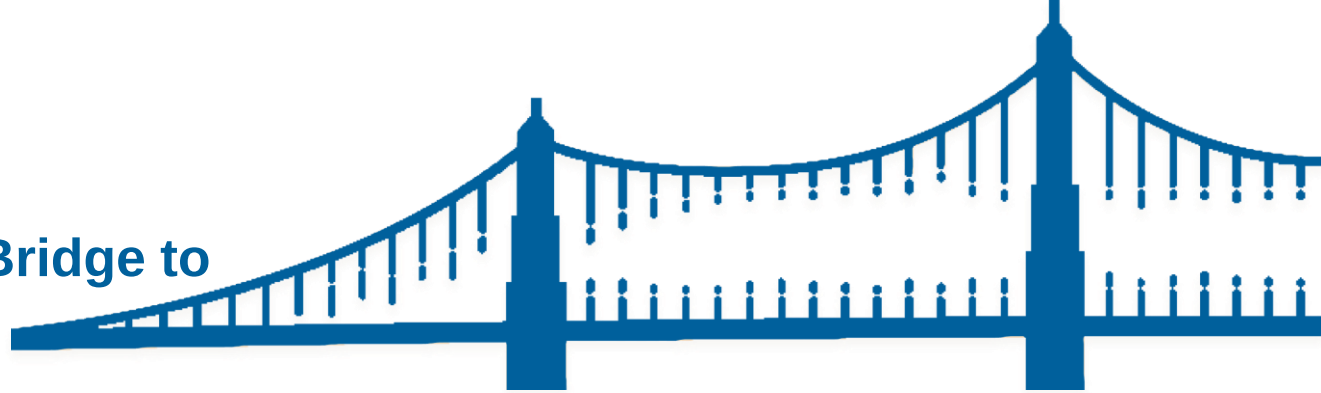
Loan Programs Office

Building a Bridge to Bankability



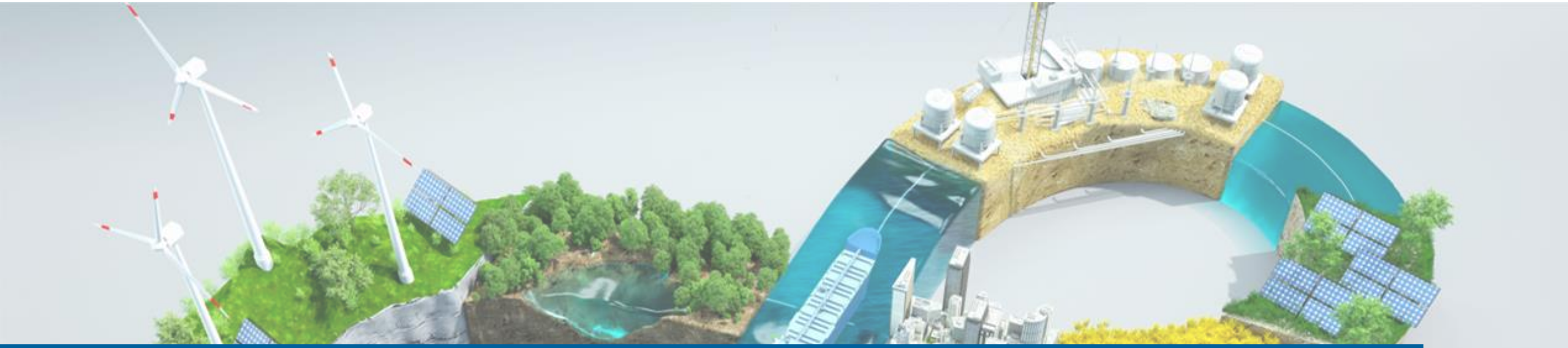
VPPs: *Pathways to Commercial Liftoff*

Flex Coalition

2/22/23

David Nemtzow
Loan Programs Office, U.S. DOE

U.S. DEPARTMENT OF ENERGY



Pathways to Commercial Liftoff

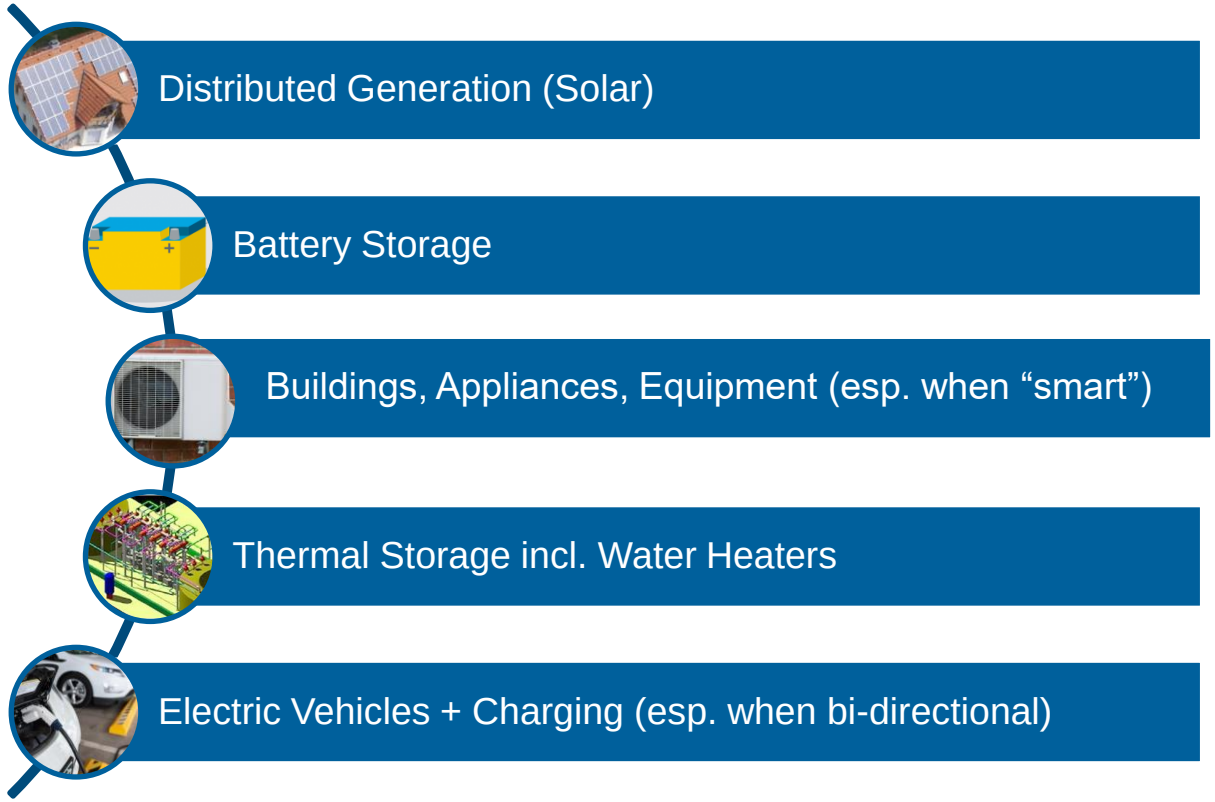
Quick review at the last several seasons…

GEBs & Connected Communities: Making the Whole Greater Than the Sum of the Parts

What are Virtual Power Plants?

*VPPs are aggregations of clean distributed energy resources (solar, storage, efficiency, EVs, etc.) that act like a powerplant…large enough to be **utility scale**, and connected, controllable & reliable enough to be **utility grade**. Each VPP has DERs in multiple locations and are connected virtually.*

