# Determining Optimal Storage Deployment Levels

## INSIGHTS FROM NEVADA

PRESENTED BY
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Energy Storage Association Webinar
December 11, 2018

THE Brattle GROUP

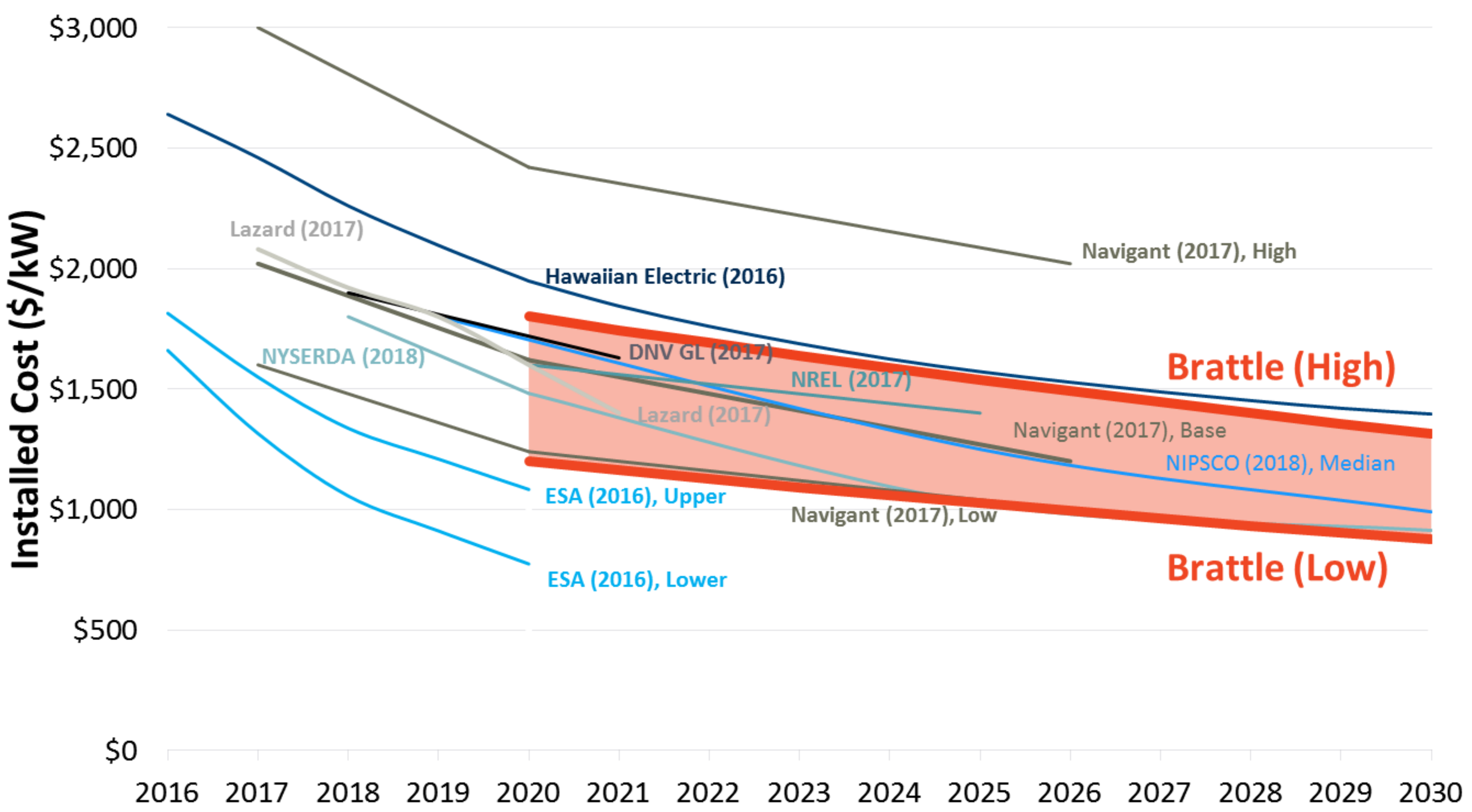
# Key considerations for estimating optimal storage deployment levels

**We focus on five critical – but complex – factors when estimating the economic potential for energy storage**

1. Technology cost uncertainty
2. Comprehensive identification of applicable value streams
3. Ability to “stack” multiple value streams
4. Decreasing incremental value of storage additions
5. Opportunity for T&D capacity investment deferral

# 1. Technology cost uncertainty

**We analyzed a range of installed costs for 4-hour storage in 2020 and 2030 to reflect uncertainty in current cost projections**




*Sources and Notes:* Literature review of Navigant (2017), Hawaiian Electric Companies (2016), NREL (2017), NIPSCO (2018), DNV GL (2017), NYSERDA (2018a), ESA (2016), and Lazard (2017). Installed cost estimates for a 4-hour storage system. All values in nominal dollars.

# 2. Identifying applicable value streams

**Assessments of storage potential must account for the full range of potential use cases**

| Quantified (primary) sources of value in the Nevada study | Additional (secondary) storage benefits |
| --- | --- |
| • Energy costs<br>• Ancillary services<br>• Avoided generation capacity costs<br>• T&D capacity investment deferral value<br>• Customer outage reduction value<br>• Environmental benefits | • Voltage support<br>• Reduced line losses<br>• Black start |

# 3. “Stacking” multiple value streams

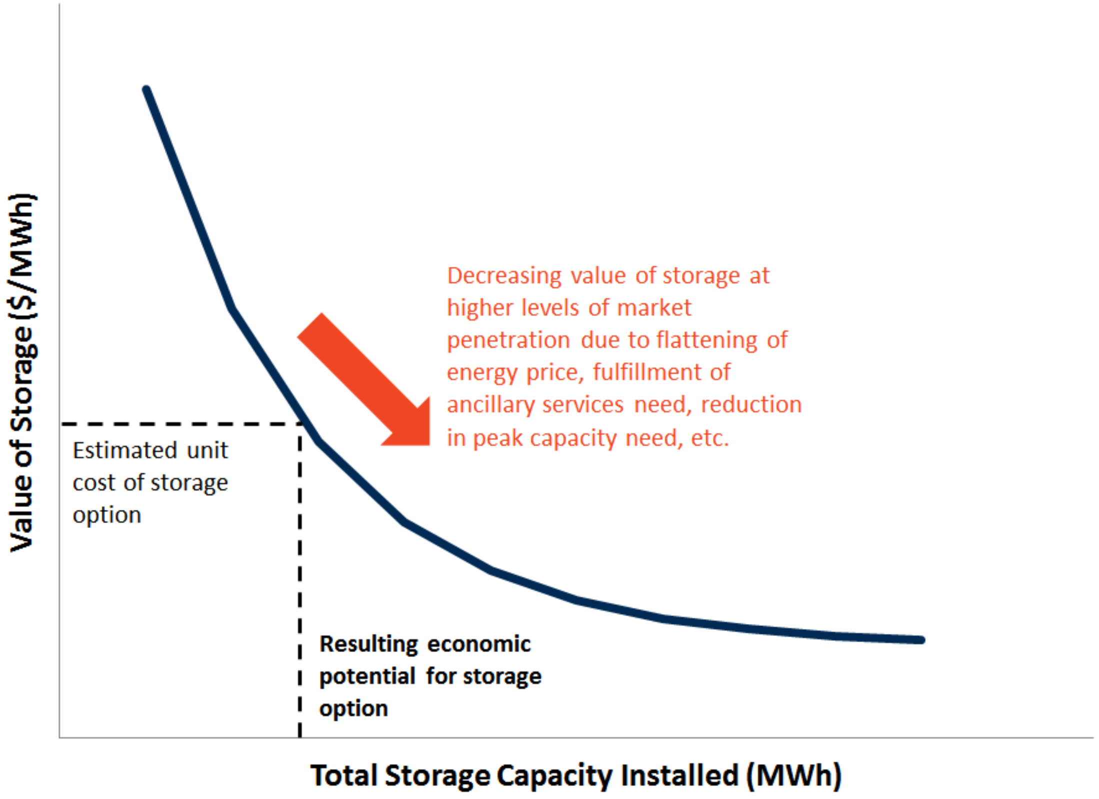
**Storage can simultaneously capture multiple value streams; however, tradeoffs must be made in the dispatch decision**

Our dispatch modeling logic:

- Value of storage is optimized subject to the following assumptions
- Generation capacity value based on ability to dispatch storage during hours with high loss of load probability
- Outage events are not predictable; storage ability to mitigate outages is based on reduced state of charge (50% on average)
- T&D deferral and outage reduction are mutually exclusive benefits
- For storage providing T&D deferral, reducing local peak load is prioritized over reducing system peak load
- Operators have accurate forecasting 24 hours out, imperfect foresight thereafter

# 4. Declining incremental value of storage additions

**An assessment of storage potential should reflect declines in incremental value of storage as more is added to the system**



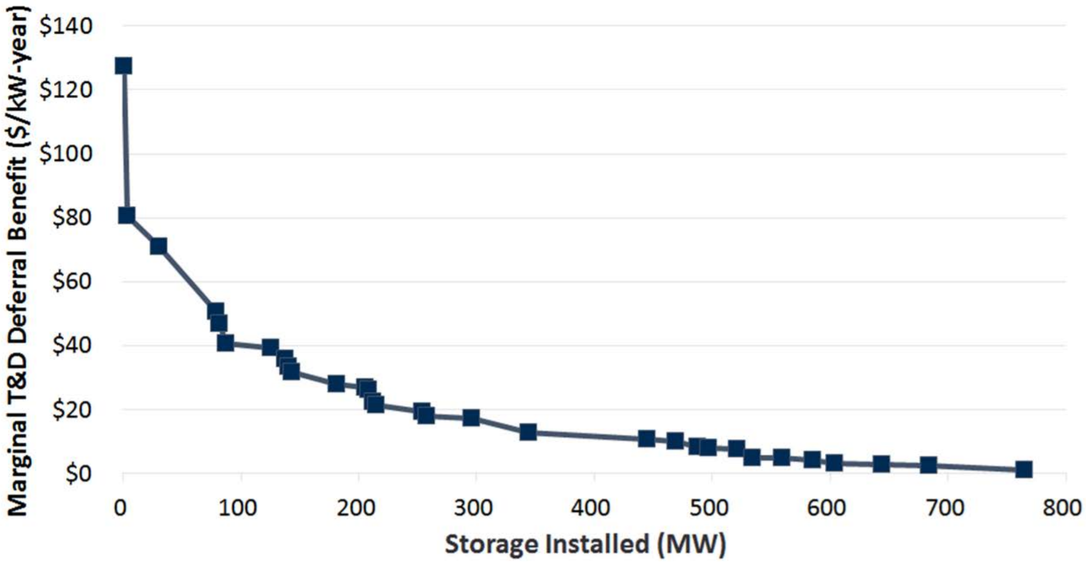

**Our approach:**

- Add storage to the model in various capacity increments
- Quantify incremental reductions in system costs with each addition
- Identify point where benefit of incremental addition equals storage costs

# 5. T&D capacity investment deferral

## T&D capacity benefits are based on an assessment of 260 individual planned upgrades in NV Energy's service territory

### Marginal T&D Deferral Benefit of Storage for Individual T&D Projects ($/kW-year)




**Our approach:**

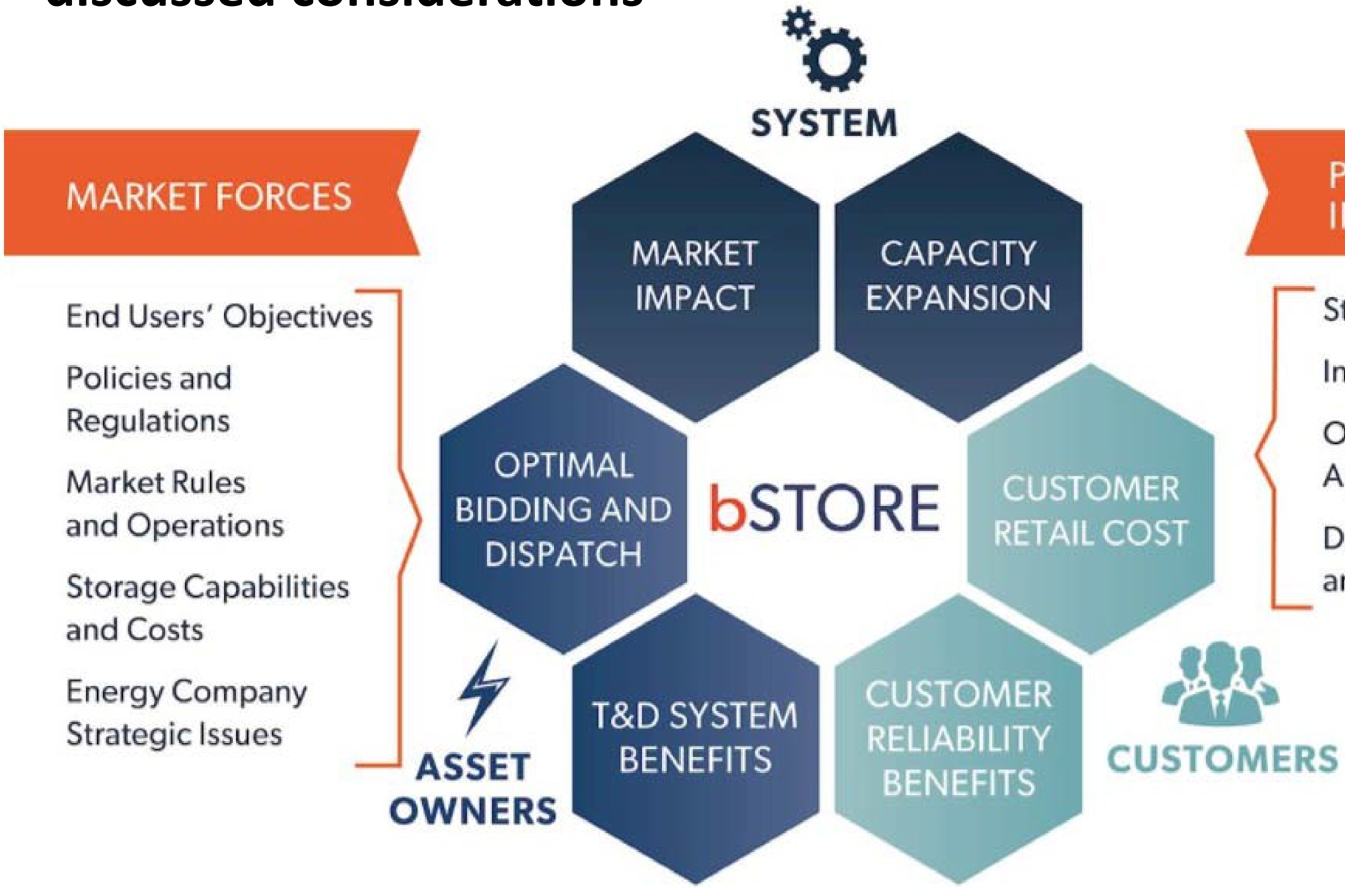
- Identify projects driven by peak growth
- Estimate load reduction required to provide 15-year deferral
- Require discharge of dedicated energy storage during hours when load reductions are needed

