INDIA SMART UTILITY WEEK

Virtual Power Plants (VPPs)

AGENDA

Virtual Power Plant

VPP-Value Stack

VPP Business Models

Policy Priorities

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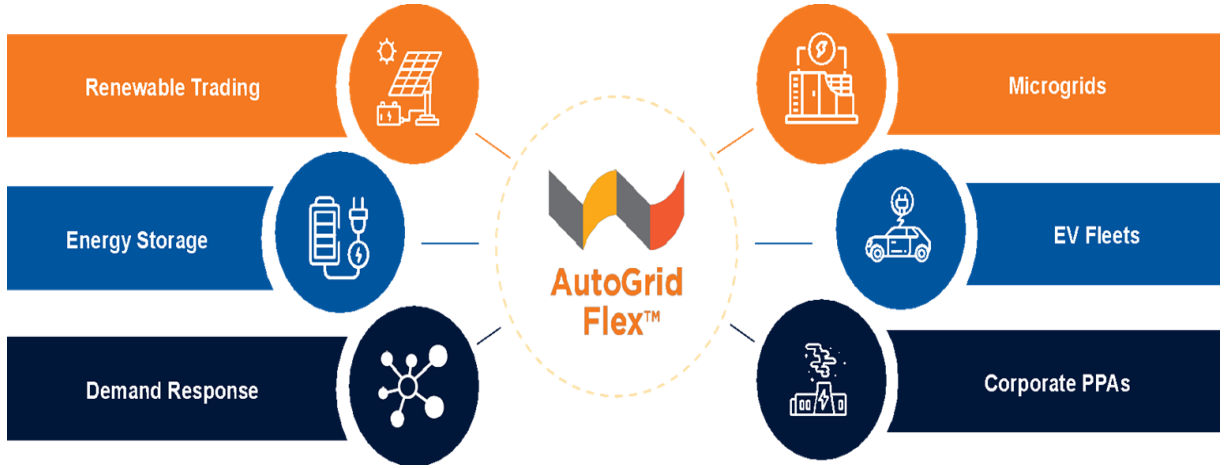
Leader in Global Flexibility Management

50+
Global Energy Customers

8,000 MW+
Flexible Resources

17 Countries
Operational Systems

Marquee Customers Across the Globe



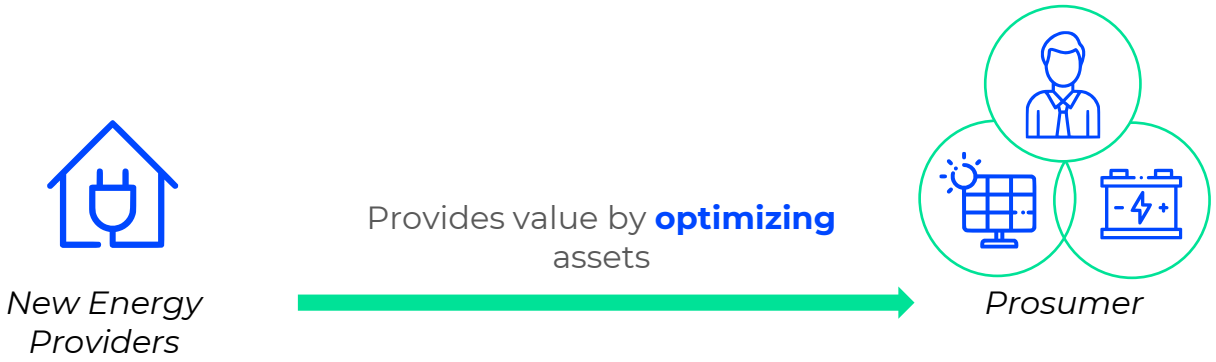
TotalEnergies · Shell · CLP · TATA POWER · Pacific Gas and Electric Company · uplight | AutoGrid · CPS Energy · CPA Clean Power Alliance · nrg · Consumers Energy

Century-Old Utility Business Model Is Being Disrupted

Traditional Utility Model

- **Capital-intensive** as utility owns production / distribution
- **Centralized,** carbon-intensive power production
- **Fragmented** market with regional monopolies
- Driven by **government regulation**

