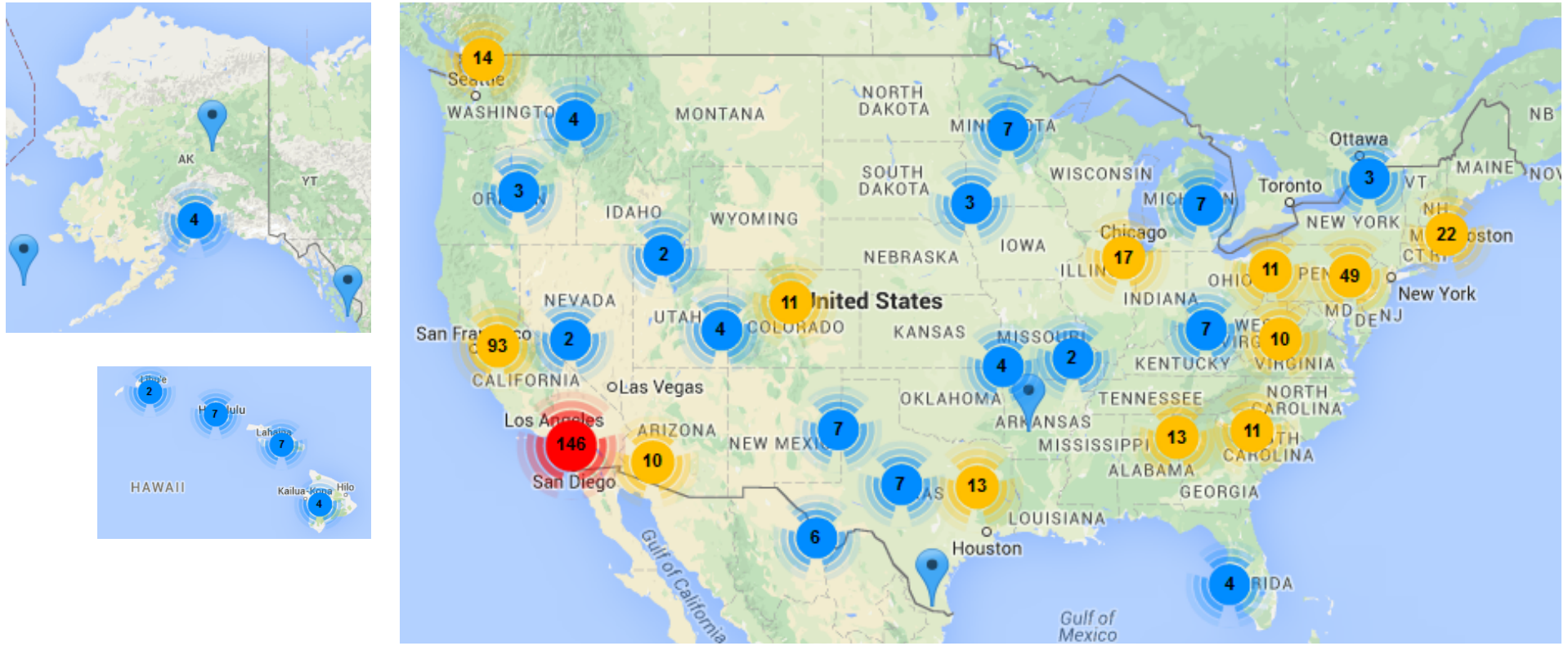
NASEO Energy Storage State Action Primer