*Notes:*

Points reflect individual projects from NV Energy's 2018 transmission and distribution capital expenditure outlook identified as deferrable by storage. Although NV Energy's outlook is over a 10-year span, we annualize the size and value of opportunities. We order projects by $/kW-year value, and plot to estimate the marginal benefit for storage from T&D investment deferral. Values in nominal dollars.

# The modeling platform

**Brattle's bSTORE model was used to address the previously discussed considerations**

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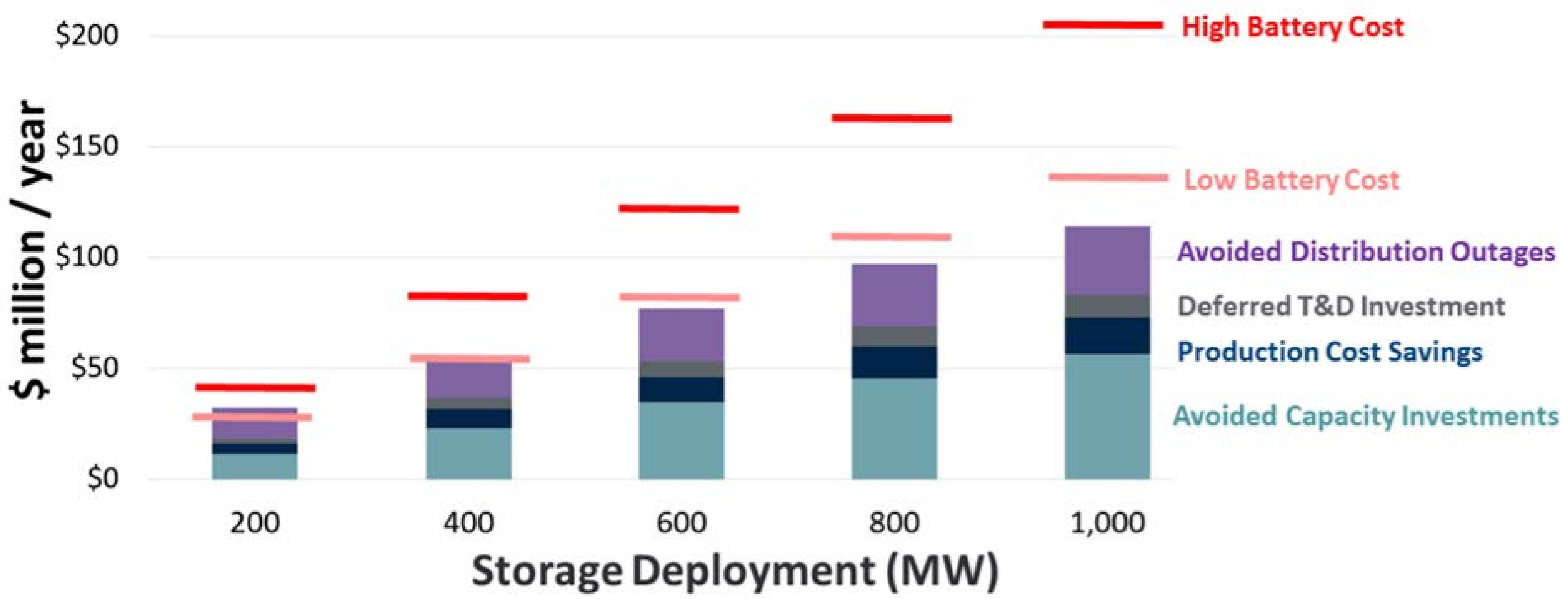
# Findings for Nevada

# System benefits and costs of storage: **2020**

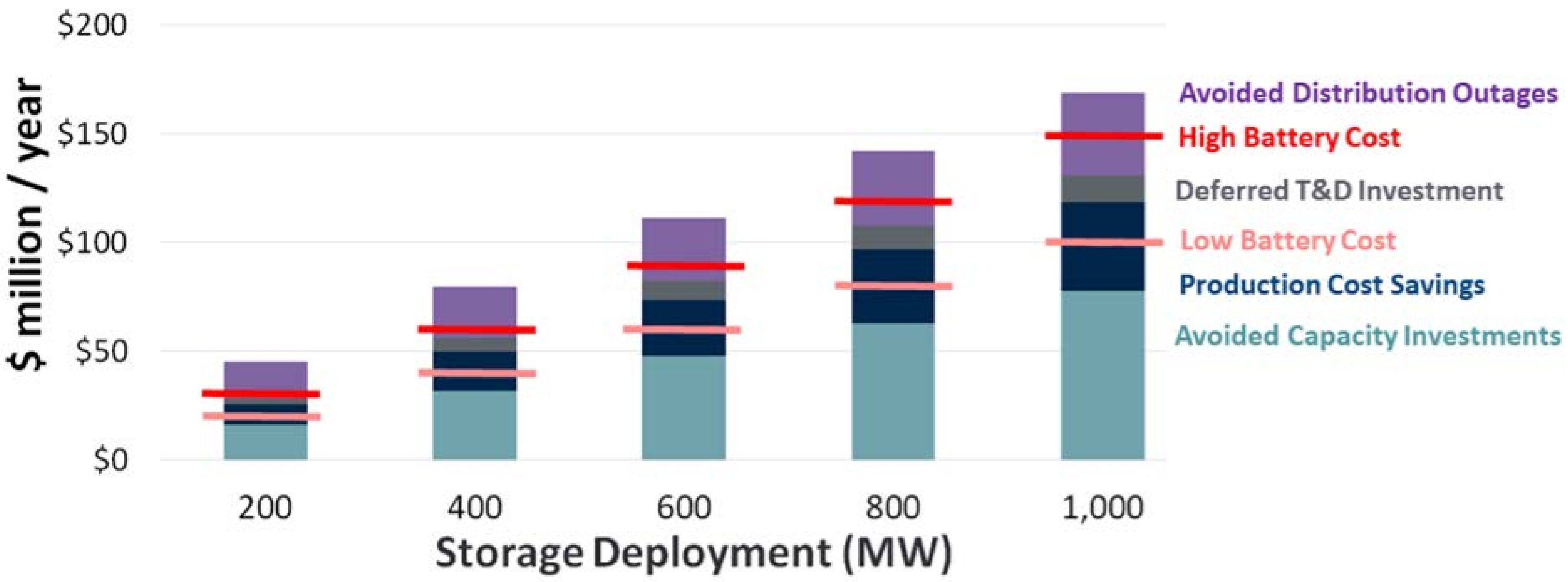
**In 2020, storage costs exceed benefits for additions greater than 200 MW**




*Note:* All values are in nominal dollars

# System benefits and costs of storage: **2030**

**By 2030, storage benefits exceed costs up to NV Energy's anticipated generation capacity need of 1,000 MW**

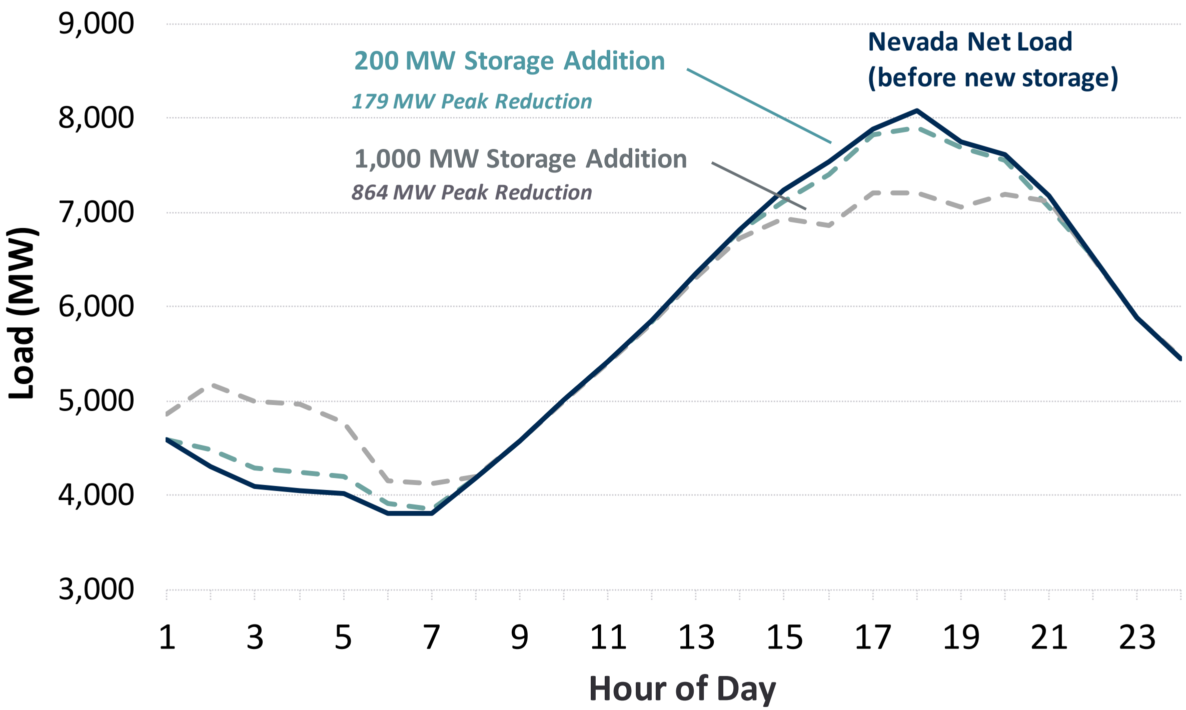



*Note:* All values are in nominal dollars

# Avoided generation capacity

## 4-hour storage can effectively offset need for new generation capacity in Nevada

### Nevada Net Load Peak Day Reduction (July 27, 2020)

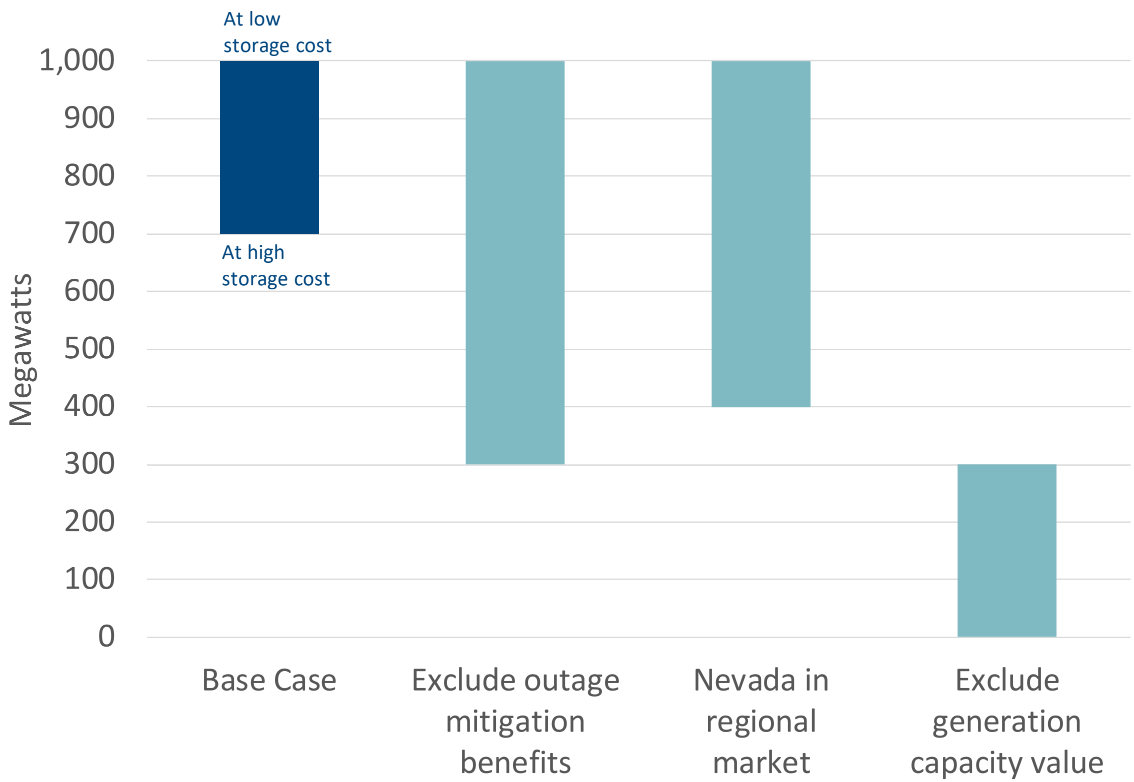



- Net load peaks concentrated in July and August
- Net load peaks are relatively short duration, due to high PV generation in summer months
- 1 MW of storage equivalent to 0.86 MW of capacity for simulated deployment of 1,000 MW

