgrades. E.g. could use a 3 year average for EUI goal.
    - May be able to take into account average weather – but larger events would be harder to account.
    - From Joe Paladino: Resiliency decisions resides at a community level. Everyone pays for them. Political decisions are needed. Tools for risk-assessment calculations are not fully developed yet.

        - This is the case all around the world – Boston – partnership with Blackrop/insurance companies. Closer to numbers that would represent risk.
        - A lot of these decisions to make investments need to be made at the local level.

Greg Anderson, Otter Tail

- What would the process look like to incentivize EUI?
    - Regulatory burden – there are more conventional ways to get the investment back. Not sure what the process would look like.
        - How to establish baseline is a consideration going above the conventional ways to return investment.

Joe Paladino, US DOE

- Q: Three different stages of the grid – what percentage of DER crosses the threshold from stage 1 to stage 2?
    - The article referenced said that around 5-8% of energy that PV is providing for peak load.
- Q: How does large industrial fit into this process – without burdening the industry with increased cost?
    - Many different competing objectives, affordability, efficient, reliability – stakeholder process where objectives and views and someone at some level will need to make a normative political decision - to determine emphasis on these objectives – hard to tackle.
    - From Niels Malskær: A lot of Danish Industrial customers are leading the charge on efficiency.
    - Need to build EUI efficiency plans into rate cases ahead of time so there are no surprises for customers.

Niels Malskær, Danish Embassy

- Q: Any examples in the US where there are some innovation and making the next steps?
    - University of Pittsburg – grid scale solutions at the university and partnered with industry.
    - Cities and states are getting more practical – policy changes in California and New York are achievable – but they need to connect decisions and get them executed – overall less centralized in the US compared to Denmark.
        - Performance based policy structure – gives utilities more predictability
- Q: How does large industrial fit into this process – without burdening the industry with increased cost?
    - Germany can lower rate for large industry.
    - Denmark – credit system – if hitting efficiency marks then the industry gets a rebate to offset some of the CO2 costs.

        - Part of long term planning process – if it is already built into the cost of the company 5-10 years ahead then it is somewhat mitigated
- Q: EUI measures that are not directly providing savings how to factor those in?
    - Denmark built in secondary and tertiary benefits associated with the measures.
        - Other social benefits – e.g. health costs.
    - MN EUI study is focusing on the EUI measures that provide energy savings.

V. Wrap Up and Next Steps

- Next stakeholder meeting will be held spring/summer 2018 and will likely address recommendations for an EUI Efficiency Roadmap and go over lessons learned from this process.
- There is a possibility for a fifth meeting if there are additional important topics to explore and budget allows.
- A formal announcement for upcoming meetings will be sent to stakeholders who have signed up to receive email updates about this project.