DOCKETED	
Docket Number:	19-AB-2127
Project Title:	Implementation of AB 2127 Electric Vehicle Charging Infrastructure Assessments
TN #:	236574
Document Title:	Presentation - AB 2127 - 2-5-2021
Description:	N/A
Filer:	Spencer Kelley
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	2/2/2021 1:27:04 PM
Docketed Date:	2/2/2021

AB 2127 Electric Vehicle Charging Infrastructure Assessment

Lead Commissioner Workshop
February 5, 2021, 1:00-3:30 p.m.

Opening Remarks

Commissioner Patty Monahan

Agenda

- 1:00: **Opening Remarks**, Commissioner Patty Monahan
- 1:10: **EVSE Deployment and Grid Evaluation**, Micah Wofford
- 1:25: **Vehicle-Grid Integration**, Noel Crisostomo
- 1:40: **Connector and Communication Standards**, Jeffrey Lu
- 2:00: **Questions and Answers**
- 2:30: *Break*
- 2:35: **Tailoring Charging Solutions to Local Constraints**, Raja Ramesh
- 2:45: **Workforce Training and Development**, Larry Rillera
- 3:00: **Questions and Answers**
- 3:25: **Closing Remarks**, Commissioner Patty Monahan
- 3:30: **Adjourn**

Questions & Answers

Please raise your hand and the moderator will unmute you.

Thank you! Questions or comments?

Contacts:

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Raja.Ramesh@energy.ca.gov
Larry.Rillera@energy.ca.gov

Webpage:

https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127

EVSE Deployment and Grid Evaluation (EDGE) Tool

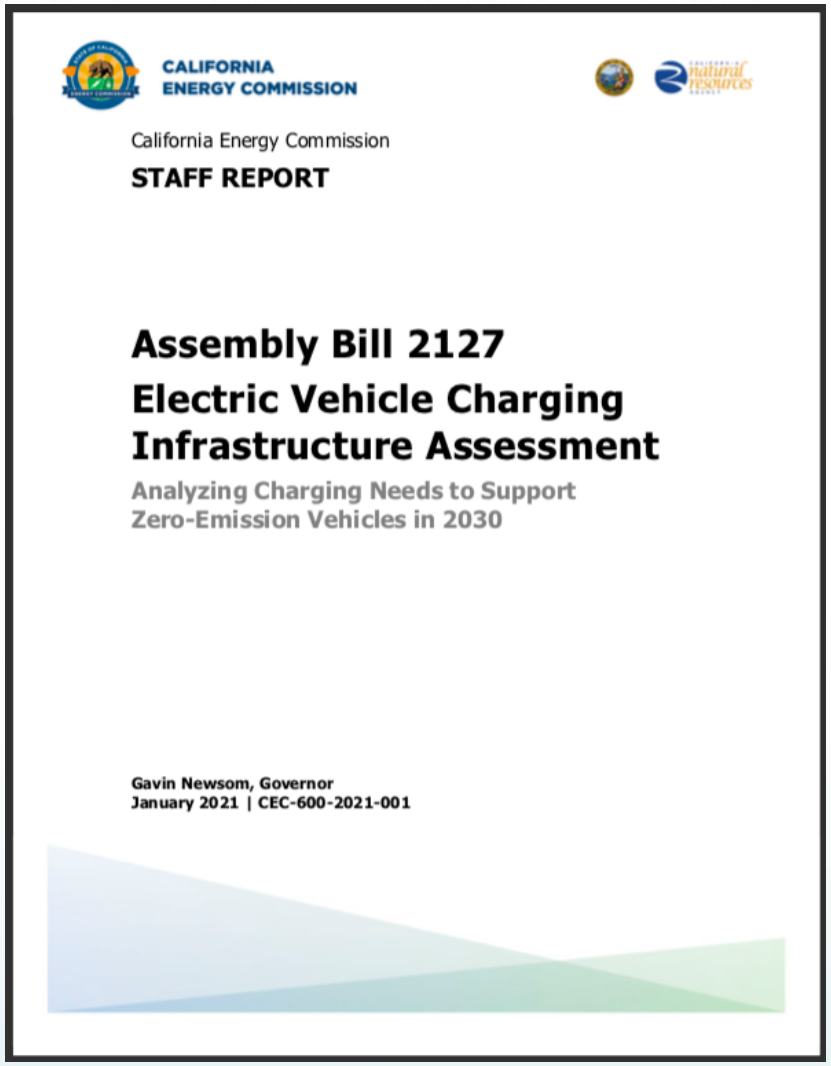
Micah Wofford

Associate Energy Specialist

Overview

- Context
  - Background and Purpose
  - Objectives
- Design
  - Data sources
  - Structure
  - Analytical Relationships
  - Allocation Methodology
- Results
  - Statewide Capacity Analysis
  - Distribution of IOU Circuit Capacities
  - EVI-RoadTrip Case Study
- Conclusion
  - Limitations and Future Work
  - Need for stakeholder engagement

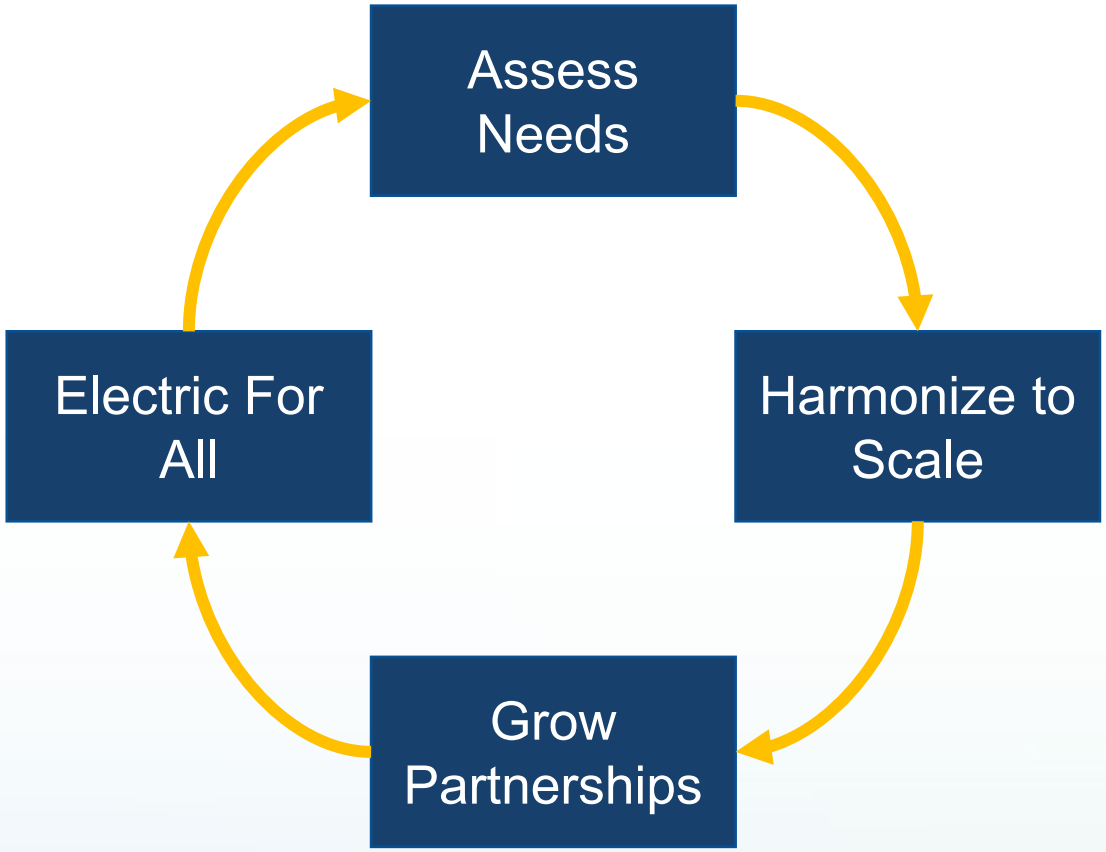
Background and Purpose



Front cover of AB 2127 report

- **AB 2127** – Assess infrastructure necessary to support 5 million ZEVs on CA roads by 2030
- Need to identify geographic locations to sufficiently, economically host charging stations
- “Early warning system”; focus infrastructure deployments and investment planning
- Iterative process which requires ongoing analysis