# Sensitivity to alternative assumptions

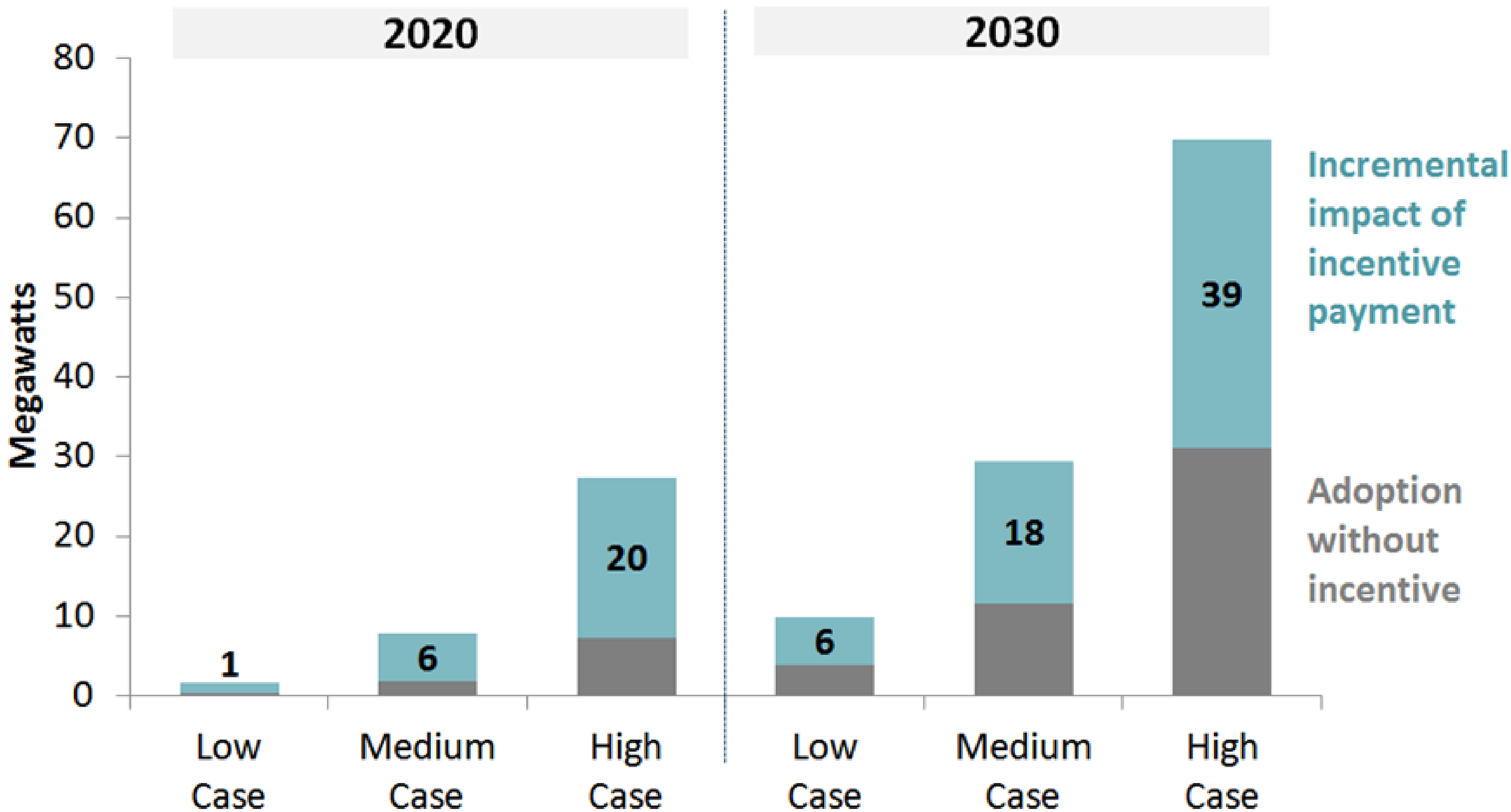
**The optimal deployment level will vary considerably depending on market definition and available value streams**

## Optimal Storage Deployment Levels for Alternative Cases



# Behind-the-meter (BTM) storage

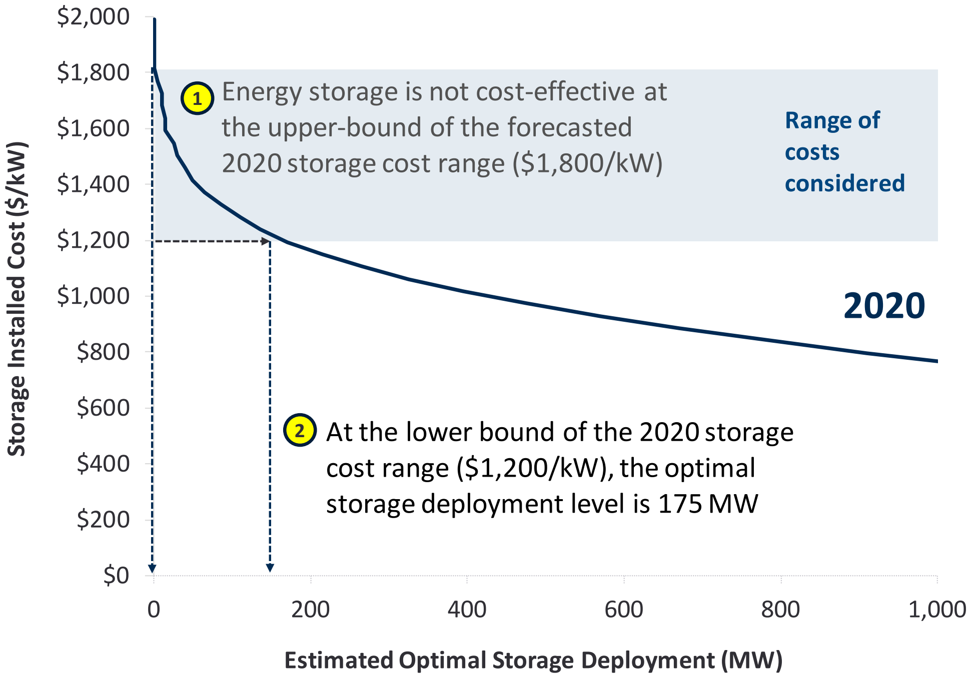
**BTM storage adoption is expected to be modest, but could more than double with the introduction of a utility incentive program**

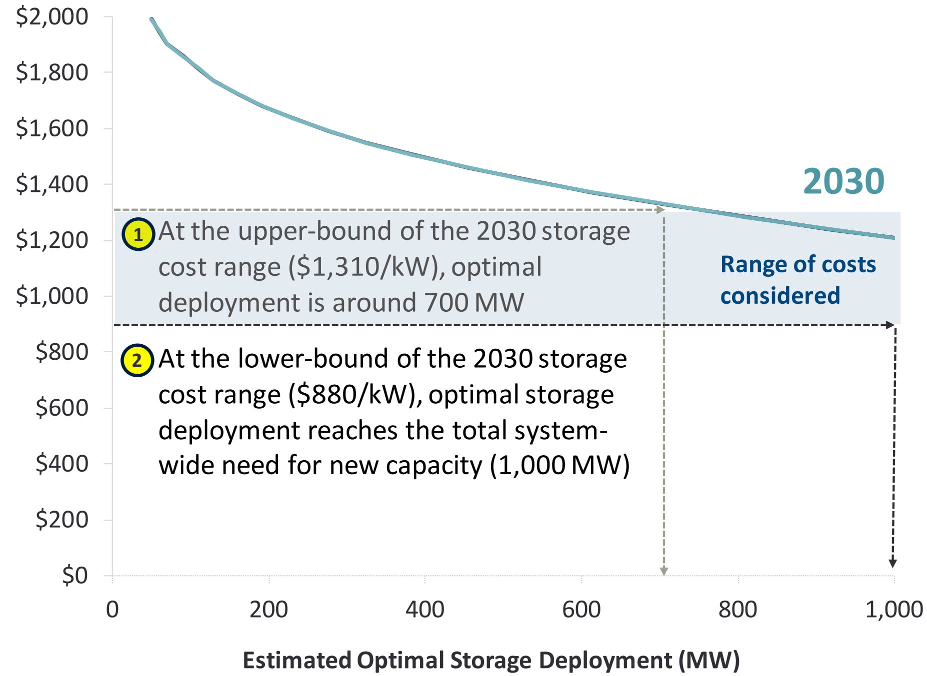



*Notes:*
The potential estimates represent long-run adoption potential based on assumed storage costs for the years shown in the figure. It would take several years to reach these adoption levels.

# Optimal Storage Deployment Curves

## Storage could be procured using an "optimal deployment curve" to account for cost uncertainty and changing system conditions



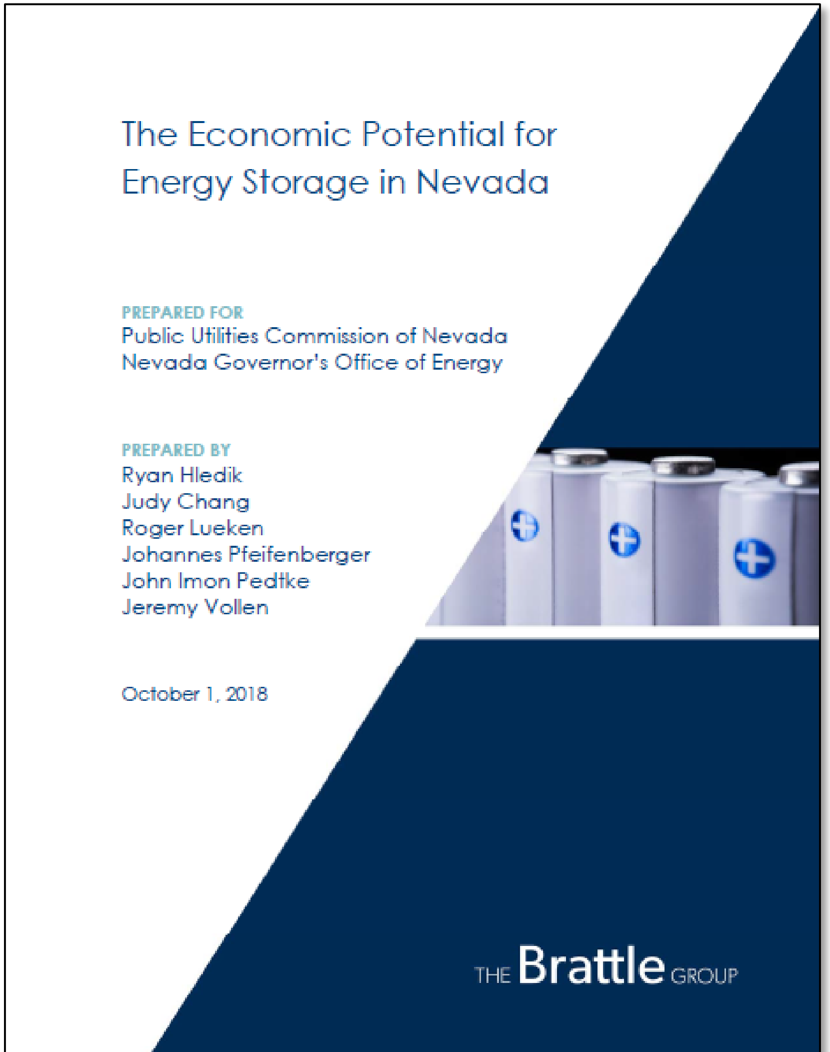




*Notes:*
Costs are shown in nominal dollars. Values are based on an assumed energy storage configuration of 10 MW / 40 MWh.