- ✓ Respond to a grid signal, price signal, and/or pre-set optimization algorithm, etc.
- ✓ Non-co-located assets scaled into a holistic demand-side and/or supply-side resource
- ✓ Entitle the VPP participants to financial (and other) bene-fits, potentially including compensation, for services rendered
- ✓ Can be organized & managed by various parties, incl. utilities, aggregators, OEMs, etc…wide array of business models
- ✓ (Non-utility) VPP provider may receive payments from retail utility and/or wholesale markets.
- ✓ VPPs serve numerous key customer, grid, societal functions (see later slide)

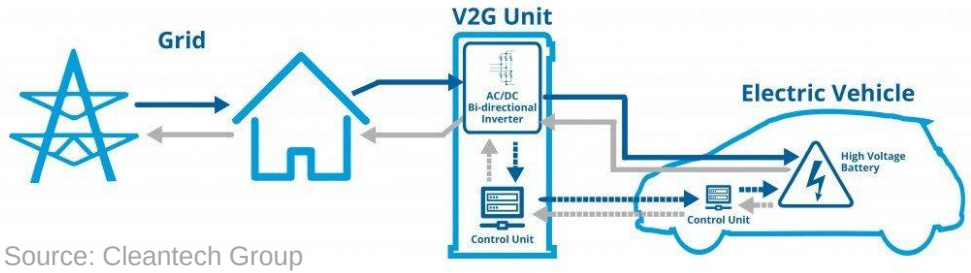


VPPs are utility-scale and utility-grade

VPPs come in many varieties (and trim levels)

swell
Hawaiian Electric

Source: www.swellenergy.com/hbrmaui



Source: Cleantech Group

CTA-2045 module (Source: Virtual Peaker)

