CHP
EPA COMBINED HEAT AND POWER PARTNERSHIP

Utility CHP Standby Rates

May 31, 2018

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Webinar Agenda

- Introduction
- CHP and Standby Services Overview: Summary Discussion of Previous Standby Rate Analyses
- The A2A Approach: Comparing Monthly Customer Standby Charges Across Utilities
- Lessons Learned from the A2A Approach
- Q&A

Speakers

- Neeharika Naik-Dhungel, EPA CHP Partnership
- Bruce Hedman, Entropy Research, LLC
- Jamie Scripps, 5 Lakes Energy LLC
- Jennifer Kefer, Alliance for Industrial Efficiency

CHP and Standby Service

Bruce Hedman
Entropy Research, LLC
May 31, 2018

Overview

- Introduction to CHP and utility rates
- Role of standby rates
- Summary of two recent studies
  - 2009 EPA study
  - 2014 RAP study
- Lessons Learned

99%+ of CHP Users Are Connected to the Grid

- CHP systems are typically sized to the base thermal load at the site
  - Maximizes heat recovery and operating hours
  - Results in maximum efficiency and emissions benefits, and best economics
- For most users, CHP provides only a portion of their power needs
  - The grid is needed for supplemental power
  - The grid is needed for standby/back up power

Tariffs Impact CHP Economics

- CHP savings comes from generating electricity on-site compared to buying from the grid
- Tariff design affects project economics
  - Tariffs influence prime mover configuration
  - Tariffs impact system sizing
  - Tariffs impact operating strategy
  - Not all impacts result in highest efficiency or most energy savings and emissions benefits

Elements of Electric Rates

- *Customer Charges* – Fixed monthly charge intended to cover fixed costs of metering, billing and "service drop" facilities
- *Energy Charges* – Volumetric commodity charges based on kWh consumed
- *Demand Charges* – Assessed against peak demand (kW) per a given period (usually a monthly period); may be ratcheted
  - Distribution, transmission and generation components
  - Bundled and unbundled

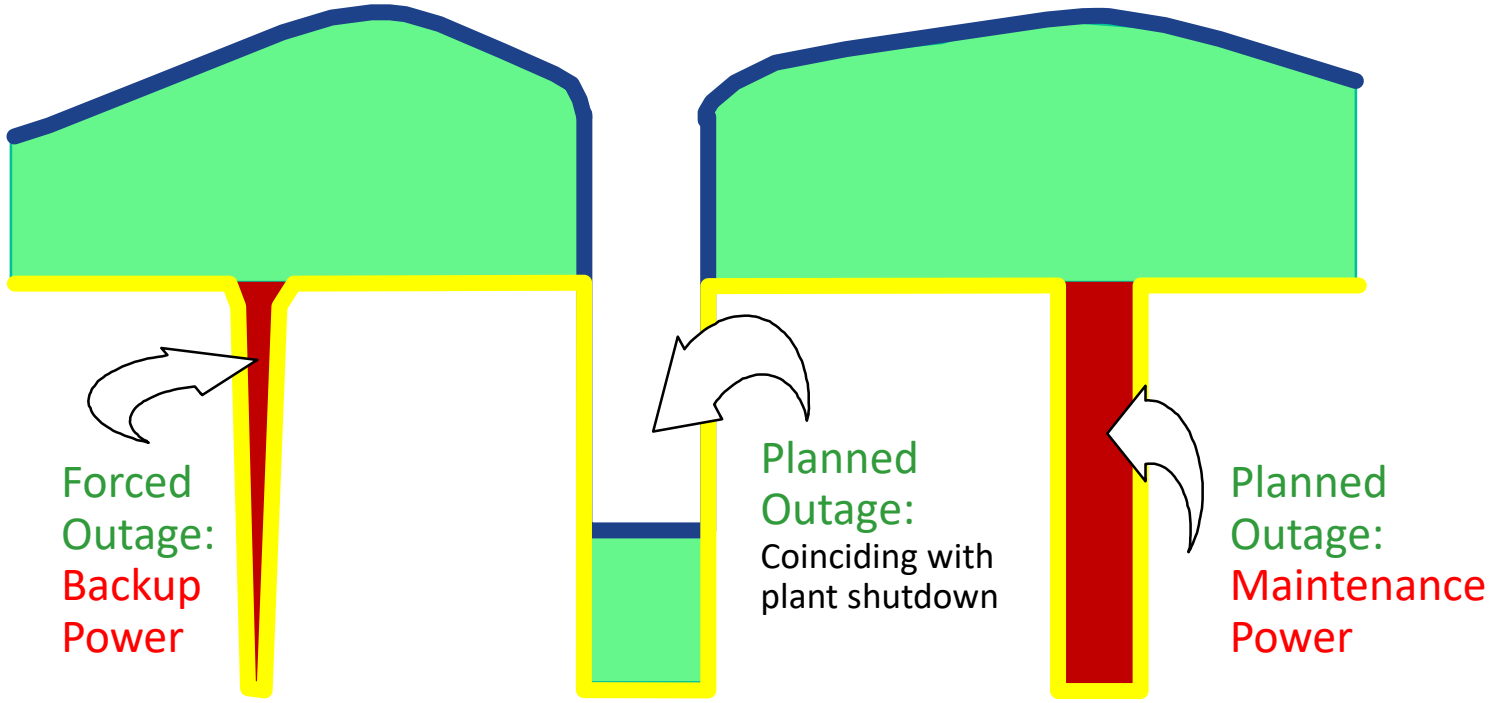
What Is Standby Service?

