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Distribution Capacity Expansion Planning: Current Practice, Opportunities

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May 16th 2023

Interview Process & Approach

- Participants
  - 12 Utilities, 1 Developer, 2 Consultants, 1 Non-profit Renewable Advocate
  - 1 Hour meetings

- Final paper here: https://www.nrel.gov/docs/fy23osti/83892.pdf

Distribution Capacity Expansion Planning: Current Practice, Opportunities, and Decision Support

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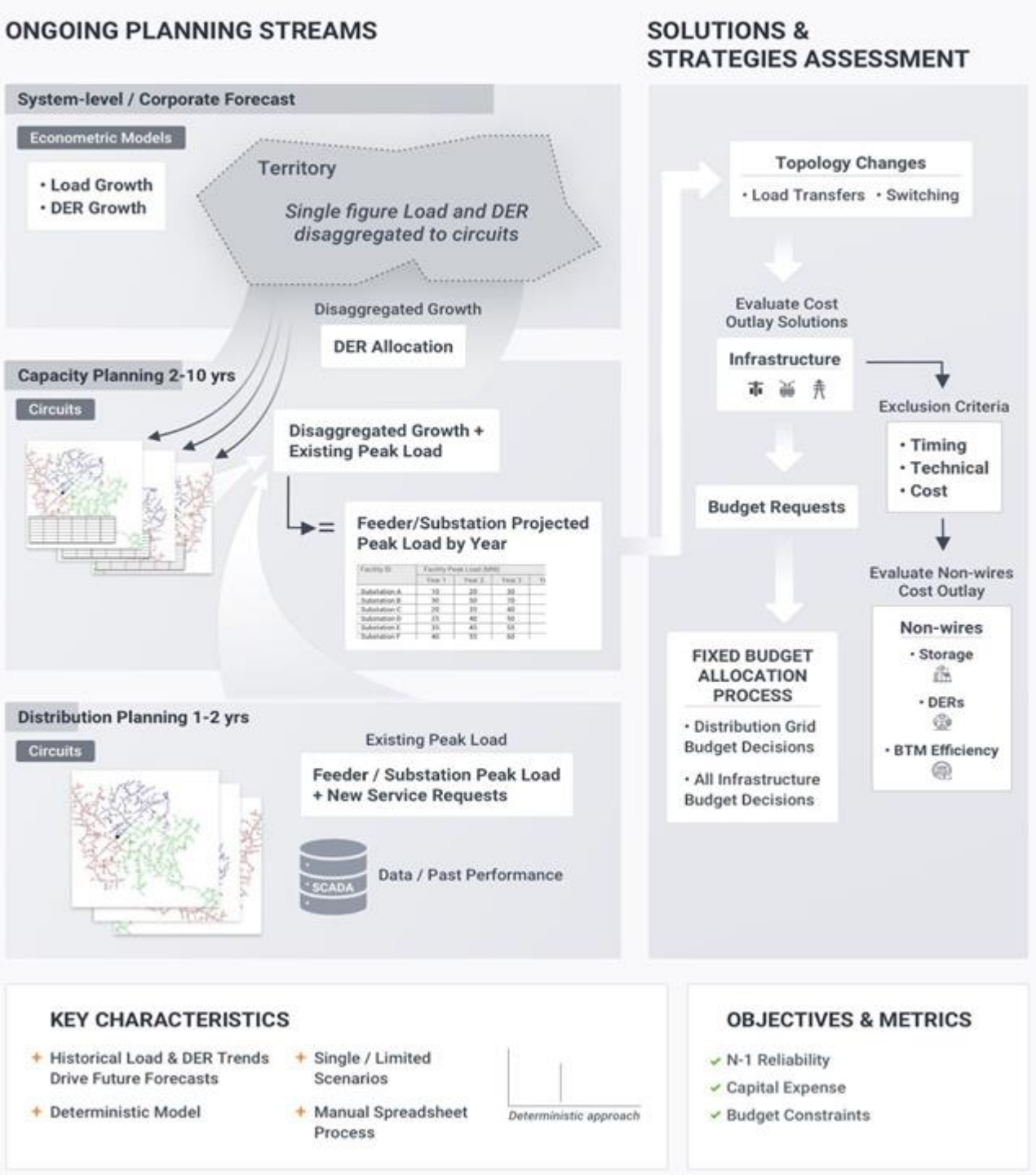
1. NREL
2. kevala
3. DLC DUQUESNE LIGHT CO.
4. Portland General Electric
5. pepco holdings AN EXELON COMPANY
6. Hawaiian Electric
7. Xcel Energy