Energy Storage Association

www.energystorage.org

ESA MEMBERSHIP

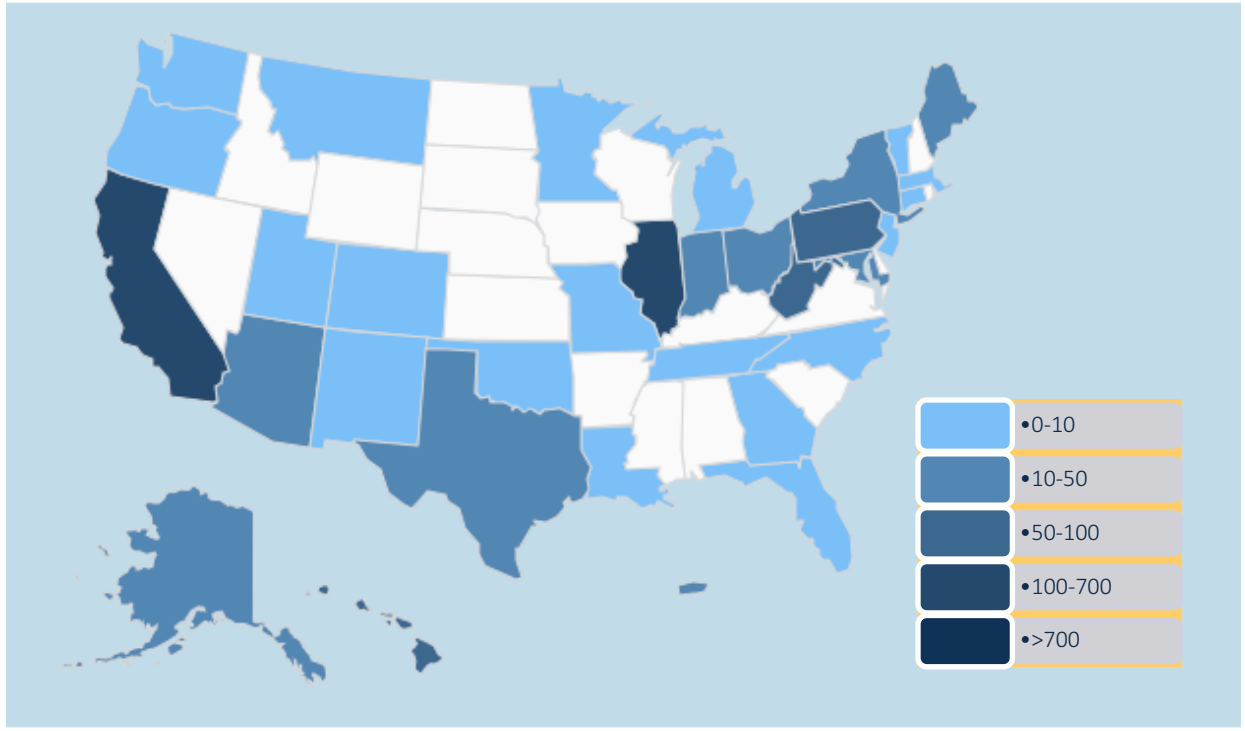
Systems Operating Across the U.S.



Several MW-scale systems have 5+ years of operations

Deployments across states

Front of the Meter Deployments - MW



Source: GTM Research Energy Storage Data Hub

Behind the Meter Deployments - MW

State	Non-Residential	Residential	Total
Arizona	0.00	0.97	0.97
California	66.53	3.10	69.63
Hawaii	1.49	1.96	3.45
Massachusetts	0.00	0.18	0.18
New Jersey	1.89	0.04	1.92
New York	2.29	0.34	2.63
PJM (Excl. NJ)	2.25	0.05	2.29
Texas	0.00	0.14	0.14
All Others	4.21	4.16	8.38
Total	78.66	10.92	89.58

Source: GTM Research

CA will remain in lead, with **HI, AZ, TX, MA,** & **NY** vying for 2nd place through 2022.