# Closing observations

- 30% decline in storage costs → 200% to 500% increase cost-effective deployment levels
- Optimal deployment in 2030 is more than 2x the level in 2020 due, in part, to evolving system conditions
- The ability to mitigate distribution system outages potentially accounts for 20% to 40% of the total benefits, significantly impacting optimal storage deployment levels
- High-value opportunities can decline quickly; most opportunities for geographically-targeted T&D investment deferral are captured with ~200 MW of energy storage
- **Stakeholder comments raise important question: Do existing resource planning practices sufficiently capture the benefits of emerging tech like energy storage? Or are new practices and/or policies needed?**

# For more information...


The Economic Potential for Energy Storage in Nevada

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Public Utilities Commission of Nevada
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THE Brattle GROUP

Link to the report:

http://files.brattle.com/files/14618_economic_potential_for_storage_in_nevada_-_final.pdf

PUCN Docket 17-07014:

http://pucweb1.state.nv.us/puc2/Dktinfo.aspx?Util=Rulemaking

Nevada Senate Bill 204:

https://www.leg.state.nv.us/Session/79th2017/Reports/history.cfm?ID=485

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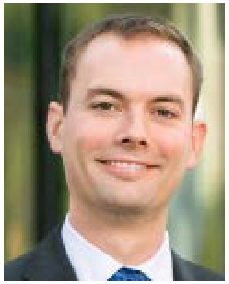

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# Disclaimer

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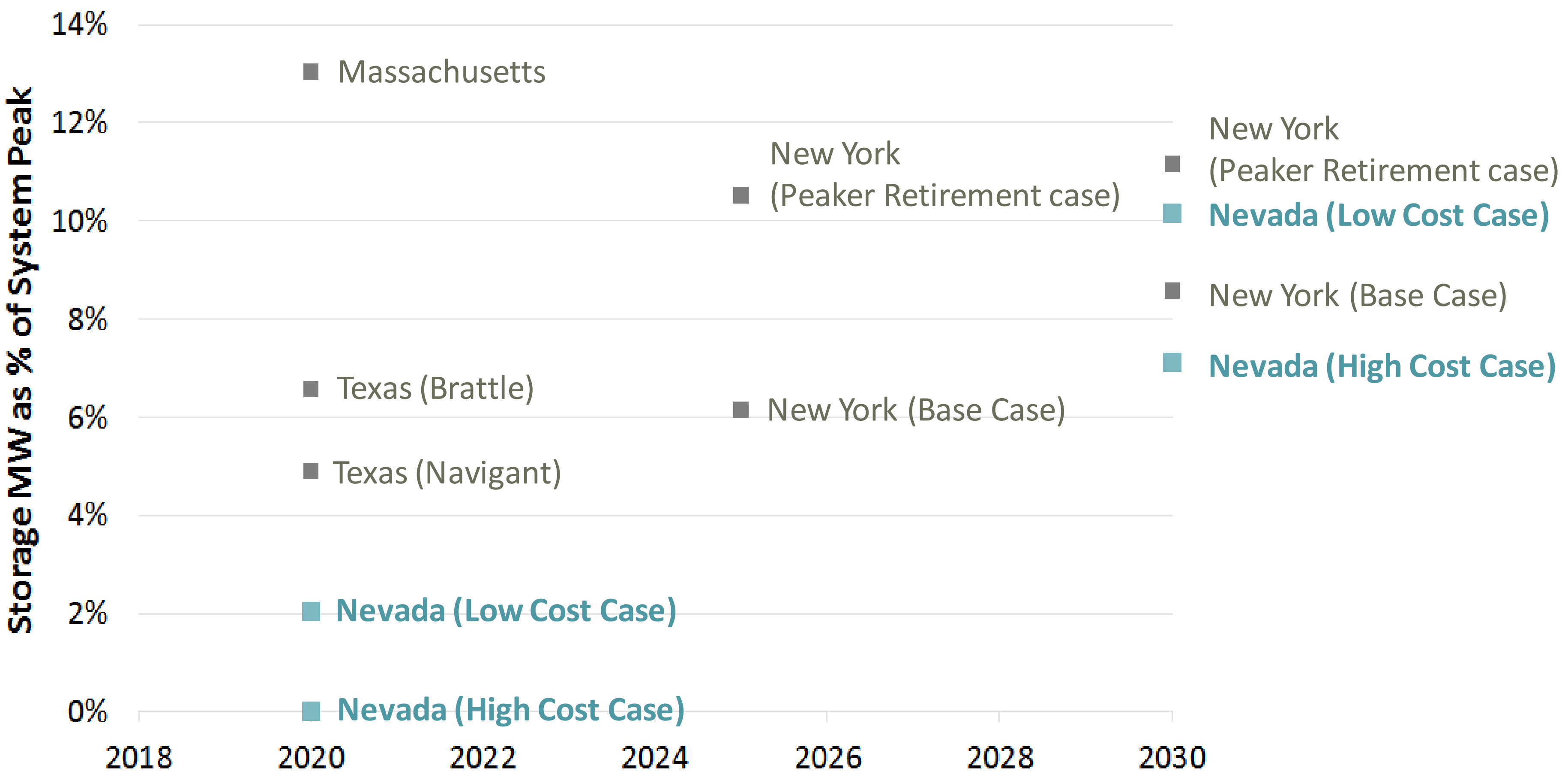
# Appendix

# Benchmarking the findings

## Studies from other jurisdictions identify a range of potential estimates



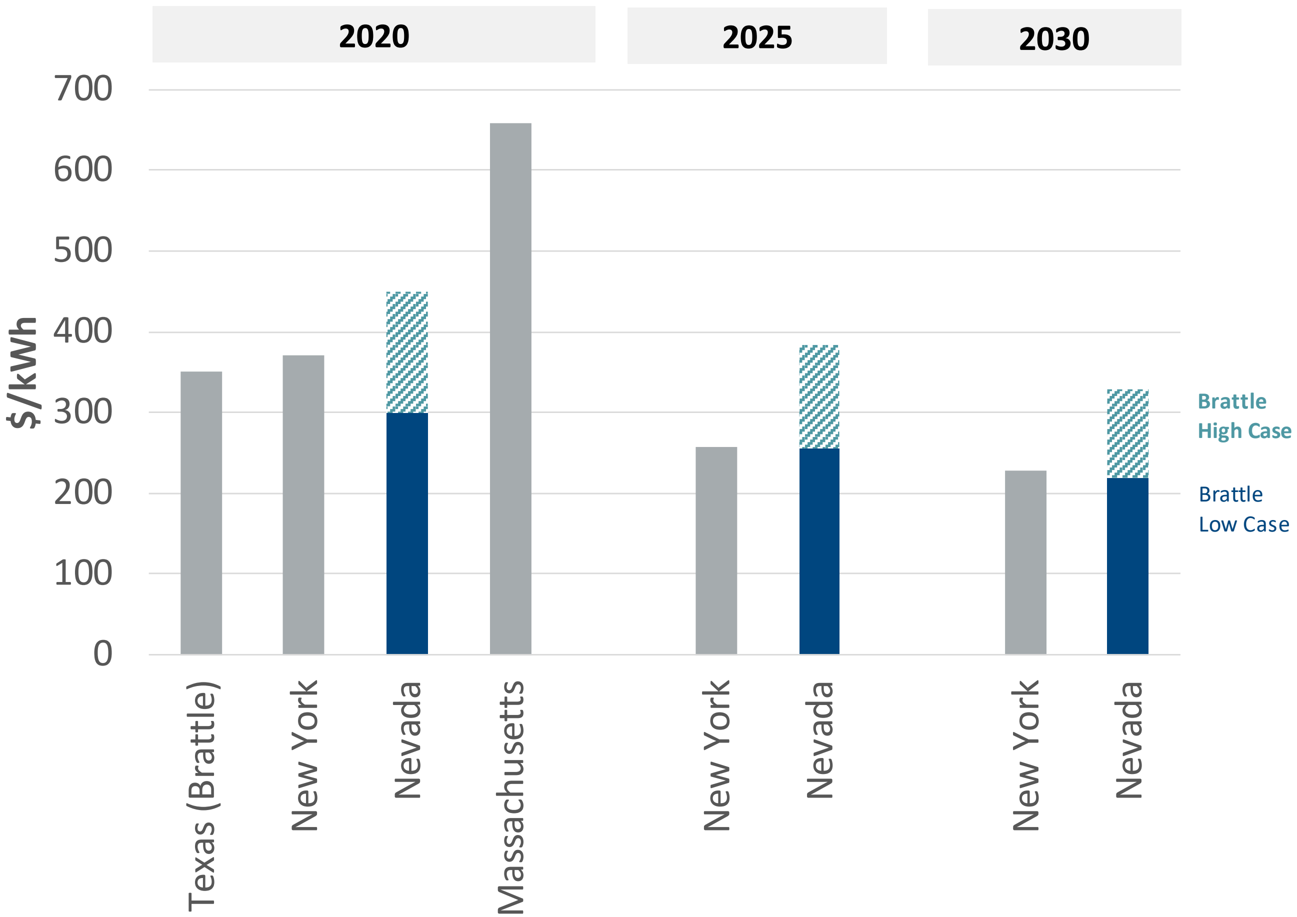
# Benefits Considered in Recent Storage Potential Studies

| | Nevada | Massachusetts | New York | Texas (Brattle) |
|---|---|---|---|---|
| **Avoided generation capacity costs** | X | X | X | X |
| **Reduced energy (fuel) costs** | X | X | X | X |
| **Deferred T&D investment costs** | X | X | X | X |
| **Ancillary services** | X | X | X | X |
| **Environmental impacts** | X | X | X | Discussed qualitatively |
| **Outage mitigation** | X | | X | X |
| **Distribution voltage support** | Discussed qualitatively | X | | Discussed qualitatively |
| **Behind-the-meter value** | X | | | |
| **Wholesale market cost reduction** | N/A | X | X | X |

*Notes:*

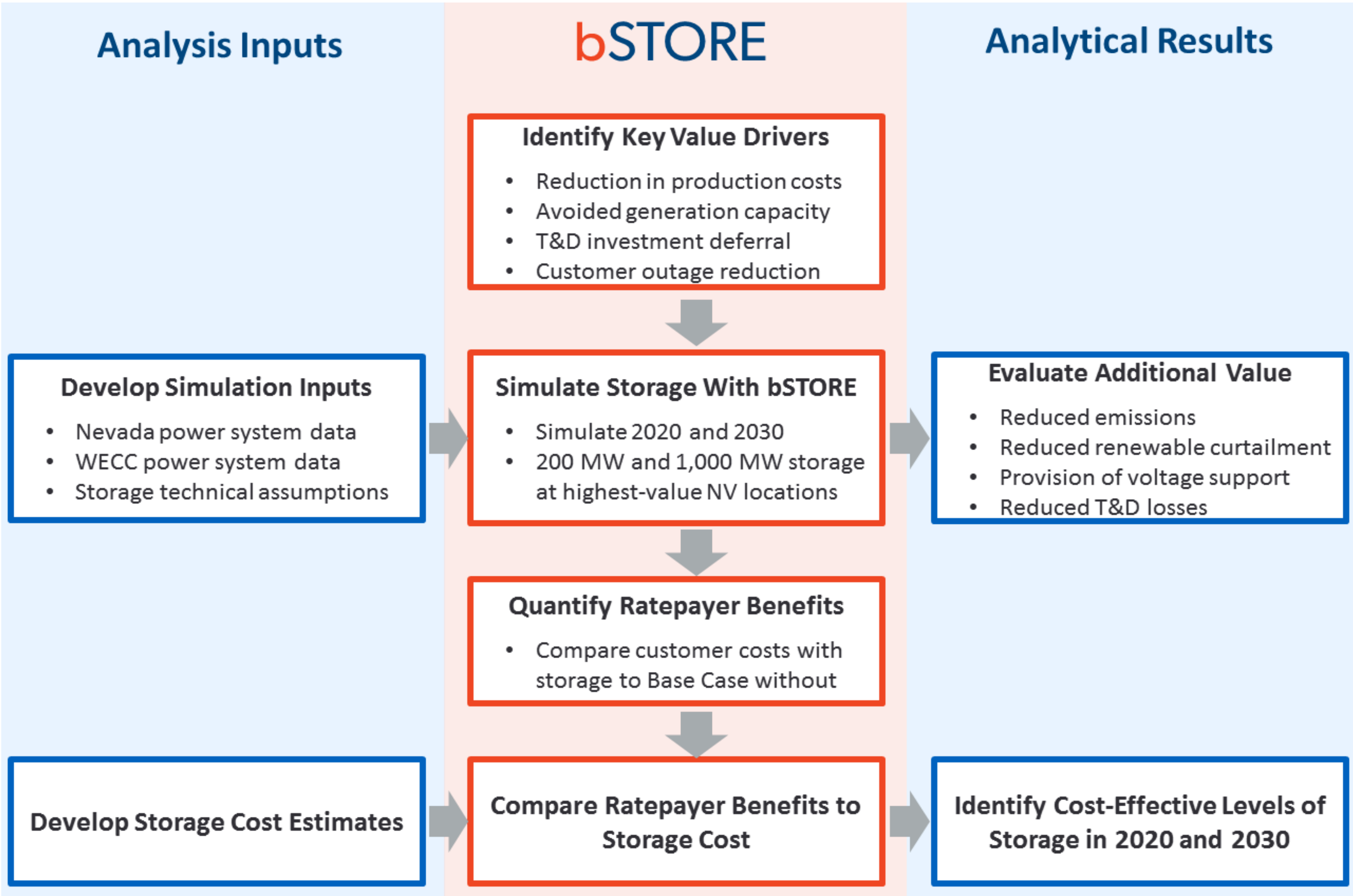
Table reflects Brattle's interpretation of the modeled benefits in each study. Approximations have been made to accommodate differences in terminology across the studies. The analysis of Texas by Navigant Research is not included because insufficient detail was provided on specific categories of value streams. The modeling of cost-effective deployment levels in New York and Massachusetts do not specifically account for BTM adoption, but the studies acknowledge behind-the-meter deployment as one of several use cases.

# Comparison of Storage Costs Across Studies




*Notes:*
Battery duration shown in figure is 4-hours for Nevada and New York, 3-hours for Texas, and roughly 2-hours on average for Massachusetts. Massachusetts cost was calculated by dividing the midpoint of the range of total reported statewide storage costs by the total statewide economic storage capacity. Values are in nominal dollars.