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

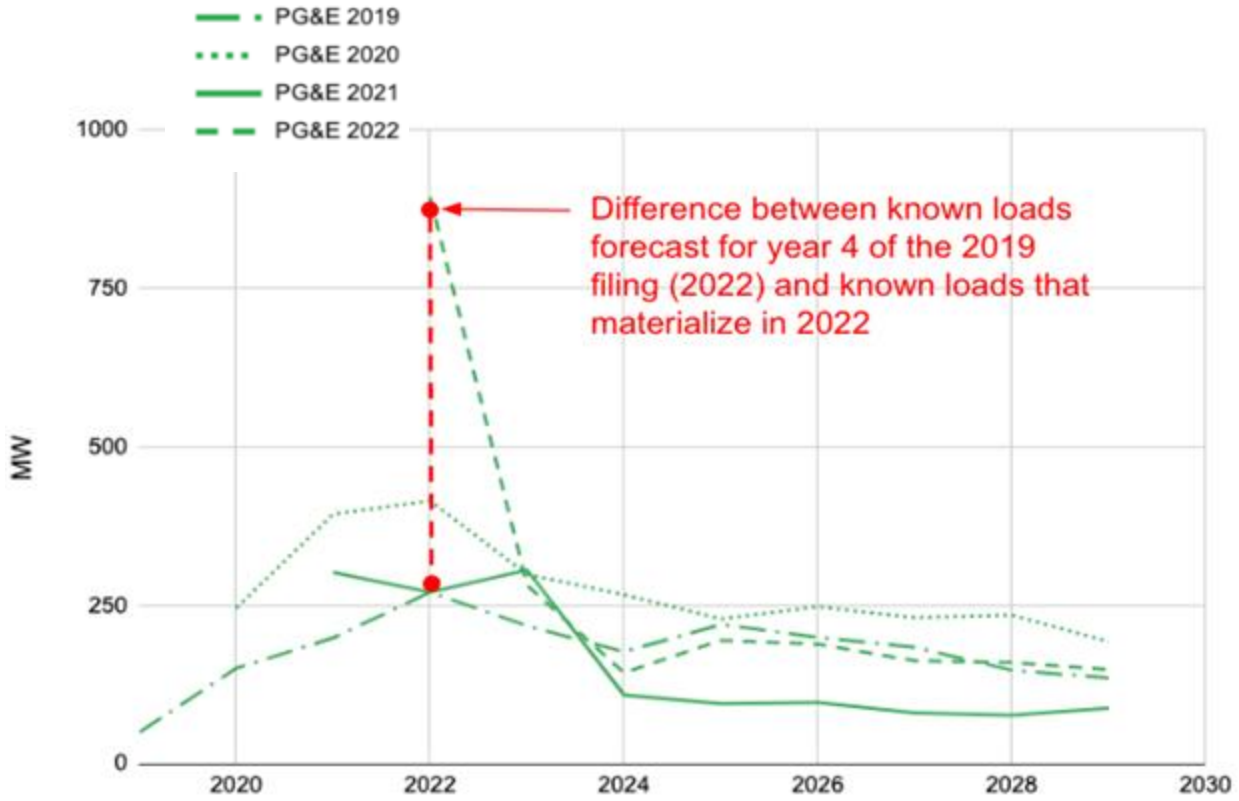
Technical Report
NREL/TP-6A40-83892
September 2022