(also called Partial Requirements Service)

- A set of retail electric products for customers with on-site, non-emergency generation
  - *Backup power* during an unplanned generator outage
  - *Maintenance power* during scheduled generator service
  - *Economic replacement power* when it costs less than on-site generation
  - *Supplemental power* – additional electricity supply for customers whose on-site generation does not meet all of their needs
  - *Delivery* associated with these energy services

15 MW gas turbine generator set at Michigan State Univ., Solar Turbines Inc.

Self-Generator's Purchase Requirements



Courtesy of Brubaker & Associates

Utility Perspective on Standby Rates

- Obligation to serve means standing ready to provide backup power when generator is not producing
- Utility maintains generation reserves and T&D facilities to do that, at a cost
- Failure to recover these costs from customer-generators results in a subsidy by other customers (or loss to utility)

Typical Elements of Standby Rates

- Customer/Facility Charges
- Reservation or contract demand charges
  - Demand charge related to amount of back-up needed to recover costs of facilities dedicated solely to the customer, sometimes ratcheted
    - Wires, transformers, possibly reserves in cases of vertically integrated utilities
- As-Used Demand Charges
  - Monthly or daily demand charges to recover costs of shared facilities, e.g., substations, feeders, transmission
- Energy charges
  - For remaining delivery costs
  - Commodity

Issues with Standby Rates

- Rates are not transparent and charges often bundled
- Rates are inconsistent among utilities
- Tariff structures can erode economic benefits

- CHP customers are “captive” ratepayers
- Rates may assume outages occur at peak times – and that all systems breakdown simultaneously

Standby Rates for Customer-Sited Resources, 2009

- Regulatory Assistance Project (RAP) and ICF International for U.S. EPA
- Primer on elements of electricity rates
- Evaluated annual electricity costs of a 5 MW on-site generation customer under various utility tariffs
  - Compared costs without generation under full service tariffs to costs with generation under partial services tariffs
  - Assumed two unplanned outages – July and November
- Identified elements of well designed standby rates
  - Tariff structures that appropriately charge on-site generation customers for services provided without creating economic barriers

Standby Rates for Combined Heat and Power Systems, 2014

- Brubaker & Associates and RAP for ORNL & U.S. DOE
- Modeled standby rates in five states: Arkansas, Colorado, New Jersey, Ohio and Utah
  - Compared costs without generation under full service tariffs to costs with generation under partial services tariffs for selected IOUs
  - Small, medium, and large non-residential customers
    - 1,500 kW at 70% load factor
    - 6,000 kW at 80% load factor
    - 30,000 kW at 75% load factor
- Evaluated potential tariff modifications based on rate design principles

Lessons Learned - Standby Rates

- Transparent and understandable - allow the customer to know how much they are paying for each component of service
- Reflect actual costs
- Recognize load diversity
  - Reflect the statistical likelihood of all interconnected systems incurring an outage at the same time
  - Reflect the statistical probability of CHP outages during peak periods
- Encourage customer to use electric service efficiently and minimize costs imposed on system
- Reasonable balance between variable charges vs. contract demand or reservation charges

Lessons Learned - Standby Rates

- Eliminate unnecessary demand ratchets
  - Daily as-used demand charges for backup power
  - Recognize on-peak vs off-peak demand
- Ensure no charges are levied for shutdowns caused by events on the utility side of the meter
- Allow minimum charges to planned outages scheduled in coordination with the utility
- Provide for customer choice:
  - Allow generation customers to buy backup power at market prices and avoid utility reservation charges for generation
  - Options for customer demand response to mitigate all or a portion of backup charges

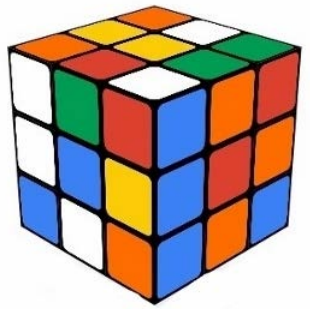
Studies on Standby Rates and CHP

- *Standby Rates for Customer-Sited Resources,* 2009, Regulatory Assistance Project (RAP) and ICF International for U.S. EPA
  https://www.epa.gov/chp/standby-rates-consumer-sited-resources

- *Standby Rates for Combined Heat and Power Systems*, 2014, Brubaker & Associates and RAP for ORNL & U.S. DOE
  http://www.raponline.org/wp-content/uploads/2014/02/rap-standbyratesforchpsystems-2014-feb-18-updated.pdf

- *The Guide to Successful Implementation of State Combined Heat and Power,* 2013, EPA and DOE SEE Action Network
  https://www4.eere.energy.gov/seeaction/system/files/documents/see_action_chp_policies_guide.pdf

More Information?



