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Overview of PG&E's Transmission Interconnection Process

May 4, 2023

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Overview of the Stages of Interconnection

Customers Submit IR Applications and Pre-study Activities
April through June (~3m)

IR Reviews and Scoping Meetings

- **Interconnection Request Reviews** – PG&E and CAISO personnel will review the Interconnection application package for completeness, technical powerflow and dynamic model validation and work with customers to close any gaps by the tariff due date
- **Scoping Meetings –** PG&E and CAISO personnel meet with interconnection customers to review the Point of Interconnection Feasibility and Options
- **PG&E Stakeholders:** Transmission Planners, System Protection, Substation and T-Line Engineering, Asset Strategy, Land and Environmental Permitting

Customers proceed through interconnection studies
Typical 18m process (Phase 1 + 2)

Identify Network Upgrades for Generation Interconnection

- **System Model Development** – Generation models are integrated into system power flow basecases
- **Deliverability Power Flow** – Basecases provided to CAISO for Deliverability study and upgrades.
- **Reliability Studies** –Reliability studies initiated with identified Deliverability upgrades. Study includes discharging/charging power flow, bus flow, stability, short circuit duty and interconnection requirements.
- **Mitigation development** – Develop Reliability Network Upgrades to mitigate identified violations along with detailed scope, costs, and duration.
- **Cost Allocation and Reports –** Finalize individual project cost allocation and responsibility and integrate into Individual and Area Reports
- **Results Meetings –** CAISO & PG&E Review project specific results with customers and finalize next steps
- **PG&E Stakeholders:** Transmission Planners, Operations Engineering, System Protection, Substation and T-Line Engineering, Asset Strategy, RAS Operations, Land and Environmental Permitting

Customers execute Interconnection Agreements and Financial Postings
6 - 36m

Project Initiation, Design and Planning

- **LGIA** – Initiate, negotiate and execute Generator Interconnection Agreement
- **Financial Posting** – Customers post their 2nd Financial posting
- **Project Authorization** – Advanced funding and Business Case approval
- **Project Manager** – released to Project Manager and Implementation team
- **Project Design** – 6-18 months
- **Long lead material procurement** – 6-25 months
- **Permitting activities**
  - 115 kV and Below: 12-24 Months
  - 230 kV and Above: 24-36 Months
- **PG&E Stakeholders:** EGI, System Protection, Substation and T-Line Engineering, Asset Strategy, RAS Operations, Land and Environmental Permitting