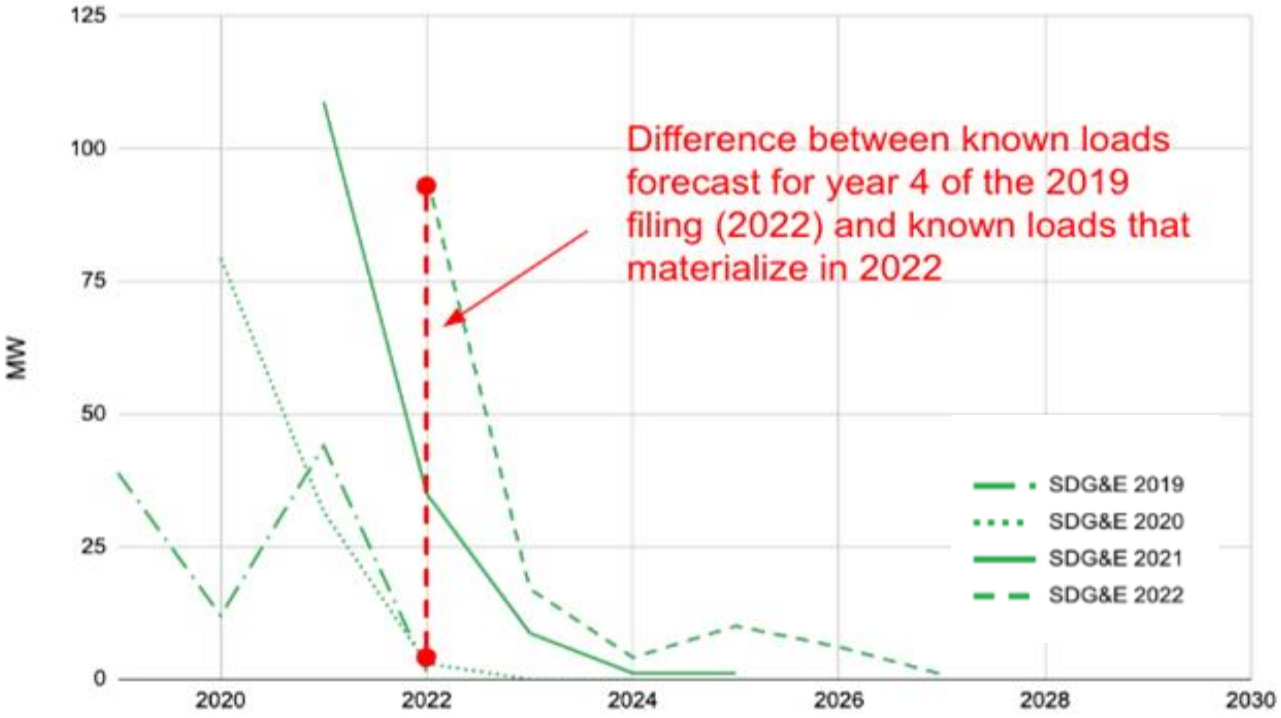
Existing Distribution Capacity Planning

- Capacity planning mismatch with long term changing policy goals
- Allocation/forecasts not aligned with electrical infrastructure and meters
- Hierarchy of solutions
- Fixed annual budgets and competition between departments for priority of projects



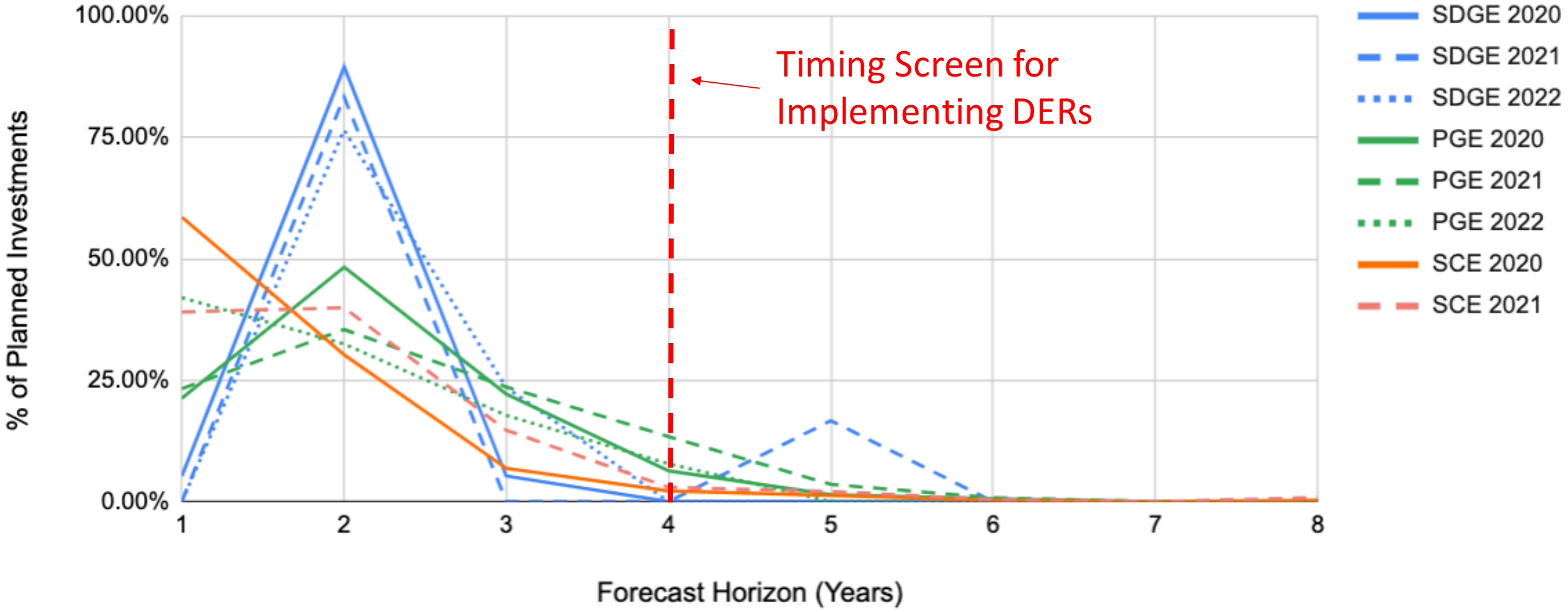
Known Loads Driving Investments is Reactive