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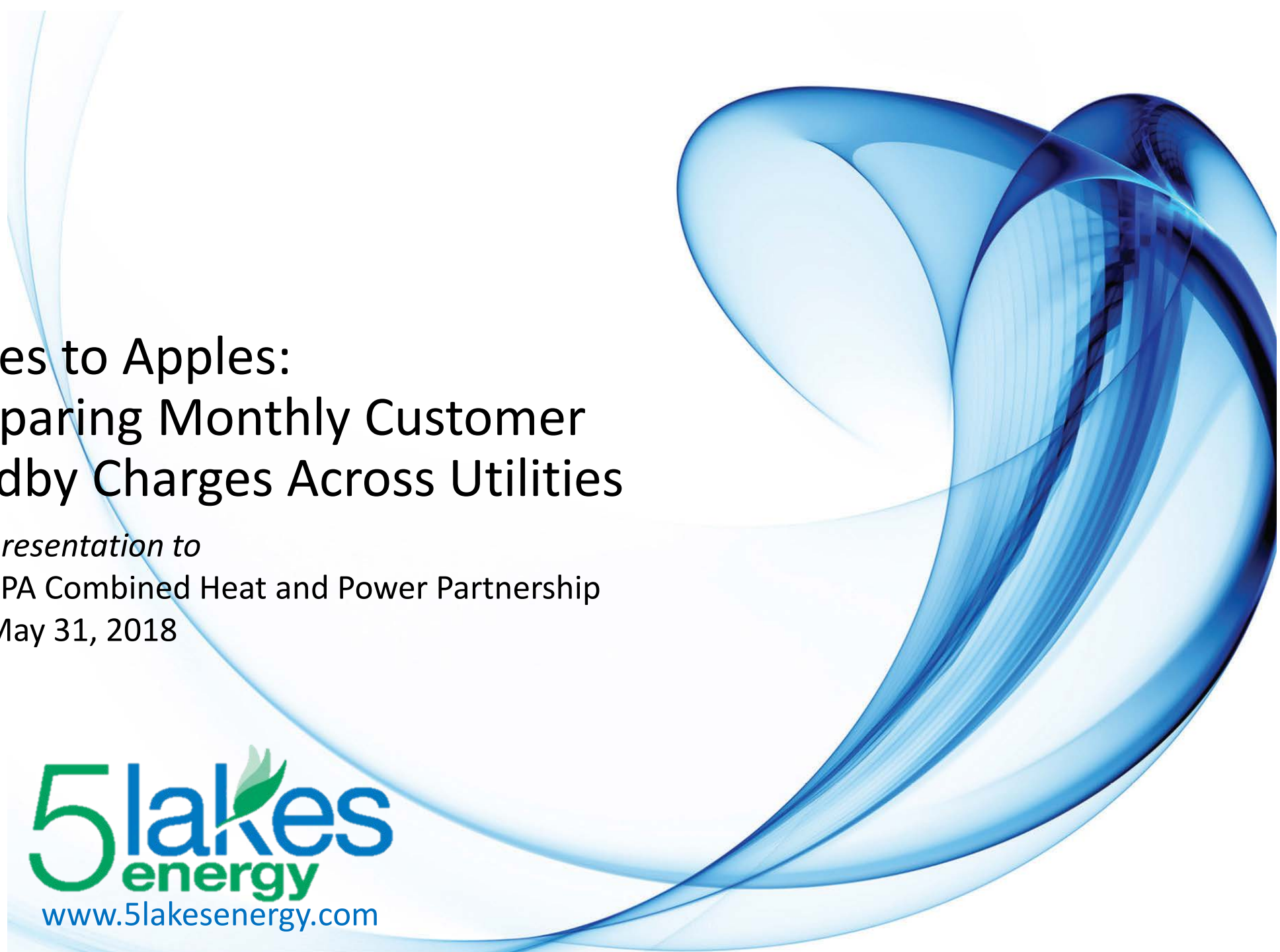
Apples to Apples: Comparing Monthly Customer Standby Charges Across Utilities

presentation to
EPA Combined Heat and Power Partnership
May 31, 2018



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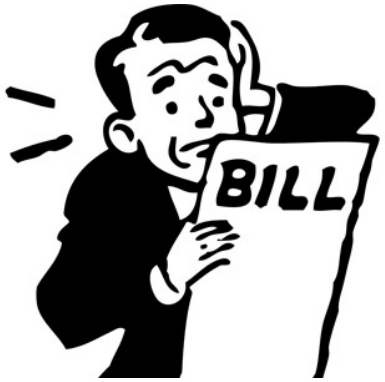
Standby Rates

- Charges imposed by utilities when a distributed generation system, such as an on-site CHP system, experiences a scheduled or forced (unscheduled) outage, and therefore must rely on power purchased from the grid
- Interfere with project economics
- Potential barrier to distributed generation



M.P.S.C. No. 1 - Electric
DTE Electric Company
(Final order Case No. U-18255)

_____ Revised Sheet No. D-67.00
Cancels _____ Revised Sheet No. D-67.00

STANDARD CONTRACT RIDER NO. 3 PARALLEL OPERATION AND STANDBY SERVICE AND STATION POWER STANDBY SERVICE

This rider provides the terms and conditions of standby and supplemental service to customers operating on-site generation. The rate distinguishes the form of service provided as either standby service or supplemental service. Standby service is generally defined as capacity and energy service provided by the Company to serve customer load that is normally served by the customer's generator. Supplemental service is generally defined as capacity and energy service provided by the Company to serve customer load above their standby service requirements. The point of separation between standby and supplemental service is based on the customer's standby contract capacity for the facility, measured in kW. Any service provided by the Company up to and including the standby contract capacity level is standby service, and any service provided above the standby contract capacity level is supplemental service. Modeling standby and supplemental rate impacts is dependant on several factors including customer load profile and type of generator(s) and other considerations. The Company provides rate impact studies for customers considering on-site generation in addition to online resources and answers to frequently asked questions.

