Tribal Informal Outreach Meetings

High Distributed Energy Resources (DER) Grid Planning Proceeding

CPUC Energy Division

Meetings Hosts

- CPUC Energy Division Staff
- California Energy Commission Staff
- Gridworks Staff (consultants to CPUC)
  - Meeting facilitation and meeting summary
- Verdant Staff (consultants to CPUC)
  - Notes today; likely leading December Workshop

Goals for Today's Meeting

1. Listen to Tribes to gain an understanding and gather information about:
   a. **Tribal priorities** with respect to energy (electric and gas);
   b. How the utilities (PG&E, SCE, and SDG&E) can best include Tribes in **electric distribution system planning;**
   c. **Tribal challenges and barriers** to adopting clean energy technologies and distributed energy resources (DERs);
   d. Tribe-specific, **long-term visions** and the role of electric utilities and DERs in achieving those visions; and
   e. How the CPUC and California Energy Commission can achieve **meaningful Tribal outreach** and establish partnerships.
2. Communicate to participants **how insights from Tribes will be used to**:
   a. Inform development of a **draft scope of work for a statewide Community Engagement Needs Assessment** to launch in 2023.
   b. Gain insights about potential visions, objectives, and characteristics of a future electric grid for California to inform a **Future Grid Study** to be developed in 2023.

Informal Outreach Meetings

- In October 2022, we're setting up **15-20 informal meetings** with:
  - Tribes;
  - Community-based and non-government organizations;
  - Rural local governments; and
  - Urban/suburban local governments.
- Almost **35 organizations and 13 tribes**
- CPUC and California Energy Commission staff will participate in the meetings.
- A meeting summary will be prepared by the CPUC and included with the draft scope of work for a statewide Community Engagement Needs Assessment.

Background: State Climate Goals

The State of California has established ambitious goals to address climate change. Among the goals, are to:

- Transition to **renewable generation** sources (100 percent clean electricity retail sales by 2045)
- **Electrify vehicles** (all new cars and light trucks sold in California to be zero-emission vehicles by 2035)
- **Electrify heaters** (all new furnaces and water heaters to be zero-emission by 2030)

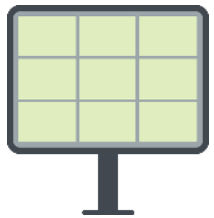
High DER Grid Planning Proceeding Overview (2021–2024)

In response to State climate goals, the California Public Utilities Commission (CPUC) opened the High Distributed Energy Resources (DER) proceeding in 2021 to:

- Enable swift evolution of **PG&E, SCE, and SDG&E grid** capabilities and operations to integrate solar, storage, electric vehicle/electric vehicle supply equipment and other DERs to meet the State's 100 percent clean energy goals;
- Improve **distribution planning**, including charging infrastructure forecasting to support cost effective and widespread transportation electrification; and
- Optimize grid infrastructure investments by **facilitating community input** about planned developments, DER siting plans, and resiliency needs.

What are Distributed Energy Resources (DERs)

- Pursuant to State Assembly Bill 327 and Public Utilities Code Section 769(a), DERs include:



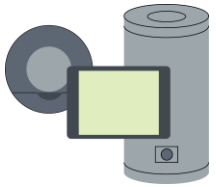
Distributed Renewable Generation Resources such as solar

Energy Efficiency

Energy Storage

Electric Vehicles

Examples: Thermostats, Internet-connected Water Heaters



Demand Response Technologies

- A core objective of the CPUC's High DER proceeding is to prepare the electric grid for a high distributed energy resource (DER) future by determining how to integrate millions of DERs within the distribution grid to maximize societal and ratepayer benefits from DERs while ensuring grid reliability and affordable rates.

Key Deliverables

- **Community Engagement Needs Assessment**
  - What do communities want and need from **electric distribution planning**?
    - Develop scope of work for a consultant team to conduct statewide outreach to address this question.
  - Hire a team and begin the assessment in 2023.
- Future Grid Study
  - What are the options for **electric distribution system operations** for a future with high numbers of distributed energy resources? What are the trade-offs between different models of distribution grid operations?
  - Complete the study in 2023 based on a series of technical workshops and public engagement to review and comment on the draft study.

Next Steps and Further Participation

- **Community Engagement Needs Assessment Workshop** (Quarter 4, 2022) to present and receive comment on a draft scope of work for the assessment
  - Draft scope of work issued prior to the workshop with outreach meetings summary appended
  - At the workshop:
    - **Summary of outreach meeting outcomes with presentations by outreach meeting participants or a panel**
    - Facilitate comments on the draft scope of work
- **Technical workshops** to begin Quarter 1, 2023 for development of the Future Grid Study (first workshop title, "Visions and Objectives for a Future Grid")

Proceeding Participation: Service List and Party Status

- The Service List receives all proceeding workshop and study issuance notices.
  - Sign up for the High DER proceeding (R.21-06-017) service list using the form and Process Office email available at: https://ia.cpuc.ca.gov/servicelists/sl_index.htm

- Choose to become a party to the High DER proceeding.
  - For details, go to: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/news-and-outreach/documents/pao/party_081221.pdf

CPUC Tribal Consultation Resources

- The CPUC Tribal consultation page: Tribal Outreach and Engagement (ca.gov)

- Email: TribalAdvisor@cpuc.ca.gov

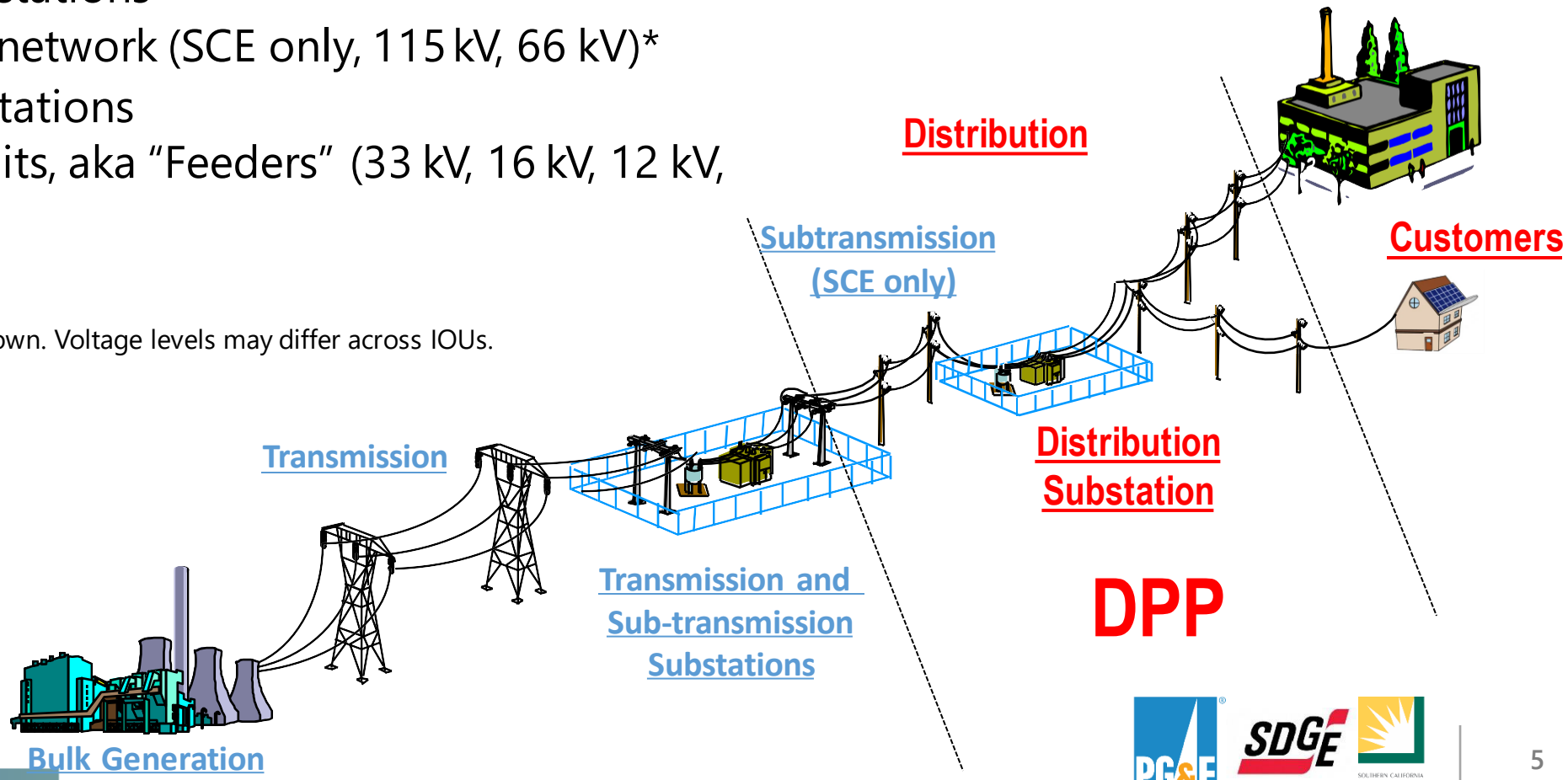
Distribution Planning Info

Slides Adapted from the Utility Distribution Planning Advisory Group primer workshop