# Summary of Analytical Approach



# Data Sources

We model Nevada consistent with NV Energy's 2018 IRP and rest of WECC consistent with 2026 TEPPC database (adjusting for 2020 and 2030).

| Data Element | Source(s) |
|---|---|
| Transmission Topology | 2026 TEPPC Common Case (as updated in 2017 CAISO TPP) |
| NV and WECC Generator List | NV Energy's 2018 IRP, 2026 TEPPC Common Case, SNL |
| NV and WECC Generator Characteristics | NV Energy's 2018 IRP, 2026 TEPPC Common Case |
| Fuel Prices | NV Energy's 2018 IRP, 2026 TEPPC Common Case, EIA |
| NV and WECC Demand | NV Energy's 2018 IRP, 2026 TEPPC Common Case, SNL |
| NV and WECC Reserve Requirements | NV Energy's 2018 IRP, 2026 TEPPC Common Case |
| NV and WECC RPS Requirements | NV Energy's 2018 IRP, Database of State Incentives for Renewables & Efficiency (DSIRE) |
| T&D Deferral Analysis | NV Energy's Transmission and Distribution Capital Expenditure Data |
| Distribution Reliability Analysis | NV Energy's Distribution Outage Data |

# Storage Technology Assumptions

Although our analysis approach is technology agnostic, we simulate batteries with operational characteristics that resemble Li-Ion chemistry.

- **Configuration and siting**
  - Stand-alone storage, not co-located with solar PV or other generator
  - Distribution and transmission connected
  - Sited in front-of-meter (behind-the-meter use case evaluated separately)
- **Size of individual storage devices:** 5 to 10 MW
- **MWh:MW ratio:** 4:1
  - Four hour discharge capability at full output
  - Consistent with types of storage systems procured in many recent solicitations
- **Round-trip efficiency:** 85%
- **Lifespan:** 15 years

*Notes:* Assumptions developed with input from the PUCN and PNNL. Our fixed-cost and cost-levelization assumptions include the costs of replacing worn-out battery cells during the 15-year period. We do not assume degradation over time, consistent with the assumption that worn-out battery cells will be replaced throughout the 15-year period.

# Levelization of Storage Costs

We assume levelized installed costs of $136-204/kW-yr in 2020 and $99-149/kW-yr in 2030 for 4-hour storage device.

## Financial Assumptions

| **Financial Assumption** | | **Value** |
|---|---|---|
| Fixed O&M | *% of Installed* | 1% |
| Developer After-Tax WACC | *%* | 7% |
| Battery Asset Life | *yrs* | 15 |
| Balance of Plant Asset Life | *yrs* | 15 |
| Total Income Tax Rate | *%* | 21% |
| Depreciation Schedule | | 15-yr MACRS |
| Annual Inflation Rate | *%* | 2% |

## Levelized and Installed Cost Assumptions For 10 MW (40 MWh) Storage Device

| | **Assumed Installed Costs** | | **Implied Levelized Costs** |
|---|---|---|---|
| | *$/kW Installed* | *$/kWh Installed* | *$/kW-year* |
| **Assumed Costs** | | | |
| *2020 Low* | $1,200 | $300 | $136 |
| *2020 High* | $1,800 | $450 | $204 |
| *2030 Low* | $876 | $219 | $99 |
| *2030 High* | $1,314 | $328 | $149 |

*Note:*
Cost and financing assumptions indicative of new development costs in Nevada. All values in nominal dollars

# Cost Effectiveness Framework

**We utilize the RIM test to evaluate cost-effectiveness of energy storage, including the value of avoided customer outages.**

The Ratepayer Impact Measure (RIM) test provides an indication of how average retail rates will change as the result of a new utility initiative

- Includes all reductions in resource costs (*e.g.*, reductions in fuel and capacity costs)
- Includes savings associated with procuring services more cheaply (*e.g.*, ancillary services)

We also include as a benefit the ratepayer value of avoided distribution outages

- Not traditionally included in RIM test (does not result a cost incurred by the utility), but reflects a benefit to ratepayers who experience fewer outages
- We separately report cost-effective storage levels excluding customer outage value

We quantify, but do not include as ratepayer benefits, the societal-cost impacts associated with changes in carbon and other emissions

# Reduction in Production Costs

## *Approach*

**We use a production cost model – Power System Optimizer (PSO) – to estimate cost of meeting Nevada's energy and ancillary service needs.**

- We simulate entirety of WECC, with focus on Nevada
- To account for changes in Nevada production costs, purchases, and sales, we calculated adjusted production costs (APC) for the Nevada footprint
- We simulate 3 scenarios: base case (no storage), 200 MW, and 1,000 MW of storage

### Calculating Nevada Adjusted Production Costs (APC)

**Nevada Adjusted Production Costs** = **Production Costs**
**+ Cost of Purchases**
**– Revenue from Sales**

**Production Costs = Cost of Nevada owned generation**

- Generation costs include fuel, emissions, variable operating, and startup costs

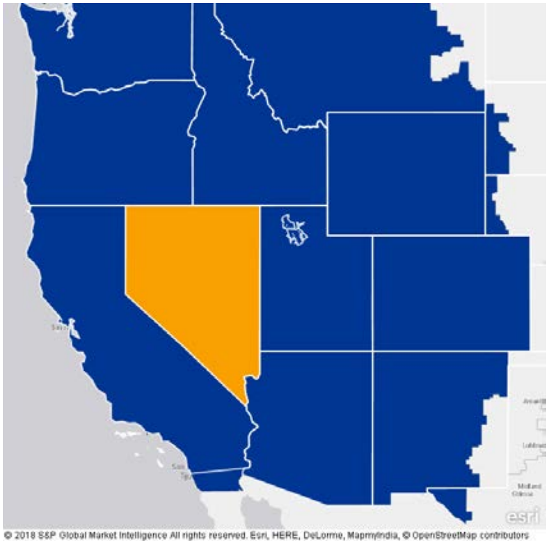
**Cost of Purchases = Deficit in generation × Price Hub**

- Purchases priced at the Malin and Mead hubs for Northern and Southern Nevada, respectively.

**Revenues from Sales = Surplus in generation × Price Hub**

- Sales priced at the Malin and Mead hubs for Northern and Southern Nevada, respectively.

### WECC Footprint




*Source:* SNL

# Reduction in Production Costs

*Findings*

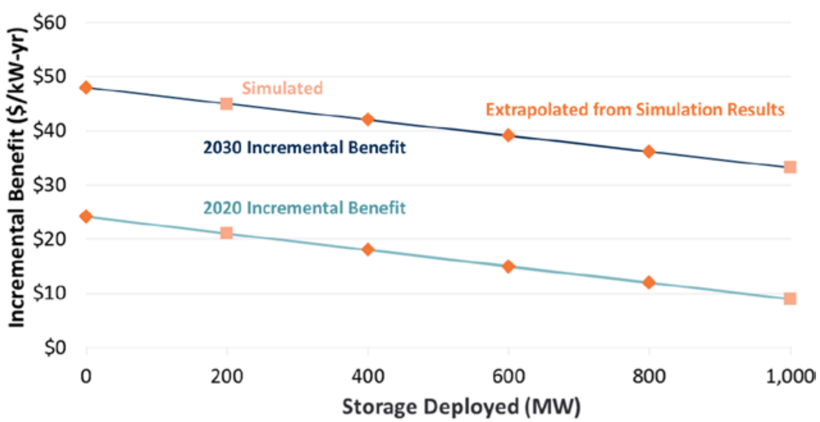
We find APC savings of $4.5 to $16.5 million in 2020 (200 MW vs. 1,000 MW storage deployed), and $9.3 to $40.6 million in 2030.

- Savings due three factors:
  - Reduced costs of operating NV generators
  - Reduced imports during high priced hours
  - Increased revenues from sales
- Savings account for the value of storage providing ancillary services
- Incremental savings (savings due to adding 1 additional MW of storage) fall as more storage is added and highest-value opportunities saturate

**2020 Adjusted Production Cost Savings**
*(in nominal $million/year)*

| | Production Cost | | | Savings (Storage Case minus Base Case) | |
|---|---|---|---|---|---|
| | Base | 200 MW | 1,000 MW | 200 MW | 1,000 MW |
| Production Cost | $421 | $420 | $423 | ($1.1) | $2.2 |
| Cost of Market Purchases | $132 | $129 | $124 | ($3.1) | ($7.9) |
| Revenues from Sales | ($46) | ($46) | ($57) | ($0.4) | ($10.8) |
| **Total** | **$507** | **$502** | **$490** | **($4.5)** | **($16.5)** |

**Estimated Incremental Benefit from APC Savings**




*Sources and Notes:*
All values in nominal dollars. The total APC savings from simulations with 200 MW and 1,000 MW were used to estimate a relationship between storage deployed and total savings, from which we can estimate the relationship between storage deployed and incremental APC savings.

# Transmission & Distribution Investment Deferral

## *Approach*

We used NV Energy capital expenditure data to identify high-value T&D deferral opportunities and evaluate how storage could defer investments.

- NV Energy provided cost data and descriptions for 260 capital projects from 2014-2027
- We estimate the subset that could be deferred by storage
  - We identified 35 projects (14% of total) are potentially deferrable by storage
  - Primarily transformer upgrades needed to support local load growth
  - We estimate the value of deferring each investment by 15 years
- We make several assumptions to approximate how much storage may be require to defer an investment
  - **Initial Peak Load:** based on NV Energy's project descriptions
  - **Rate of Load Growth:** Assumed 2%
  - **Hourly Load Shape:** Based on average residential or C&I load shapes
- We size the storage to 15 year load growth

* Average of NPC and SPPC After Tax Weighted Average Cost of Capital (ATWAAC) per NV Energy 2018 IRP, weighted by each system's contribution to total peak load.

# Customer Outage Reduction Value

## *Approach*

We evaluate the reliability value to customers of deploying storage on specific feeders that historical experience relatively high levels of outages.

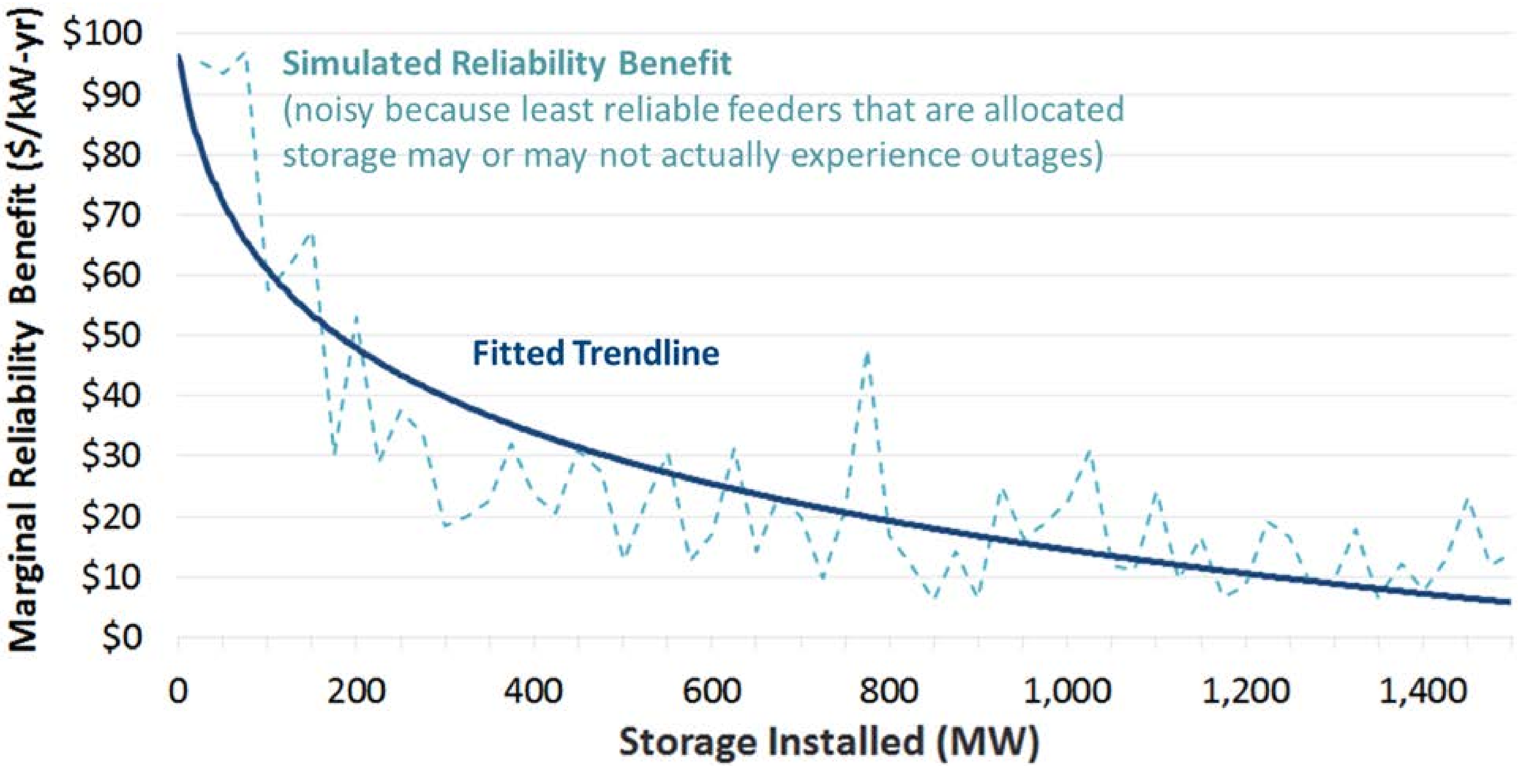
- NV Energy provided data on 43,000 distribution-level outages for 2014-2018
- We evaluate customer outage reduction benefits of siting storage at least-reliable feeders
  - We simulate storage deployed at each identified feeder, sized at average feeder peak load
  - Account for both the duration (hours) and magnitude (MWh) of each outage
  - Account for unpredictability of outages
  - Assume customers value improved reliability at $12,500/MWh value of lost load (VOLL)
- Analysis assumes feeders can be "islanded" in event of an outage
  - Requires grid modernization investments, e.g. microgrids, automated distribution switching
  - We separately report cost-effective storage levels if grid modernization efforts not made and customer outage value cannot be captured

# Customer Outage Reduction Value

*Findings*

The marginal benefit from avoided distribution outages declines as storage is added to the least-reliable feeders.