Objectives



Infrastructure Deployment Process Flow

- Cyclic deployment process flow – infrastructure for all
- Objectives of the analysis:
  - Minimize/mitigate grid impact
  - Achieve air quality improvement goals
  - Meet EV travel demand
  - Equitable deployment
- EDGE domains:
  - Grid impact
  - Air quality
  - Travel demand
  - Equity considerations

Data Sources

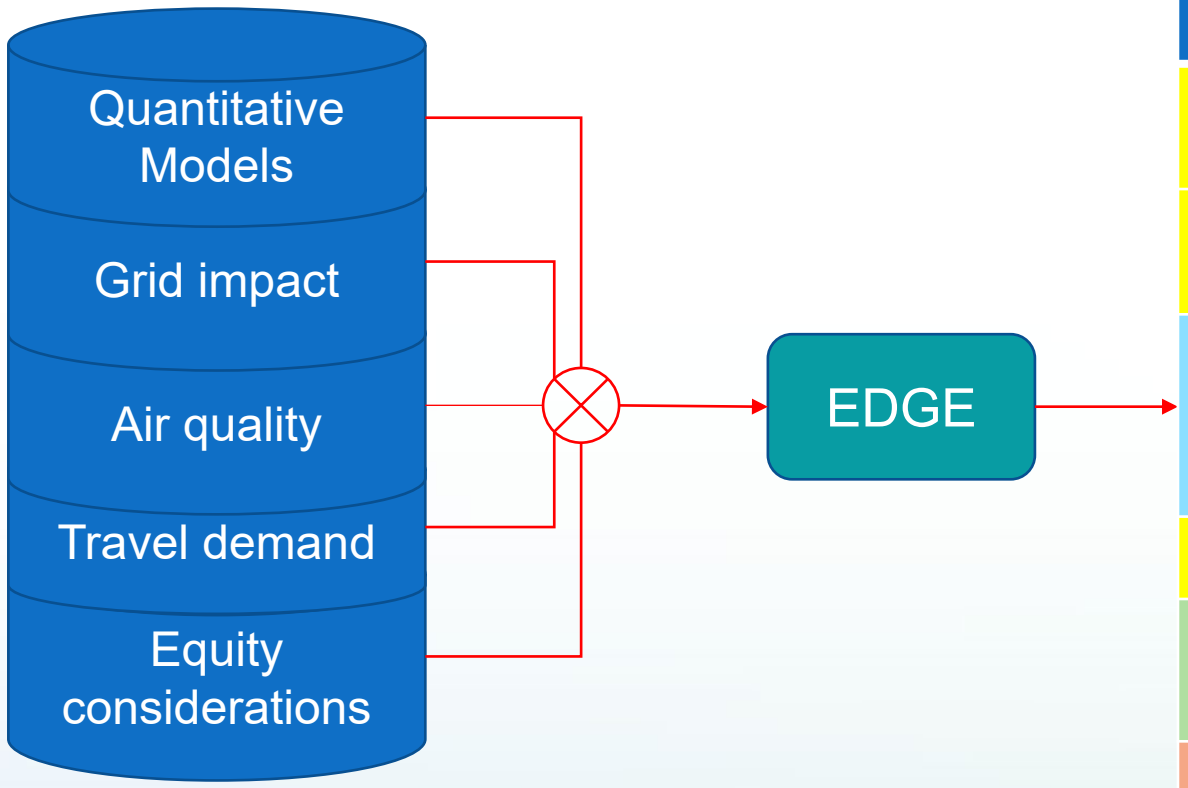
- EVI-Pro and HEVI-LOAD infrastructure quantification results
  - Foundation on which to layer other analyses and data
- **G** – Grid impact
  - Regional distribution grid hosting capacity – Grid Needs Assessment (GNA), Integration Capacity Analysis (ICA)
- **A** – Air quality
  - Energy Assessment Division (EAD) GHG emission factors
- **T** – Travel demand
  - Statewide vehicle stock – EAD Zero-Emission Vehicle and Infrastructure Statistics
- **E** – Equity considerations
  - Disproportionality analysis – SB 1000 assessment
  - Auto ownership burden – Location Affordability Index