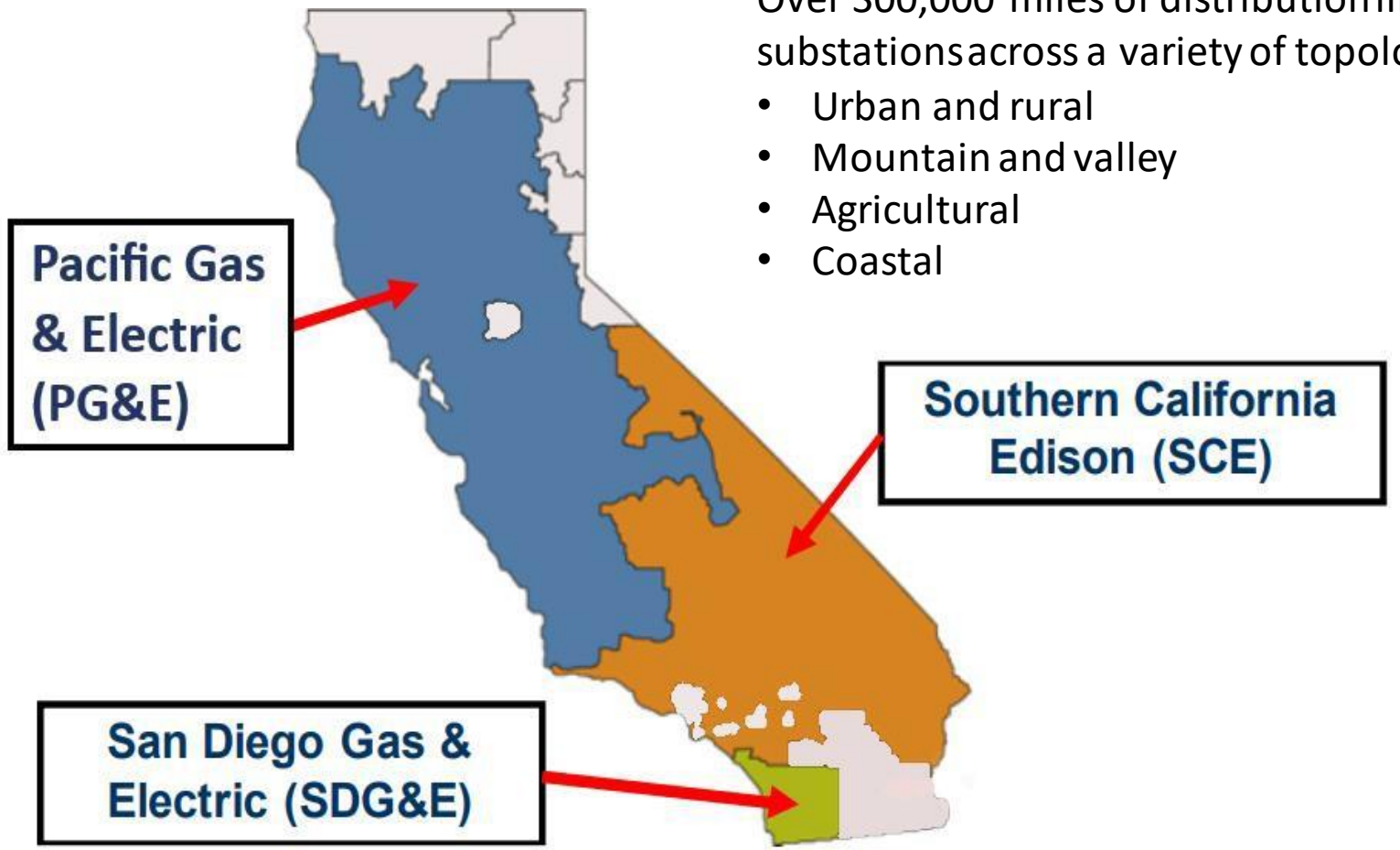
Electric Power System Overview

- The electric power system broadly consists of:
  - Central-station bulk generation
  - Transmission network (500 kV, 220 kV)*
  - Transmission Substations
  - Subtransmission network (SCE only, 115 kV, 66 kV)*
  - Distribution Substations
  - Distribution Circuits, aka "Feeders" (33 kV, 16 kV, 12 kV, 4 kV, 2.4 kV)*

*Typical voltages for SCE system are shown. Voltage levels may differ across IOUs.



California IOUs Have Diverse Topologies and Service Areas



Over 300,000 miles of distribution lines and over 1,500 substations across a variety of topologies:

- Urban and rural
- Mountain and valley
- Agricultural
- Coastal

Distribution Planning vs. Distribution Operations

	Distribution Operations	Distribution Planning
Timeframe	Real Time, 24/7 management of the distribution grid	Mid to Long Term (1 to 10 years) management of the distribution grid
System Configuration	Possibly Abnormal or Emergency	Normal
Future Load	Not used or useful	Used to identify future grid needs in the Distribution Planning Process
Future Projects	Not used or useful	Identified through the Distribution Planning Process
Hidden Load	Issue when it affects real time loading	Annual issue when gathering historic peak loads for planning process

A Distribution Operations 101 presentation was given on August 23rd, 2022 and recorded. The recording and other workshop material are available at the following URL: https://gridworks.org/initiatives/california-future-grid-study/

Distribution Planning Process Overview

The Distribution Planning Process is an annual process that lasts 7-10 months and identifies projected distribution capacity deficiencies[1] and determines mitigation plans to address those projected deficiencies.

Establish baseline assumptions for:

- Future load growth and loading profiles
- DER growth
- Distribution project deployment

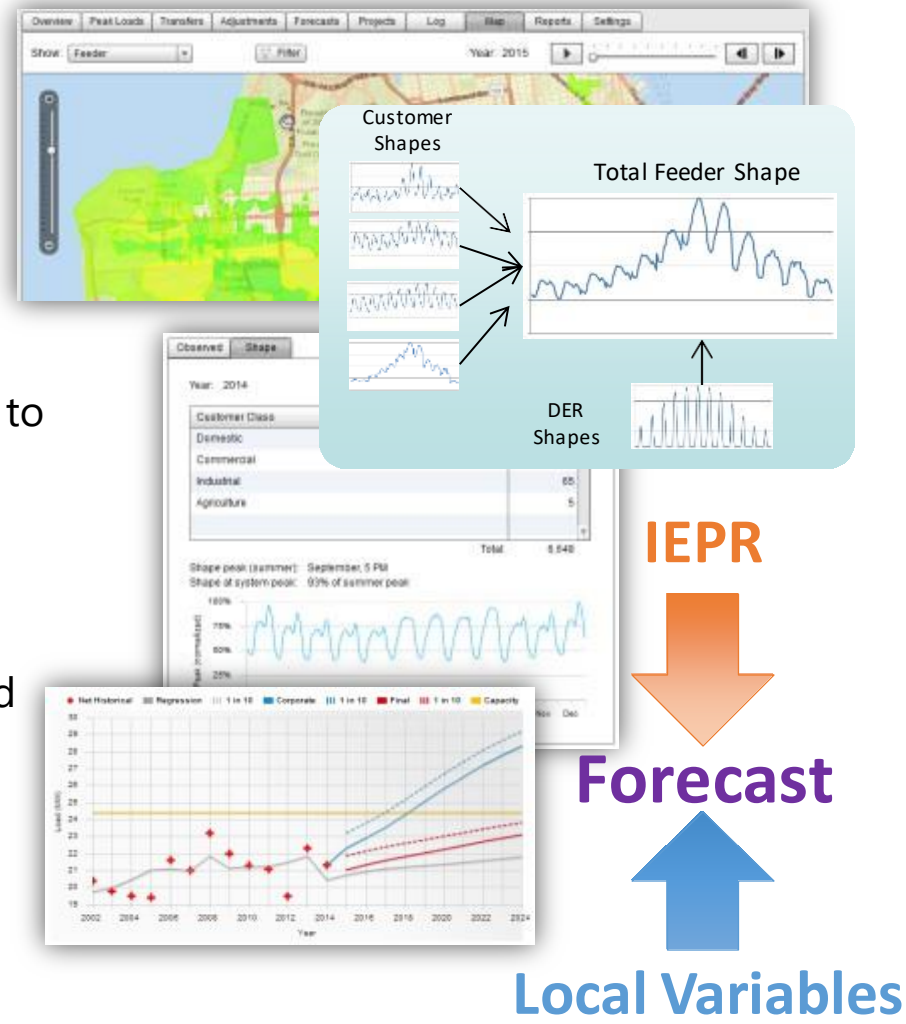
Assess distribution grid capacity requirements to:

- Meet projected load and DER growth
- Maintain safety and reliability for end users

Evaluate project alternatives that cost-effectively address grid needs and plan for the future

[1]Distribution capacity deficiencies include capacity, voltage support, reliability (back-tie), and resiliency (microgrid).