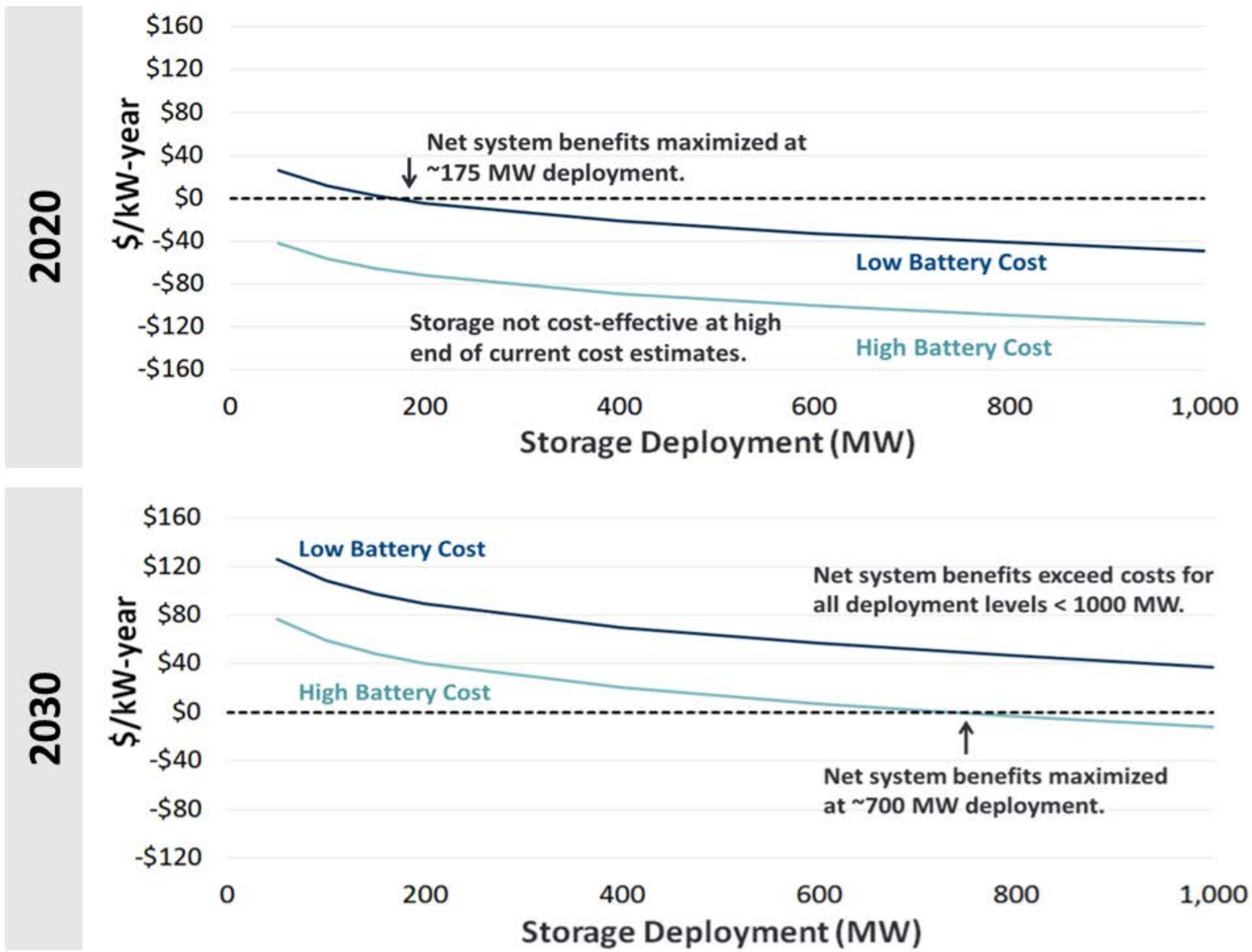
## Incremental Reliability Benefit of Storage ($/kW-year)




*Note:*
All values in nominal dollars.

# Incremental Net Benefits of Storage Deployment in Nevada

2020 cost-effective storage levels are up to 175 MW, depending on storage costs. In 2030, cost-effective levels are greater than 700 MW.




*Note:* All values are in nominal dollars

# Renewable Integration and Emission Benefits

Storage reduces WECC-wide emissions in both 2020 and 2030. Storage also reduces Nevada solar curtailments in 2030.

## Reduction in Nevada Renewable Generation Curtailments, 2030

| | GWh | | | [Change] - [Base] | |
|---|---|---|---|---|---|
| | Base | 200 MW | 1,000 MW | 200 MW | 1,000 MW |
| **Nevada** | | | | | |
| Total Solar Generation | 6,630 | 6,633 | 6,659 | 3 | 29 |
| Solar Curtailment | 57 | 54 | 28 | -3 | -29 |
| Percent Change in Curtailment | | | | -5% | -51% |

- In 2020, minimal curtailments with or without storage
- In 2030, 1,000 MW of storage significantly reduces curtailments

## Impact on WECC-Wide Emissions

| | Change in Emissions (tons) | | Change in Emissions (%) | |
|---|---|---|---|---|
| | 200 MW | 1,000 MW | 200 MW | 1,000 MW |
| **2020 Cases** | | | | |
| CO2 | -46,974 | -131,998 | -0.02% | -0.06% |
| NOX | 135 | 117 | 0.06% | 0.05% |
| SO2 | 161 | 351 | 0.12% | 0.26% |
| **2030 Cases** | | | | |
| CO2 | -63,162 | -234,955 | -0.03% | -0.10% |
| NOX | -79 | -455 | -0.03% | -0.17% |
| SO2 | 8 | -480 | 0.00% | -0.26% |

- Storage reduces WECC-wide $CO_2$ emissions in all cases
- Societal savings of $2.6 to $7.2 million in 2020 and $5.0 to $18.5 million in 2030*

* Emission reductions valued consistent with U.S. Government Interagency Working Group on the Social Cost of Carbon. Baseline 2020 value of $54/ton and 2030 value of $79/ton (3% discount rate scenario). See report for results under 5% and 2.5% discount rate scenarios.

# Behind-the-Meter Storage Applications

# Overview

**We evaluate the economic potential for BTM storage adoption by C&I customers with and without a utility-administered program.**

C&I customers most likely to adopt BTM storage in the near- to medium-term

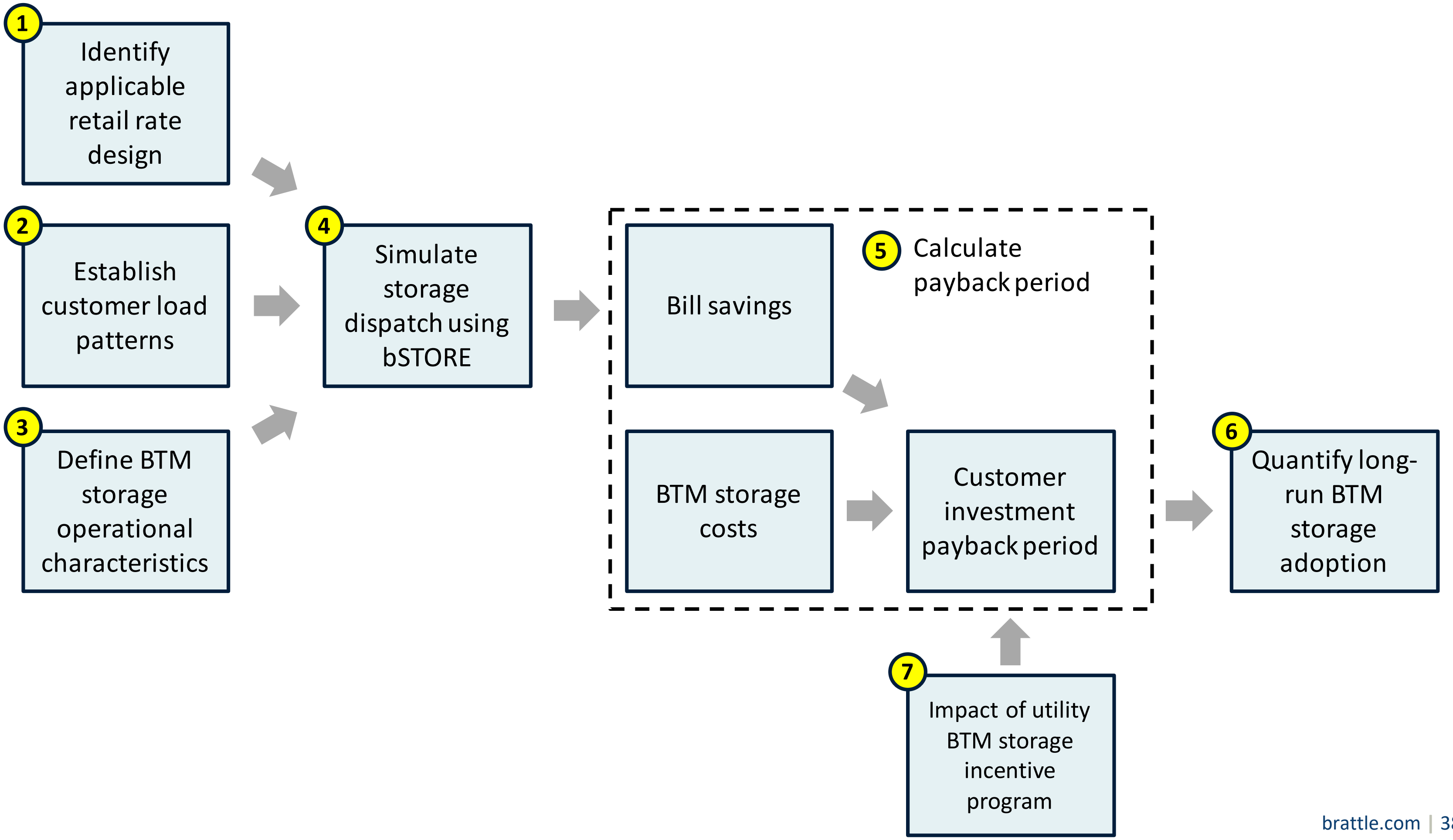
- Uses include retail bill reduction, backup generation, and aggregation as DR
- Significant residential adoption unlikely, absent changes to retail rate design and NEM policy

The utility could incentivize further adoption of BTM storage

- Incentive could take the form of a cost-effective payment
- In return, utility would control device for a limited number of days per year to address resource adequacy needs

# Approach to Quantifying BTM Storage Potential

We use a 7-step process to evaluate BTM adoption with and without a utility-administered program