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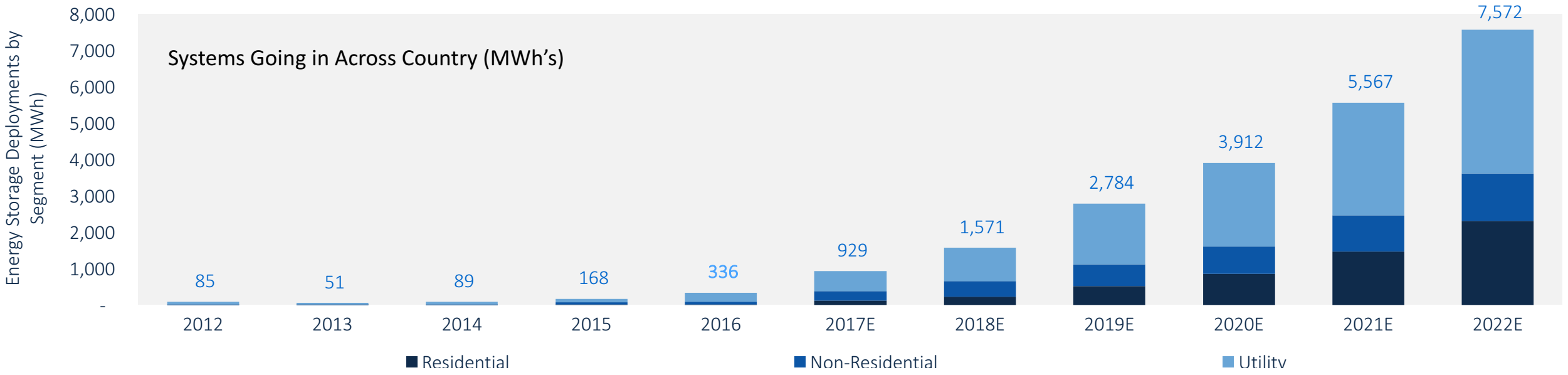
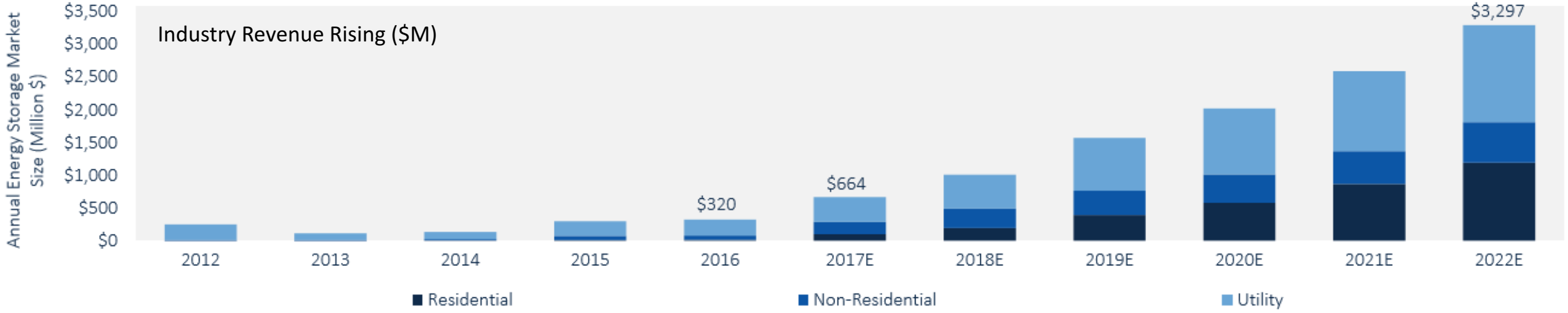


U.S. Annual Energy Storage Market Size, 2012-2022E (Million $)



Source: GTM Research

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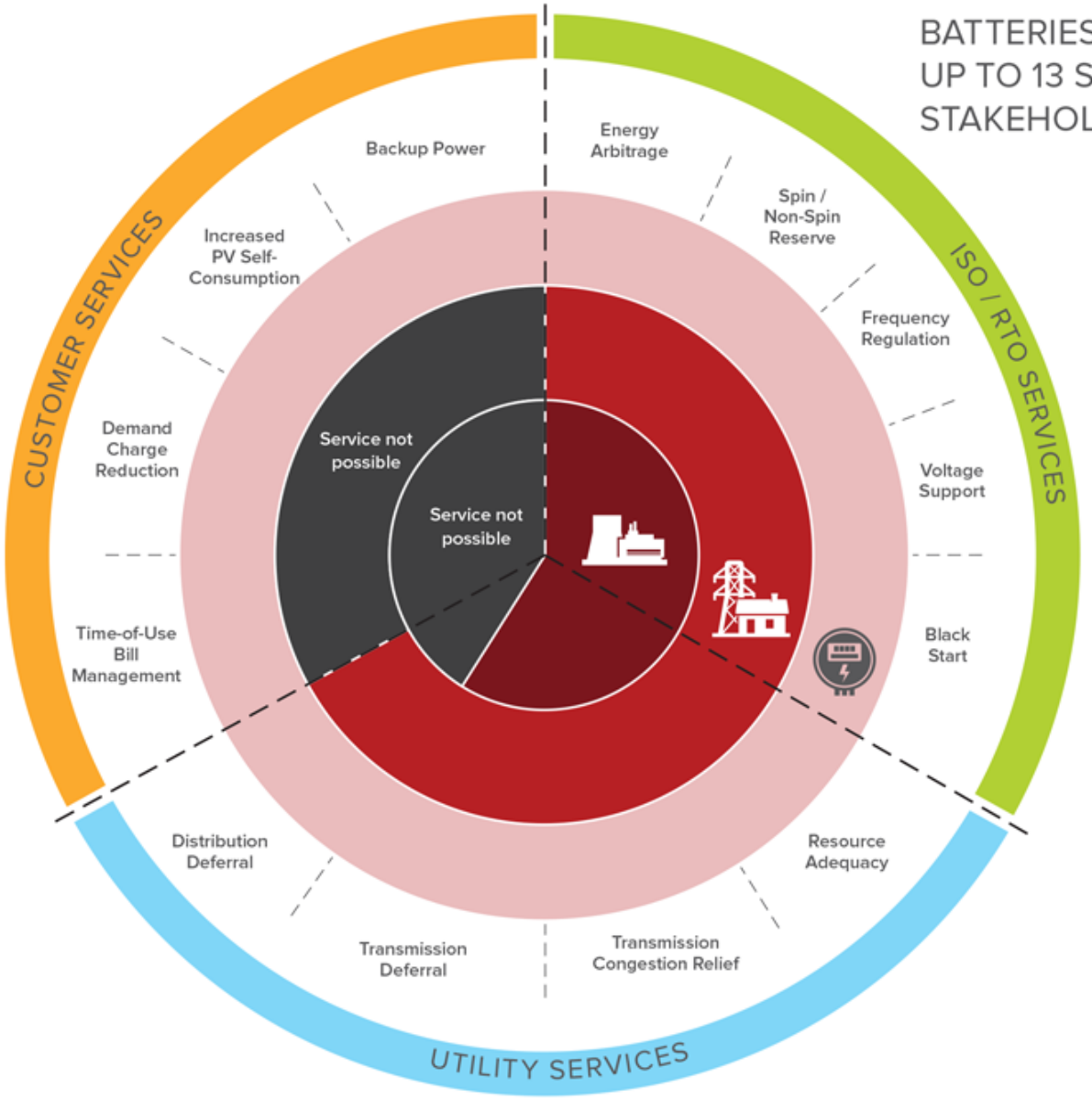
BATTERIES CAN PROVIDE UP TO 13 SERVICES TO THREE STAKEHOLDER GROUPS