Load and DER Forecasts



Load Forecast

- System Level
  - Utilize CEC's Integrated Energy Policy Report (IEPR) (top down) forecast to establish system growth forecast.
- Substation Bank and Feeder Levels
  - Utilize historical area loading (bottom up), economic indicators and temperature data to develop 1-in-10 year temperature adjusted load forecast at substation and circuit levels.

DER Forecast

- Future DER growth added to forecast
  - DER hourly profiles are incorporated into the load forecast just as loads growth is incorporated.

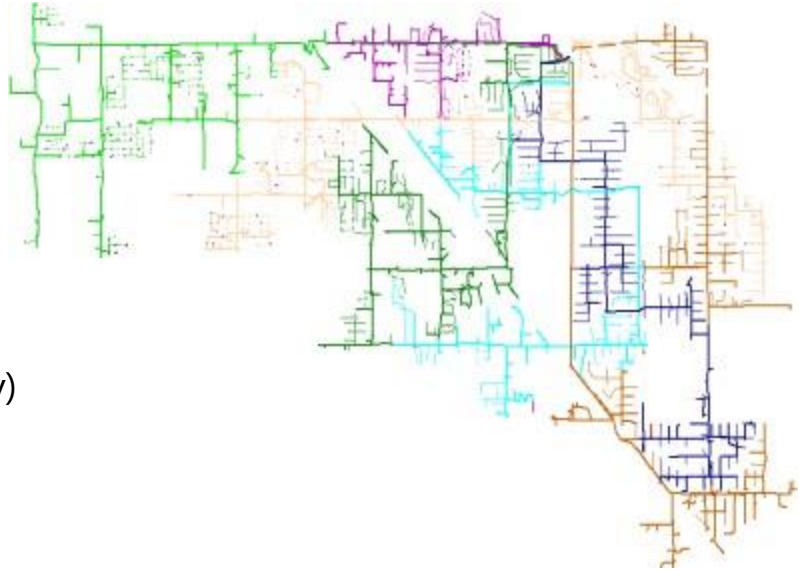
Determine Distribution System Capacity Needs

Timeline

- Process is performed on a yearly basis

Things to Consider

- Effects of planned utility projects on the needs of the system
- Maintain operability to transfer customers during emergencies (Operational Flexibility)
- Diversity of specific geographic load and customer mix
- Effects on protection schemes due to projects

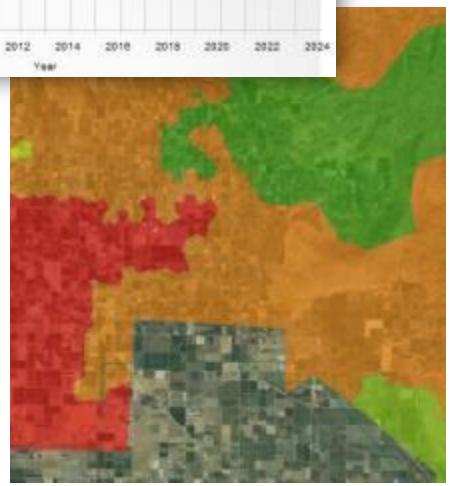


General Process

- Determine Thermal Capacity Needs
- Evaluate Voltage and Power Quality Needs

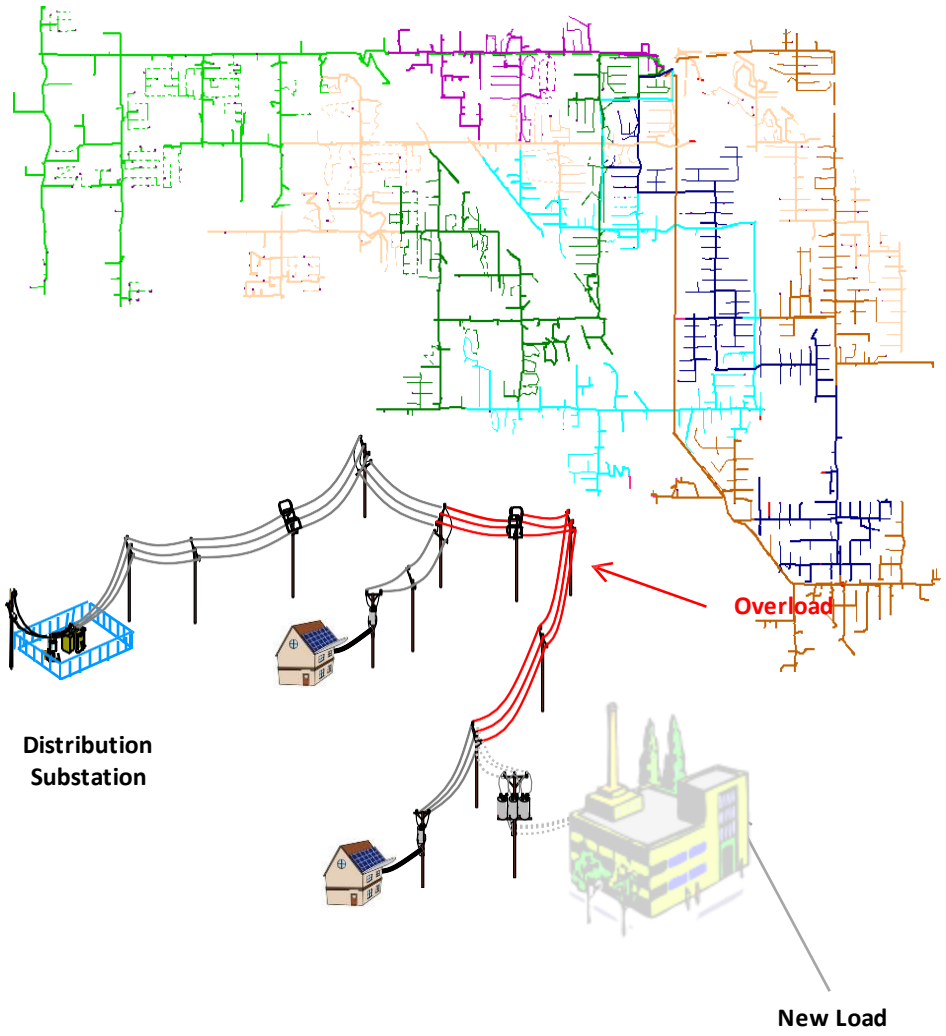
Substation and Bank Capacity Needs

- Compare existing capacity to forecast
  - Evaluate substation equipment
- Determining:
  - When? (i.e., 2024)
  - How much? (i.e., 4 MW or 10%)
- Local Knowledge is needed to ensure accurate forecast such as:
  - Historical regression
  - Weather patterns
  - Customer Mix
  - Local construction, economics, and geography
  - Identifying areas that have high potential for new known load additions (Downtown, Port, Etc.)

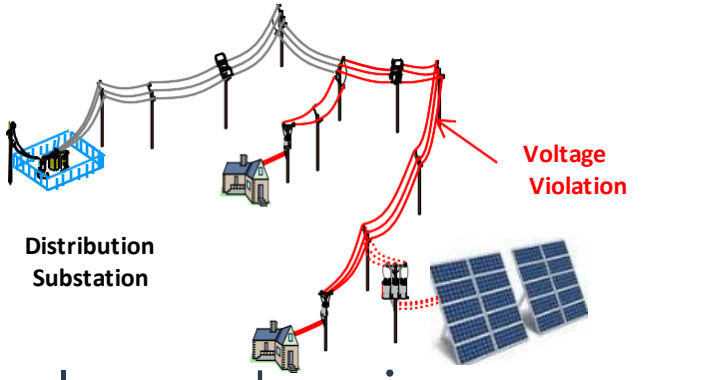


Distribution Circuit/Line Section Capacity Needs

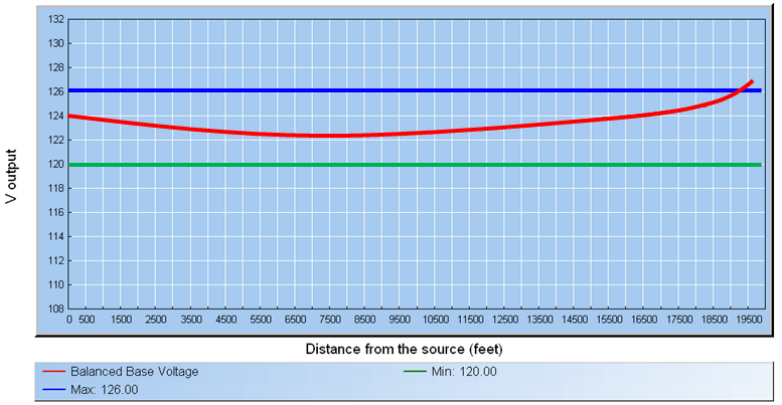
- Compare existing capacity to forecast load
  - Evaluate circuit/line sections
- Determining:
  - Overloaded circuits
  - Emergency circuit transfer capability
- Granular information is needed to ensure accurate forecast such as:
  - Local development projects
  - Change in customer loads
  - Projected area growth rates



Distribution Circuit Voltage Needs



- Compare reactive power needs to available supply, and review available voltage data
- Determining:
  - Voltage levels on distribution circuits
  - Reactive Power demands on circuit
- Voltage mainly affected by length of lines and
  - Need to know length of lines and conductor sizes
  - Reactive demands of loads
  - Load diversity and variability



Distribution Operations In Depth

& the Impact of DERs

Adapted from utility presentation July 26, 2022, Data Portals Workshop

Key Responsibilities of Distribution Operations

- Responsible for the safe, efficient management and 24/7 operations of the distribution grid
- Create and direct switching plans to accommodate planned and emergency work
- Direct emergency switching to isolate fault location and restore customers rapidly and safely
- Support large storm responses, major events and incidents as required [earthquakes, solar eclipses, major sporting events, atmospheric rivers, wildfires]

- Monitor the distribution grid for real time overall power quality requirements
- Coordinate with transmission control centers (where separate)
- Coordinate between Planning and Operations regarding planned investments.