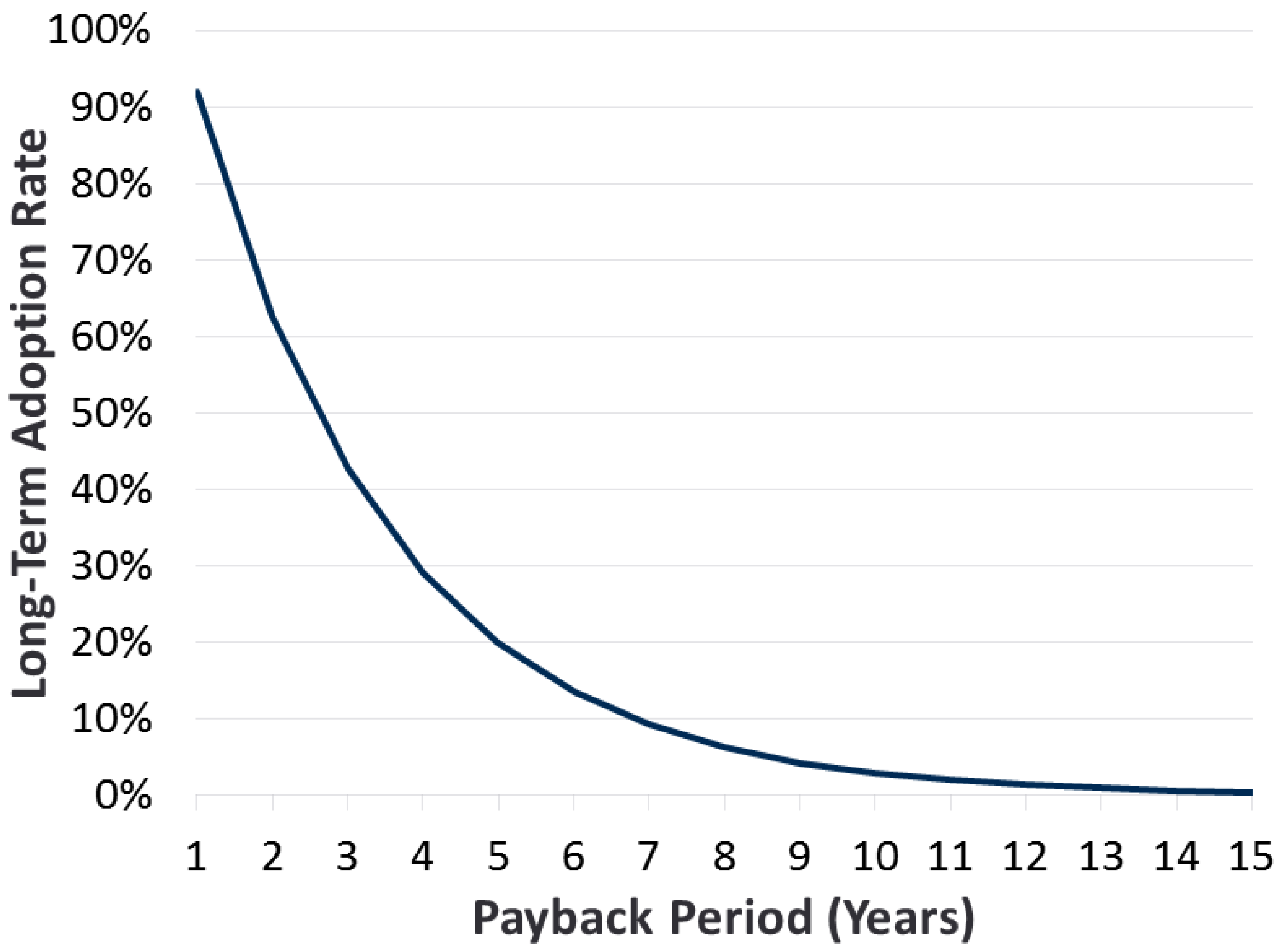


# BTM Storage: NV Energy LGS-2 (Secondary Service) Rate, Southern Service Territory

| Description | Charge |
|---|---|
| Basic service charge ($/month) | 193.10 |
| Facilities charge ($/kW-month) | 3.14 |
| Demand charge | |
| Winter ($/kW-month) | 0.40 |
| Summer on-peak ($/kW-month) | 13.35 |
| Summer mid-peak ($/kW-month) | 2.04 |
| Summer off-peak ($/kW-month) | 0.00 |
| Energy charge | |
| Winter ($/kWh) | 0.05213 |
| Summer on-peak ($/kWh) | 0.08508 |
| Summer mid-peak ($/kWh) | 0.06449 |
| Summer off-peak ($/kWh) | 0.04573 |
| Riders ($/kWh) | 0.00105 |

*Notes:* Summer season is June through September. On-peak period is 1 pm to 7 pm daily. Mid-peak period is 10 am to 1 pm and 7 pm to 10 pm. Off-peak period is 10 pm to 10 am.

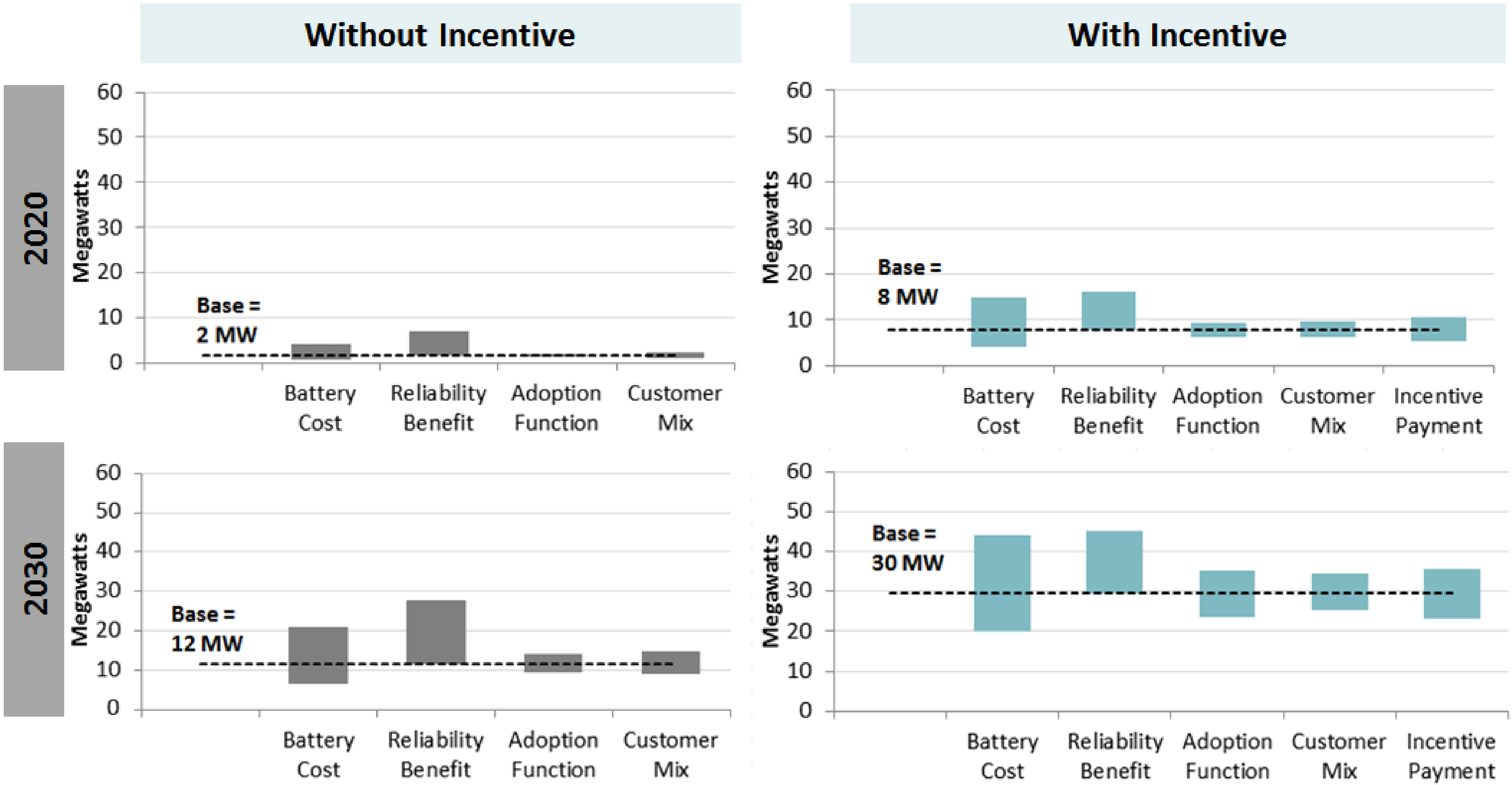
# Commercial &Industrial BTM Storage Adoption Function



# Assumptions Behind BTM Storage Adoption Cases

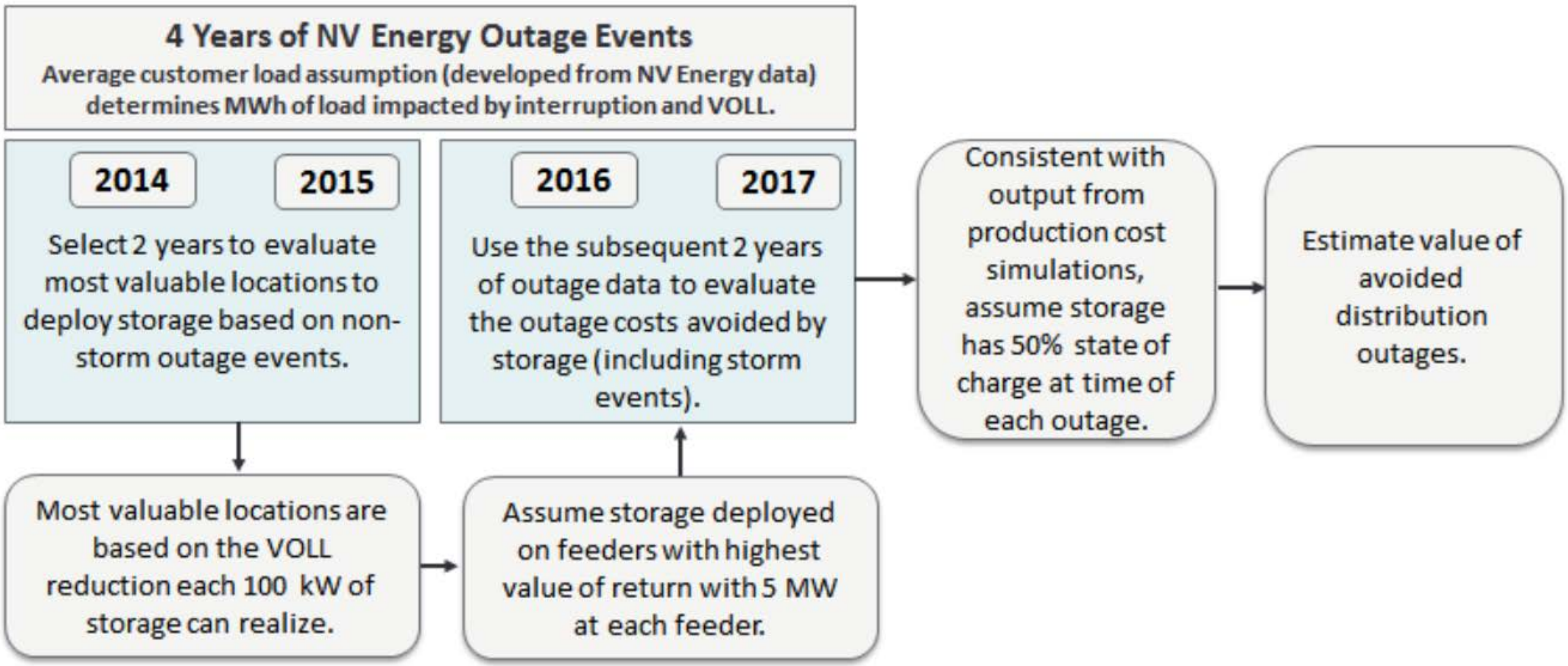
| | Low Adoption Case | Medium Adoption Case | High Adoption Case |
|---|---|---|---|
| **Battery cost** | 2020: $700/kWh<br>2030: $400/kWh | 2020: $575/kWh<br>2030: $325/kWh | 2020: $450/kWh<br>2030: $250/kWh |
| **Adoption function** | 20% reduction from Medium Case | Base adoption function based on investment payback period | 20% increase from Medium Case |
| **Utility incentive payment** | 50% of avoided generation capacity cost | 75% of avoided generation capacity cost | 100% of avoided generation capacity cost |
| **Customer mix** | Skewed toward segments with lower BTM storage value | Average customer mix | Skewed toward segments with higher BTM storage value |

# Summary of Sensitivity Analysis with BTM Storage



# Additional Supporting Material

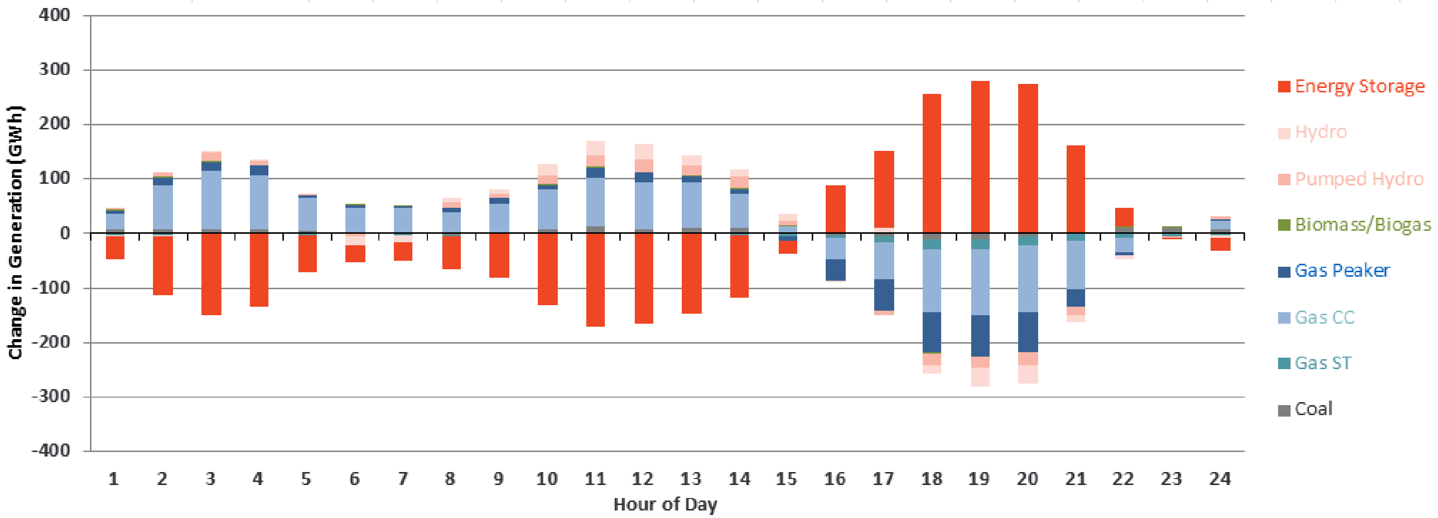
# Framework for Determining Value of Storage to Reduce Distribution Outages



