Getting to Zero Carbon by 2030: The Role of Distributed Energy Resources

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Impacts of DERs on the Bulk Power System Training

NARUC/NASEO/NASUC

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Powering forward.
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Flexible pathway to zero carbon

Natural gas generation repurposing

Goal to retire 2 power plants in 2024-2025 and re-tool fleet

to drastically reduce operations and emissions.

Proven clean tech

90% reduction of greenhouse gas emissions*

>3,000 MW of new renewable energy & storage –equivalent to energy needs of more than 600,000 homes.

Growing rooftop solar and batteries.

New tech & business models

Pilot & scale new projects & programs

Research game changing technologies and alternative fuels.

Financial impact & options

Rate impacts limited to rate of inflation

Expand partnerships and grants to offset costs & generate operational efficiencies.

100% Zero carbon by 2030

Work with all our communities to reduce greenhouse gas emissions together.

Partner and collaborate with community organizations, attract business, innovation and jobs to Sacramento.

Alignment with SMUD's Sustainable Communities Initiative.

* ~ 1.8 million metric tons per year

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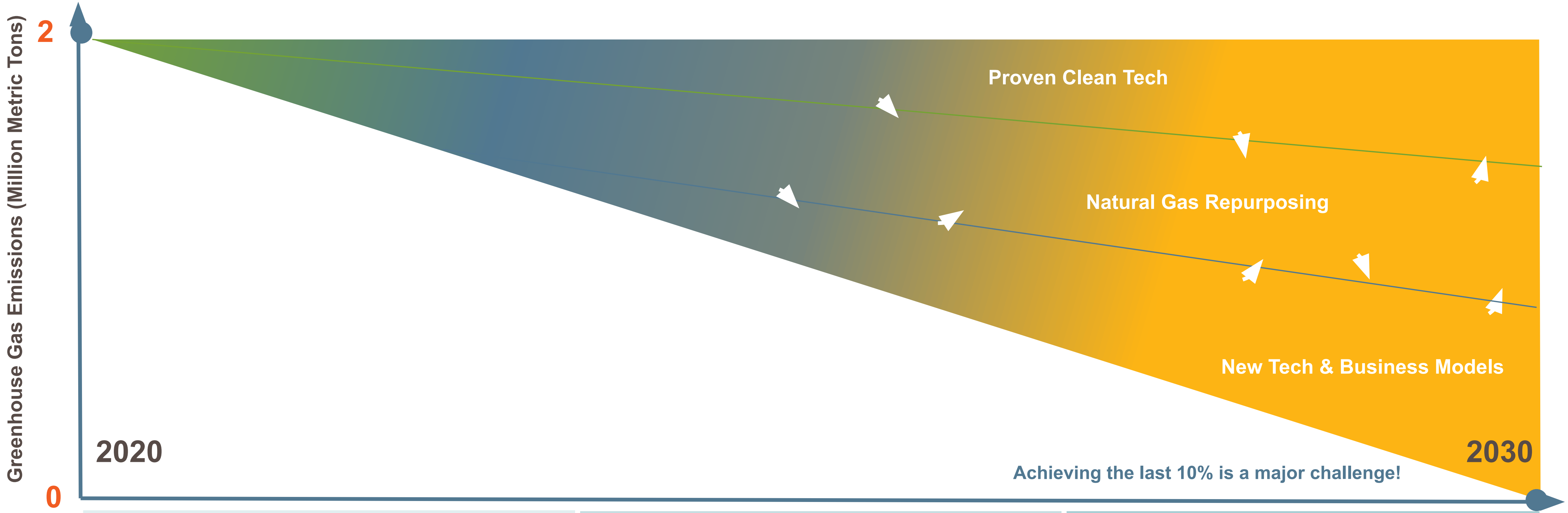
A flexible pathway with a firm commitment



2021-2023: Least flexibility, least risk	2024-2026: More flexible, more uncertainty	2027-2030: Most flexible, least certain
• Resource mix known. • New Tech needs to be proven & piloted. • Risks well known and hedged (costs/rates, regulatory, markets etc.).	• Resource tradeoffs - distributed resources, renewables, conventional plants. • New Tech tested and beginning to scale. • Risks are less known (resource prices, regulatory, markets, etc.).	• Resource tradeoffs - distributed resources, renewables, conventional plants, new tech. • New Tech is proven and operational • Risks are less clear (resource prices, regulatory, markets, etc.).