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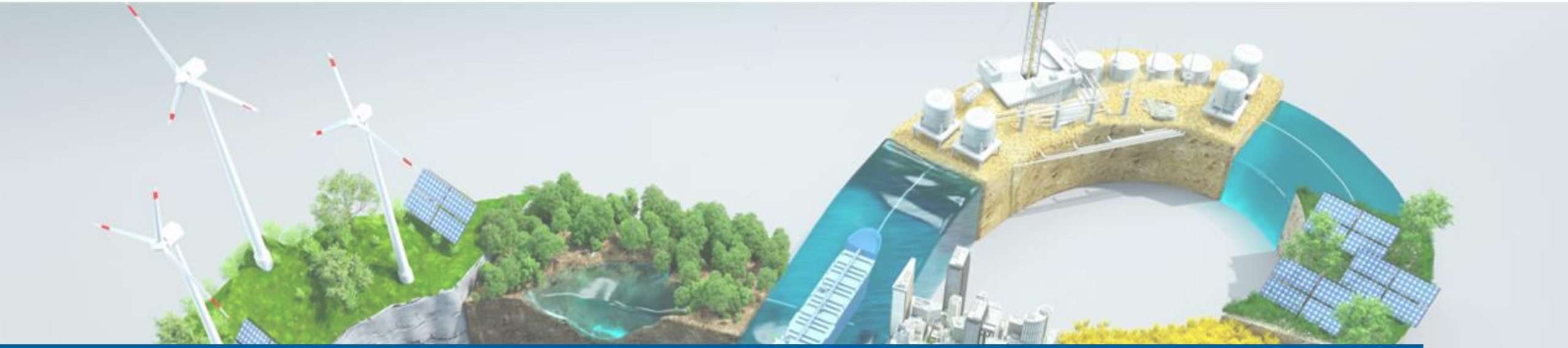
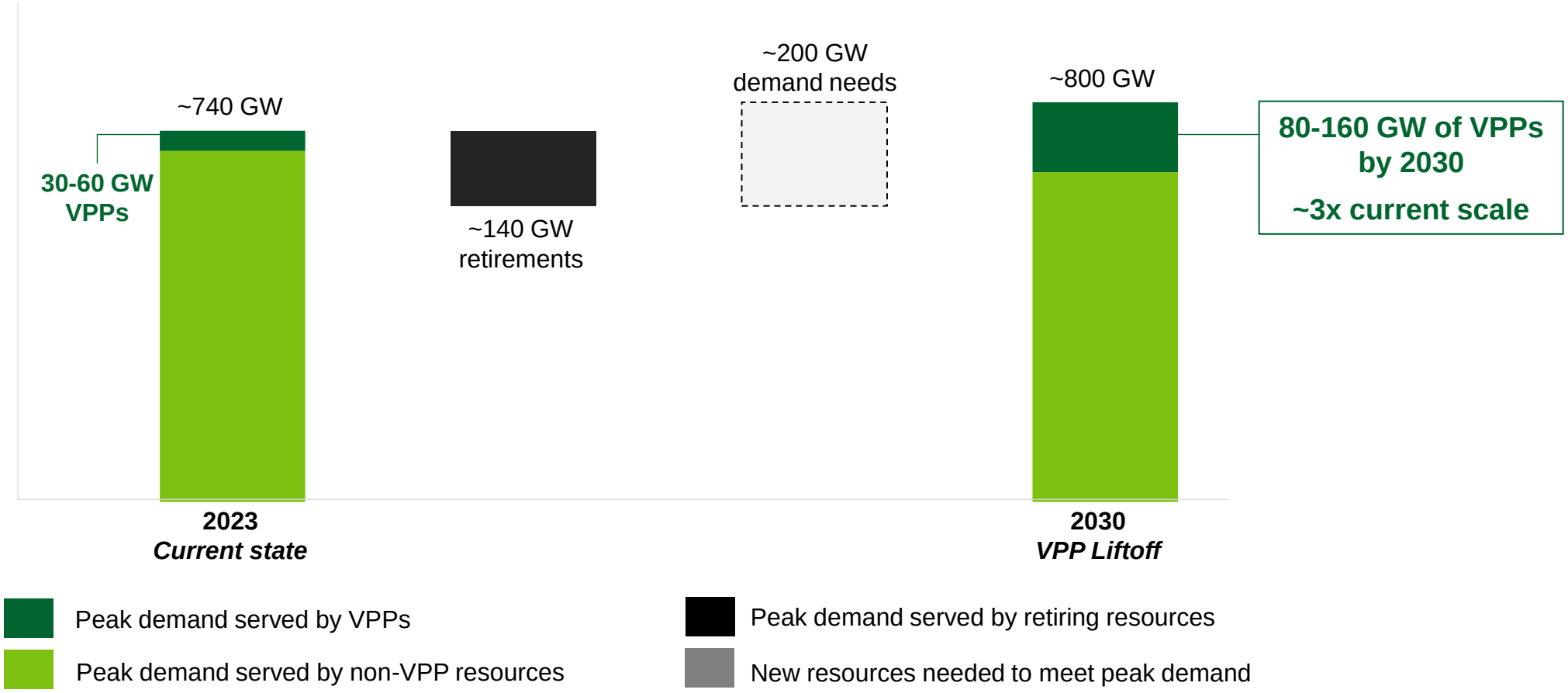