Distribution Operations: Key Functions

Function	Location	Description
System Operators	Control Room	Operates the grid to perform load transfers to minimize customer impacts for planned work and rapidly restore customers from unplanned outages.
Operations Engineers	Control Room	Assists operators to perform more complex maneuvers on the distribution grid
Switching Program Writers	Control Room	Dedicated personnel to create switch programs for planned work
Dispatchers	Adjacent to Control Room	Schedule various field resources to support operations and also direct various field resources for unplanned outages.
Troublemen	Field	Performs field activities to support operators, including but not limited to, executing switching requiring manual operations, patrolling circuits for damage, make safe activities for public safety hazards
Substation Electricians/Operators	Field	Performs field activities similar to troublemen but at substations
Construction Crews	Field	Performs various overhead and underground construction jobs. Can also support troublemen on switching.
Scheduling Coordination	Adjacent to Control Room	Schedules and reschedules planned work into the system that requires system operators to manage workloads of operators and field
Outage Coordination	Adjacent to Control Room	Communication with customers on planned outages (scheduled and rescheduled) to ensure that they are well notified
Distribution Line/Apparatus Technicians	Field	Performs and maintains programming / telecom of field devices.

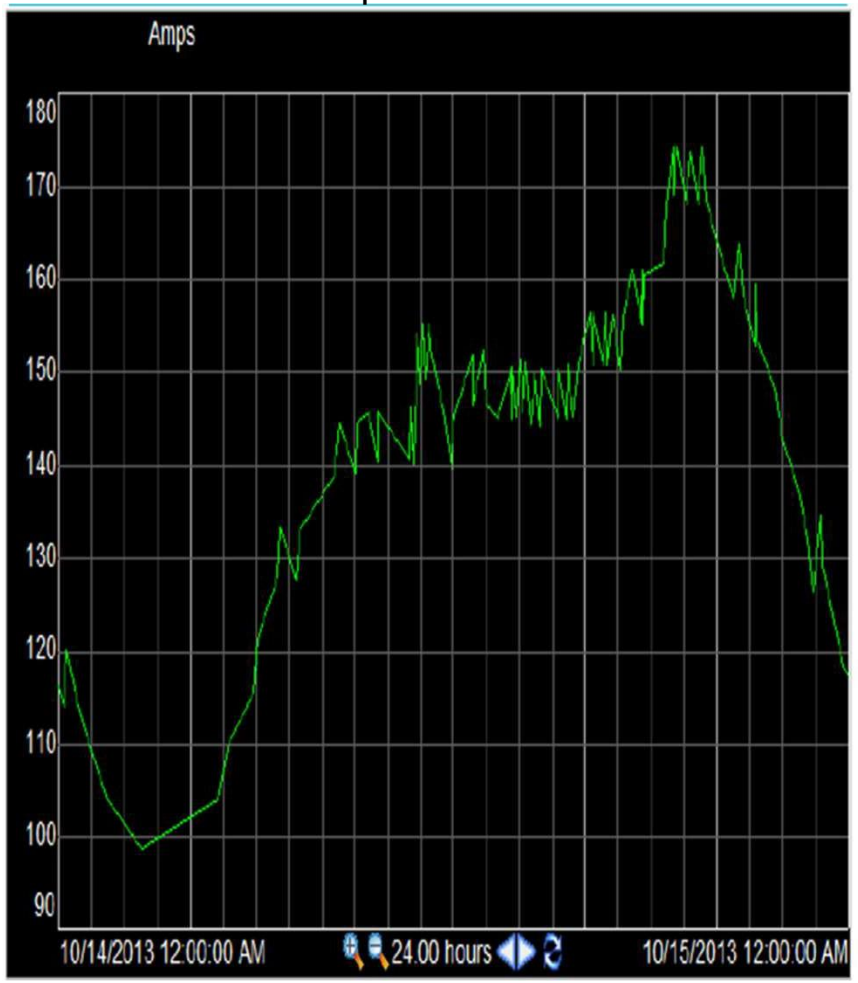
High and Active DER Penetration

As DER penetration continues to increase and become more active in the marketplace, certain considerations are needed to ensure that the grid can be operated

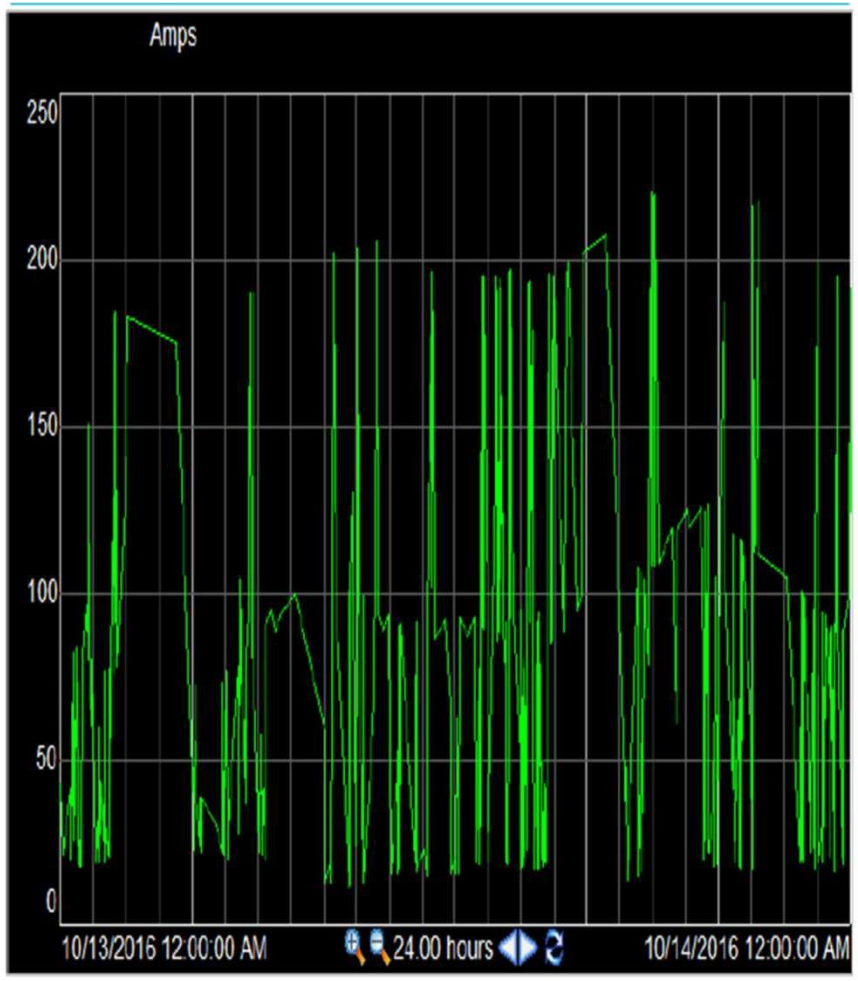
1. Altered load profiles
2. Abnormal configurations created by switching creates un-studied constraints
3. Masked load impacts to switching operations
4. Local circuit constraints vs. system