There are two categories of standby service provided under this rider ***for customers operating on site generation***, "STANDBY SERVICE" AND "STATION POWER STANDBY SERVICE". STANDBY SERVICE applies to customers with generation facilities that are located within the Company's retail service territory and directly interconnected with the Company. STATION POWER STANDBY SERVICE applies to customers with generation facilities that are located within the Company's retail service territory and that are directly interconnected to ITC Transmission.**STANDBY SERVICE**

STANDBY SERVICE: Available to customers with generation facilities that are located within the Company's retail service territory and directly interconnected with the Company. Customers who desire the Company to serve the power supply requirements of load that ***is*** normally served by the customer's generator or prime mover must take standby service under the provisions of this rider unless otherwise exempted by order of the Michigan Public Service Commission or by the provisions set forth below and must take supplemental service on one of the

M.P.S.C. No. 1 - Electric
DTE Electric Company
(Add Station Power Standby Service Provision)

First Revised Sheet No. D-68.00
Cancels Original Sheet No. D-68.00

(Continued from Sheet No. D-67.00)

STANDARD CONTRACT RIDER NO. 3 (Contd.) **PARALLEL OPERATION AND STANDBY SERVICE AND STATION POWER STANDBY SERVICE**

PARALLEL OPERATION: The customer must meet the interconnection requirements of the Company specified in "The Michigan Electric Utility Generator Interconnection Requirements" as approved by the Commission, and must enter into an Interconnection and Operating Agreement with the Company before parallel operation will be permitted. Operating in parallel with the Company's system without written approval by the Company of the interconnection and any subsequent changes to the interconnection will make the customer subject to disconnection.

DEFINITIONS:

STANDBY CONTRACT CAPACITY: Standby contract capacity in kW will be established for electric capacity sufficient to meet the customer's standby load. Unit sizes, number of units, site demands, operating characteristics and other factors impact the amount of electric capacity that is sufficient to meet the customer's standby load. Standby contract capacity will be established according to one of the following methods with the intent to use the method which best determines the electric capacity sufficient to meet the customer's standby load.

(a) If the customer's generating units are electrically base loaded during peak hours the standby contract capacity for billing months that include periods from calendar months June through October will be set at the 1001st highest half-hourly kW output toward internal load during billing months that include periods from calendar months June through October over the latest 12-month period. The standby contract capacity for remaining billing months will be set at the 1001st highest half-hourly kW output during those months over the latest 12-month period. The standby contract capacity will be adjusted on an ongoing basis reflecting the current month

M.P.S.C. No. 1 - Electric
DTE Electric Company
(Final Order Case No. U-18255)

_____ Revised Sheet No. D-71.00
Cancels _____ Revised Sheet No. D-71.00

Continue from Sheet No. D-70.00)

STANDARD CONTRACT RIDER NO. 3 (Contd.) **PARALLEL OPERATION AND STANDBY SERVICE AND STATION POWER STANDBY SERVICE**

Power Supply Charges (contd.):

The daily on-peak backup demand charge is $***1.19*** per kW per day during periods other than maintenance periods as defined below.

The daily on-peak backup demand charge is $***0.59*** per kW per day during maintenance periods as defined below.

Energy Charge:

For customers served on supplemental rate schedules D3, D3.2 and D3.3, the energy charge will be the applicable power supply energy charge specified in the customer's supplemental rate.

The energy as stated herein, is also subject to provisions of the PSCR clause and other Surcharges and Credits Applicable to Power Supply as approved by the Commission. See Section C8.5.

Non-Capacity

Monthly Generation Reservation Fee:

$***0.19*** times the standby contract capacity in kW, per month.

The daily on-peak backup demand charge is $***0.51*** per kW per day during periods other than maintenance

Components of Standby Charges

- Reservation Fee
  - Per kW
  - Best practice to incorporate forced outage rate (FOR)
- Demand Charges
  - Per kW
  - Best practice to pro-rate based on duration of outage
- Energy Charges
  - Per kWh

Difficult to Compare

- Lack of uniformity
- Lack of transparency
- Utilities provided simulated calculations, but system sizes and other assumptions differed
- A need to highlight customer experience through estimated standby bills

Customer Characteristics

- 3,000 kW in supplemental service
- 2,000 kW in reserved standby service
- General service, primary distribution level
- One month of standby charges