Structure

Input Data

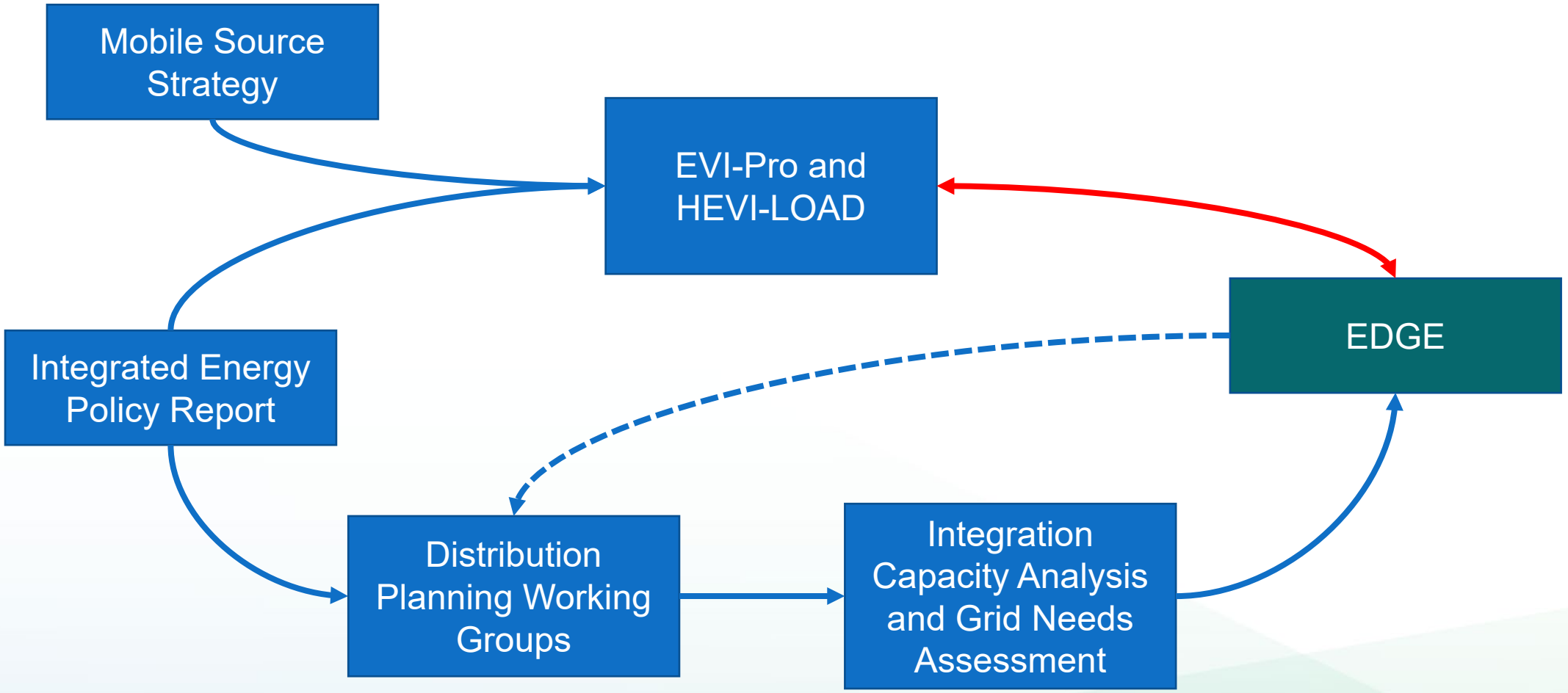
Processing

Output Domains



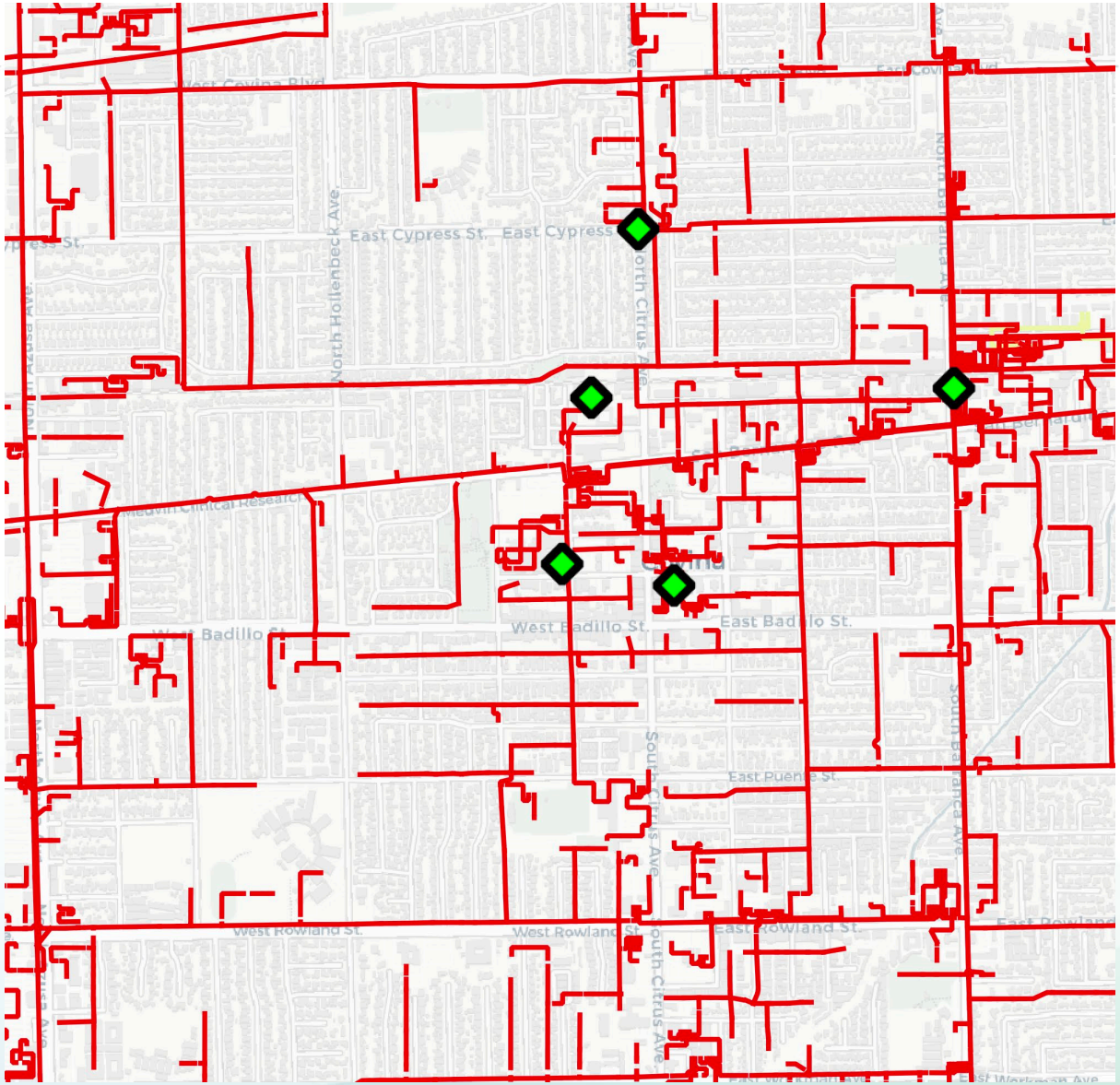
Spatial Unit	G – Grid	A – Air quality	T – Travel demand	E – Equity
Block Group	✓			✓
Census Tract		✓		✓
Traffic Analysis Zone (TAZ)			✓	
County	✓	✓	✓	✓
Air Quality District		✓		
Utility Territory	✓			