[Distribution Investment Deferral Framework: Evaluation and Recommendations]

Investments Consistently Needed

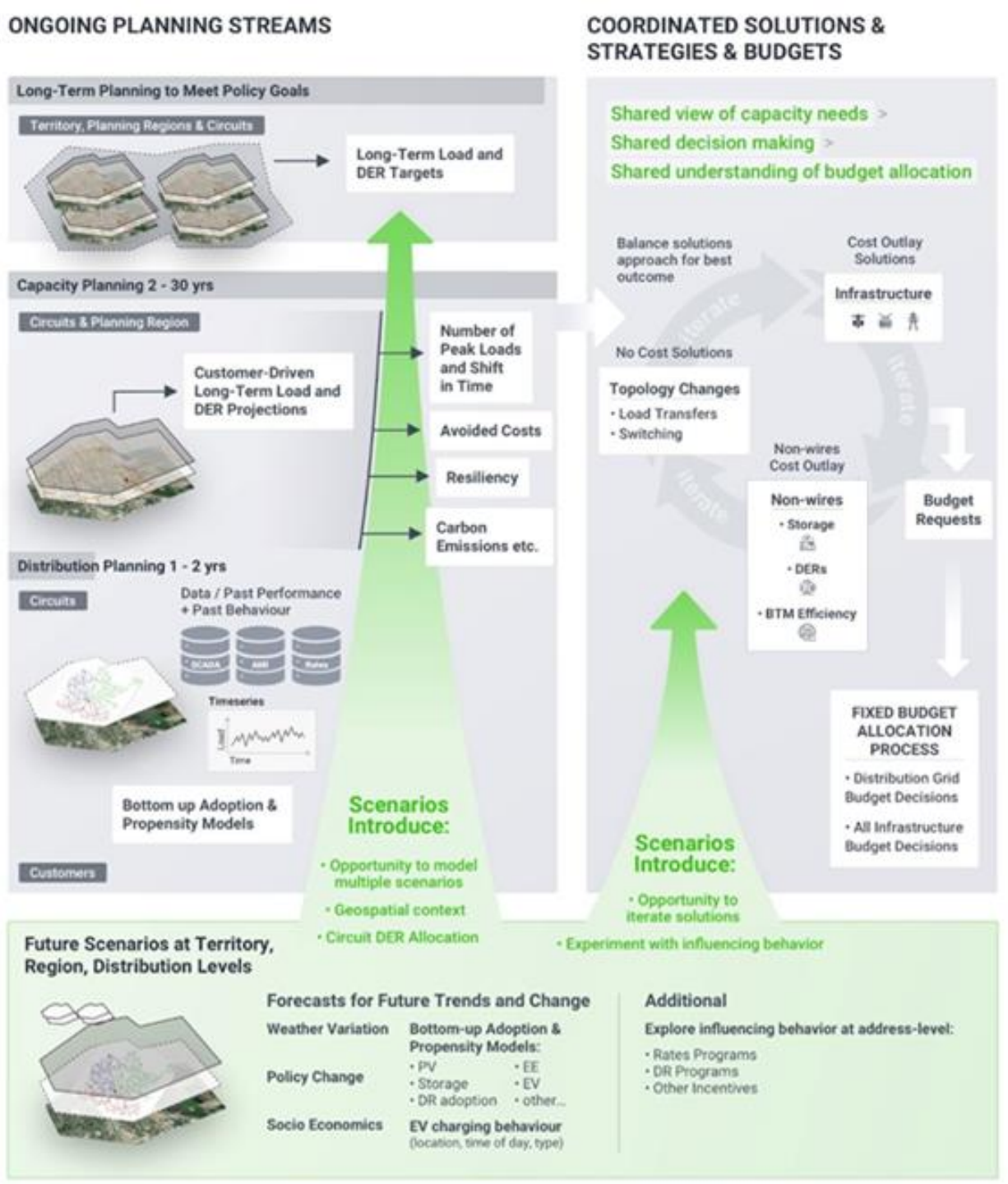


Distribution Investment Deferral Framework: Evaluation and Recommendations

*SCE 2022 GNA delayed until Jan. 2023

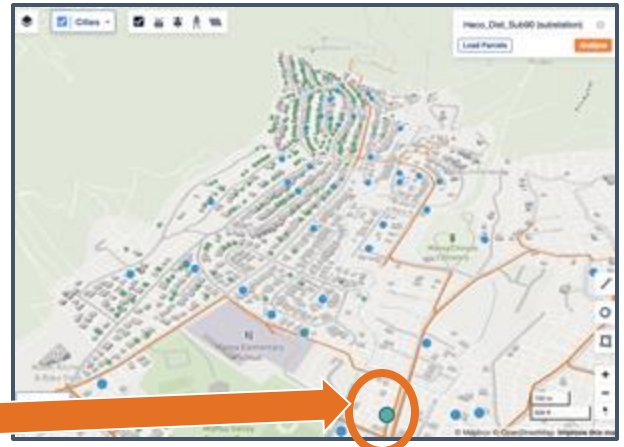
Gaps & Opportunities

- Load and DER Forecasting
  - High spatial and temporal resolution
  - Longer term forecast
- Scenario and Probabilistic Methods
- Objectives and Metrics