Outage Scenario Comparison

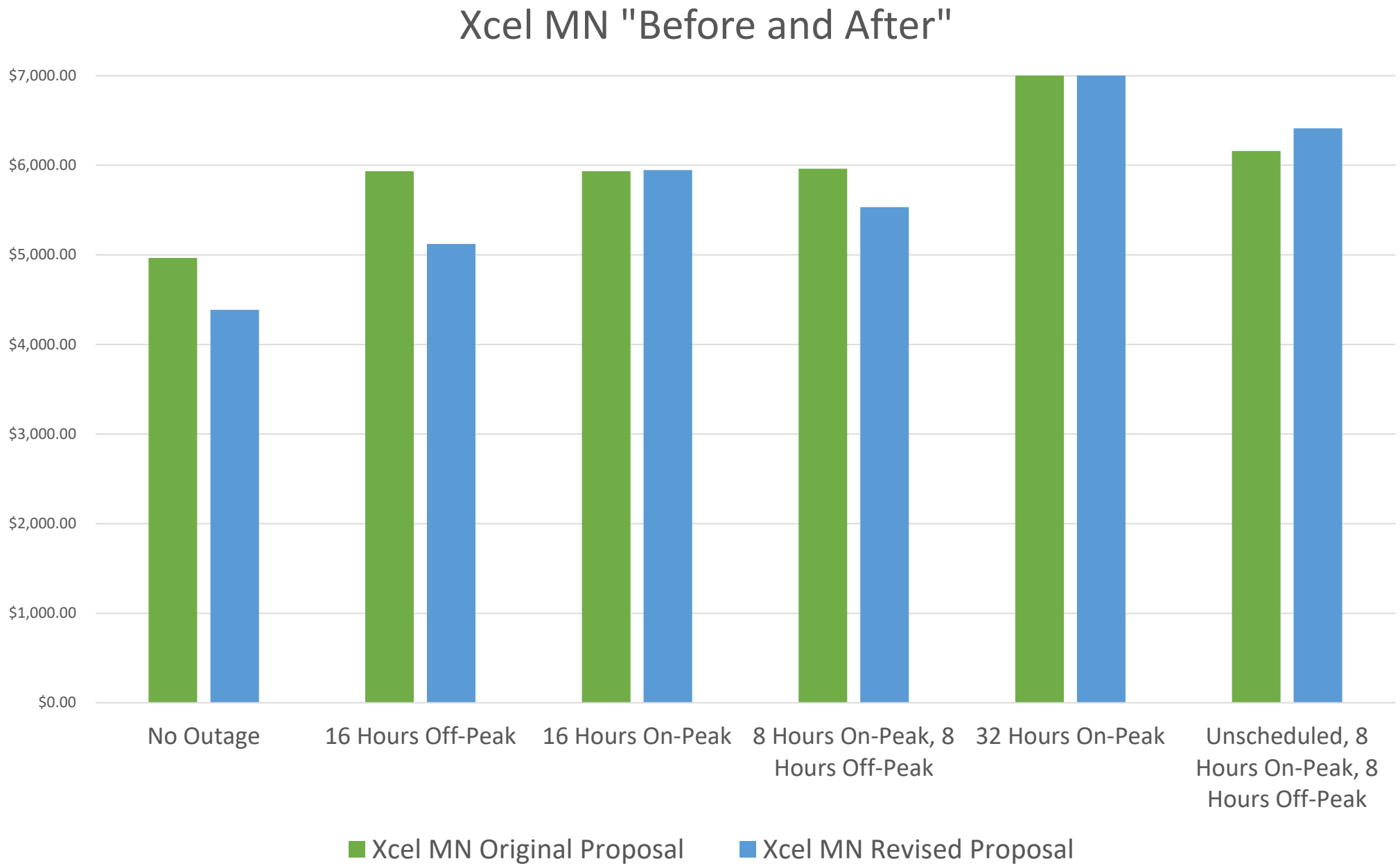
- No outage
- Scheduled, 16-hour off-peak outage
- Scheduled, 16-hour ON-peak outage
- Scheduled, 8-hour ON-peak, 8 hour off-peak outage
- Scheduled, 32-hour ON-peak
- Unscheduled, 8-hour ON-peak, 8-hour off-peak outage

Minnesota Utilities

2 MW Cogeneration – Outage Scenarios

Cost of Standby Service ($) - monthly

Scenario Description	Minnesota Power	Xcel	Otter Tail Power	Dakota Electric
No Outage	1,007	4,965	1,632	6,594
Scheduled Outage 16 Hrs Off-Peak	2,699	5,934	3,166	20,127
Scheduled Outage 16 Hrs On-Peak	2,699	5,934	4,113	20,127
Scheduled Outage 8 Hrs On-Peak, 8 Hrs Off-Peak	2,699	5,934	3,639	20,127
Scheduled Outage 32 Hrs On-Peak	4,391	7,958	6,593	22,560
Unscheduled Outage 8 Hrs On-Peak, 8 Hrs Off-Peak	20,180	6,160	4,407	20,127


Xcel MN "Before and After"
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$0.00
No Outage
16 Hours Off-Peak
16 Hours On-Peak
8 Hours On-Peak, 8 Hours Off-Peak
32 Hours On-Peak
Unscheduled, 8 Hours On-Peak, 8 Hours Off-Peak
Xcel MN Original Proposal
Xcel MN Revised Proposal