Analytical Relationships



Flow chart of related analyses

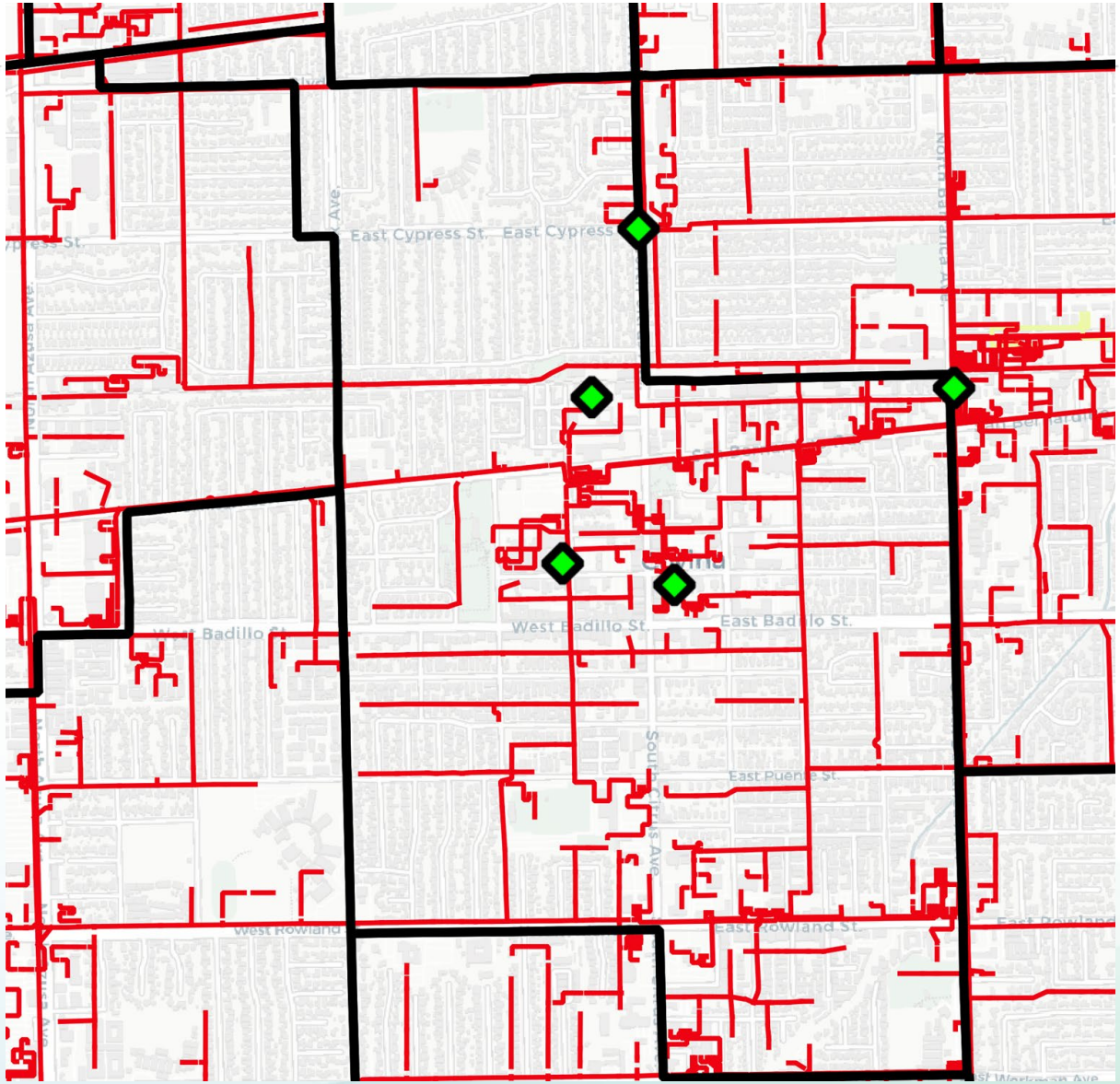
Allocation Methodology



Example EDGE output