New Energy Providers Are Powered by AutoGrid



- **Capital-light** as new energy providers optimize existing assets
- **De-centralized,** clean power production
- **Globally scalable,** creating market network effects
- Driven by **market competition**

AutoGrid provides **AI-based optimization** to improve IRR for new energy assets

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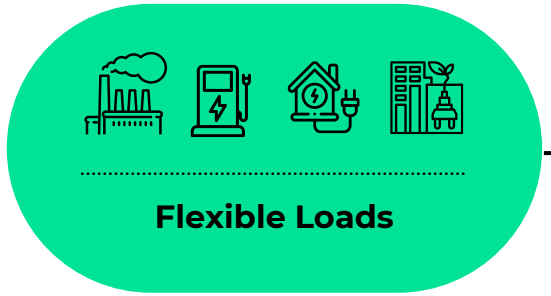
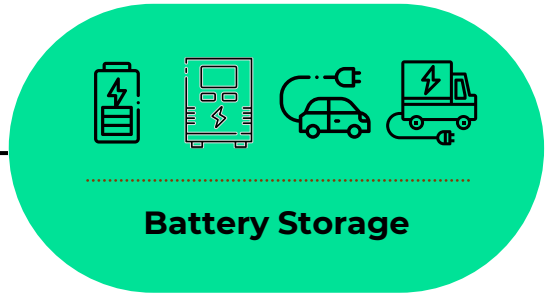
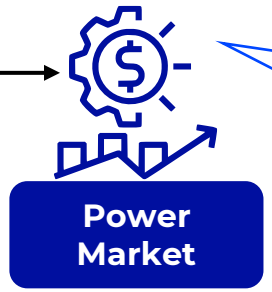
VPP Framework