Michigan Utilities

2 MW Cogeneration - Outage Scenarios

Cost of Standby Service ($) - monthly

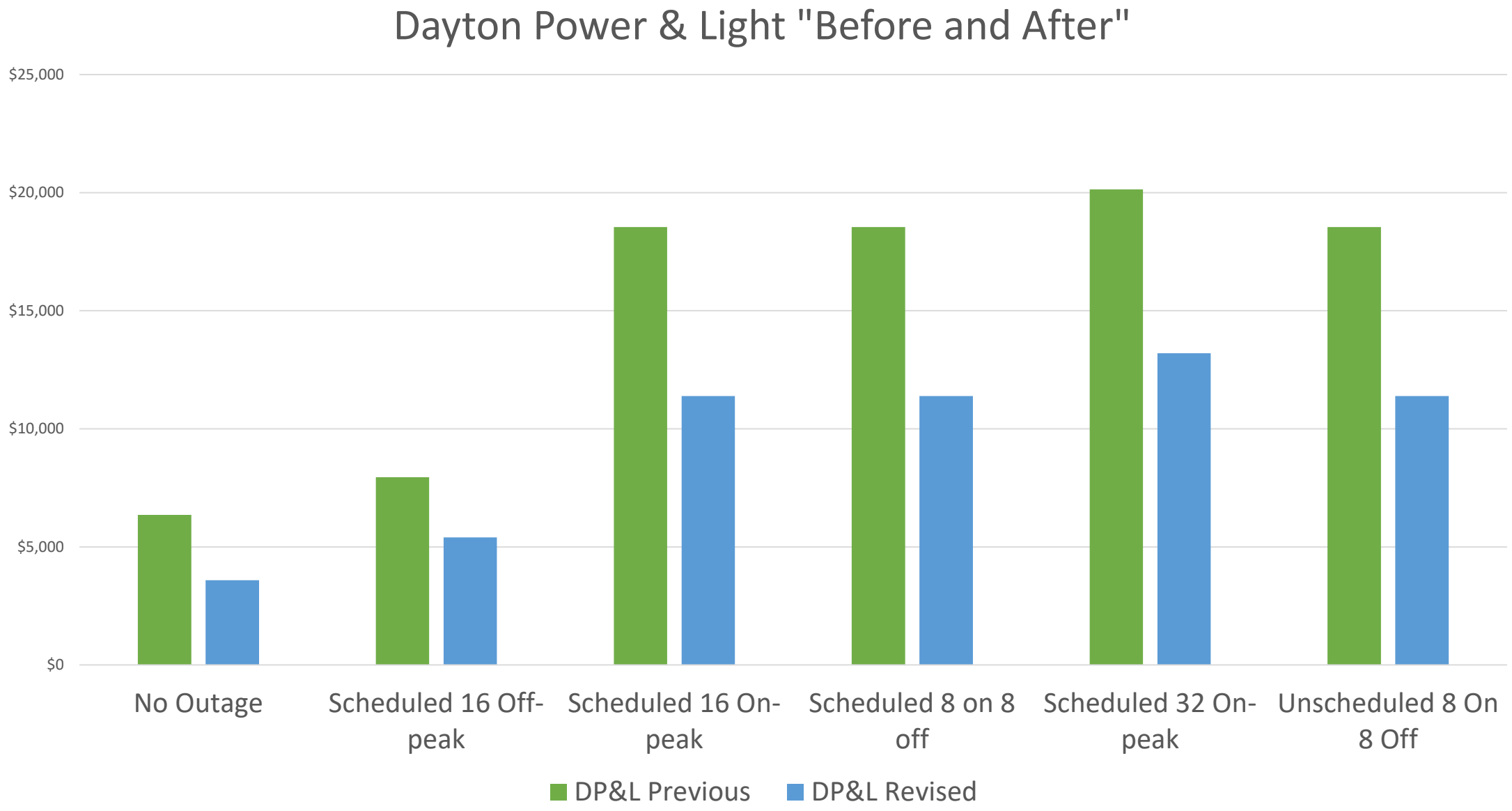
Scenario Description	Consumers	DTE	UMERC	UPPCO
No Outage	8,300	10,535	0	0
Scheduled Outage 16 Hrs Off-Peak	9,246	11,657	2,218	2,911
Scheduled Outage 16 Hrs On-Peak	11,645	18,653	3,098	3,883
Scheduled Outage 8 Hrs On-Peak, 8 Hrs Off-Peak	11,191	13,405	2,658	3,397
Scheduled Outage 32 Hrs On-Peak	14,833	30,272	6,196	7,766
Unscheduled Outage 8 Hrs On-Peak, 8 Hrs Off-Peak	11,191	17,545	30,536	31,631