Construction and Implementation
6- 24m

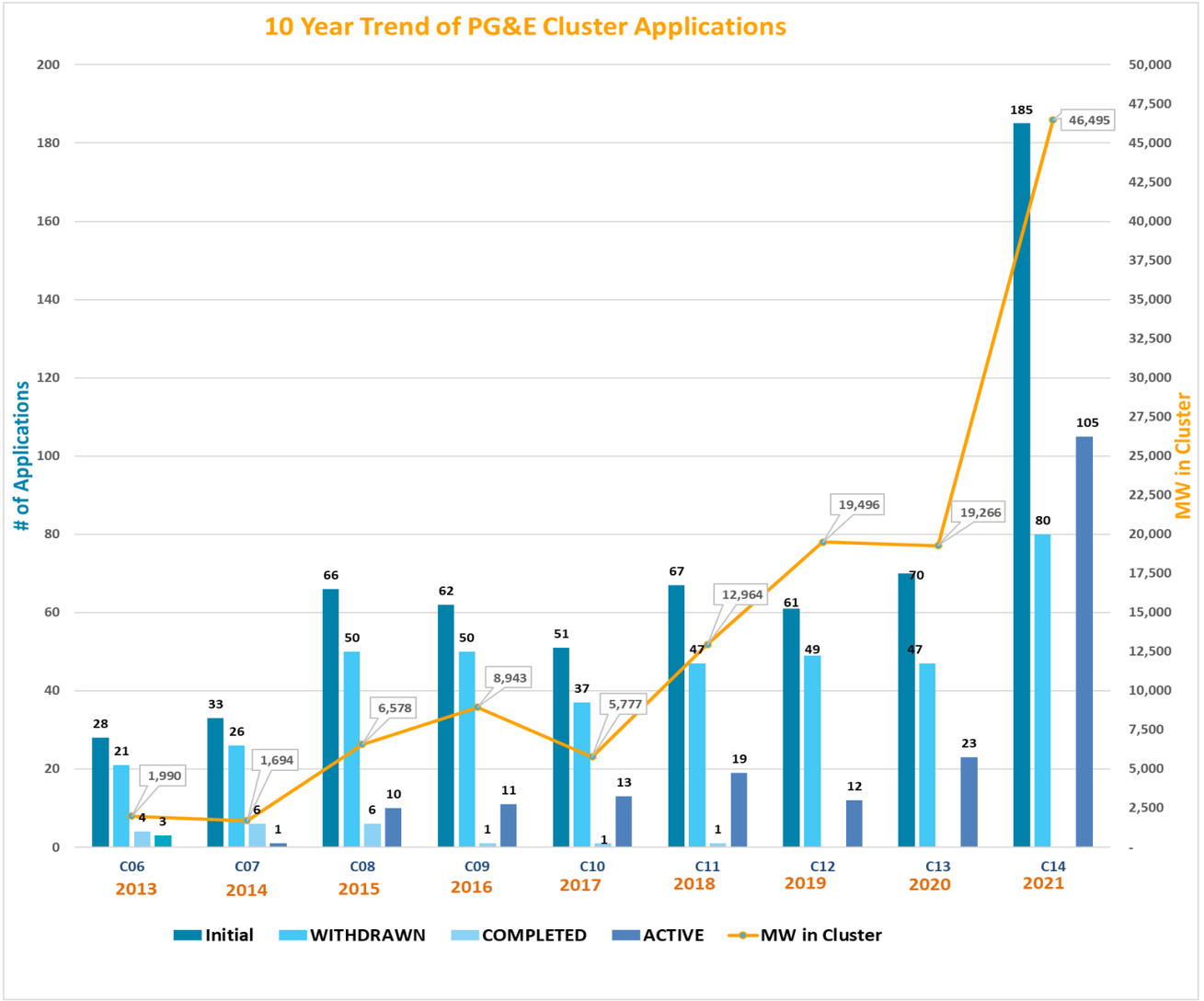
Project Implementation

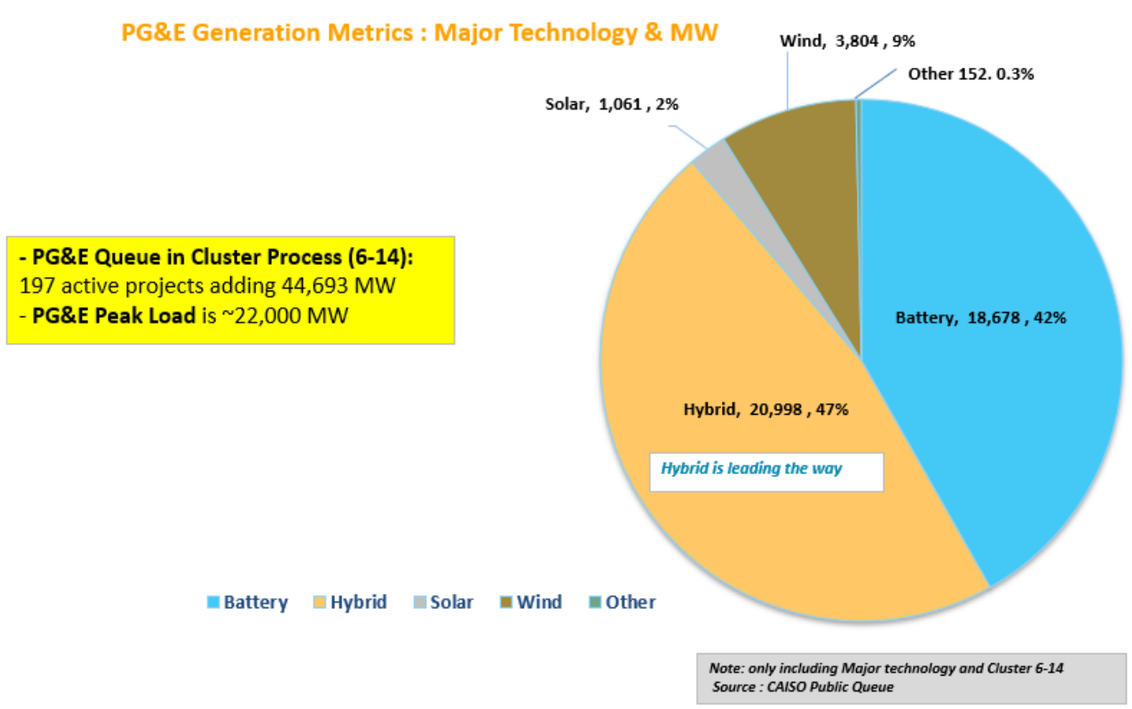
- **Financial Posting** – Customers post their 3rd Financial posting
- **Clearances** – 5 months
- **Substation and T-Line Construction** 6 - 24 months
- **Customers** – begin their gen-site - 12 months
- **Commissioning** – pre-parallel inspection and grid energization – 3 months
- **CAISO New Resource Interconnection (NRI)** – 6 months
- **Project Cost Reconciliation** – (Project cost True-up and Final Invoice (6-12 months post-COD)
- **PG&E stakeholders:** Project Managers, Construction, Substation Test, EGI, System Protection, Substation and T-Line Engineering, Land and Environmental Permitting, Metering