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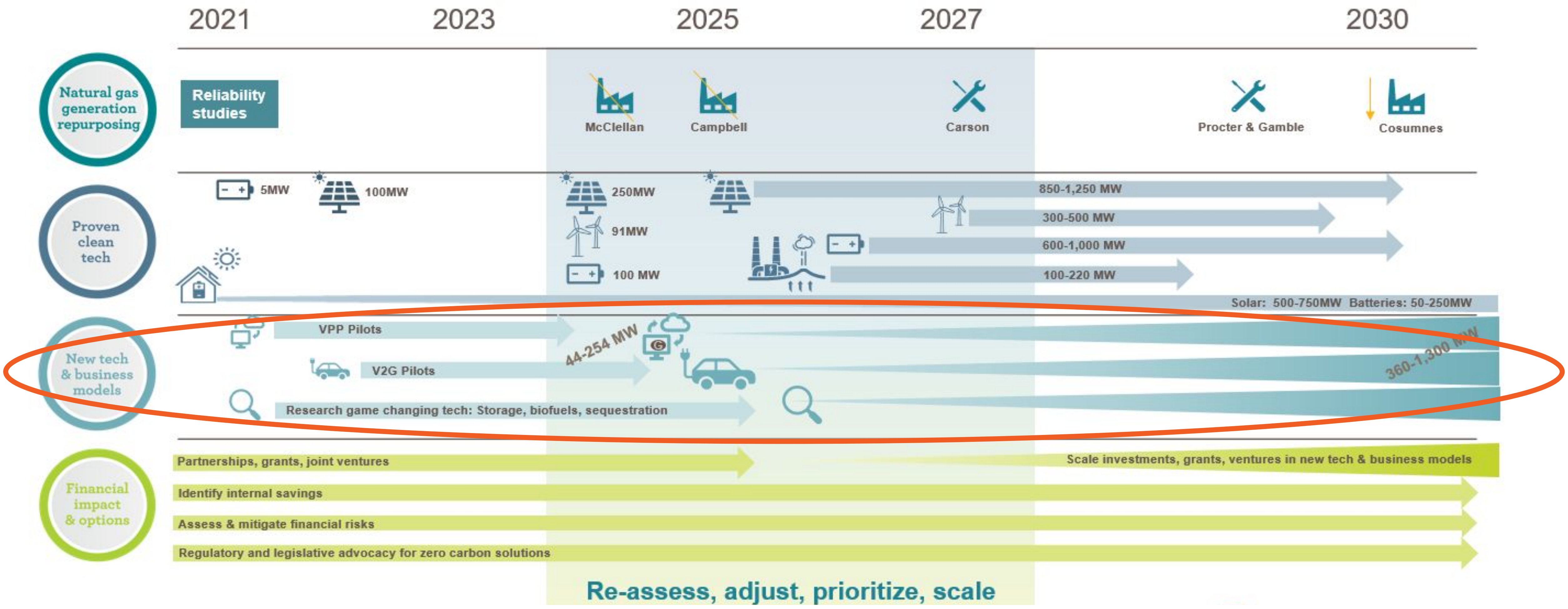
The Role of Virtual PowerPlants in the 2030 ZCP