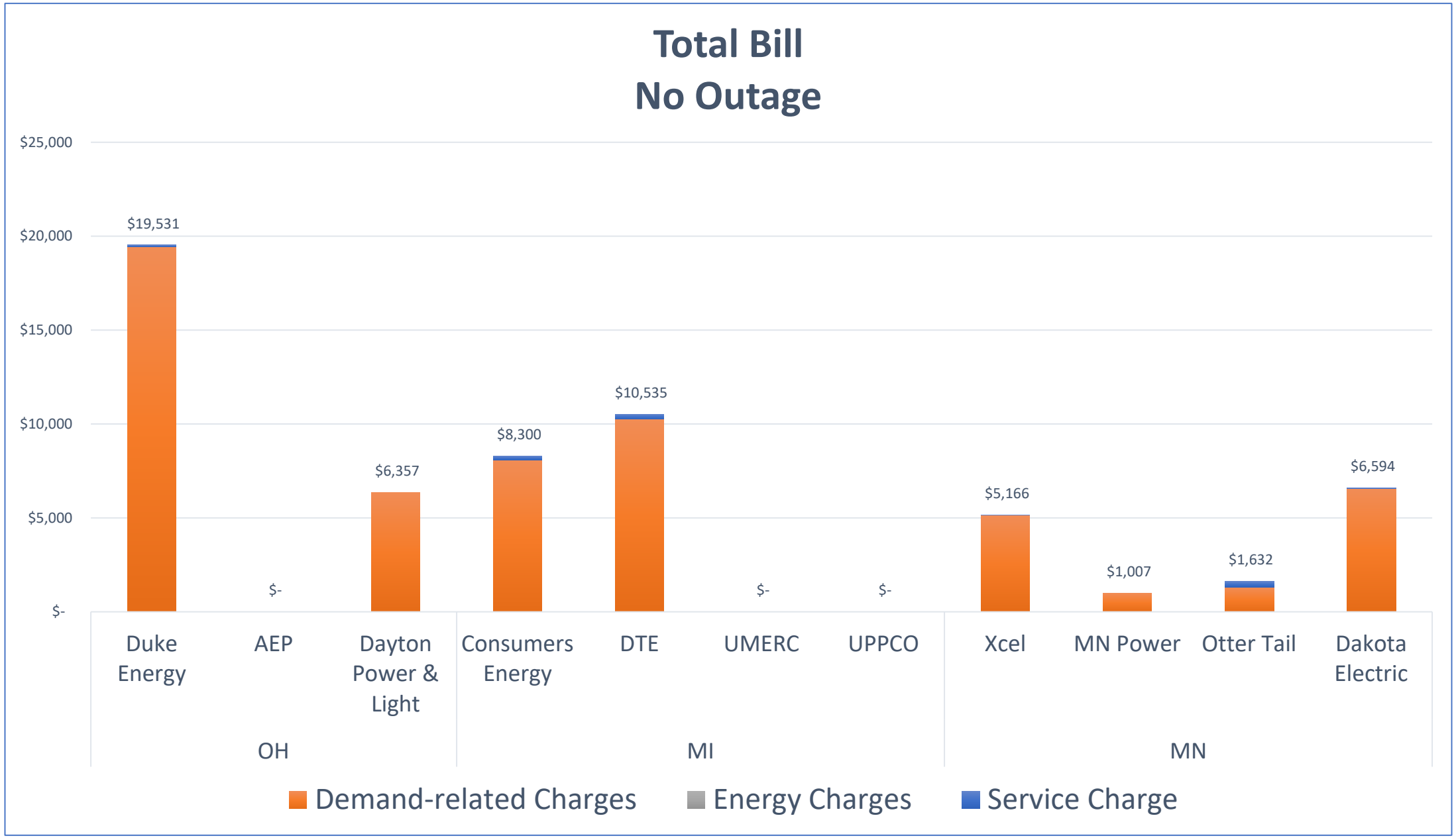
Ohio Utilities

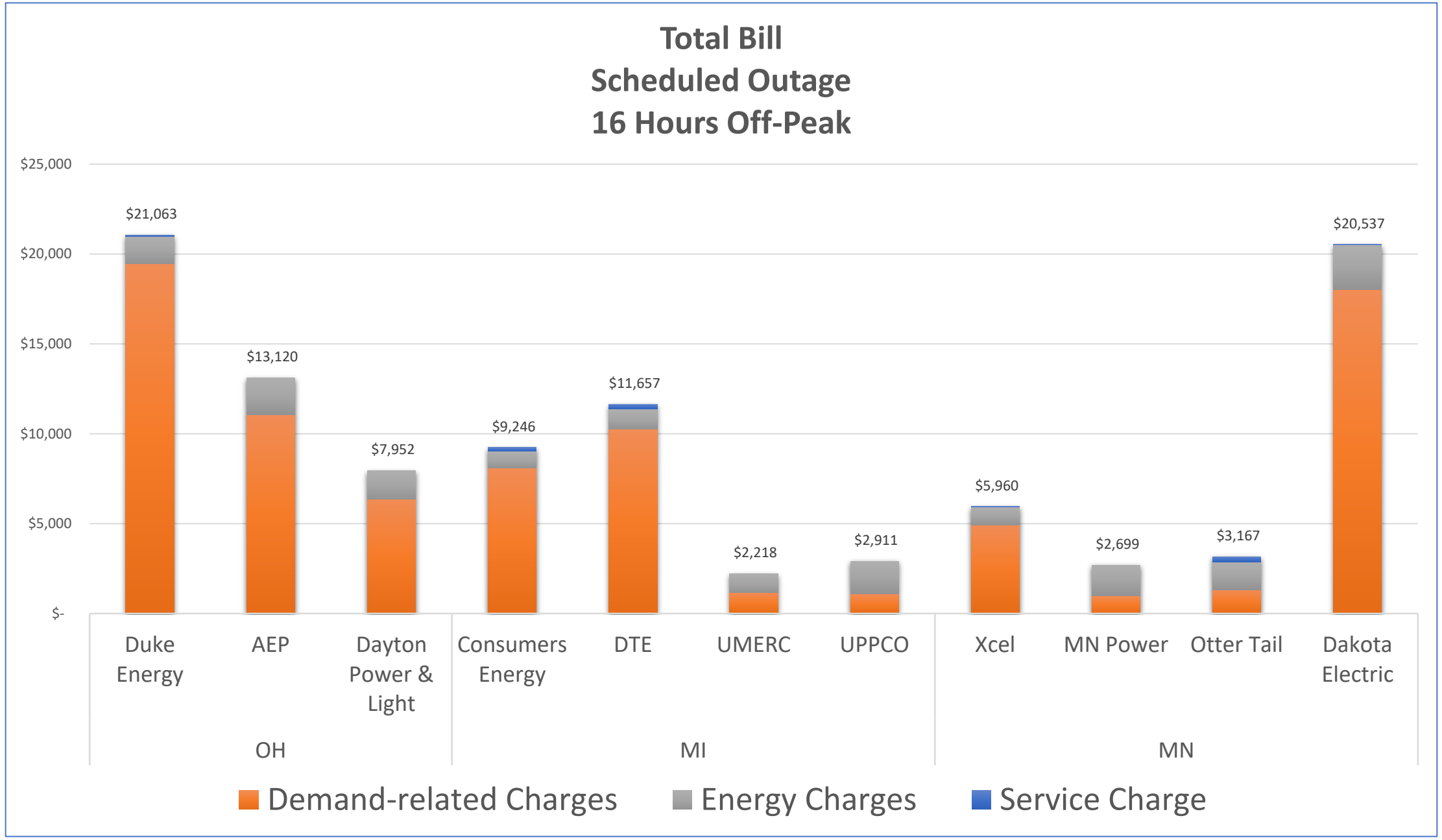
2 MW Cogeneration – Outage Scenarios

Cost of Standby Service ($) - monthly

Scenario Description	Duke	AEP Ohio	Dayton Power & Light
No Outage	19,531	0	6357
Scheduled Outage 16 Hrs Off-Peak	21,063	13,120	7952
Scheduled Outage 16 Hrs On-Peak	21,063	22,360	18,547
Scheduled Outage 8 Hrs On-Peak, 8 Hrs Off-Peak	21,063	22,360	18,547
Scheduled Outage 32 Hrs On-Peak	22,661	24,436	20,143
Unscheduled Outage 8 Hrs On-Peak, 8 Hrs Off-Peak	22,011	22,360	18,547