Source: Rocky Mountain Institute

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Why is storage important?

Storage optimizes use of the grid & enables system transformation

- **Saves households & businesses money** – reduce spending on excess capacity to meet peak system & local demands, optimize use of grid assets → lower rates
- **Makes the grid more reliable & resilient** – balance supply & demand fluctuations; mitigate supply disruptions and outages; manage planning uncertainty
- **Integrates more clean & distributed energy** – compensate natural variability of renewables and making them "dispatchable;" increase DER hosting capacity
- **Creates businesses & jobs** – new, growing industry offer investment and employment opportunities across the map

Highlights of Recent State Activities

(since Feb 2017 NARUC Winter Mtg)

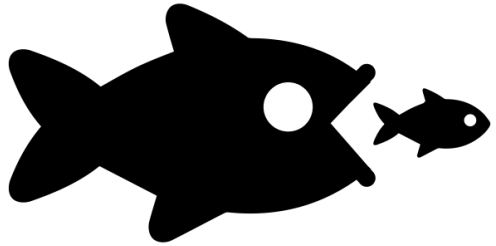
- **TARGETS**
  - **MA:** 200 MWh voluntary target announced
  - **NY:** PSC directed utilities to each complete 2 storage projects by end of 2018
  - **NY:** bill passed that directs PSC to create binding 2030 target
  - **NV:** new law direct PUC to study and establish increasing biennial targets
- **INCENTIVES**
  - **MD:** state tax credit for customer-sited energy storage
  - **MA:** incentive adder for solar PV paired with storage, varying by systems size and duration
  - **NV:** new law creates $5MM solar + storage incentive
  - **NY/FL:** bills passed exempting storage from property tax
  - **CA:** low-income carve out proposed in SGIP funds
- **STUDIES/DEMONSTRATIONS**
  - **MA:** $20MM RFP for storage demos
  - **NY:** $21MM for storage demos
- **RESOURCE PLANNING/PROCUREMENT**
  - **AZ:** All three IOUs selected energy storage in their IRPs
  - **MA:** utility-owned storage proposed in rate case
  - **CA:** 84 MW 4-hour storage delivered in less than 6 months from contract approval to address Aliso Canyon gas shortage
  - **WA:** UTC policy statement on including storage in planning
  - **NM:** NOPR issued to require storage in IRPs
- **DISTRIBUTION PLANNING/GRID ACCESS**
  - **CA:** framework on multiple-use storage proposed
  - **NV:** new law gives customers right to interconnection storage, choose optional TOU rates
  - **NV**: new law requires distribution planning, inclusion in IRPs
  - **NY:** BQDM non-wires alternatives project extended indefinitely
  - **MD**: working group on storage in distribution planning
  - **RI**: proceedings establishing frameworks for distribution planning