Challenges for Generation Resources to Come Online

- **Lengthy process** – The typical timeline for ISD can be 6 years post CAISO queue application
- **Overheated Queue** – The large volume of new interconnection projects in the CAISO queue not only make the study process difficult but also trigger large numbers of interconnection upgrades and various Reliability and Deliverability upgrades
- **Upgrades can be difficult** – Often require complex project design, execution, extensive permitting, multi-year sequential clearance windows, and timely generation customer financial commitments.
  - **Permitting and procurement processes** – Typically run parallel to each other after significant progress in the design process where clear scope and construction methods can be included into the application for a permit – a land and environmental strategy is also required (at times Imminent Domain is required)
  - **Clearances** – Once able to get into construction phase activities, smaller projects may only require one clearance season while more complex projects may span multiple clearance cycles to safely sequence work while mitigating grid impacts
- **Constrained resources and Supply Chain Issues** – Engineering (planning, protection, substation & t-line, automation), Project Management, Telecom, & Test resources. Finding and training such highly skilled resources is an industry- wide concern
- **Customer readiness** – Timely LGIA execution and financial posting by generation customer as active projects not proceeding could impede initiation of upgrades and impact ISD downstream projects

CAISO Cluster Metrics and Trends in the PG&E Area





Key Takeaways:

- **Withdrawal Rate**: Cluster 6-13 was ~75% while Cluster 14 was ~43% (through Phase 1)
- **Heated Queue:** PG&E has a large of volume of projects to consider in interconnection studies
- **IA Status**: 38% of Active projects up to C13 do not have executed IAs

Timely IA execution, customer financial posting and readiness are key for PG&E project initiation and execution activities to meet customer in-service dates

Steps Taken to Improve the Interconnection Process

- **Staffing increase:** PG&E continually monitors, evaluates, and addresses staffing and resources to meet the needs of the existing and future generators in the interconnection portfolio.
  - In 2021, PG&E created a substation and transmission line engineering group specifically for generator interconnections.
  - Has increased its interconnection planning staff and augments in other areas with contractors as needed
- **Process and procedure updates:** To streamline PG&E execution of the active interconnection projects efficiently and expeditiously, PG&E is undergoing an extensive review of its policies and procedures related to these interconnection projects
- **500 kilovolts (kV) circuit breakers (CB) upgrades:** To mitigate schedule impacts to generation customers, PG&E identified a solution to increase the interrupting capability of the overstressed 500 kV breakers instead of completing full breaker replacements
- **Transmission Development Forum (TDF):** Through the CAISO and CPUC hosted TDF, PG&E has provided status updates on key transmission planning and generation interconnection projects. This forum helps address stakeholder questions and requests related to the development of PG&E's grid and network upgrades to enable generation interconnections.
- **CAISO initiatives** – continue working with CAISO on initiatives to address the challenges with the current process like overheated Queue, aligning resource and transmission planning activities and resource procurement.