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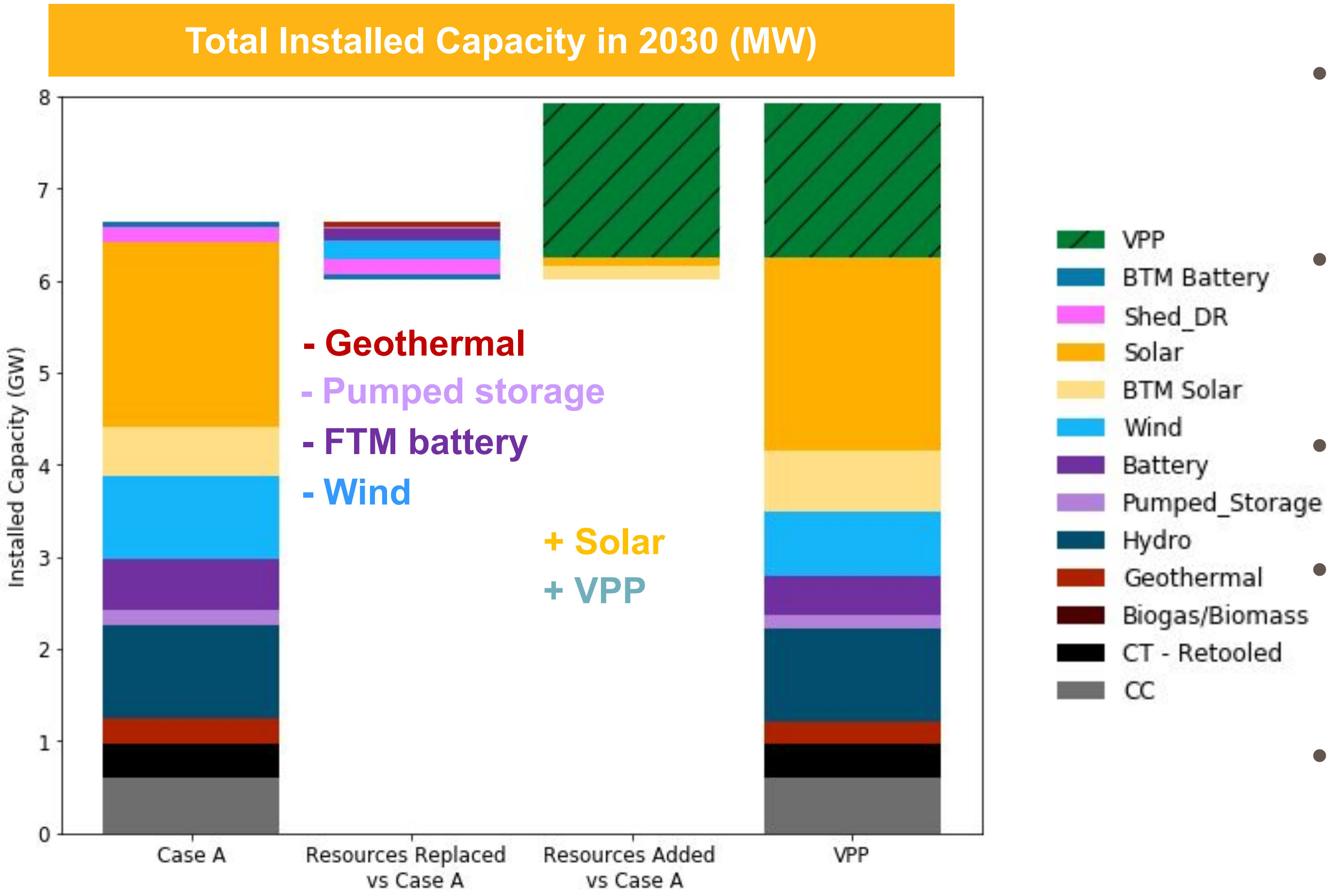
Upcoming Virtual Power Plant Pilots

- Multi-DER Virtual Power Plant
  - 30,000 customers, 2021-2024, primarily T-stats but also Evs + Storage

- Storage Based Virtual Power Plant
  - 15 – 30 MW of residential BTM storage, 2022-2024

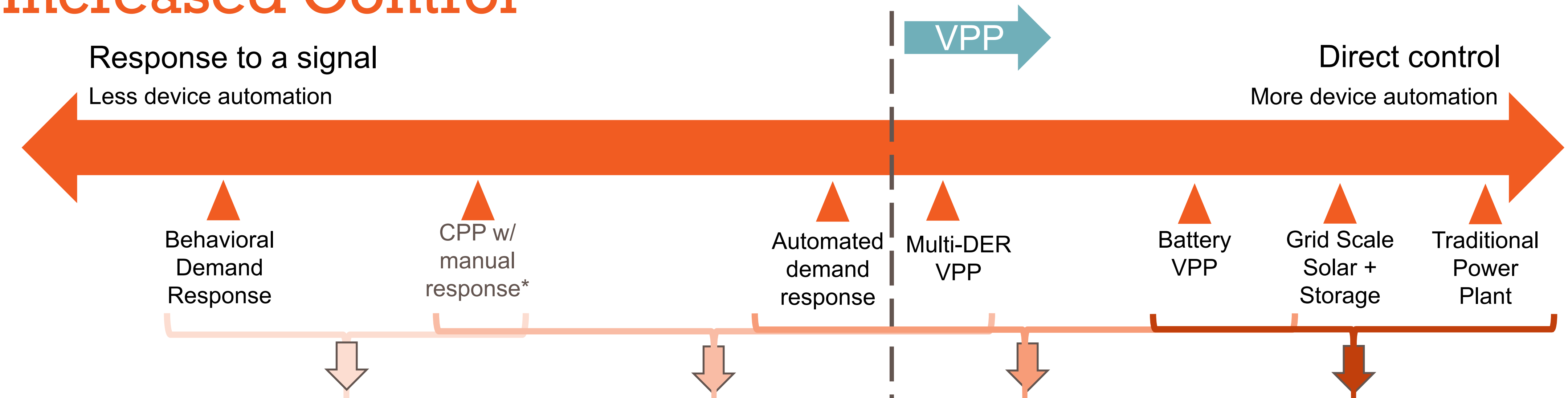
Potential Value of VPP's in the 2030 ZCP Plan