…plus storage-related activities in **OR, CO, HI, MN, VA, PA, VT, NJ,** and more

Policy Tools Fall Into Three Categories

Capture the full VALUE of energy storage

Ensure accurate market signals that monetize economic value, operational efficiency, and societal benefits



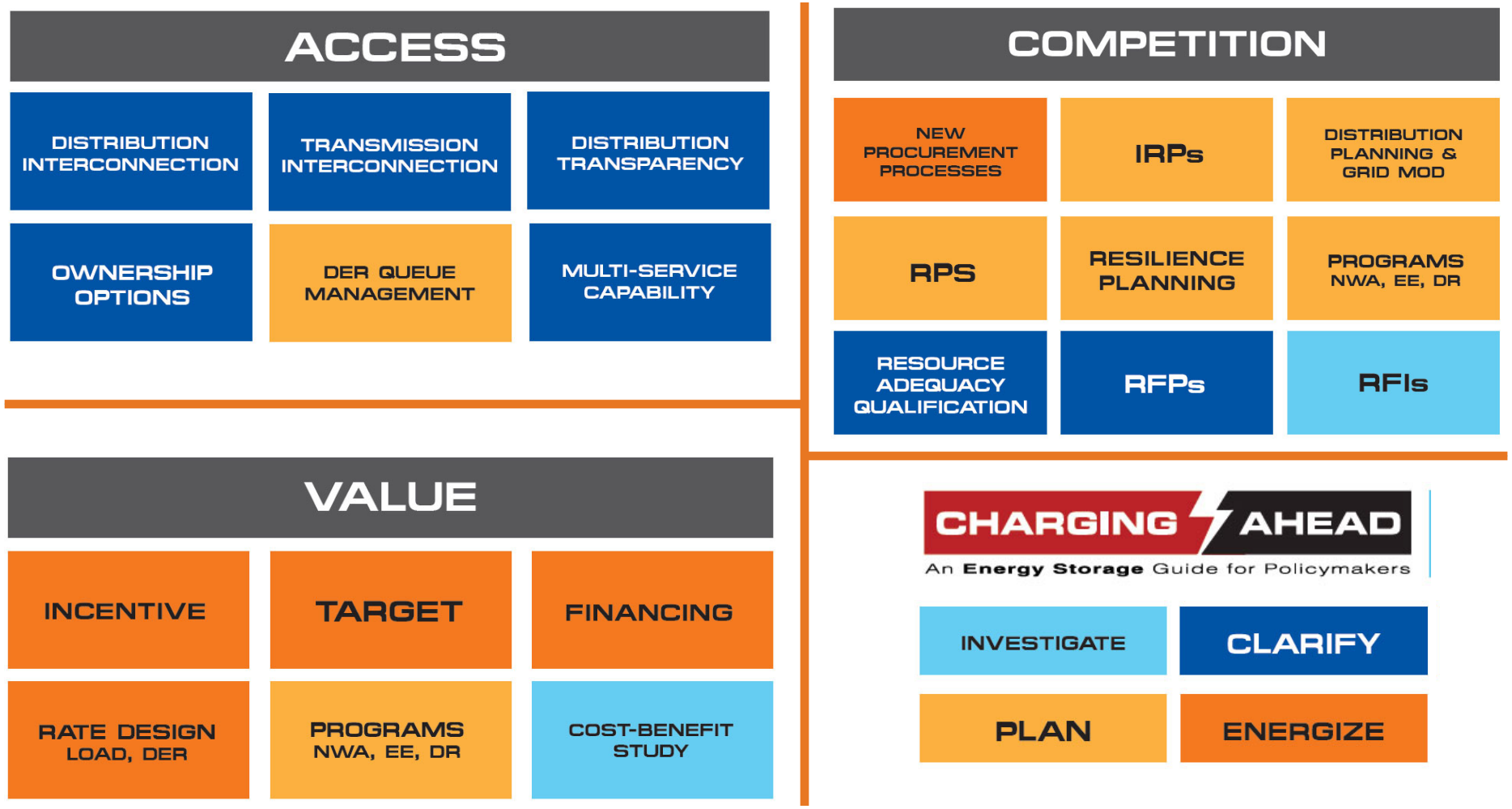
Enable COMPETITION in all grid planning and procurements

Storage can be a cost-saving and higher-performing resource at the meter, distribution, and transmission levels

Ensure fair and equal ACCESS for storage to the grid and markets

Reduce market and grid barriers that limit the ability for energy storage systems to interconnect