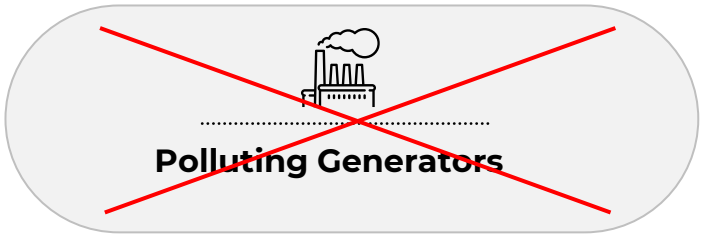


- Peak Management
- Network Management
- Price Hedging
- Grid Emergencies

AGGREGATOR



- Capacity
- Energy
- Ancillary services



Information and Education

Customer Incentive and Engagement

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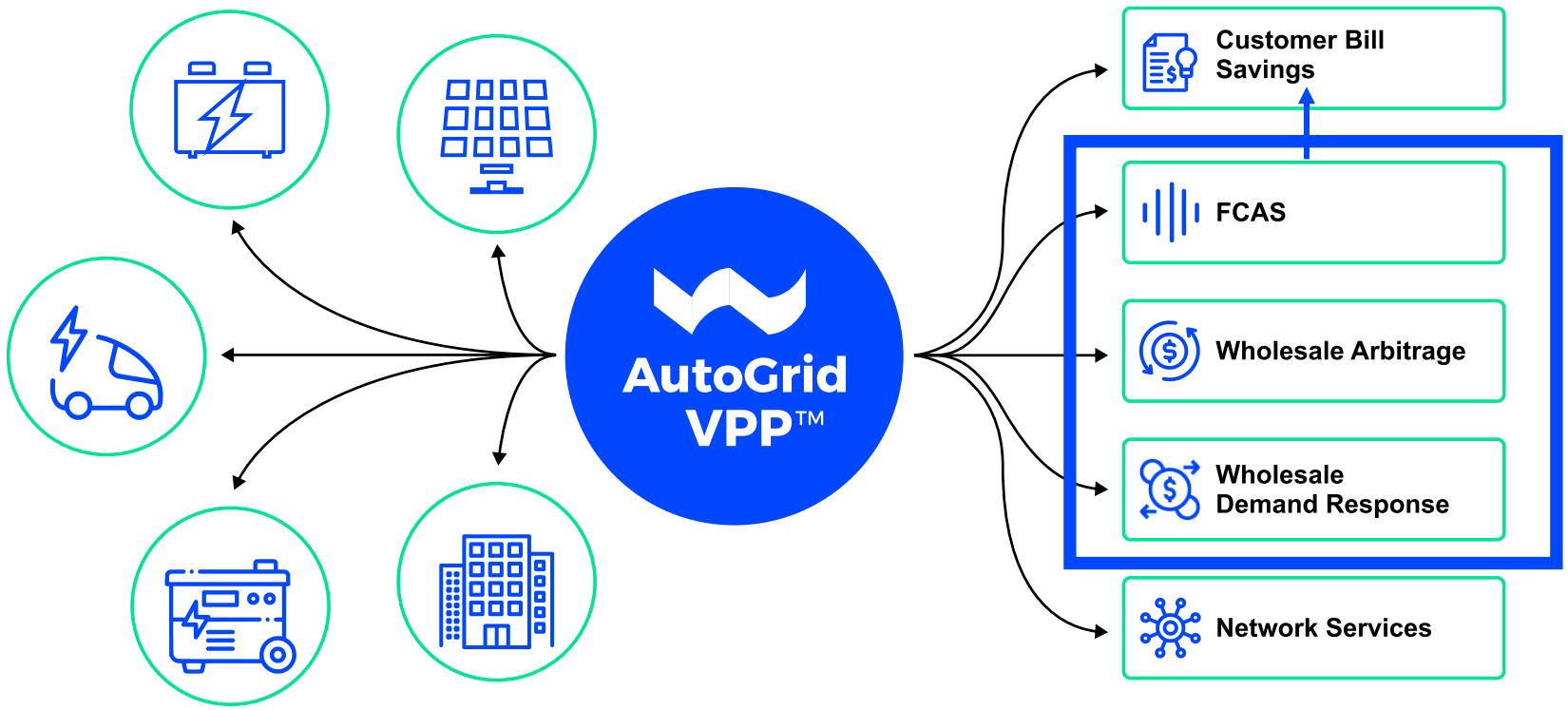
Multi-Asset, Multi-Market VPP



- Grid Flexibility & Resiliency
- Increase Customer Satisfaction
- Hedge Against Market Volatility
- Open New Revenue Streams

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VPP Business models

VPP Solutions

- Bring Your Own Things
- C&I Automated DR
- Behavioral DR
- Renewable and DER Trading
- Utility Scale Storage
- Virtual PPAs
- Solar + Storage Fleets
- Microgrids
- EV Fleet Management

Segments

- Utilities
- New Energy
- Retailers/ EaaS
- EV Fleet

Customers and Partners

CLP 中電 · CPS ENERGY

TOTAL

Shell · Life Is On Schneider Electric · GreenStruxure

Zūm

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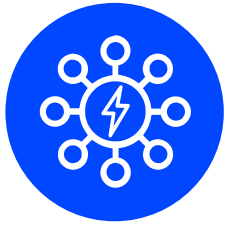
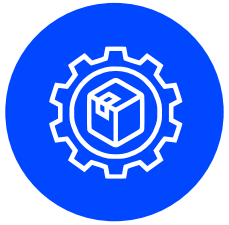
Policy Priorities for VPP Deployments

Appropriately Compensate VPPs

- End customer incentives
- Dynamic rates for DER exports
- VPPs compensated for T&D deferral



Interoperability & Open Protocols



- Open Standards (OpenADR, IEEE 2030.5) promote customer choice
- Open access to proprietary APIs (pay API fees, expect access / documentation)

Incorporate VPPs into Utility Planning Procedures

- VPPs as cheaper source of Capacity
- VPPs should be included in IRPs, especially for NWAs