- Potential to displace ~500 MW of Geothermal, PHS, utility scale batteries and wind
- Potential total savings on the order of 5%* (rate and rev. reqmt.), in addition to payments going back to customers
- Dominated by EV V1G and V2G at single family homes
- Time flexibility of EV's to charge, discharge, creates potential to displace broader set of resources
- Metering costs to support Ancillary Services currently out of the $

* Does not fully account for distribution value associated with increased EV forecast

Increasing grid and Resource Adequacy Value with Increased Control



Concept	Event Signal used to encourage customers to modify energy usage	Customer rates modified to provide economic benefits and incentives for load modification	Capacity payments made to customers and/or aggregators for participation.	Management and scheduling of devices done by SMUD.
Customer	Opportunity to help.	Exposure to premium price days in exchange for non-event day discounts.	Technology adjustments made by an aggregator.	No interaction required beyond maintaining connectivity.
Aggregator	Limited role.	Ability to support customers with a more reliable response and better savings.	Increased reliability and capacity benefits used to pay aggregators	Aggregates individual devices into a portfolio and dispatches based on grid needs.
SMUD	Low grid reliability.	Medium Reliability	High Reliability can be used for infrastructure or location support as well.	Full Reliability

*Note: This will not be an option for customers at the onset of CPP

Grid Benefit

Accessing Resource Adequacy Value for DERs

Current State

Load Forecast

Includes Customer-Dispatched DERs + Non-Dispatchable DERs

Defines Need for RA Procurement

→

RA Procurement Process

Requires 4 hour duration

Typically no dispatch constraints

4 year horizon for procurement coverage

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Accessing Resource Adequacy Value for DERs

Future State

Load Forecast

Includes Customer-Dispatched DERs + Non-Dispatchable DERs

Defines Need for RA Procurement

→

Dispatchable DER Adjustment

Identify shorter duration, & dispatch constrained need

Extend procurement consideration to 5-10yrs

→

RA Procurement Process

Requires 4 hour duration

Typically no dispatch constraints

4 year horizon for procurement coverage

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Longer-term challenges with DERs and RA value

- Overlapped Value with Utility Storage
- Climate Change impacting 1 in 2 Forecast Conditions
- Net-load shifting capacity needs
- Shift to winter-peaks with electrification
- Longer duration peak potential with electrification?