Policy Tools in the Toolbox



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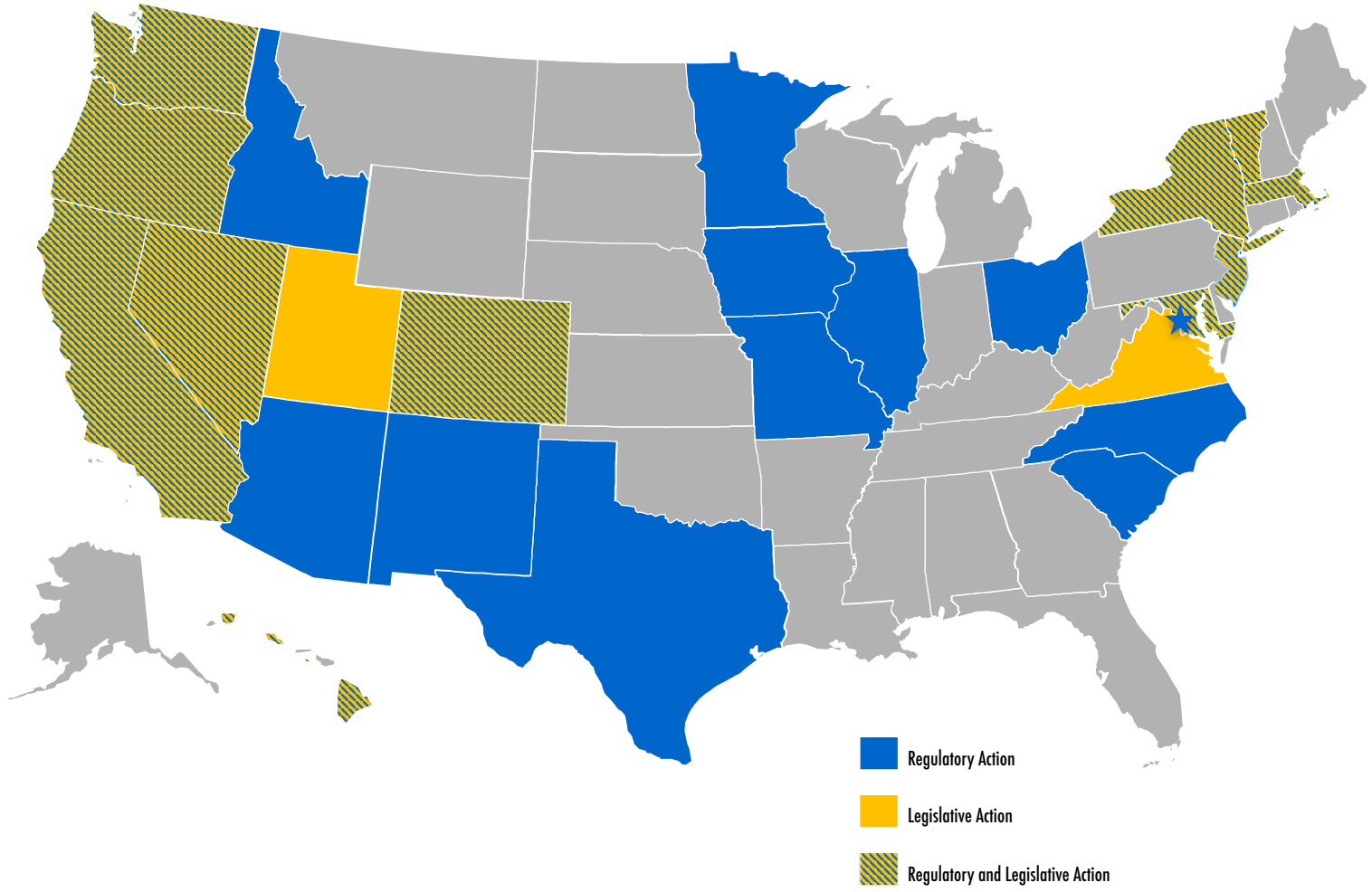
State Storage Activity



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Top Storage Policy States

	Incentives	Procurement Target	Rate Design	Interconnection Standards	Distribution Planning	Cost-Benefit Study	IRP
California	●	●	◗	●	◗		◗
New York		◗			●		
Oregon		◗				●	◗
Nevada	●	◗		●		●	◗
Maryland	●		◗	◗		◗	
Massachusetts	◗	◗				●	
Hawaii			◗	●	◗		●
Arizona			●				◗
Washington							◗