1. New Load Profiles and Grid Impacts from DER Market Participation

Before Market Participation

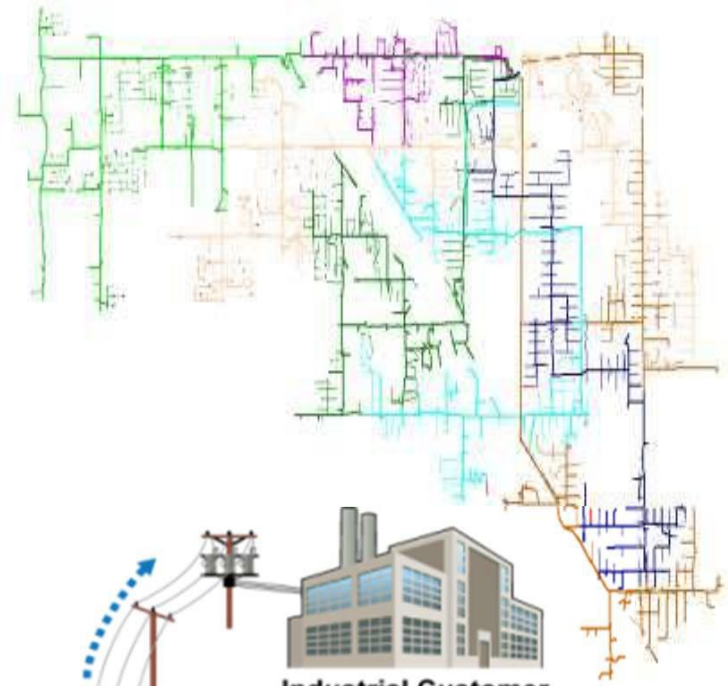


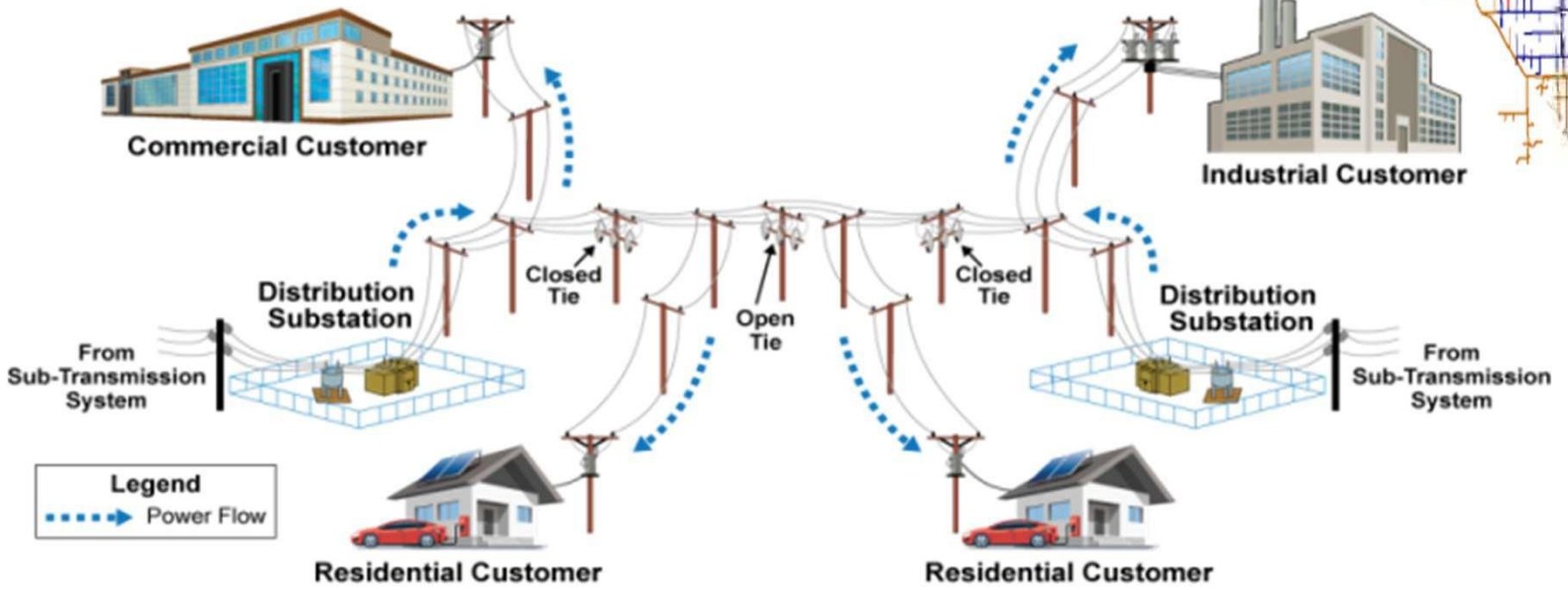
After Market Participation



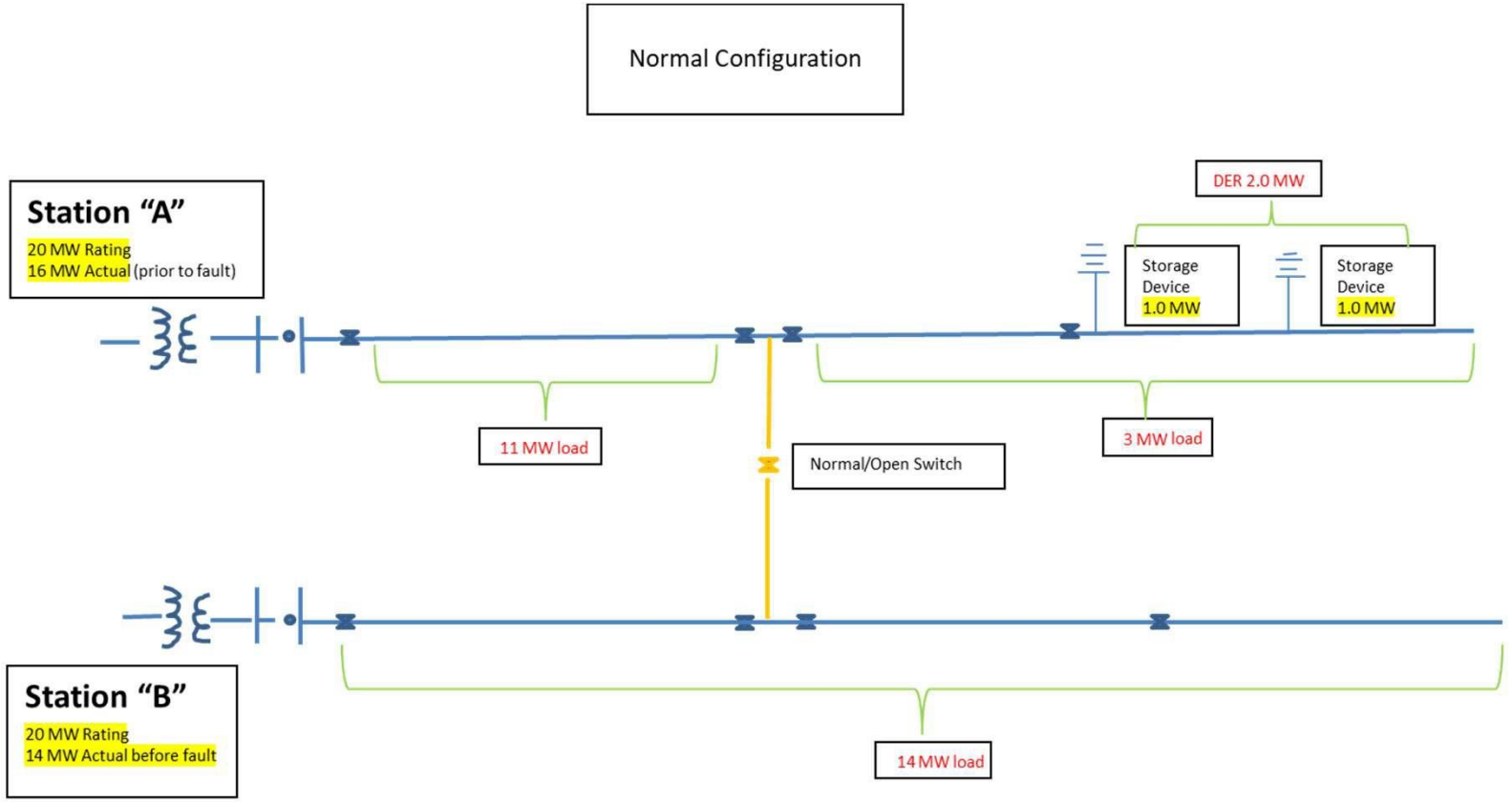
2. Outages and Abnormal Circuit Configurations

- Radial distribution design is reconfigurable via connections between feeders
- Many possible configurations adding operational complexity
- Outages and abnormal circuit configurations can create capacity constraints, which can affect DERs' ability to participate in wholesale markets