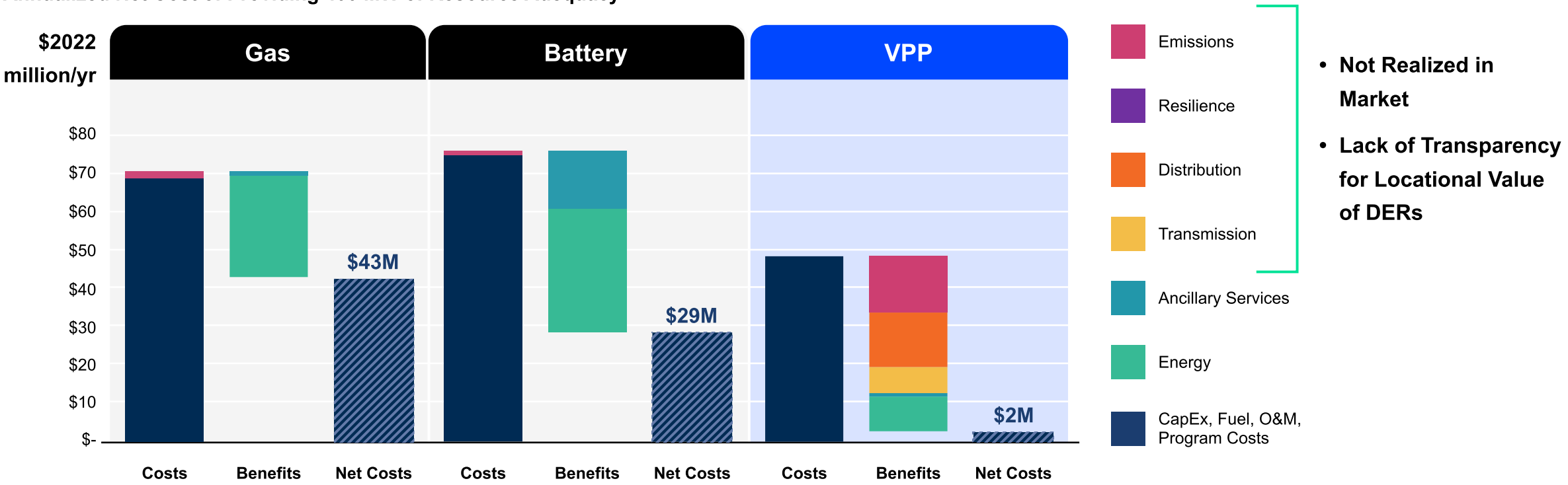
Market Participation for DERs

- Participation in wholesale markets
- Realistic telemetry requirements
- Market products access for DERs (capacity payments, T&D deferral, etc)

1. VPPs Provide Under-Valued Grid Benefits

VPPs could provide the same resource adequacy at a significant cost discount and emission reduction.