Dayton Power & Light "Before and After"
$25,000
$20,000
$15,000
$10,000
$5,000
$0
No Outage
Scheduled 16 Off-peak
Scheduled 16 On-peak
Scheduled 8 on 8 off
Scheduled 32 On-peak
Unscheduled 8 On 8 Off
DP&L Previous
DP&L Revised


Total Bill
No Outage
$25,000
$20,000
$15,000
$10,000
$5,000
$-
$19,531
$-
$6,357
$8,300
$10,535
$-
$-
$5,166
$1,007
$1,632
$6,594
Duke Energy
AEP
Dayton Power & Light
Consumers Energy
DTE
UMERC
UPPCO
Xcel
MN Power
Otter Tail
Dakota Electric
OH
MI
MN
Demand-related Charges
Energy Charges
Service Charge


Total Bill
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$25,000
$20,000
$15,000
$10,000
$5,000
$-
$21,063
$13,120
$7,952
$9,246
$11,657
$2,218
$2,911
$5,960
$2,699
$3,167
$20,537
Duke Energy
AEP
Dayton Power & Light
Consumers Energy
DTE
UMERC
UPPCO
Xcel
MN Power
Otter Tail
Dakota Electric
OH
MI
MN
Demand-related Charges
Energy Charges
Service Charge

Benefits of Comparison

- Evaluate transparency, clarity
- Evaluate utility's level of openness and cooperation
- Illustrates incentives in current SBR design
- Outliers jump out and suggest areas for further discussion and investigation regarding fairness and cost justification

Other ways to study standby rates

- Avoided electricity rate comparison
  - Looks at full costs of CHP (standby plus supplemental) compared to full costs of full requirements service for same size load
- Utility cost of service analysis
  - Rate cases

“Apples-to-Apples” Applications

- Regulators very interested in “apples to apples” standby rate comparisons
- Economic development interest
- Can be used in general rate case intervention or other proceedings, in conjunction with cost of service analysis
- Customers interested in cogeneration can estimate monthly standby bills and better understand how to interpret the published tariff

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ALLIANCE
FOR INDUSTRIAL EFFICIENCY

Jennifer Kefer

Utility CHP Standby Rates – Lessons Learned

EPA Combined Heat and Power Partnership

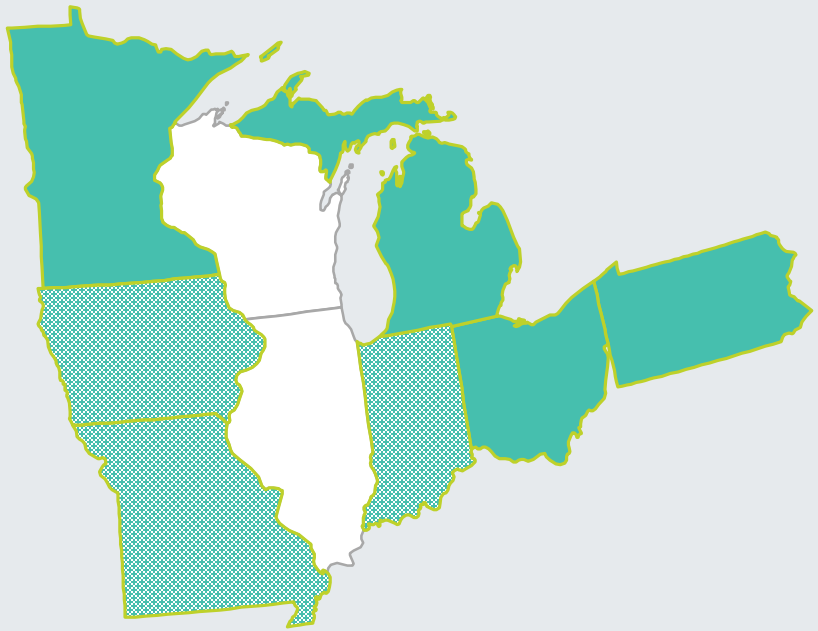
Jennifer Kefer
Alliance for Industrial Efficiency
Executive Director
202-816-9302

May 31, 2018

Lessons Learned

- Transparency
- Reflect actual costs
- Eliminate “demand ratchets”
- Allow for customer choice

Real Results



- Minnesota
- Michigan
- Ohio
- Pennsylvania
- Indiana
- Missouri

Options for Engagement

- Conduct analysis for your utilities
- Stakeholder meeting with PUC
  - Weigh in with other manufacturers
- Encourage PUC to open a SBR docket
- Intervene in a rate case

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Resources

The EPA CHP Partnership Policy Portal
https://www.epa.gov/chp/dchpp-chp-policies-and-incentives-database

Standby Rates for Customer-Sited Resources, 2009, Regulatory Assistance Project (RAP) and ICF International for U.S. EPA
https://www.epa.gov/chp/standby-rates-consumer-sited-resources

The Guide to Successful Implementation of State Combined Heat and Power, 2013, EPA and DOE SEE Action Network
https://www4.eere.energy.gov/seeaction/system/files/documents/see_action_chp_policies_guide.pdf

Standby Rates for Combined Heat and Power Systems, 2014, Brubaker & Associates and RAP for ORNL & U.S. DOE
http://www.raponline.org/document/download/id/7020

Standby Rates: Barriers to CHP Deployment on a National Scale, 2018, Alliance for Industrial Efficiency
http://bit.ly/SBRfactsheet

Contact Information

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