2. Outages and Abnormal Circuit Configurations



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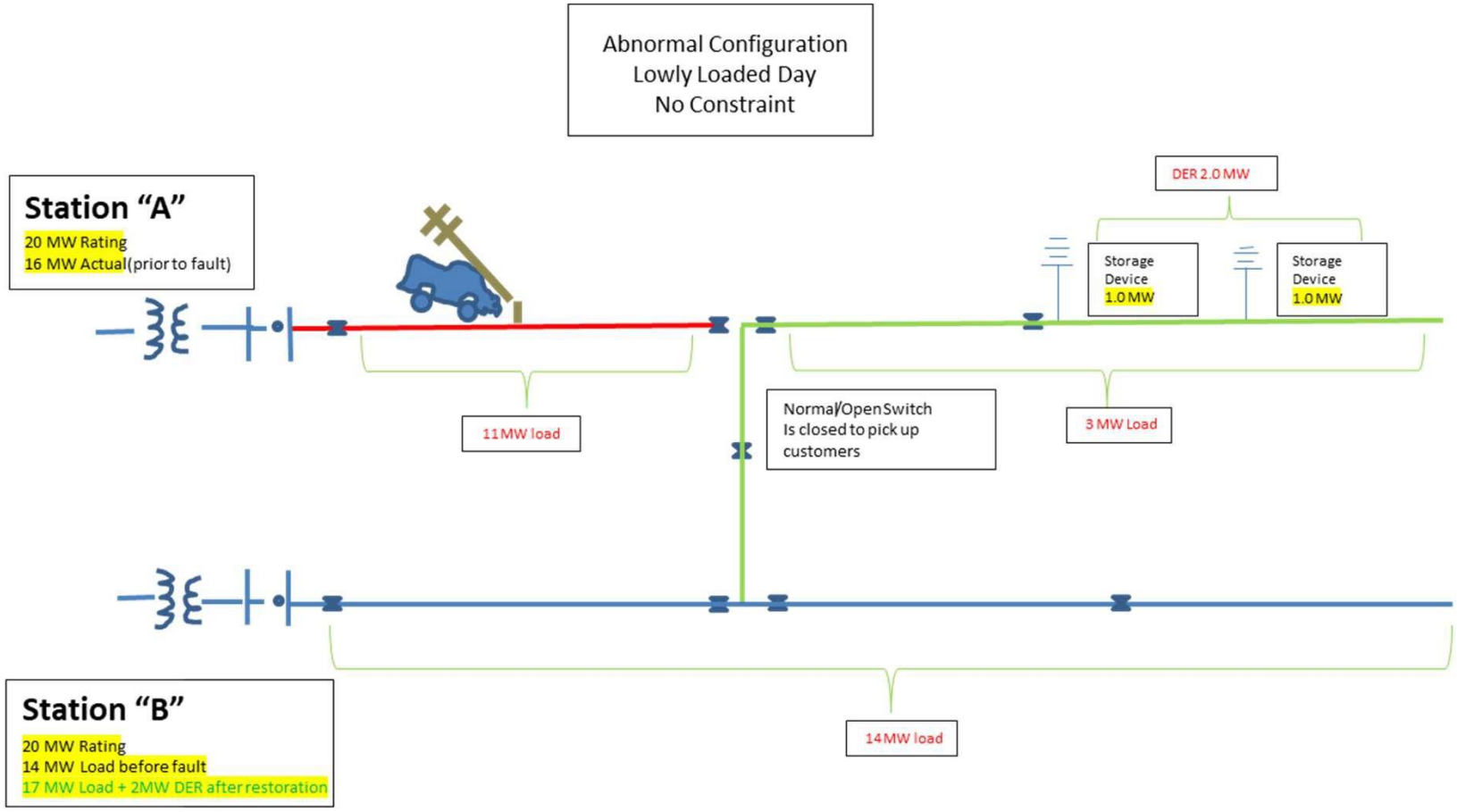

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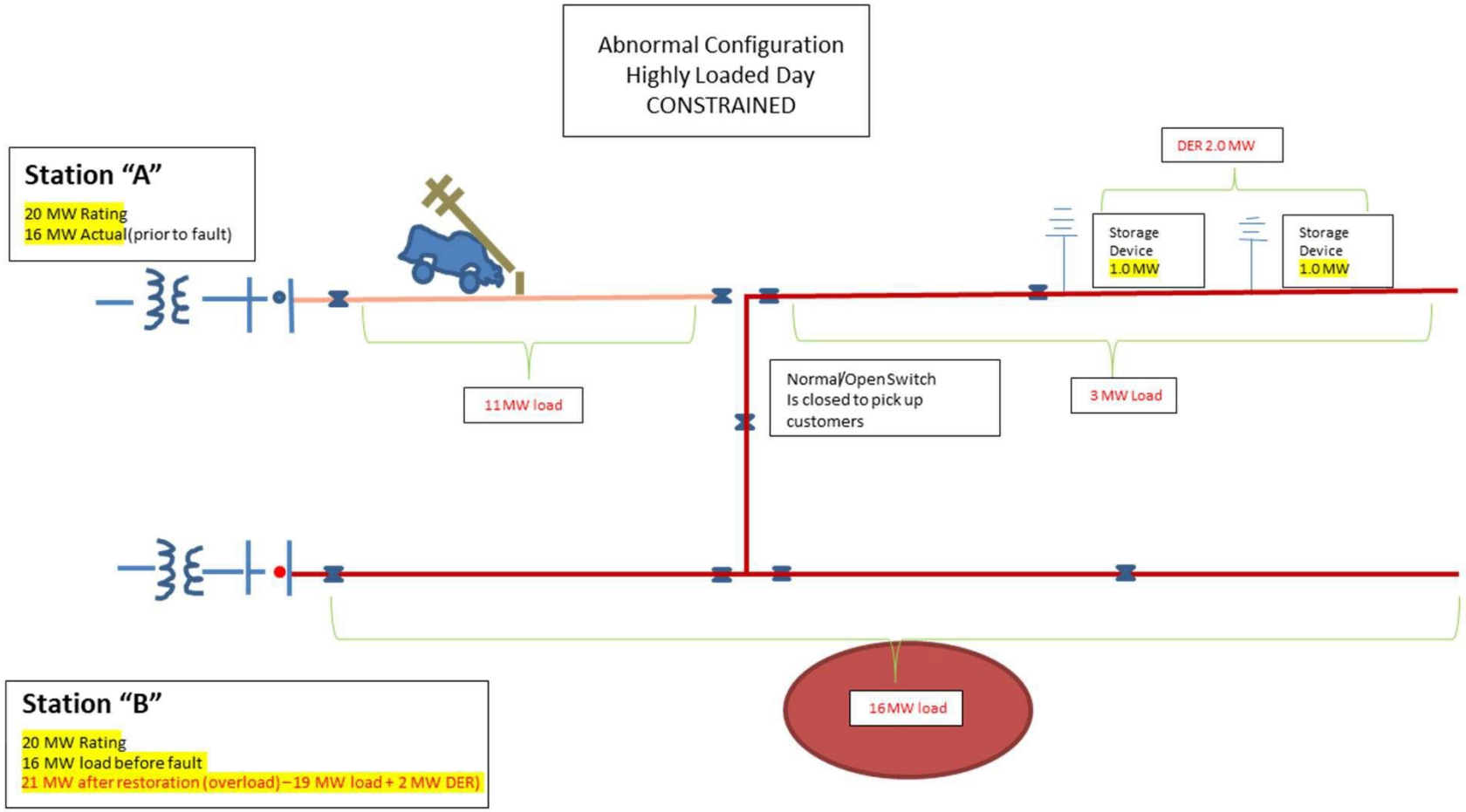


