PG&E Flexible Service Connection

Program Overview

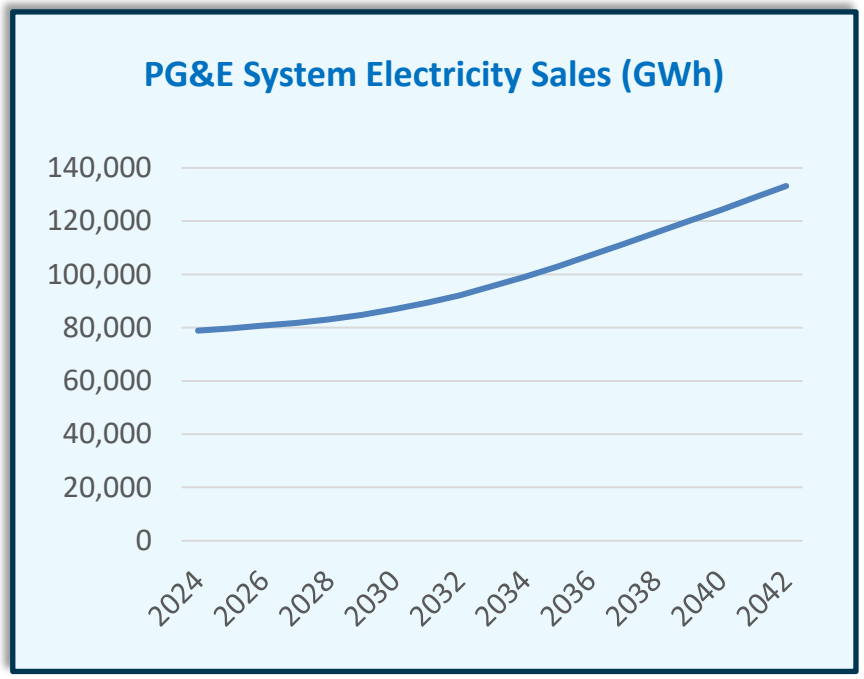
March 2024

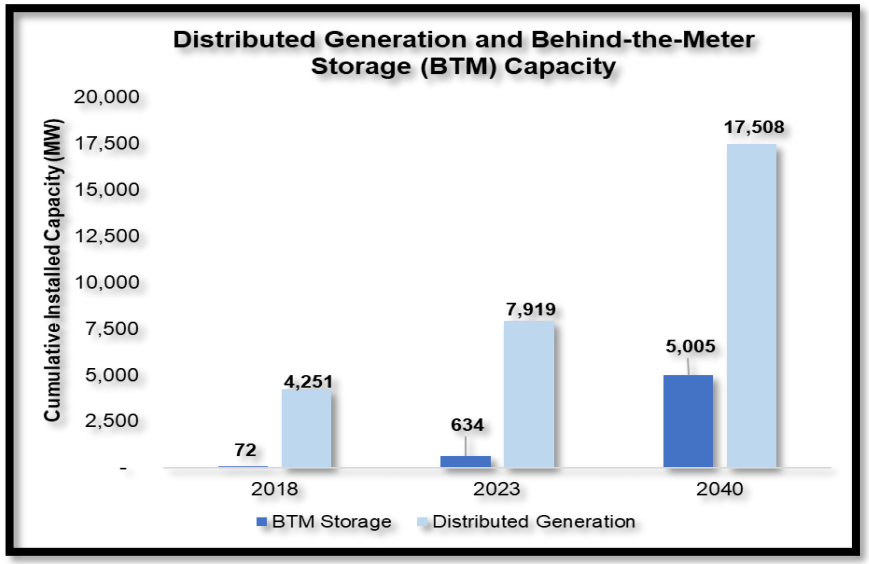
Together, Building a Better California

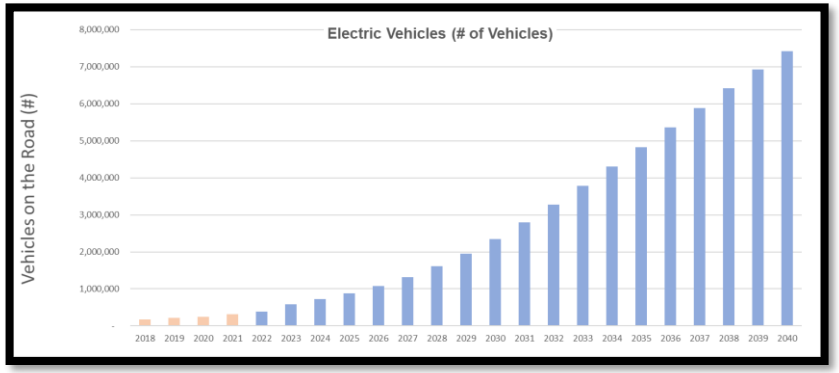
Context Setting: The need for new DER Management Tools & Processes

PG&E anticipates increased load driven by EV adoption and building electrification – coupled with continued adoption of distributed solar, significant growth of behind-the-meter storage and flexible loads.