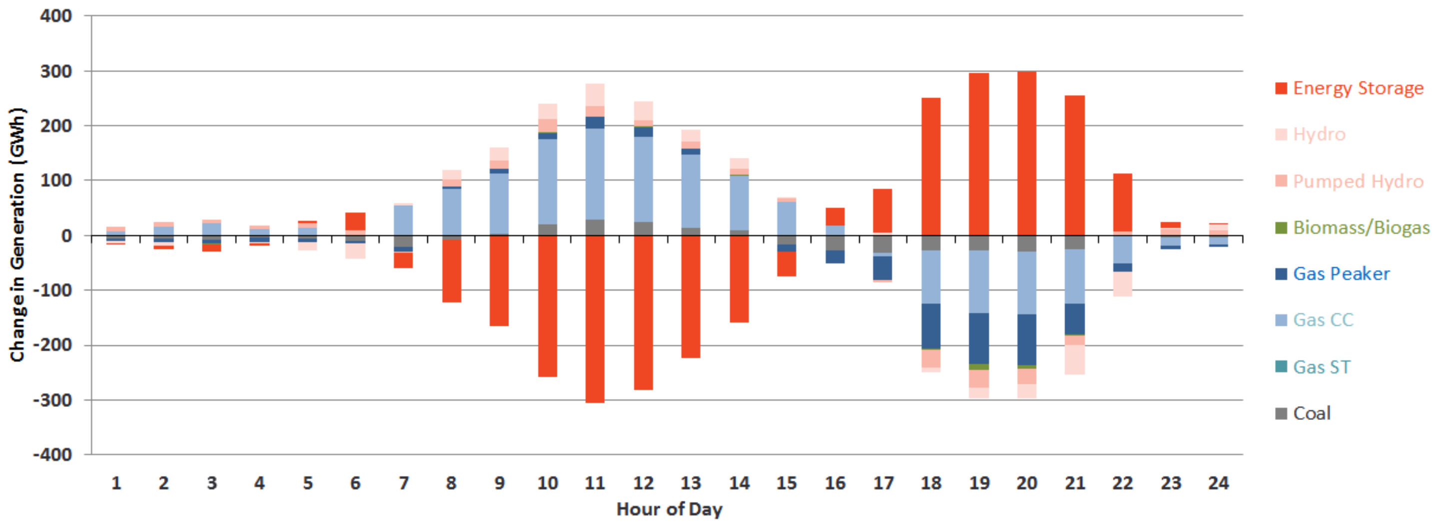
# Change in WECC-Wide Generation Due to Storage

*By Hour of Day (1,000 MW Case minus Base Case)*

**2020**




**2030**



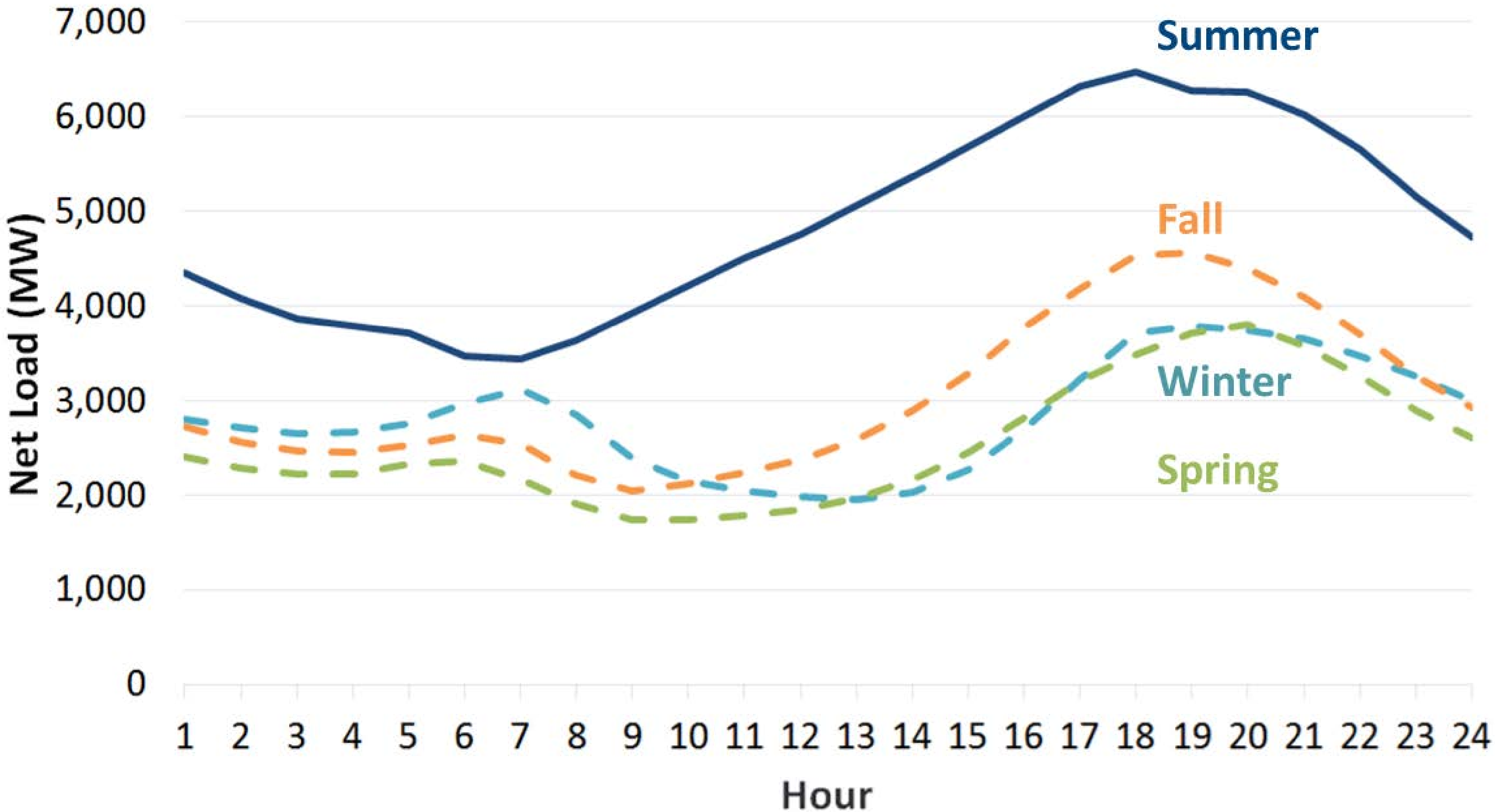
# Change in Societal Cost Associated with Carbon Emissions

| | Change in Societal Costs ($M) | | Change in Societal Cost ($/kW-yr) | |
|---|---|---|---|---|
| | 200 MW | 1,000 MW | 200 MW | 1,000 MW |
| **2020 Cases** | | | | |
| Low | -$0.7 | -$2.0 | -$3.6 | -$2.0 |
| Baseline | -$2.6 | -$7.2 | -$12.8 | -$7.2 |
| High | -$3.8 | -$10.6 | -$18.8 | -$10.6 |
| **2030 Cases** | | | | |
| Low | -$1.6 | -$5.9 | -$8.0 | -$5.9 |
| Baseline | -$5.0 | -$18.5 | -$24.9 | -$18.5 |
| High | -$7.3 | -$27.0 | -$36.4 | -$27.0 |

*Sources and Notes:*

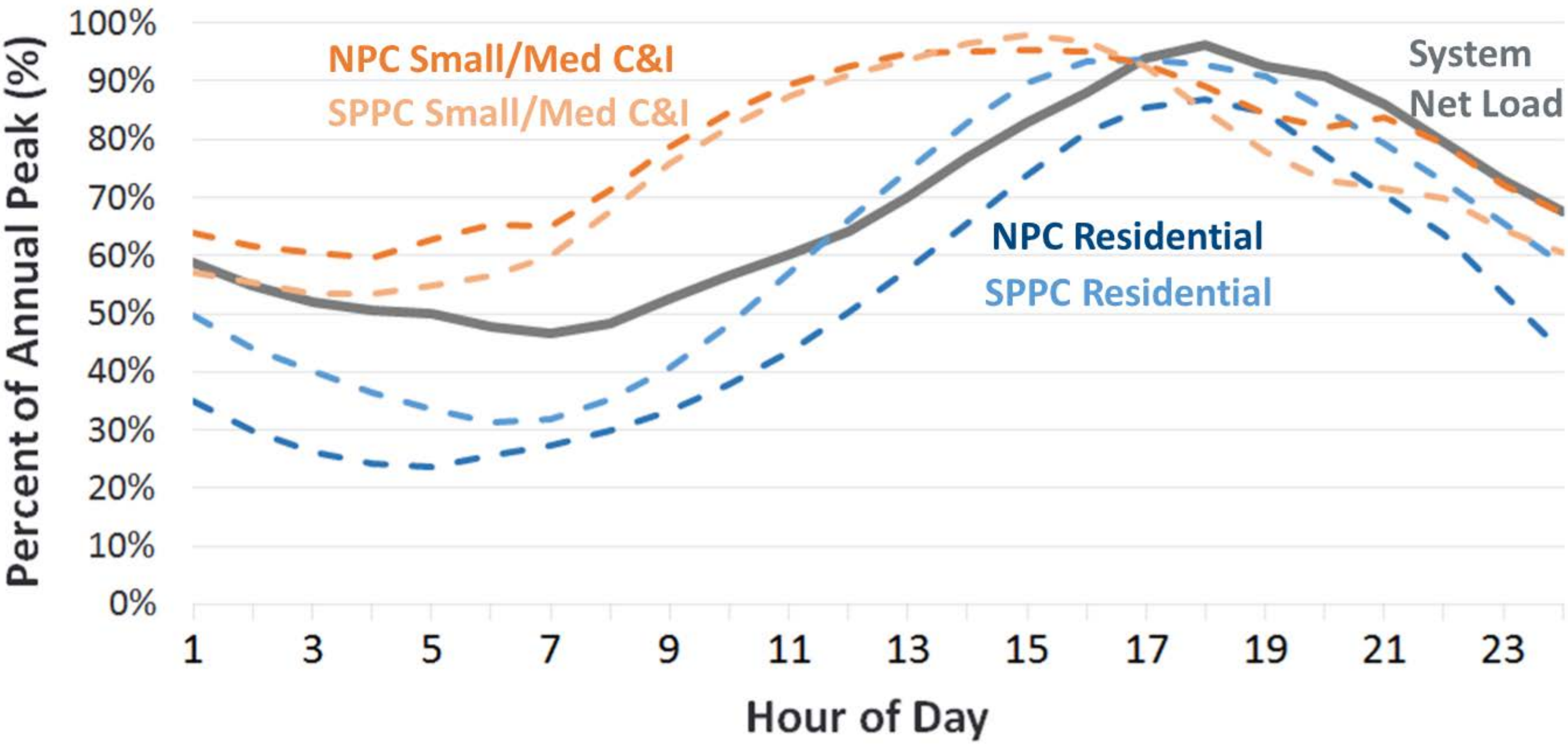
Low estimate uses IWG's 2.5% discount rate SCC estimate, baseline estimate uses IWG's 3% discount rate SCC estimate, and high estimate uses IWG's 5% discount rate SCC estimate. All values are in nominal dollars.

# Nevada Average Daily Load Shapes, by Season




*Sources and Notes:* Hourly load data from 2026 TEPPC Common Case. Net load is net of renewables, distributed generation, and energy efficiency.

# Average Peak Load Shapes by Customer Class




*Sources and Notes:* Load by Customer Class data, provided by NV Energy. Load Shapes are averaged over top 10 peak days.

# Additional Reading

"Maximizing the Market Value of Flexible Hydro Generation ," Pablo Ruiz, James A. Read, Jr., Johannes Pfeifenberger, Roger Lueken, and Judy Chang, Comments in Response to DOE's Request for Information DE-FOA-0001886, April 4, 2018

"Getting to 50 GW? The Role of FERC Order 841, RTOs, States, and Utilities in Unlocking Storage's Potential," Roger Lueken, Judy Chang, Johannes P. Pfeifenberger, Pablo Ruiz, and Heidi Bishop, Presented at Infocast Storage Week, February 22, 2018

"Battery Storage Development: Regulatory and Market Environments," Michael Hagerty and Judy Chang, Presented to the Philadelphia Area Municipal Analyst Society, January 18, 2018

"U.S. Federal and State Regulations: Opportunities and Challenges for Electricity Storage," Romkaew Broehm, Presented at BIT Congress, Inc.'s 7th World Congress of Smart Energy, November 2, 2017

"Stacked Benefits: Comprehensively Valuing Battery Storage in California," Ryan Hledik, Roger Lueken, Colin McIntyre, and Heidi Bishop, Prepared for Eos Energy Storage, September 12, 2017

"The Hidden Battery: Opportunities in Electric Water Heating," Ryan Hledik, Judy Chang, and Roger Lueken, Prepared for the National Rural Electric Cooperative Association (NRECA), the Natural Resources Defense Council (NRDC), and the Peak Load Management Alliance (PLMA), February 10, 2016

"Impacts of Distributed Storage on Electricity Markets, Utility Operations, and Customers," Johannes Pfeifenberger, Judy Chang, Kathleen Spees, and Matthew Davis, Presented at the 2015 MIT Energy Initiative Associate Member Symposium, May 1, 2015

"The Value of Distributed Electricity Storage in Texas - Proposed Policy for Enabling Grid-Integrated Storage Investments," Ioanna Karkatsouli, James Mashal, Lauren Regan, Judy Chang, Matthew Davis, Johannes Pfeifenberger, and Kathleen Spees, Prepared for Oncor, March 2015

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The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies worldwide.

We combine in-depth industry experience and rigorous analyses to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

Our services to the electric power industry include:

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