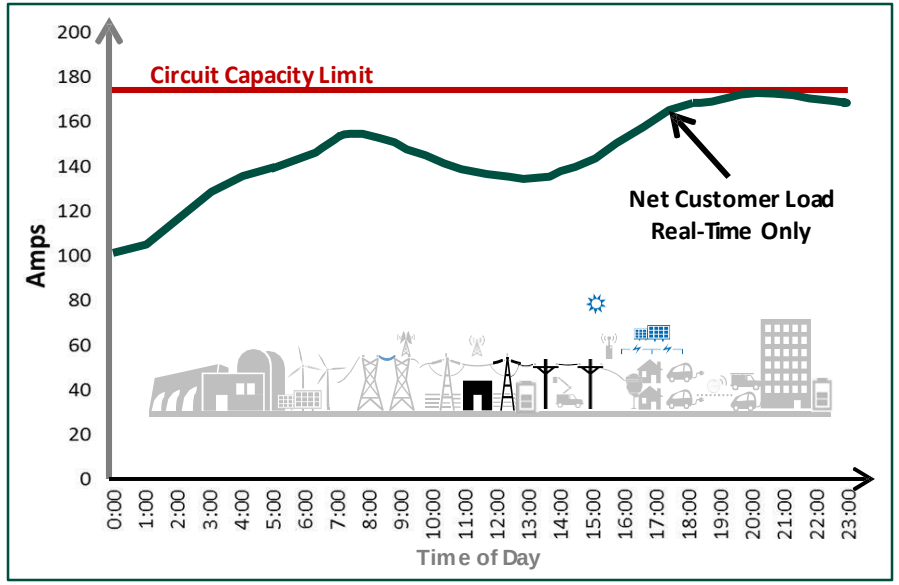
3. Masked Load

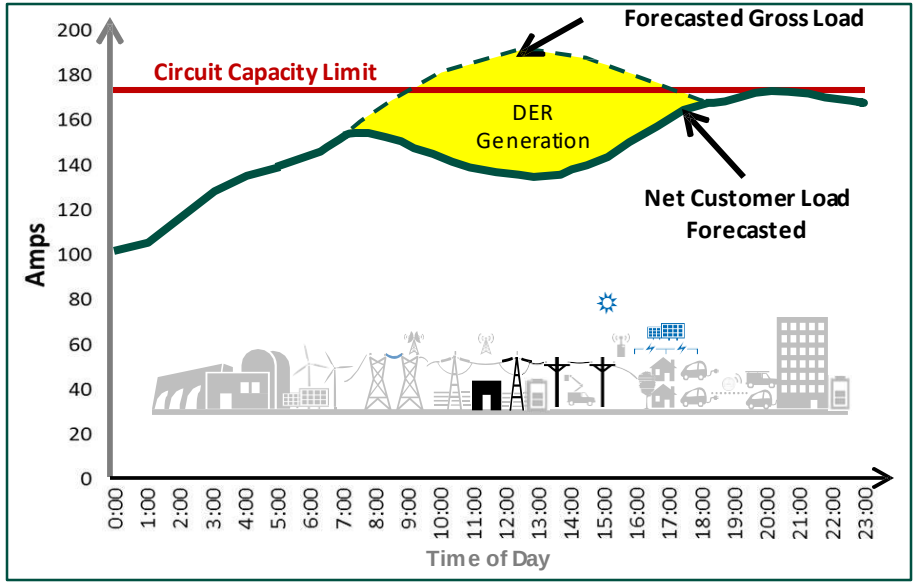
Current State

Operators only see real-time net loads at existing SCADA measurement points and may be <u>unaware of the true load</u> on each circuit

Future State

Increase DER Awareness for grid operations will be provided by integration of all measurement points and forecasting capabilities with advanced analytics and a power flow engine (i.e. Distribution State Estimation)

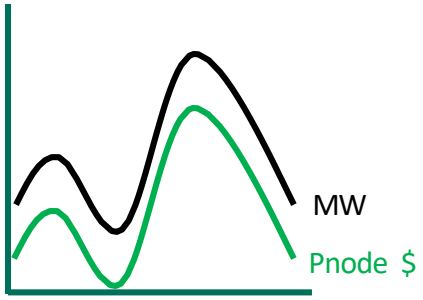




At high levels of penetration awareness of DER impacts is necessary to ensure safe and efficient system reconfiguration during outage restoration, service planning, and maintenance

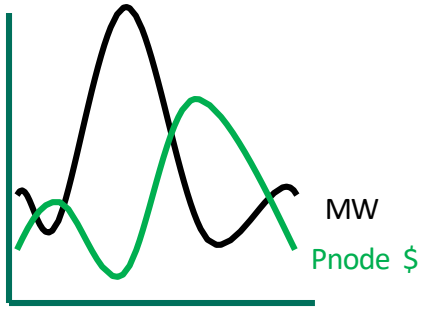
4. Local Circuit vs. CAISO Price Curve Alignment

Feeder 1:
Market Prices are Correlated w/Feeder Load



24-hour Period

Feeder 2:
Market Prices are NOT Correlated with Feeder Load

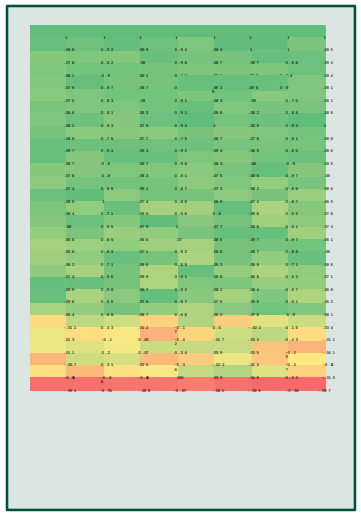


24-hour Period

Green:
Positive
Strong
Correlation

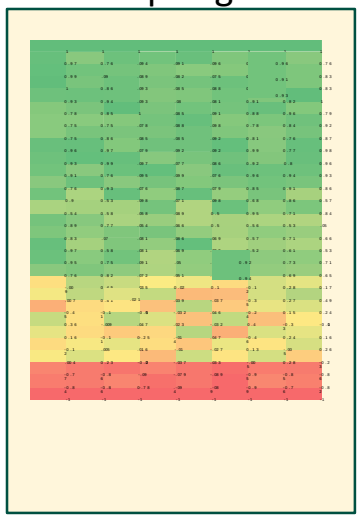
Red:
Negative

Entire Year



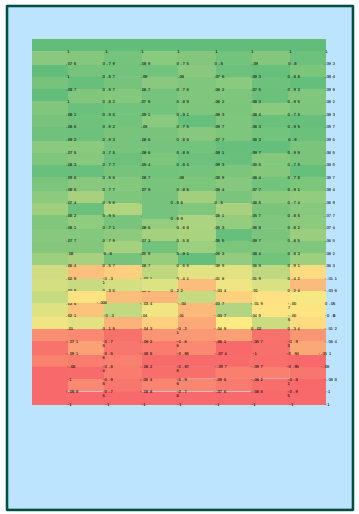
24-hour Period
(t0-t23h)

Spring



24-hour Period
(t0-t23h)

Month of March



24-hour Period
(t0-t23h)

Additional Slides

We Anticipate a High-Penetration Distributed Energy Resource (DER) Future

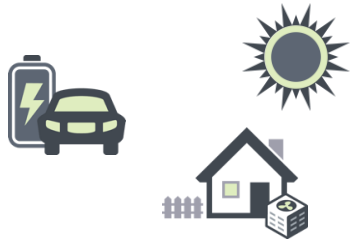
"This OIR anticipates a high-penetration DER future and seeks to determine how to optimize the integration of millions of DERs within the distribution grid while ensuring affordable rates."

– High DER OIR at p. 9

"This OIR neither seeks to set policy on the overall number of DERs nor does it seek to increase or decrease the desired level of DERs. This OIR focuses on preparing the grid to accommodate what is expected to be a high DER future and capture as much value as possible from DERs as well as mitigate any unintended negative impacts."

– High DER OIR at p. 10

Three High DER Proceeding Tracks



1

Distribution Planning Process and Data Improvements

- Phase 1: Near-Term Actions
- Phase 2: Distribution Planning Process Improvements
- Topics:
  - IOU Distribution Planning Processes
  - Electrification Impacts and Potential Mitigation
  - Data Portals
  - Community Engagement Needs Assessment for Distribution Planning

2

Distribution System Operator (DSO) Roles and Responsibilities

- Long-term grid vision(s) and associated policy issues
- Investigation of grid operations models
- Future Grid Study development and public outreach
- Future actions identified that could lead to a successor proceeding

3

Smart Inverter Operationalization and Grid Modernization Planning

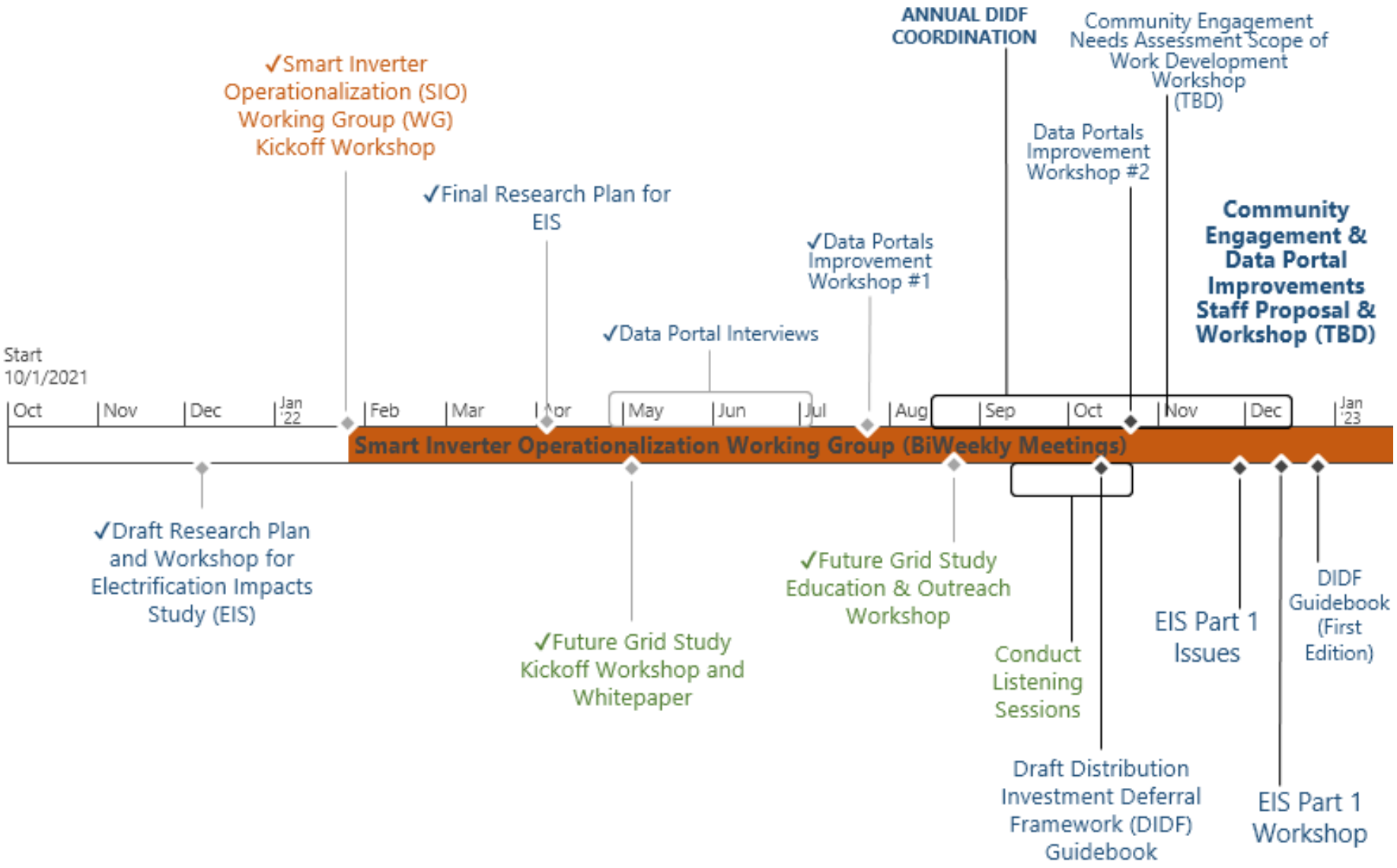
- Phase 1: Smart Inverter Operationalization
- Phase 2: Grid Modernization Planning and Cost Recovery
- Topics:
  - Business Use Cases for Smart Inverters
  - DER Dispatchability
  - Smart Grid Investment Planning