Annualized Net Cost of Providing 400 MW of Resource Adequacy

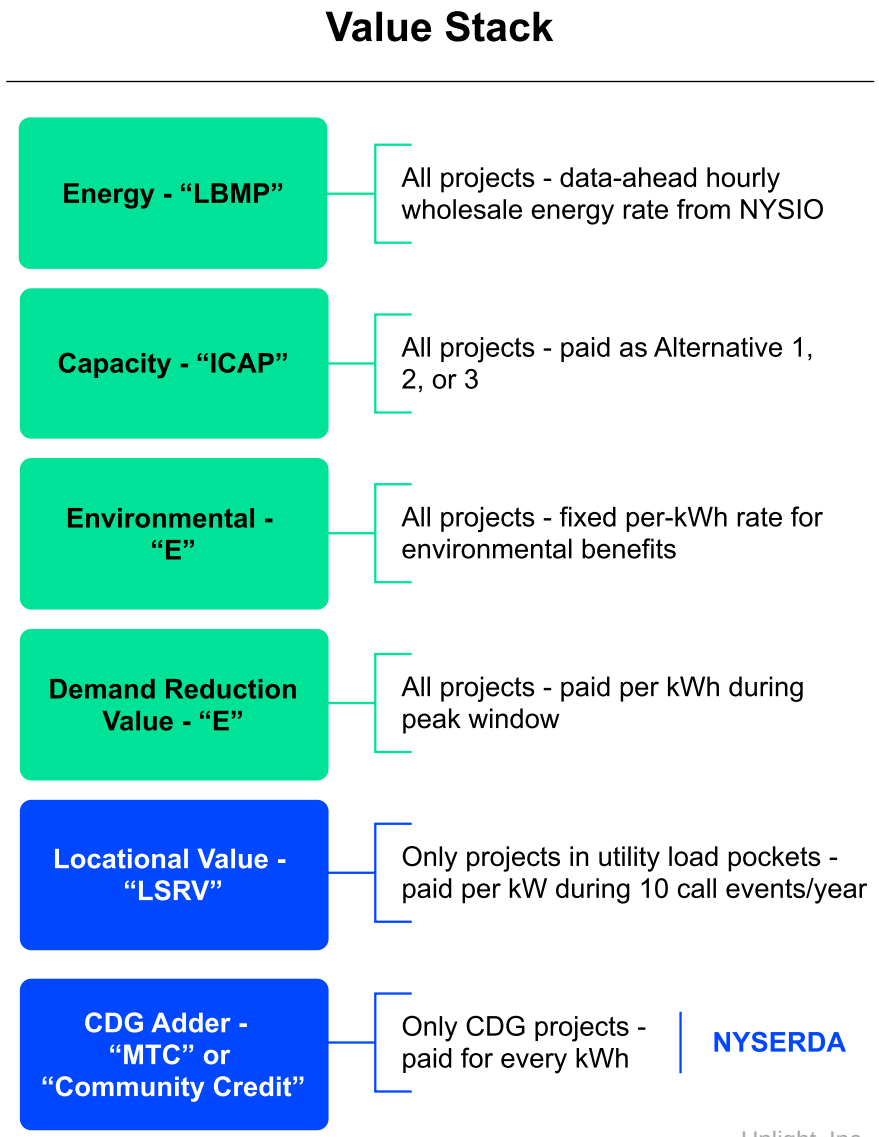


- **Not Realized in Market**
- **Lack of Transparency for Locational Value of DERs**

Source: The Brattle Group's "The Value of Virtual Power" (2023)

1. Dynamic Tariffs Appropriately Compensate DERs

- ✓ Create dynamic hourly tariffs for DERs
- ✓ Compensation based on when and where energy is provided to the grid
- ✓ EV Time of Use (TOU) tariffs



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2. Importance of Interoperability for Scaling VPPS

Common Goal: Full utilization of demand flexibility to provide reliability services

Interoperability promotes **customer choice** and smoothest customer experience

Vendor-agnostic (by platform providers) and **platform-agnostic** (by DER providers) approach key to scaling VPPs cost-effectively and efficiently

Proprietary Operating Systems + APIs

Leave MWs on the table when they don't give DER access to third-party aggregator

Proprietary APIs

Allow for control of DERs, but higher cost to maintain

Open Standards

Cheapest & fastest way to scale VPPS

3. VPP flexibility in Distribution Planning

- ✓ DISCOM need to conduct a load growth analysis, identify substations with needed infrastructure upgrades to outline when NWAs should be implemented and for which locations
- ✓ Develop hosting capacity maps
- ✓ VPPs could act as a *bridge to wires* solution to avoid infrastructure costs

NWA Projects in Central Sub-Region				
#	Project	Substation Location - Town	Projected In Service Date	First Year of Overload
6	Pratts Junction Rebuild	Sterling	2029	2023
9	New Substation Near Grafton	Grafton	2034	2026
15	East Webster Feeder Expansion	Webster	2029	2023
18	New Substation Near Southbridge	Southbridge	2034	2023
19	New Substation Near Webster	Webster	2034	2023
21	New Substation near Greendale	Worcester	2034	2025
23	Grafton Street Rebuild	Worcester	2034	2025

4. All-of-the-Above Strategy Successful in Australia

- ✓ BTM batteries actively participating in Australia's **Frequency Control Ancillary Services (FCAS), Wholesale** markets are some of the first DERs to provide fast-responding ancillary services.
- ✓ Australian Energy Market Operator (AEMO) is iterating on regulations that allow DERs to participate in other **market products, traditionally limited to front-of-meter (FTM) assets**.
- ✓ ARENA funds **VPP to cool demand from supermarkets and refrigerated warehouses.**
- ✓ Australia's market operator contracts **Enel X for VPP flexibility 120MW of flexible demand capacity** to the Western Australia wholesale energy market
- ✓ AutoGrid has been working with leading retailers and gentailers, network operators, and other partners in the Australian markets as AEMO continues to develop the regulatory frameworks for DERs and VPPs.

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Where to make the start ?