Note: Charger data sourced from AFDC, not actual CEC analysis results

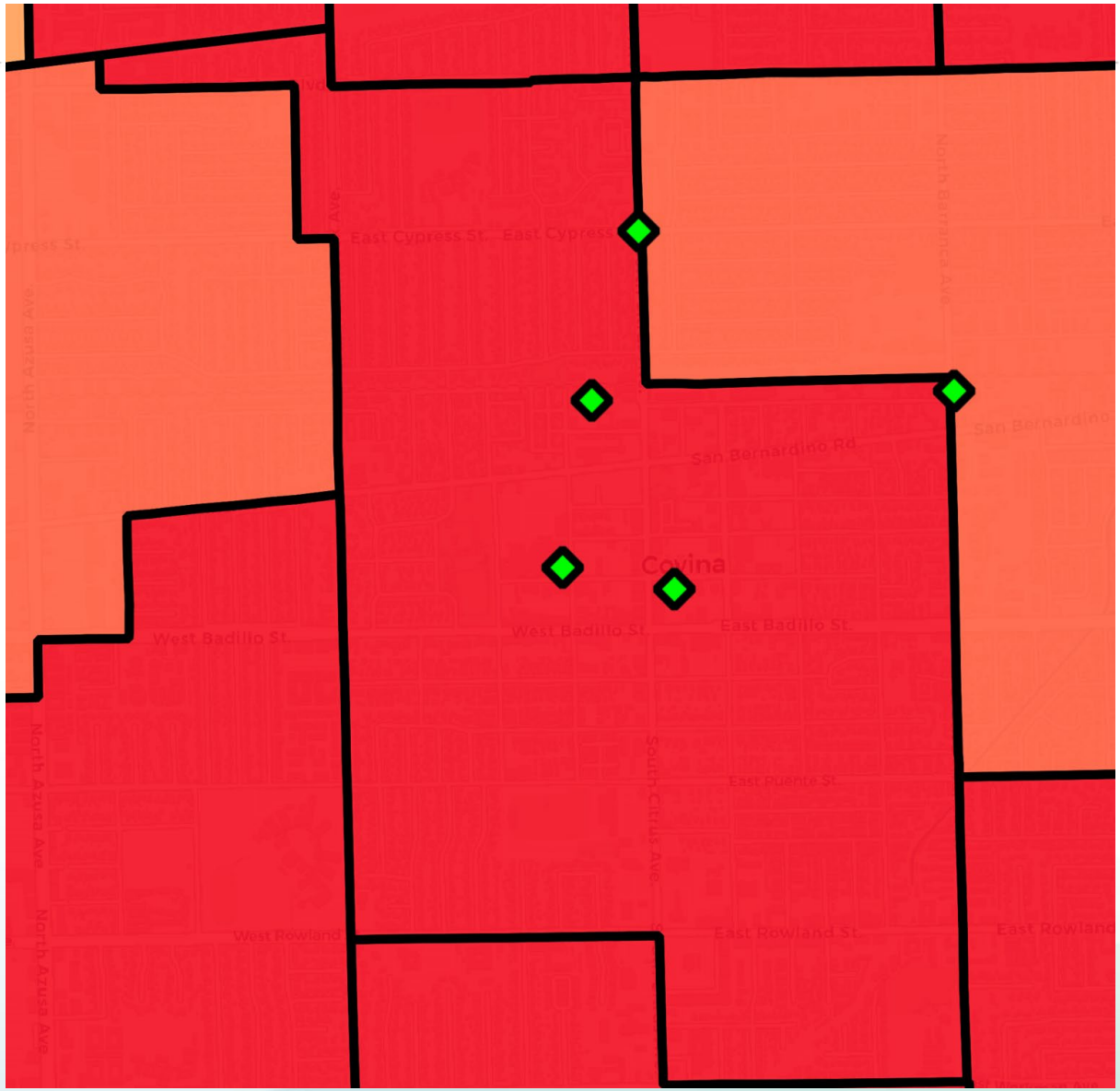
Allocation Methodology (cont'd)