Work Plan

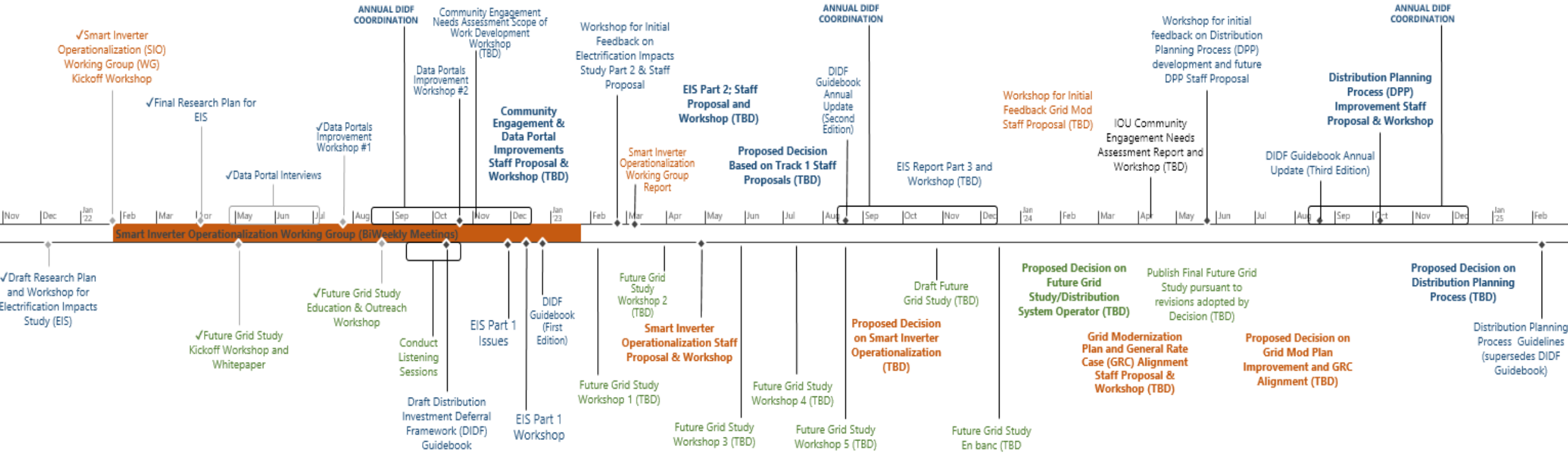
Work Plan Timeline (2021-2022)

Legend

- Bold are staff proposals and Decisions
- Proceeding Track 1
  - Distribution Investment Deferral Framework (DIDF)
  - Distribution Planning Process (DPP)
  - Electrification Impact Study (EIS)
- Proceeding Track 2
- Proceeding Track 3
  - Smart Inverter Operationalization (SIO)
  - Working Group (WG)
  - General Rate Case (GRC)



Work Plan Timeline (2021-2025)



Scoping Questions & Key Deliverables

Track 1 Scoping Questions About Distribution Planning and Community Engagement

Track 1, Phase 1

#5. What initial analysis is needed for the Commission to determine in Track 1, Phase 2, of this proceeding how best to improve local engagement in utility distribution planning?

- See also, Scoping Ruling at p. 13, "Energy Division will conduct a workshop on the scope and funding of a potential **community engagement needs assessment** during the third quarter of 2022 to inform Track 1, Phase 2 of this proceeding."

Track 1, Phase 2

#3. Leveraging the analysis identified in Track 1, Phase 1, are there ways in which utility distribution planning representatives could better engage with local and Tribal governments, Environmental and Social Justice communities, and local developers to ensure new planned loads and developments are factored into Utility Distribution Planning Processes and local concerns regarding distribution planning are adequately addressed?

Note: The full list of scoping questions is provided in the proceeding's Scoping Ruling.

Track 1 Community Engagement Needs Assessment

- Among the many Track 1 goals are to improve utility distribution planning to be more responsive to the needs and plans of communities.
- An external consultant is anticipated to create and implement a Community Engagement Needs Assessment **to determine what communities want and need from distribution planning**.
- The scope and cost of the needs assessment would be approved by the CPUC via a Decision.
- The scope of work for the needs assessment will be developed in a Quarter 4, 2022 Tribe workshop and released via a staff proposal following the workshop.

Track 2 Scoping Questions and Future Grid Study

#1. How do alternative DSO models compare in their ability to plan and operate a high DER grid, unlock economic opportunities for DERs to provide grid services, limit market power, reduce ratepayer costs, increase equity, support grid resiliency, and meet State policy objectives?

#2. Should the Utilities be incentivized to cost-effectively prepare for widespread DER deployments? If so, how?

- The Future Grid Study is the primary deliverable planned for Track 2. It is designed to address these two scoping questions. For further details, see: https://gridworks.org/initiatives/california-future-grid-study

Track 2 Future Grid Study

- The study would explore, assess, and develop a detailed strategy for options to evolve California's electric grid to the grid of the future—one that enables the full integration of DERs cost effectively, safely, reliably, and in line with State policy.
- Tribes would be included in the development of California's vision for the future grid, its design principles, the required functionality, and each step that must be taken to meet these objectives.
- Various Distribution System Operator models would be explored and options for piloting feasible models would be identified.
  - The models evaluated might be prioritized according to likelihood of future implementation or highlighted for additional study.
  - We expect issues appropriate for a successor proceeding and potential legislative action to be identified for consideration during the Study development and review processes.

Technical Workshop Series for Study Development

- **Workshop 1** (Q1 2023): Visions and Objectives for a Future Grid
- **Workshop 2** (Q1/Q2 2023): Operations Needed for the Future Grid
- **Workshop 3** (Q2 2023): Gap Assessment, Collect Additional Gap Information
- **Workshop 4** (Q2/Q3 2023): Present and Socialize Distribution System Operator Model Proposals
- **Workshop 5** (Q3 2023): Identify Barriers, Actions, Trade-Offs

Robust and Meaningful Comments on the Draft Future Grid Study

- To ensure robust comments are received on the Draft Future Grid Study, including from Tribes that have not traditionally participated in CPUC proceedings on energy issues, Staff expect that **outreach already scoped for Track 1 will be coordinated with Track 2**.
- This would be accomplished by ensuring that the scope of work to be developed for the Track 1 Community Engagement Needs Assessment includes widespread education and outreach support specific to the Draft Future Grid Study.
  - Support for repeating the educate-listen-focus principles during widespread outreach in the State and among diverse communities would be included.
- Scope of work approval, including funding for consultant support, would be determined in a Track 1 Proposed Decision.

Other Deliverables by High DER Track

- **T1:** Research Plan for Electrification Impacts Study
- **T2:** White Paper for Future Grid Study
- **T1:** Community Engagement Needs Assessment Scope of Work
- **T1:** Distribution Investment Deferral Framework Guidelines
- **T1:** Electrification Impacts Study (Parts 1, 2, and 3)
- **T3:** Smart Inverter Operationalization Working Group Report
- **T3:** Smart Inverter Operationalization Staff Proposal
- **T2:** Future Grid Study
- **T1:** Community Engagement Needs Assessment Report
- **T3:** Grid Modernization Plan Improvement and GRC Alignment Staff Proposal
- **T1:** Data Portal Improvement Technical Report
- **T1:** Distribution Planning Process Guidelines Staff Proposal