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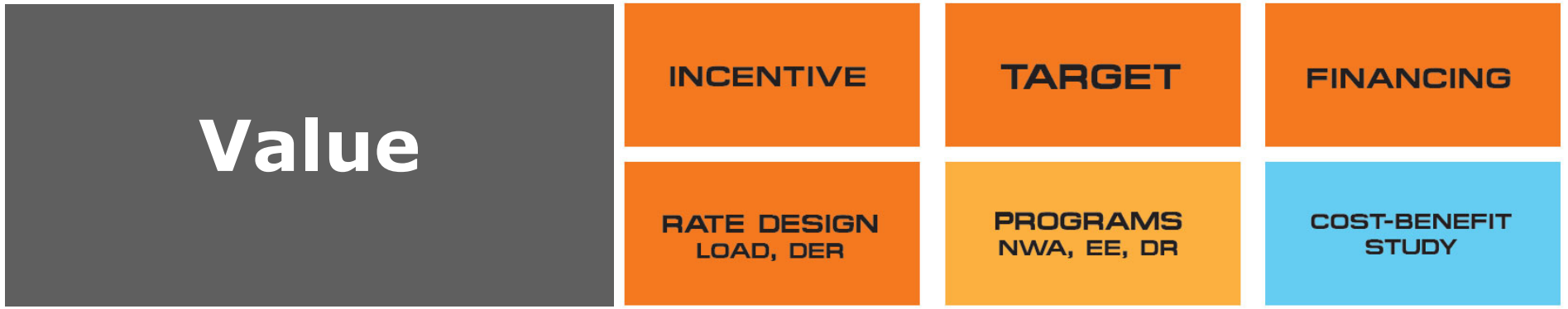
Why Focus on Value?

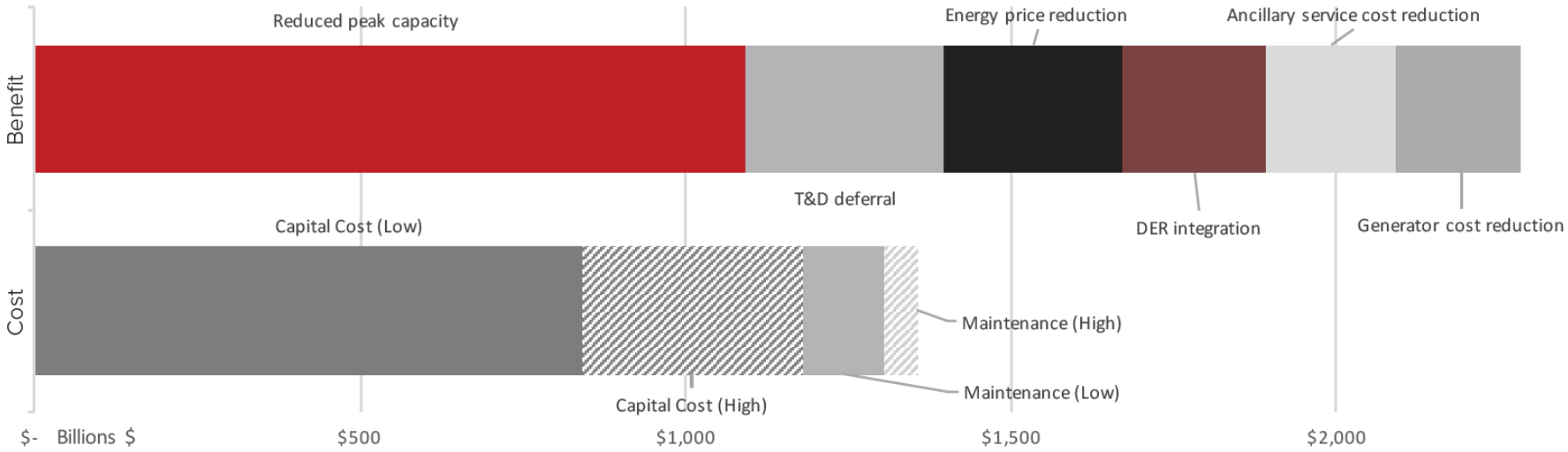
- Current market structures and policies lack clear mechanisms to identify and capture full value of energy storage systems
- Ensure net system benefits and cost savings to ratepayers by setting accurate market compensation for energy storage systems



- Setting a cost-effective, "no regrets" **procurement target** for storage jump-starts market creation, drives learning-by-doing, and orchestrates development of regulatory framework
- **Incentives** in the form of rebates, grants, or various tax incentives, can provide a bridge to scalable deployment for storage
  - Incentives should be designed to decline as storage values become more readily monetized
- Dynamic and **time-varying rates** can signal to customers the value of leveraging storage while better aligning customer costs with system costs

Cost-Benefit Analysis

Massachusetts' State of Charge Report an excellent example of storage cost-benefit analysis



Source: MA DOER State of Charge Report, 2016. Note: Graph recreated from original "State of Charge" report.