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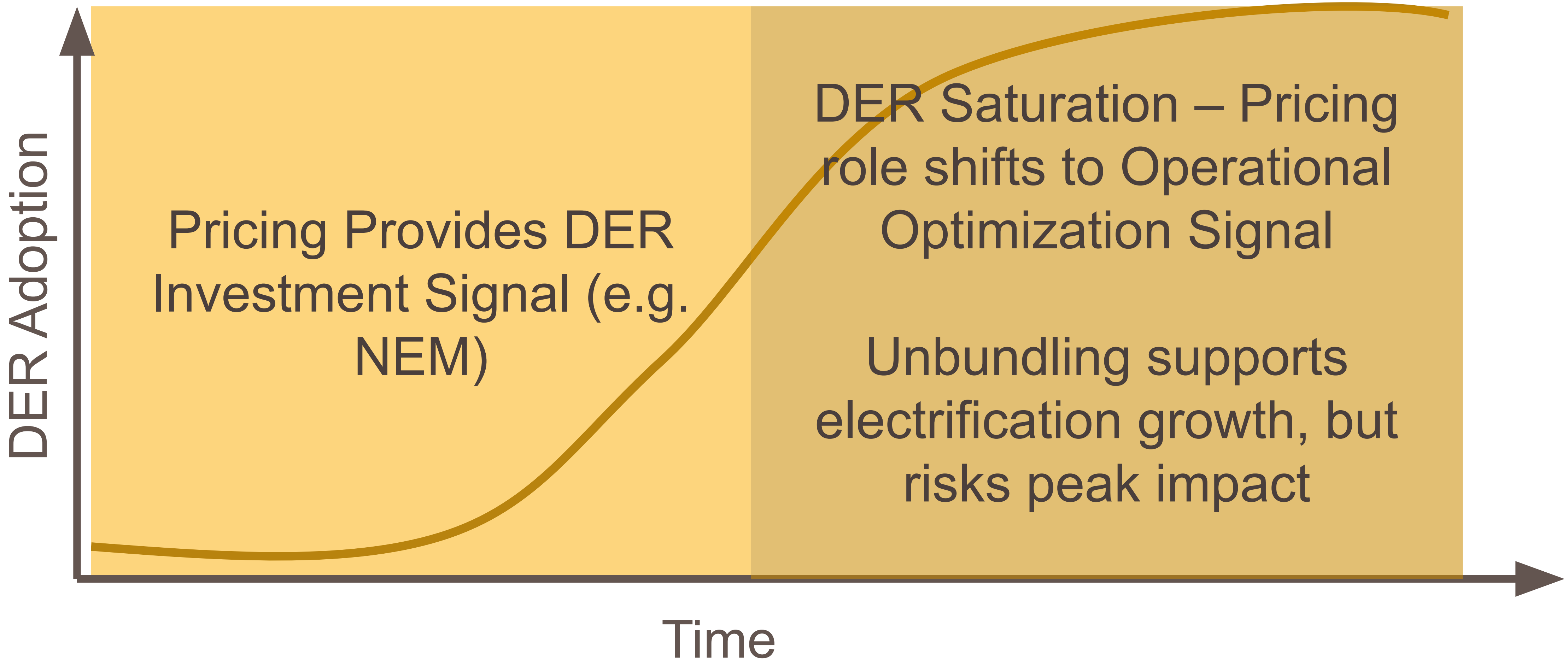
Pricing Considerations for DERs



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Pricing Considerations for DERs Cont'd

- Greater divergence of bundled rate from underlying costs increases cost of recruiting DERs to provide grid service – higher opportunity cost to give up retail rate benefits
- High 'strike price' retail rate interface creates, esp. Critical Peak Pricing and ToD, creates need to address decoupling, fixed cost loss/cost-shift in business case
  - Considering avoided RA purchase value can lead to $1 - $1.50 per dispatched kWh in benefits (assumes 50 - 75 hr resource)
- Unbundling and dynamic rates will still require a significant peak avoidance signal to avoid driving infrastructure cost

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Locational Value Considerations

Today:

- Relatively few opportunities for substantial savings
- Institutional, cultural resistance to wholesale change
- Modest DER deployment and retail rate opportunity cost limit DER side

Tomorrow:

- Massive electrification of fleets and light duty cars, buildings will drive imperative for streamlined non-wires processes
- Retail rates will need substantial complexity to manage creating layered distribution and bulk value
- Substantial DER deployments will create competition and lower costs for location-specific services

Standardization Critical

Proprietary communications protocols risk stranding assets, overpayment for aggregation services, reduce competition

Standardization will offer opportunity for cost-of-service competition with private service aggregation, but will also lower costs of aggregation generally

Requiring adherence to standards, or at least a pathway there, in utility procurements should be a common aim of regulatory bodies

ESIG | Open Networks: Key Deliverables – 2021 Special Project of ESIG DER Working Group

	Scope & Deliverables
DER Integration into Wholesale Markets and Operations Report	• Investigate and recommend opportunities for changes in planning and operating procedures, regulatory frameworks and standards to enable integration and participation of DER. • Identify procedures to coordinate bulk system and distribution system dispatch in a manner that is workable for DER providers and reliable for both the distribution and bulk system operators. • Develop a report summarizing these findings.
Educational Stakeholder Materials	• Develop materials to enable informed participation in the stakeholder processes.
Assessment: UK & Australian Open Networks	• Summarize the UK & Australian Open Networks scope, methods and key lessons learned to inform recommendations for a US Open Networks Project. • Identify key US dimensions of the international Open Networks' approach. • Develop a series of US Open Networks recommendations and facilitate structured discussions on the US vision.
US Open Networks initiative roadmap	• Develop a US specific Open Networks charter including scope, methods and engagement model. • Determine how a national Open Networks initiative could be organized given regional regulatory and market diversity. • Identify a roadmap of the specific ESIG activities and actions process to address key gaps and barriers to full integration of DERs.

ESIG
ENERGY SYSTEMS INTEGRATION GROUP

Questions?

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