Pathways to Commercial Liftoff

Recent findings

Tripling current VPP scale by 2030 could address 10-20% of peak load nationally while saving ~$10B per year in grid spending

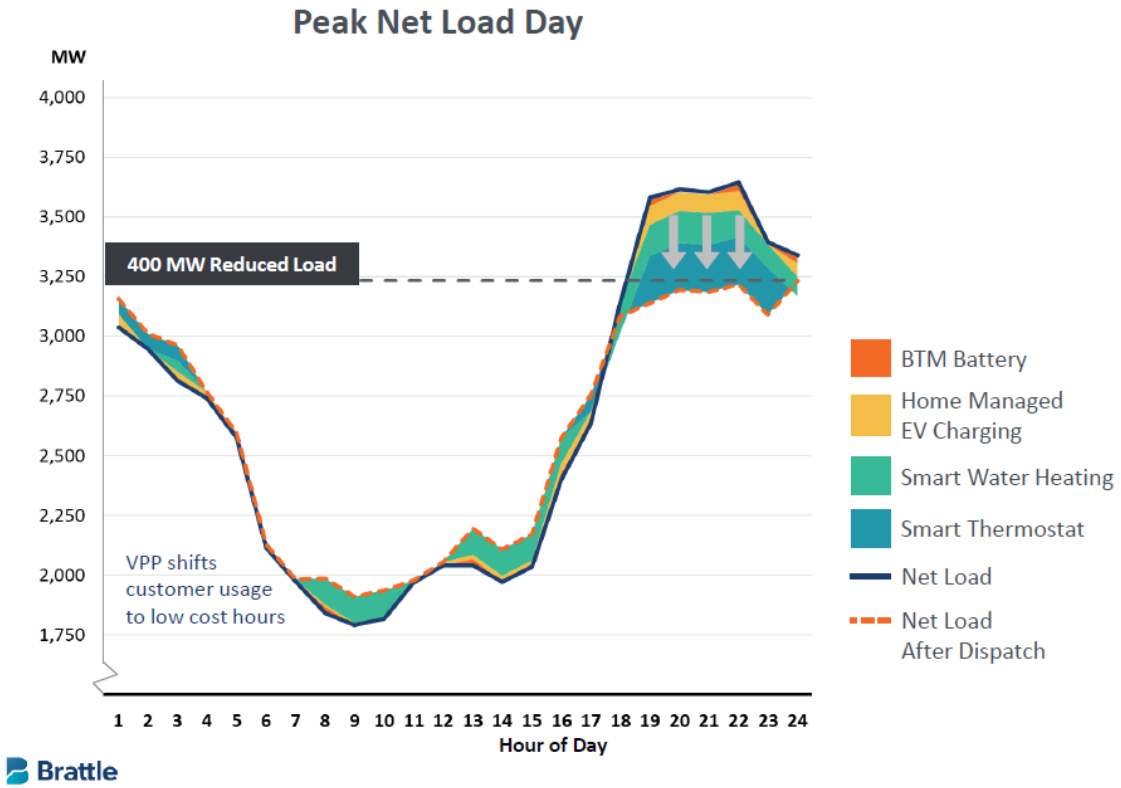
U.S. peak electricity demand, GW



Modeling 400 MW VPP (1 of 2)

The modeled VPP can fully provide 400 MW of resource adequacy for a moderately-sized utility

