ENERGY

Exploring Uncharted Waters: Valuing Additional Benefit Streams of DERs

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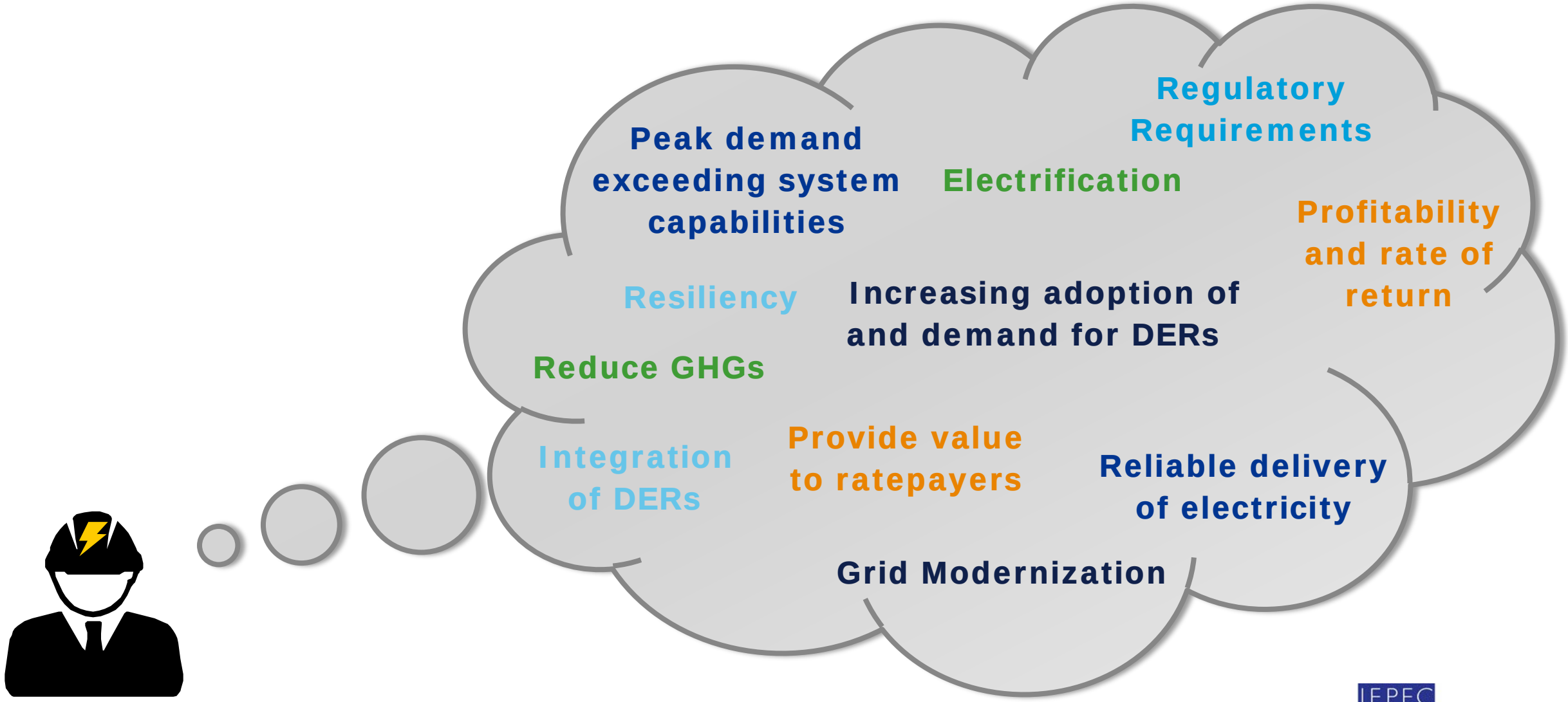
International Energy Program Evaluation Conference

Denver, Colorado August 19-22, 2019

Discussion Overview

01	Setting the Stage for Non-Wires Alternatives
02	Quantifying the Benefits of NWAs
03	Net Avoided Outage Costs
04	Net Avoided Restoration Costs
05	Net Non-Energy Impacts
06	Arbitrage Value of Batteries