  - N-1 thermal
  - Cost
  - + Resilience, hosting capacity, equity, energy efficiency and carbon emissions



Aligning Top-down & Bottom-up Forecasts

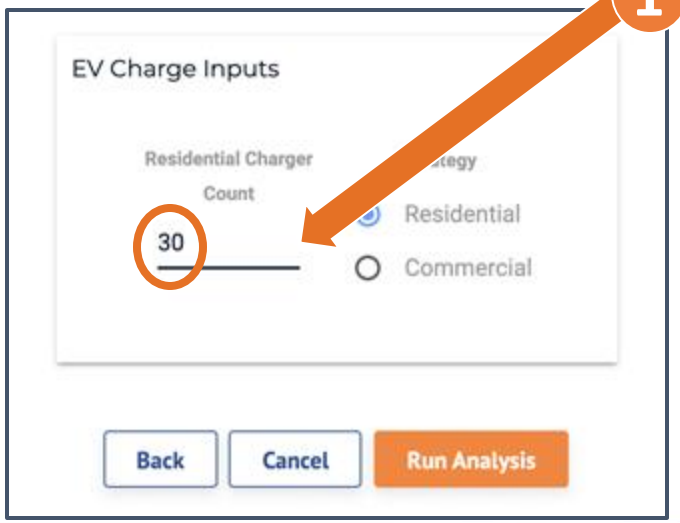
Select grid infrastructure or area to allocate appropriate number of EV chargers to align with regional EV adoption forecasts



Identify the most probable locations for EV charger deployment and load impacts on a feeder, circuit, or within an area and generate time-series forecasts