We modeled four commercially available residential demand flexibility technologies for an illustrative utility composed of 1.7 million customers

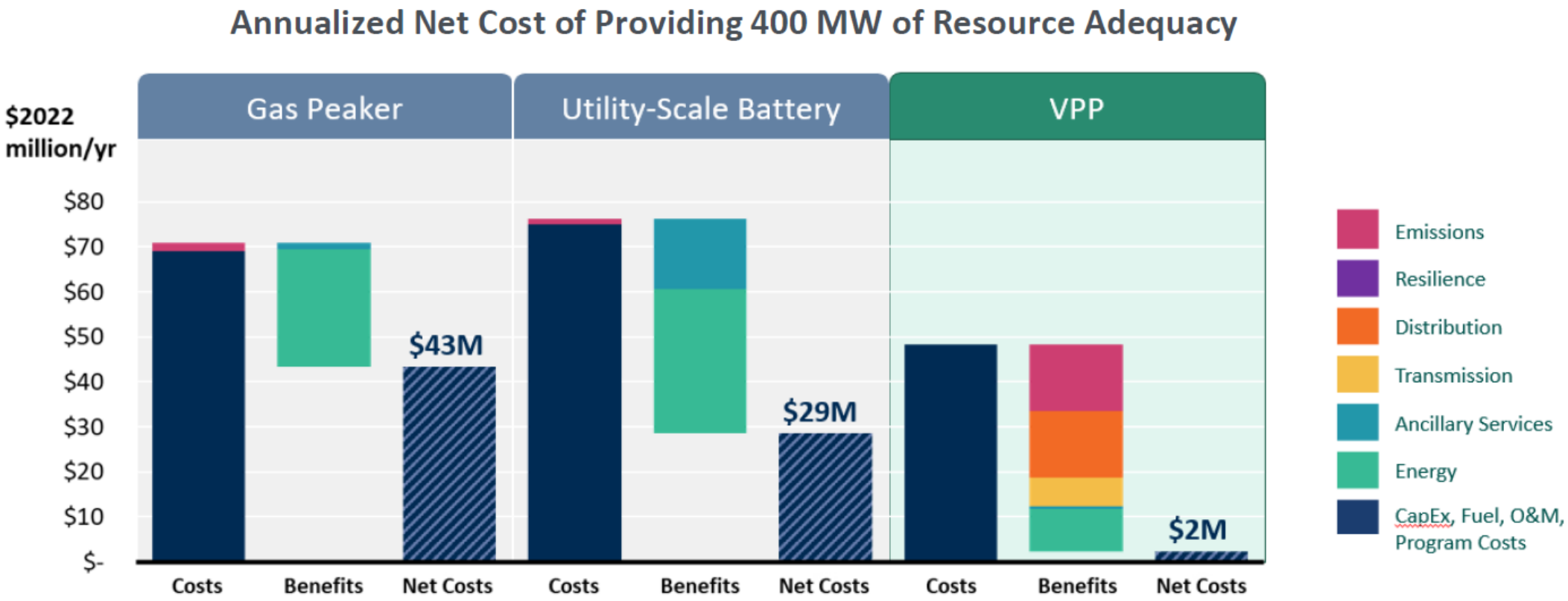


The VPP reduces load in:

- Summer and winter
- 7 months
- 63 hours of the year
- 7 consecutive hours

Source: Ryan Hledik, Brattle Group

“Resource Adequacy…for Cheap” (2 of 2)



RMI estimated that 60 GW of VPPs could be deployed nationally by 2030. At that scale, VPPs would save $15 to $35 billion in resource costs relative to the alternatives over 10 years … plus $20 billion in societal benefits