Utility Challenges in a Changing World



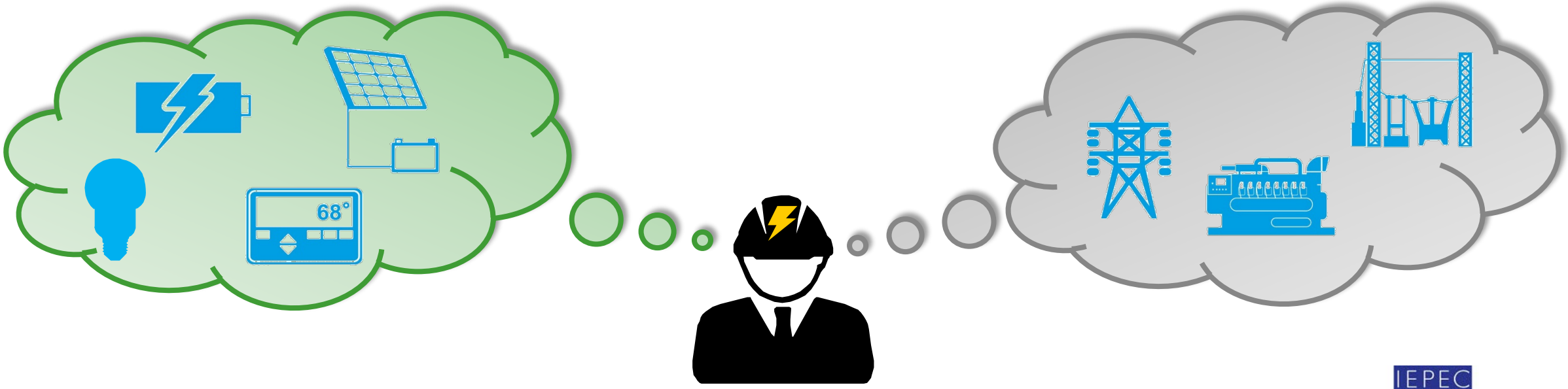
Defining Non-Wires Alternatives / Solutions

"A **solution that removes or defers the need to construct or upgrade components** of a distribution and/or transmission system, also known as a "wires investment".

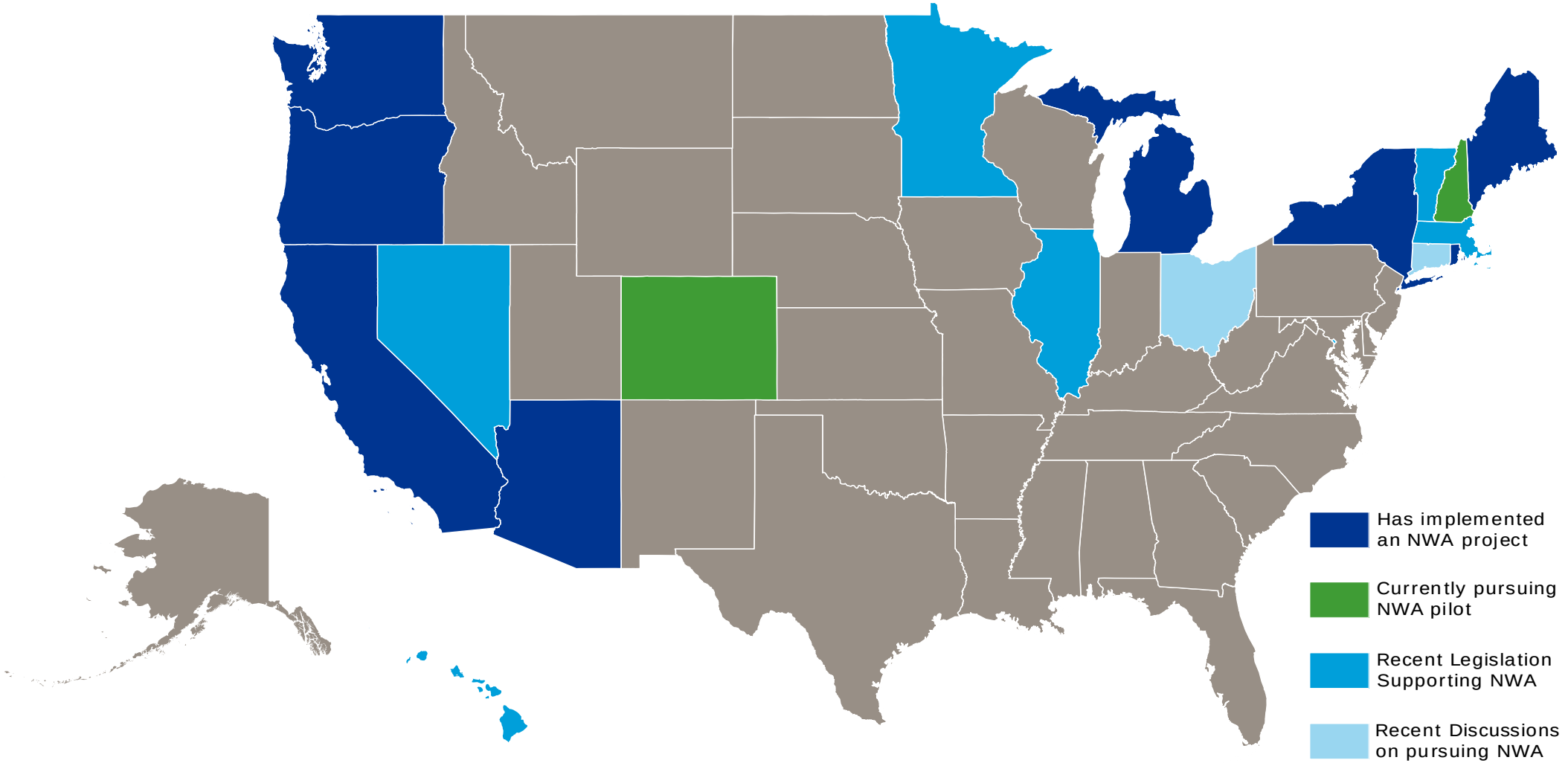
Projects where a **combination of DERs and DSM solutions** can be used to meet the same need as a "poles and wires" solution