New tools and processes to orchestrate Distributed Energy Resources (DERs) are necessary to safely and effectively operate the grid.







7/25 PG&E Innovation Summit announcing DERMS Initiative

Source: PG&E's Spring 2023 Annual Load Forecast

PG&E's Flexible Service Connection Concept

Flexible Service Connection aims to allow customers with controllable loads to connect to the system without waiting for a service upgrade as a bridge solution

Customer Value

Quicker connections

- Avoid Long Wait Times
- More Available Energy
- Improved Utility Partnership

Distribution Value

Improved customer experience

- Unlock Available Capacity
- Higher Grid Utilization
- Operational Flexibility

Energy System Value

Support EV industry goals

- Timely Energization
- Cost Effectiveness
- Manage Grid Constraints

Flex Serve Program Overview

Flexible Service Connection will allow customers with controllable loads to connect to the system without waiting for a service upgrade and will increase the utilization of existing grid capacity

Flexible Service Connection Overview

- **What**: Flexible Service Connection will enable customers with eligible loads to connect sooner by dynamically managing consumption based on grid availability until infrastructure projects are completed
- **How**: PG&E's DERMS will connect to the customer's energy management system and send automated hourly limits, that cannot be exceeded, based on the day ahead loading of the constrained PG&E equipment (e.g. substation transformer)
- **When**: Targeting Q2 2024 for the first pilot sites to be connected

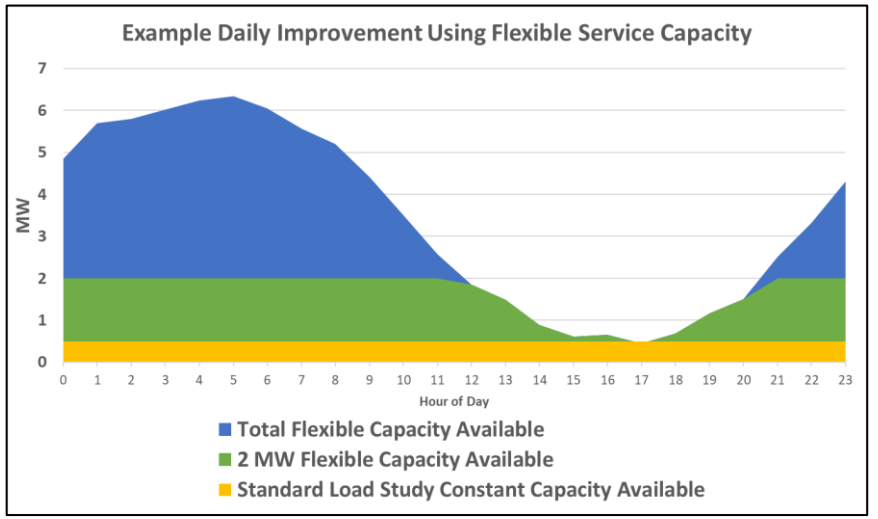
Customer Experience Outcomes

Today

- Potential wait times of 2 to 4 years+ if grid upgrades are required
- Static load limits agreed upon at a fraction of request (if available)

Future enabled by DERMS

- Customer submits application and receives a distribution of availability to serve proposed load
- Option to connect immediately while autonomous load reductions occur only on the most constrained hours of the year



Daily Constraint Improvement Example

Standard Load Study Capacity Available	2 MW Flexible Capacity Available	Total Flexible Capacity Available
0.5 MW (constant)	0.5-2 MW (time dependent)	0.5 to 6.0 MW (time dependent)
12 MWh / Day	**39 MWh / Day**	**82 MWh / Day**

Real World Example of Potential Benefits

Hour of the Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
1	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
2	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
3	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
4	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
5	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
6	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
7	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
8	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
9	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
10	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
11	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
12	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
13	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
14	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
15	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
16	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
17	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
18	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
19	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
20	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
21	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
22	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%
23	71%	71%	71%	20%	20%	20%	20%	20%	20%	20%	71%	71%