Source: Ryan Hledik, Brattle Group

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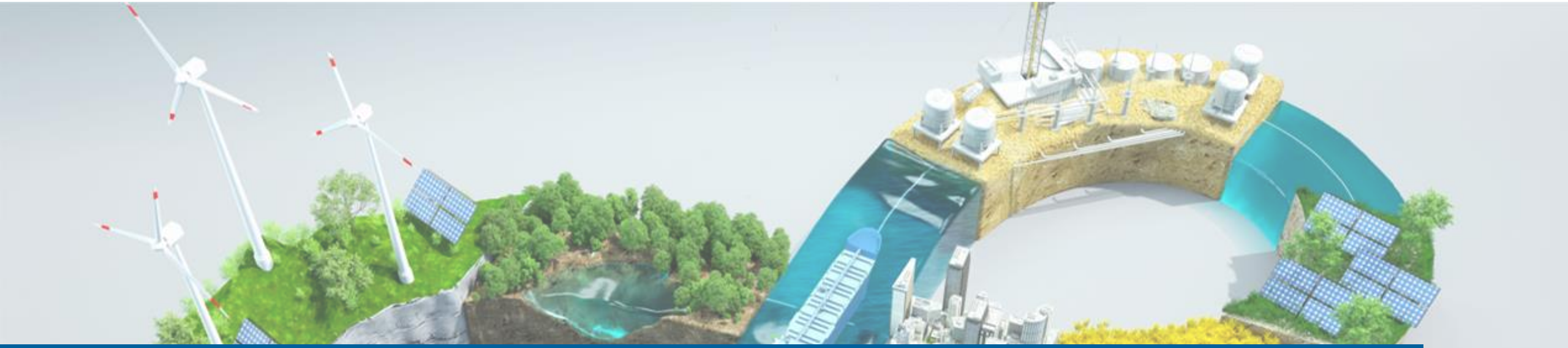

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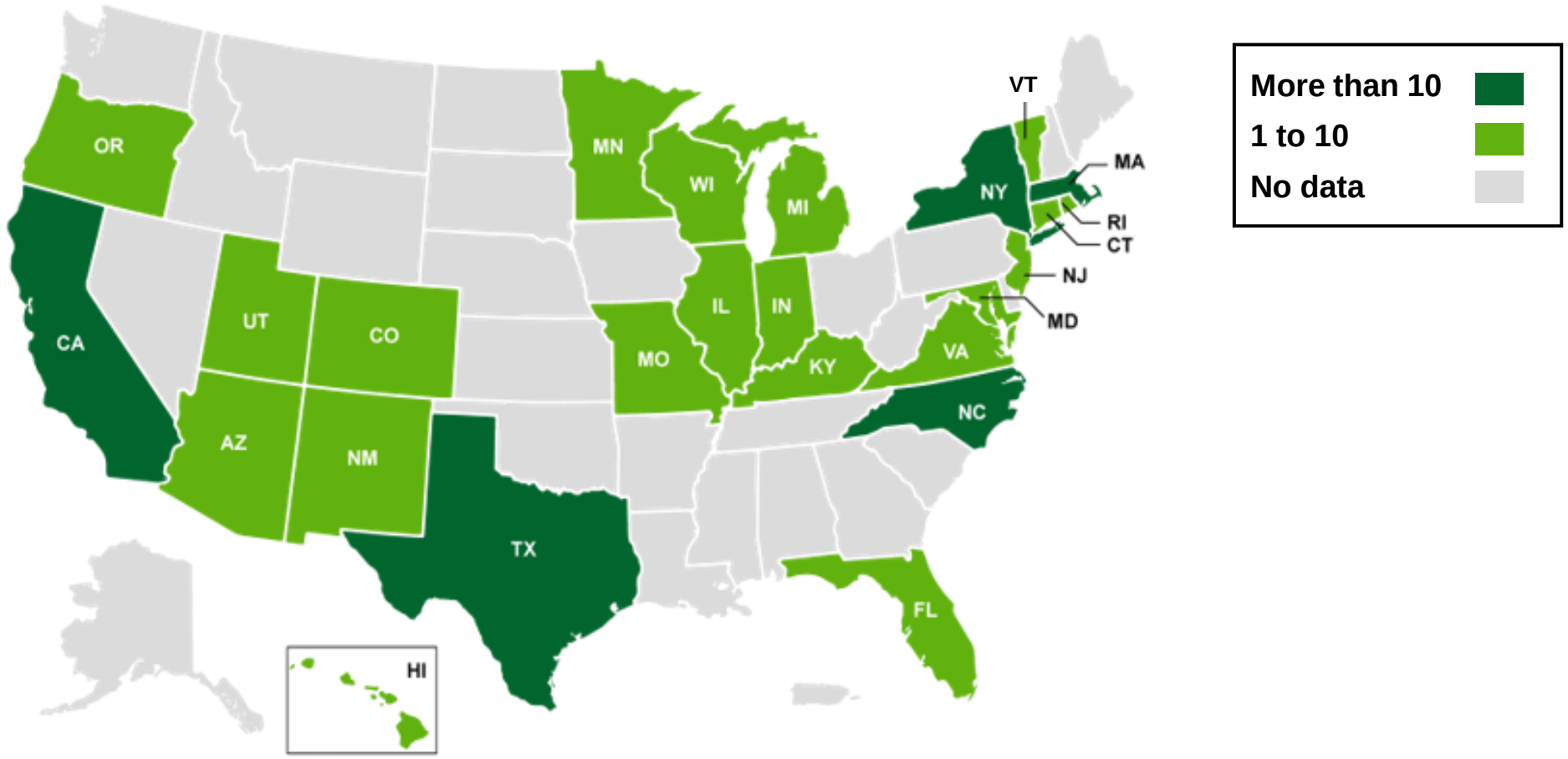
Virtual Power Plants | September 2023

liftoff.energy.gov/vpp

VPPs are concentrated in a few states with favorable market mechanisms in wholesale and retail markets