VPP Trial programs

Design Programs

Govt funding

Participants

Policies

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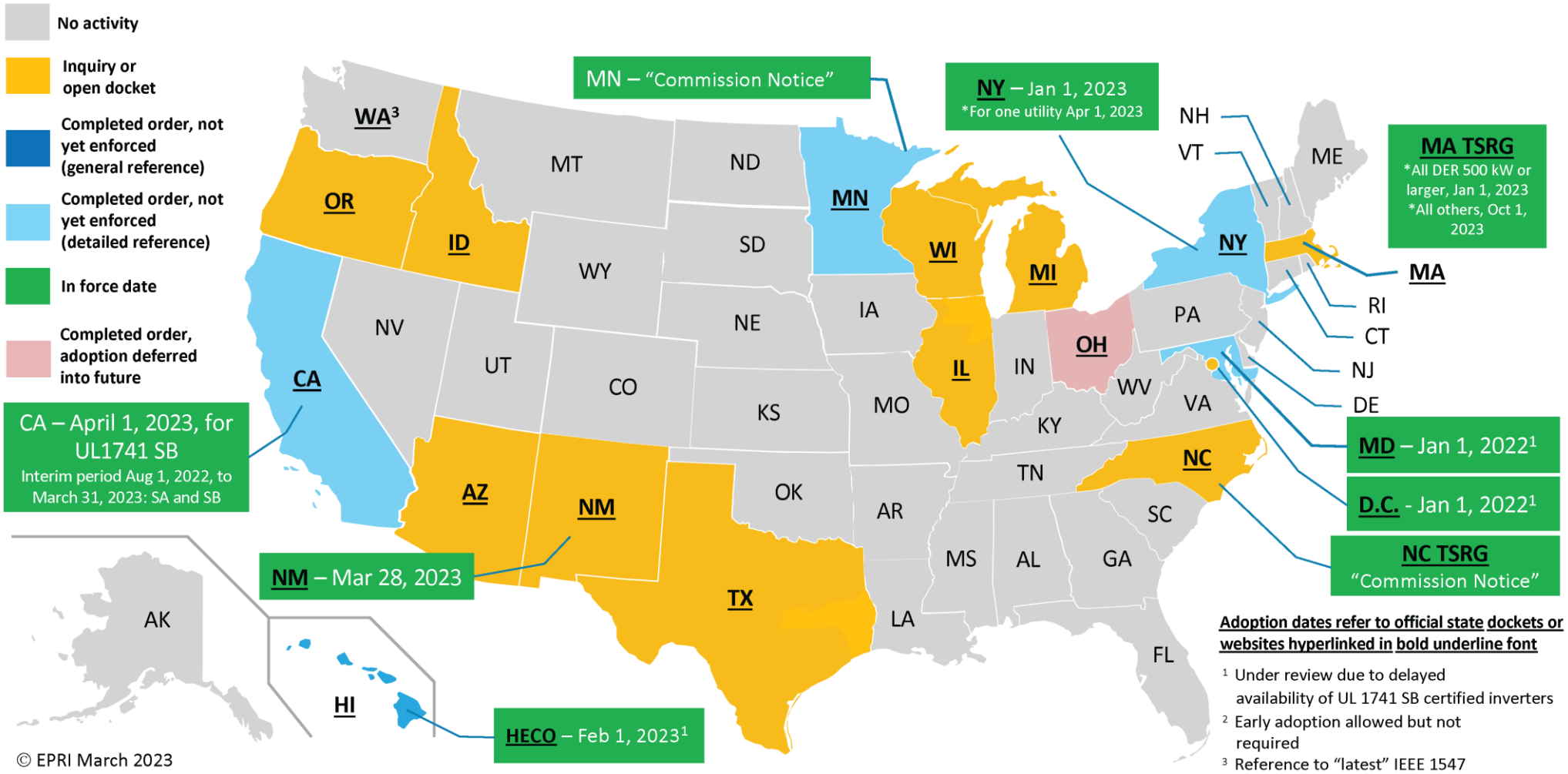
4. Open Standards Accelerate VPP Deployments



Inverter interoperability standards adoption by state. (Image credit: EPRI)

Thank You

Vishwajeet Singh

Senior Manager, Industry Solutions

vishwajeet.singh@uplight.com