STATUS QUO: Planning Limits for 3.8MW EV Charging Station

Hour of the Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	100%	100%	100%	100%	100%	100%	92%	100%	99%	100%	100%	100%
1	100%	100%	100%	100%	100%	100%	98%	100%	100%	100%	100%	100%
2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
4	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
7	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
8	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
9	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
10	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
11	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
12	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
13	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
14	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
15	100%	100%	100%	100%	100%	100%	100%	100%	87%	100%	100%	100%
16	100%	100%	100%	100%	100%	100%	89%	94%	83%	100%	100%	100%
17	100%	100%	100%	100%	100%	100%	75%	83%	71%	100%	100%	100%
18	100%	100%	100%	100%	100%	100%	59%	68%	64%	100%	100%	100%
19	100%	100%	100%	100%	100%	100%	63%	66%	56%	100%	100%	100%
20	100%	100%	100%	100%	100%	100%	64%	66%	59%	100%	100%	100%
21	100%	100%	100%	100%	100%	100%	75%	76%	73%	100%	100%	100%
22	100%	100%	100%	100%	100%	100%	85%	87%	84%	100%	100%	100%
23	100%	100%	100%	100%	100%	100%	85%	94%	88%	100%	100%	100%

FLEX CONNECT: Can Support Full Request ~90% of the time on Average

Key Takeaway – If a customer can reduce consumption for 3 months during 3-11PM we can serve their full load request

Customer Journey for participation in Flexible Service Connection MVP

In 2024 PG&E will be working to standardize customer engagement and site evaluation processes based on initial learnings

1 Identify

Customer identifies a site and PG&E checks eligibility

2 Evaluate

PG&E evaluates suitability for MVP & provides Customer with historical site analysis

3 Agree

Customer evaluates benefits and agrees to program terms

4 Build

Customer contracts with aggregator and controls vendors

5 Deploy

PG&E supports Customer with testing and commissioning

6 Operate

PG&E communicates day-ahead hourly capacity forecast

Flexible Service Connection Operations

24hr ahead DER customer import limits

Enabling customers with eligible loads to connect sooner by dynamically managing consumption based on grid availability