1

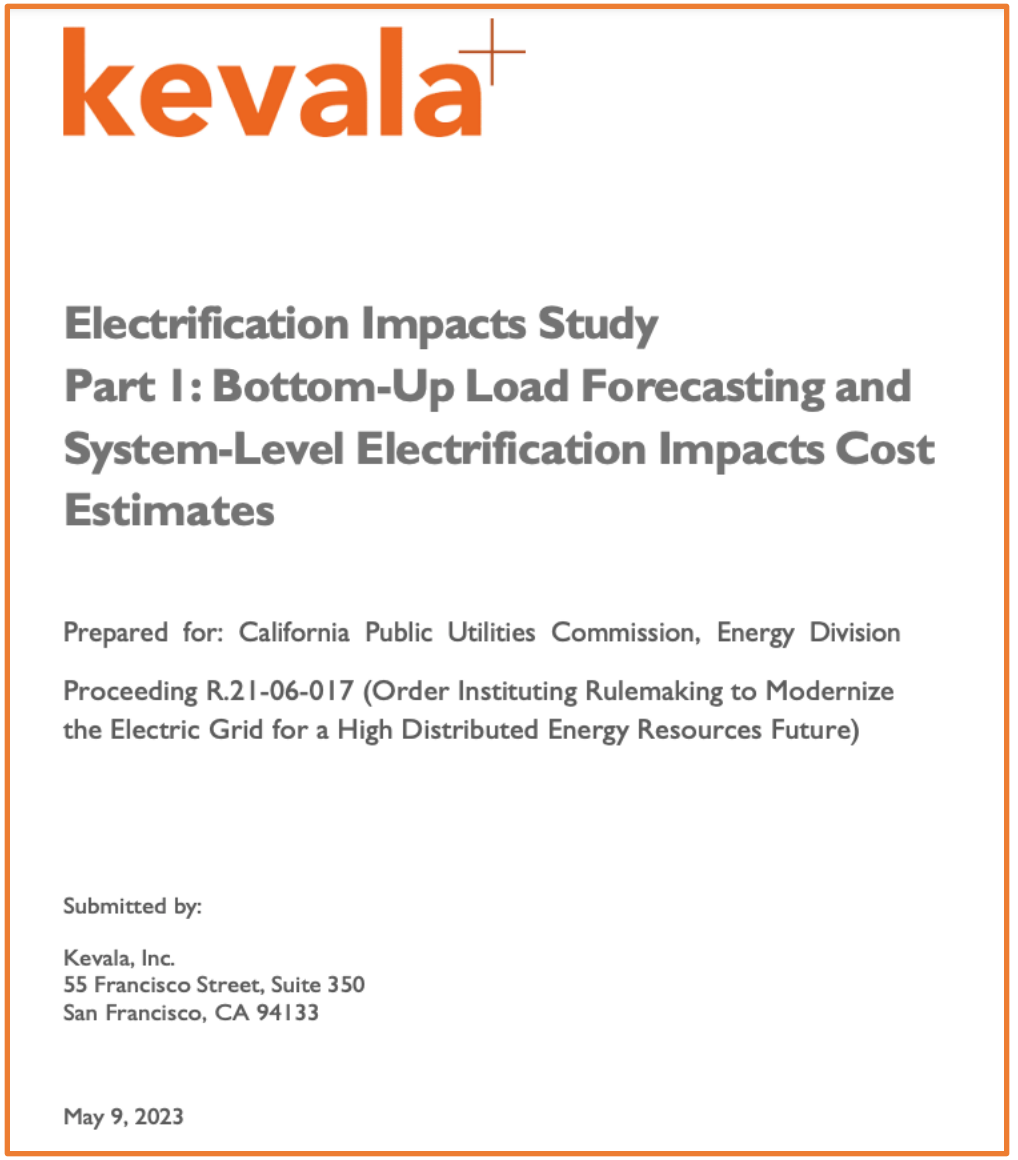
2



Electrification Impacts Study in California

- Electric distribution grid requirements and their associated costs increase significantly beyond the traditional distribution grid planning cycle
  - Up to $50 billion in traditional electricity distribution grid infrastructure investments by 2035 across these unmitigated load scenarios
  - Secondary transformer and service upgrades alone are a non-negligible contribution to the total grid capacity upgrade costs

https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M508/K423/508423247.PDF



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Electrification Impacts Study
Part 1: Bottom-Up Load Forecasting and System-Level Electrification Impacts Cost Estimates

Prepared for: California Public Utilities Commission, Energy Division

Proceeding R.21-06-017 (Order Instituting Rulemaking to Modernize the Electric Grid for a High Distributed Energy Resources Future)

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May 9, 2023

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Thank you!

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