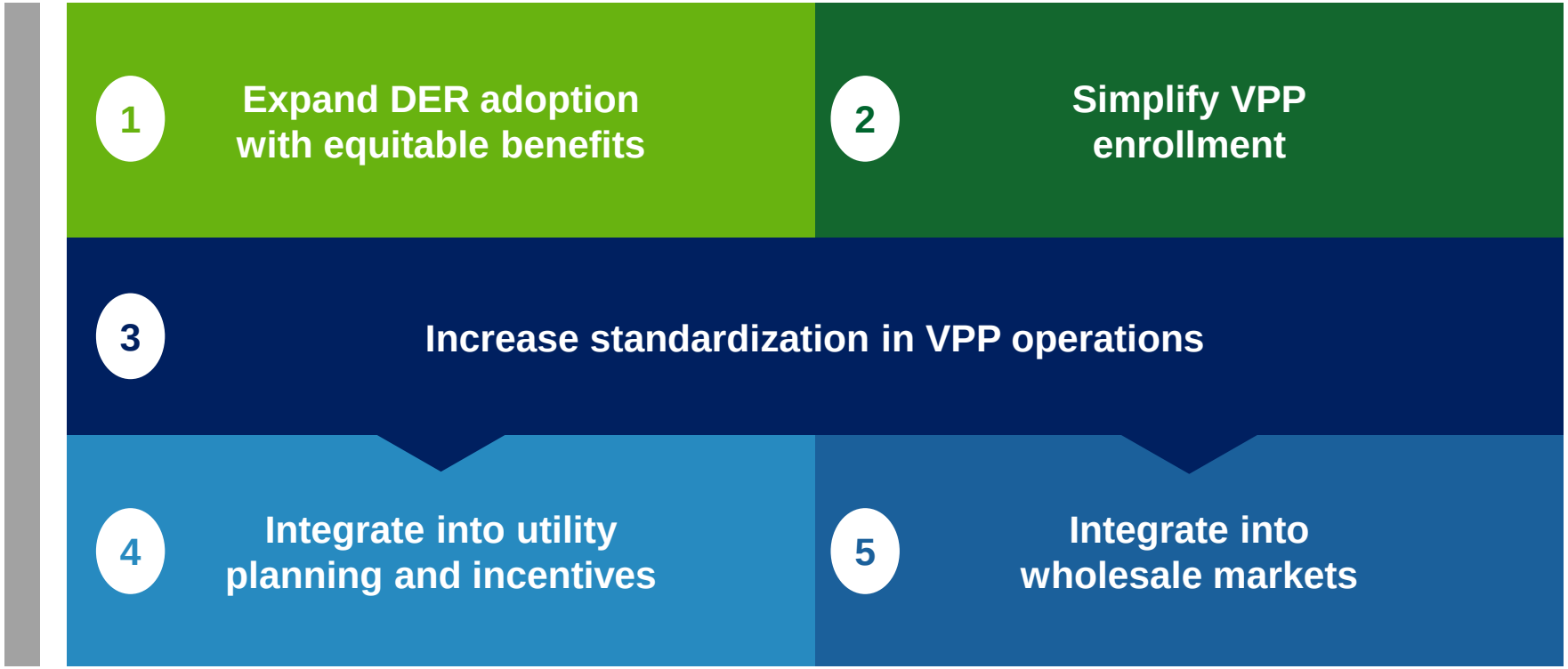
Number of 3rd party VPPs procured by utilities in each state (2022)



Source: Wood Mackenzie Grid Edge Service. Industry interviews.