Customer and DER data

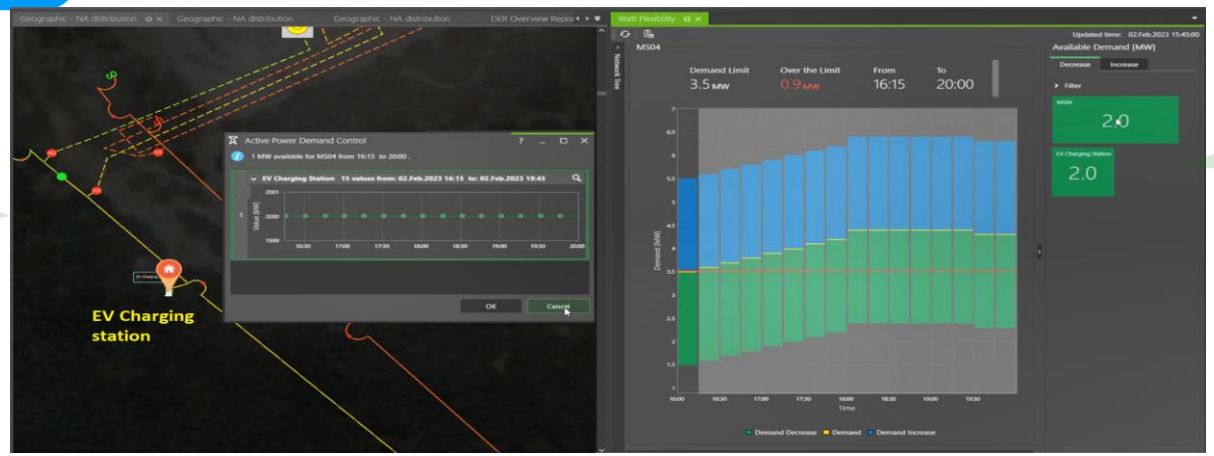
Flexible service parameters

Network connectivity data

Historical data

Weather data

Microsoft Azure



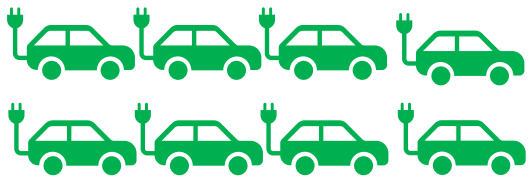
Determine dynamic site limit

Detect feeder loading capacity constraints

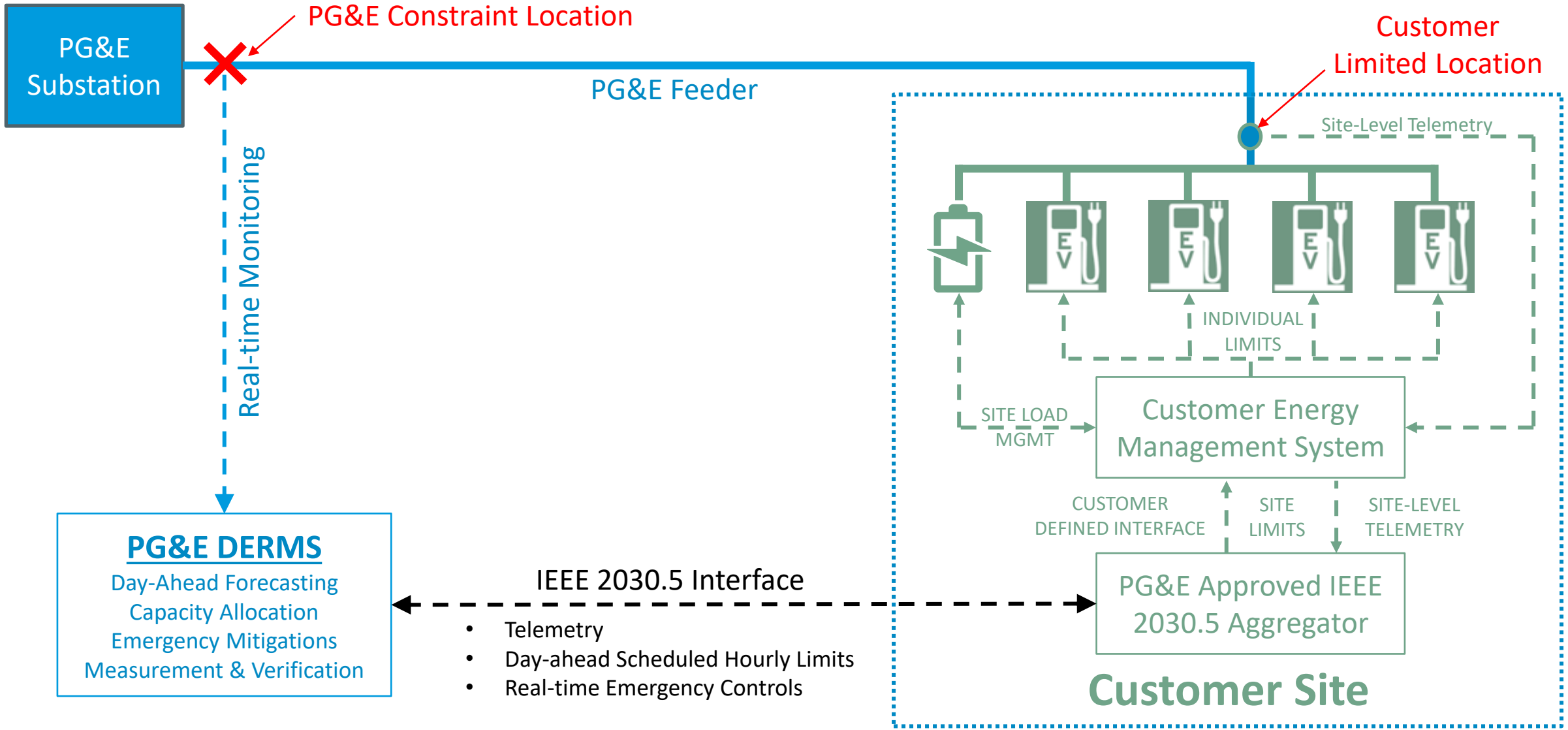
Re-calculate flexible capacity

Telemetry

Dynamic site limits



Illustrative Site Configuration



Agility is required to rapidly iterate toward a future end state

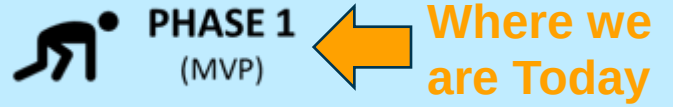
Capabilities, technology and processes are still being developed and require validation and further evaluation prior to scaling

Key Customer considerations:

- Value vs cost
- Customer experience impacts
- Local site technology readiness and timing
- Ability to adhere to dynamic limits

Key Utility considerations:

- PG&E technology and DERMS readiness – Forecasting, dispatching, and integrations with 3rd-party and internal systems
  - Key enhancements based on initial deployment already identified
  - Geographic expansion of DERMS capabilities
- Building confidence in customer-owned solutions and ensuring failsafes and contingencies
- Operational integration
- “Next-customer” considerations



Thank you

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a Better California

Utility vs Customer Responsibilities

PG&E

- Site analysis
- Testing and commissioning
- Automated day-ahead schedule w/ hourly limits
- On-going technical and program support

Customer

- Signed agreement
- Control system & Metering
- Aggregator integration
- Telemetry
- Single Line Diagram & Description of Operations

1) Preliminary Site Analysis
2) Aggregator Approved Vendor List
3) Customer Participation Agreement