Where a utility's **distribution planning, energy conservation, DER strategy, and regulatory** groups intersect

Can provide **ratepayer and stakeholder benefits** while delivering environmental benefits and grid services



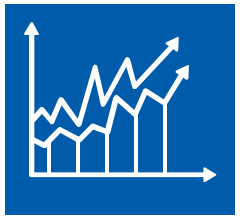
Who's talking about non-wires anyway?



What's in it for the utility and ratepayers?

Utilities pass on costs of capital investments such as power lines and transformers to ratepayers. They earn a validated rate of return

DERs and DSM that reduce delivered load reduce a utility's volumetric sales revenue without decoupling



Non-wires solutions can thus reduce delivered load revenue and reduce a utility's return on capital investments

A shareholder incentive approach allows utilities to earn an incentive on the present value of the net benefits of an NWA project versus the net benefits of a traditional solution

Benefit-Cost Frameworks for Non-Wires Alternatives

Benefit Category	Can include a location specific value?			
Avoided Generation Capacity Costs	X	X	X	X
Avoided LBMP/ Bulk System Energy Purchases	X	X	X	X
Avoided Transmission Capacity Infrastructure	X	X	X	X
Avoided Transmission Losses	X	X		X
Avoided Ancillary Services	X	X		X
Wholesale Market Price Impacts/DRIPE		X	X	
Avoided Distribution Capacity Infrastructure	X	X	X	X
Avoided Utility Operations and Maintenance	X	X		X
Distribution Losses	X	X		X
Net Avoided Restoration Costs	X	X		
Net Avoided Outage Costs	X	X		X
Net Avoided CO2		X	X	X
Net Avoided SO2 and NOx	X	X	X	X
Avoided Water and Sewer Impacts	X	Water	Water and Sewer	
Avoided Land Impacts	X	X		
Net Non-Energy Benefits		X	X	
Arbitrage Value of Storage	X			
Environmental Compliance	X		X	X
Avoided Natural Gas and Delivered Fuel Costs			X	
Economic Development Benefits			X	

Evaluated Benefit Categories

Benefit Category		
Net Avoided Outage Costs	None	Feasible
Net Avoided Restoration Costs	None	Feasible
NEIs- Customer	Feasible	Limited
NEIs- Utility	Feasible	Limited
NEIs- Environment and Health	Limited	None
Arbitrage Value of Batteries	N/A	Limited

Net Avoided Outage Costs

The value of customer cost savings due to a reduction in the frequency and duration of outages

Net Avoided Outage Costs are measured as a function of:

- Change in outage duration based on changes in SAIFI, SAIDI, and CAIDI (utility outage metrics).
- Average demand
- Value of Lost Service

Value of lost service can be:

- The retail rate (represents lost utility revenue)
- Include value of lost load to represent value of resilience and continuous service

Net Avoided Outage Costs- Value of Lost Load

Measuring the stated or implicit value of not being inconvenienced with an outage:

- Product Loss
- Perceived inconvenience
- How much a customer is willing to pay to avoid an outage

Current sources:

- ICE Calculator- does not consider locational inputs
- Customer willingness to pay/ revealed preference surveys

Calculated Values of Lost Load ($/kwh)

Report Year	Author	Region	Small C&I	Large C&I	Residential	Average across sectors
2015	LBNL (Sullivan, et al)	US	$280	$16	$2	
2014	London Economics (2012)	US	$46	$31	$2	
2014	London Economics (2012)	ERCOT	$7	$4		$10
2012	USAID (NZ)	New Zealand	$33	$84	$12	$44
2012	USAID (IE)	Ireland	$4	$11	$19	$10
2012	USAID (AU)	Australia	$11	$31		$50
2012	USAID (AT)	Austria			$2	$7
2012	USAID (NL)	Netherlands			$25	$6
2010	Centolella	Midwest	$56	$28	$5	

Note: The highlighted study is a lost-productivity analysis of VoLL.

Net Avoided Restoration Costs

The avoided costs of **restoring electricity service** during outages due to a reduction in the frequency and/or duration of outages

Outages often require immediate support to restore electricity service to customers.

- Restoration often occurs regardless of time of day or week

DERs do not necessarily change this need

- A utility will still need to restore service even if a customer can operate independently

DERs could be used to island locations from the grid and shift or defer restoration crew priorities.

- Would require flexible operation systems that could cost more than the potential cost savings.

NEIs- Customer Operational NEIs

The **additional costs or benefits to the customer** apart from energy and usage related changes

A number of utilities have evaluated NEIs associated with energy efficiency including:

- Operations and Maintenance savings
- Revenue/sales increases, increased productivity, reduction in product loss
- Increased safety, reduced downtime

NEIs such as reduced downtime and product loss could apply to DERs

- Need to ensure this would not be double counting with any value of lost load used to value avoided outage costs

NEIs- Utility Operational NEIs

Benefits that are **incremental to an avoided capacity infrastructure benefit and investment deferrals** from NWAs such as cost savings from reduced office labor needs.

Different benefit cost frameworks include different NEIs in this category:

- Cost savings from improved customer service
- Decreased labor for meter readings
- Reduced service terminations, reconnections, and late payment notices due to bill savings from energy efficiency

Care should be taken in trying to value these benefits

- Current methods are not well established though values included in TRMs should be reviewed before applying elsewhere

NEIs- Health and Environmental NEIs

Health, environmental, and safety impacts such as **reduced emissions, improved indoor air quality, thermal comfort, and noise reduction.**

Avoided emissions are the most common environmental NEIs

- DOE research demonstrates other health and safety benefits of energy efficiency

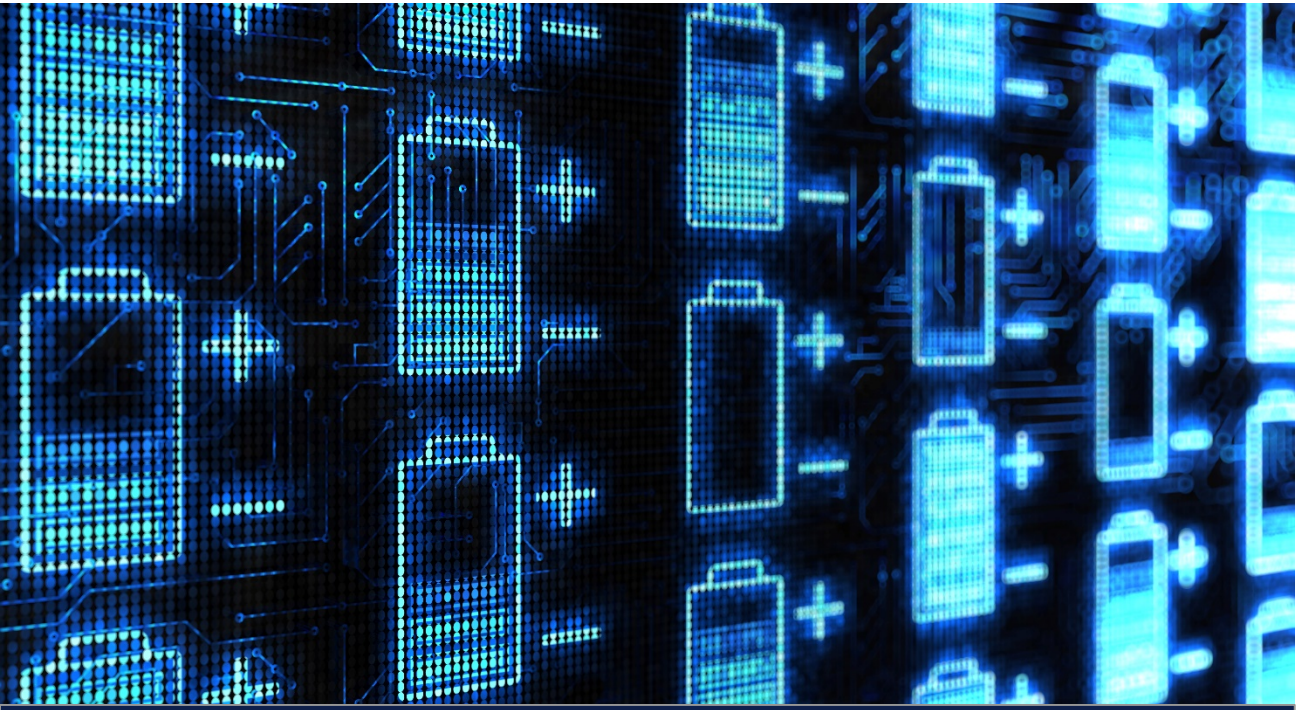
Rhode Island has quantified similar NEIs beyond emissions:

- Thermal comfort
- Noise reduction
- Improved air quality

Minimal research on health and environmental impacts of batteries

- Should be conducted on a project specific basis as chemistry, size, and location will vary

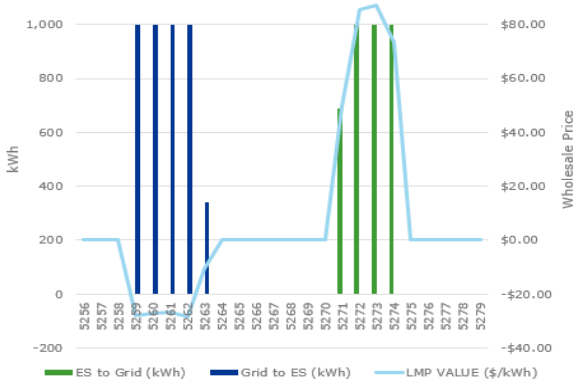
Arbitrage Value of Batteries



Arbitraging the charging and discharging of storage systems to generate potential **value from strategic charging**

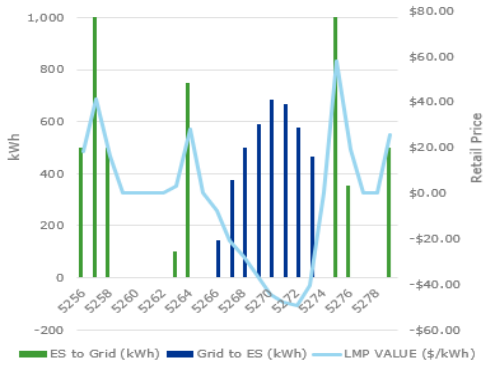
Dedicated Storage Use Case

Represents a utility-owned battery, pricing based on wholesale market prices



Distributed Storage Use Case

Represents a customer-sited battery, pricing based on retail rates



The optimal charging and discharging suggest dedicated storage generates more benefits

- This methodology can be applied to other locations

Valuing the Benefits of NWAs:

Have we set the right course to avoid turbulent waters?

Confusion about how to apply the BCA amongst utilities and market participants

Quantified values exist from various studies, but care must be taken before using elsewhere

Continue testing approaches to ensure a fair rate of return to ratepayers and utilities

Thank You

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What's driving NWA

New Hampshire

- Development of non-wires pilots included in Development of New Alternative Net Metering Order

Hawaii

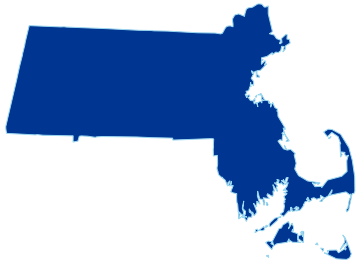
- Has 100% RPS
- HECO proposed an Integrated Grid Planning Process (IGP) which supports NWA. Accepted in 2019

New York

- 2016: NY REV required utilities to examine NWA in distribution planning

Rhode Island

- 2019 System Reliability Procurement Plan Report
- Competitive solicitation procurement process similar to NY REV



Massachusetts

- 2018 Act to Improve Grid Resiliency through Energy Storage allows for competitive solicitation of NWA

California

- IOUs are required to file distribution resource plans and review non-wires opportunities