Five imperatives will accelerate Liftoff for VPPs

Imperatives for VPP liftoff



Five imperatives will accelerate Liftoff for VPPs, including increased DER enrollment, standardized VPP ops, and improved market integration

Imperatives for VPP liftoff

1. Expand DER adoption with equitable benefits
2. Simplify VPP enrollment
3. Increase standardization in VPP operations
4. Integrate into utility planning and incentives
5. Integrate into wholesale markets

Example solutions

Low-cost financing for DERs

Five imperatives will accelerate Liftoff for VPPs, including increased DER enrollment, standardized VPP ops, and improved market integration

Imperatives for VPP liftoff

1. Expand DER adoption with equitable benefits
2. **Simplify VPP enrollment**
3. Increase standardization in VPP operations
4. Integrate into utility planning and incentives
5. Integrate into wholesale markets

Example solutions

Automatic enrollment upon DER purchase, with opt-out

Five imperatives will accelerate Liftoff for VPPs, including increased DER enrollment, standardized VPP ops, and improved market integration

Imperatives for VPP liftoff

1. Expand DER adoption with equitable benefits
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Example solutions

Common modeling tools and datasets for performance forecasting, management, and measurement

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Example solutions

Aligned incentives in utility compensation and rate design

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Example solutions

Support for ISOs/RTOs to overcome region-specific barriers

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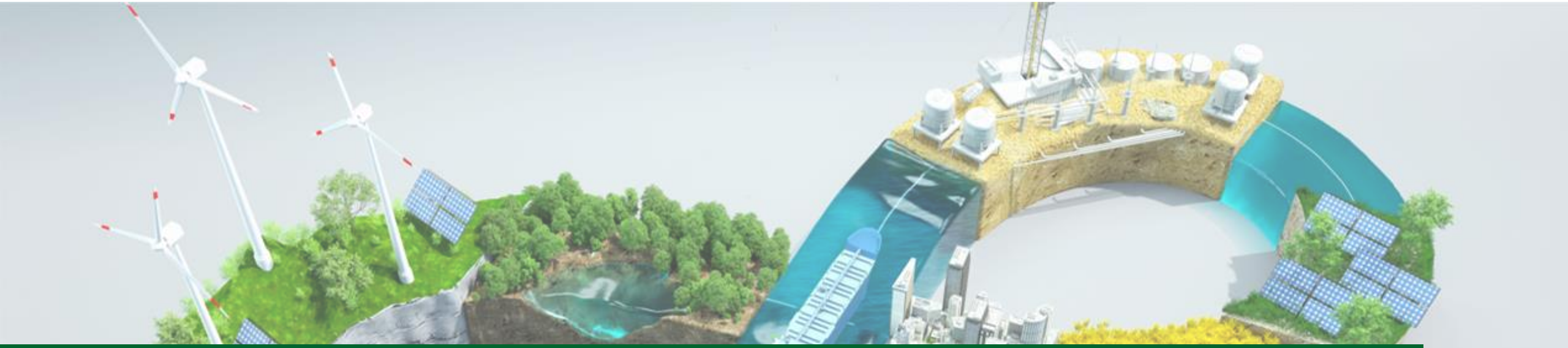

Pathways to Commercial Liftoff

What now needs to happen?

Challenges/Responses for VPP Deployment

- **Enhance discussion** of VPPs and issues among market, policy, regulatory actors
- **Perception** among utilities (& grid operators, regulators, others) that VPPs are not reliable
- Increase low-cost **financing** for DERs
- Ensuring **reasonable ratings** from rating agencies (based on credible portfolio model)
- Simplified, or even automatic (with opt-out), **enrollment** upon DER purchase
- **Common** modeling tools and datasets for performance forecasting, management, and measurement
- (At least more) **standardized data access** and sharing among customers, 3rd parties, grid operators
- **Align incentives in utility compensation** and rate design
- Enhance other **regulatory mechanisms** & signals, incl. IRP, DSP, RA
  - PUCs, FERC, ISOs/RTOs
- Ensuring that **all Americans**, including LMI households, have access to clean DERs/VPPs

PUCs potential roles accelerating VPPs (& DERs)

Investigate / Adopt / Engage / Consider re: role of VPPs by state or service territory:

- **Performance-based regulation** – to help avoid conflicting signals re: non-capex options
- **Distribution system planning** requirements that include all resource options including DERs
- **Energy efficiency resource standards** or other EE procurement requirements – include, as allowable, peak management, demand flexibility etc.
- **Peak demand management** goals/requirements
- **Time-sensitive valuation** – for sizing rebates/incentives, to focus utility technical assistance, potentially for tariffs/charges
- Standardize access to **utility and customer data** to promote deployment of DERs
- Utility-supported **financing mechanisms**, e.g. on-bill financing
- Utility-supported **consumer education, technical assistance**, etc. for end users

Loan Programs Office

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