Other states investigating storage include

Nevada, Oregon, and **North Carolina.**

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Why Focus on Competition?

- Storage often not on the menu of options in planning and procurement.
- When storage is included, it is often with outdated assumptions.
- Legacy metrics such as LCOE do not reflect the operational parameters or value proposition of energy storage.
- The benefits storage can offer may not be captured in metric by which value is defined.

Competition

- Including storage in **IRPs** and **distribution planning** is critical to least-cost planning
- Utilities in some states are pioneering reverse auctions for peak load reduction as **non-wires alternatives**
- States are revisiting **RPS programs** and **resource adequacy qualifications** to consider how storage can meet system needs

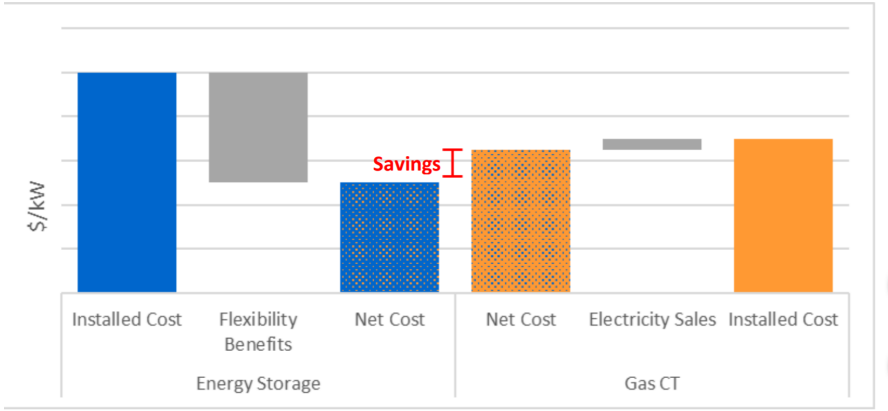
IRPs and Storage

- IRPs are used in ~25 states
- Utilities planning to invest billions of dollars in new and replacement capacity over the next several years
- Planning models not granular enough to capture operations of advanced storage
- Models use inaccurate and out-of-date cost information

How Can Storage Be Included in IRPs?

- Should take proactive approach to include storage in resource planning
- ESA recommendations:
  - Ensure storage is included as eligible technology
  - Use latest cost/performance data
  - Match resource need with resource selection
  - Use sub hourly modeling
  - Ensure net cost of capacity (stacked benefits) are considered
  - Incorporate load-sited storage options as a potential resource
  - Check out www.EnergyStorage.org/IRP for more info!

Figure 1 Example Net Cost of Capacity Calculation



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Net cost of capacity = Total installed cost – Operational benefits (flexibility operations & avoided costs)

Why Focus on Access?

- The market wasn't designed to include storage
- Inadvertent roadblocks prohibit storage from interconnecting and participating in the market
  - ✓ Arcane rules require 100 MW wind farm with 20 MW battery to interconnect at 120 MW, resulting in unnecessary and costly upgrades – *PROJECT NOT BUILT*
  - ✓ Behind the meter storage simply used to shift load may be treated as an injecting resource requiring unnecessary interconnecting processes and costs – *PROJECT NOT BUILT*

- Updating **interconnection** rules and standards is key to ensuring fair, streamlined and cost effective access for storage
- In **wholesale** markets, reform rules on metering, telemetry and accounting to allow customer-sited storage to provide both retail and wholesale services

States Advancing Storage Access

States updating their interconnection procedures to include storage:

- *California* – Rule 21
- *Hawaii* – Rule 14H and Rule 22 (CSS)
- *Nevada* – Rule 15 update
- *Maryland* – PC 44 interconnection working group

- NC, MN, AZ, and others considering revisiting

Conclusions

- It all comes down to **Value**, **Competition** and **Access**
- Investigative studies are useful, but only if they have an end goal of developing a procurement target
- Procurement targets are good tool to encourage learning by doing and jumpstarts process to include storage in utility processes
- Procurement targets and incentives not enough – need effective interconnection and rate design to make sure resources show up
- Many states are already designing policies for a robust storage market. Now is the time to act!

Thank you…and Q&A

Matt Roberts

m.roberts@energystorage.org

Jason Burwen

j.burwen@energystorage.org