Example EDGE output

Note: Charger data sourced from AFDC, not actual CEC analysis results

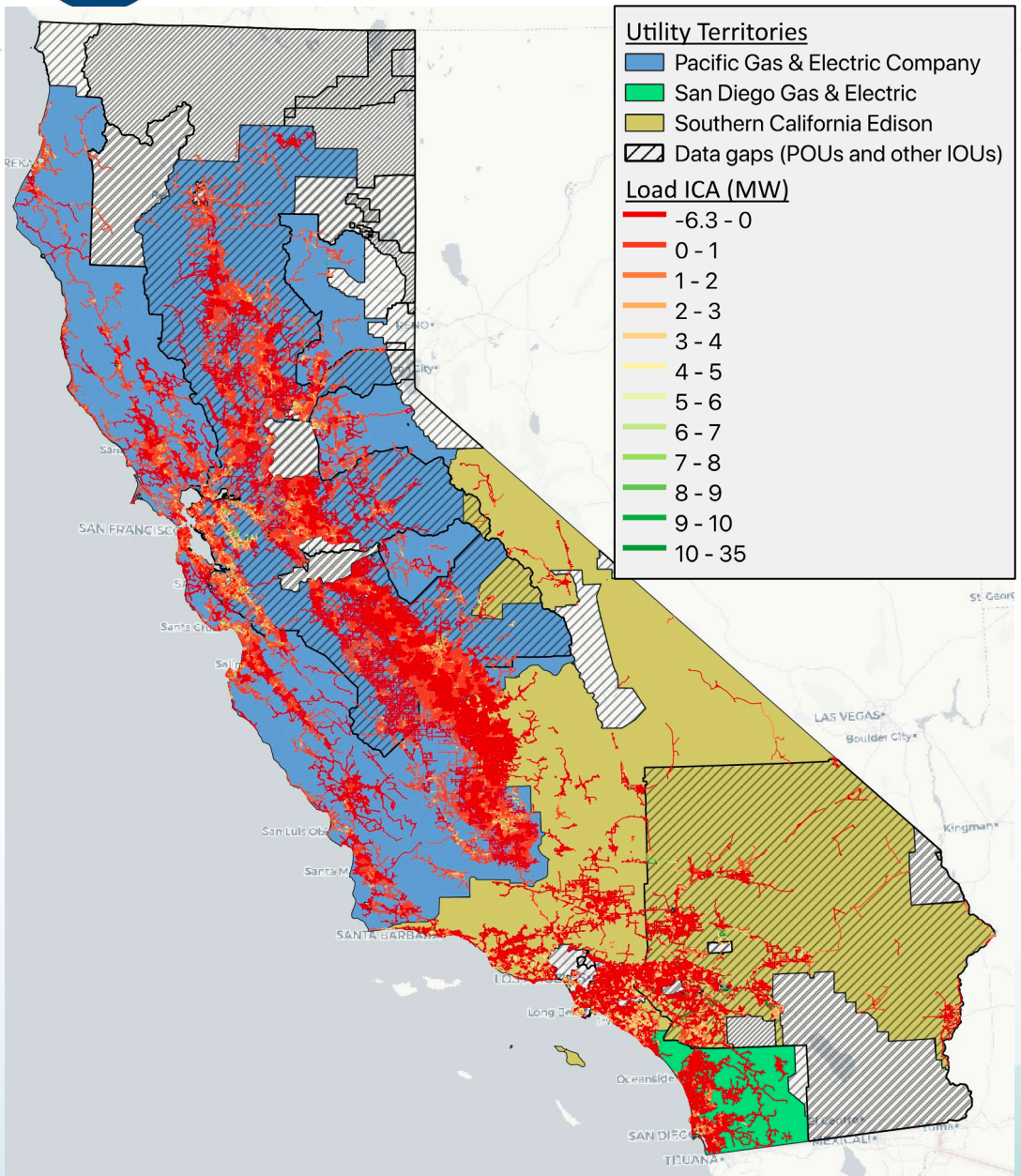
Allocation Methodology (cont'd)

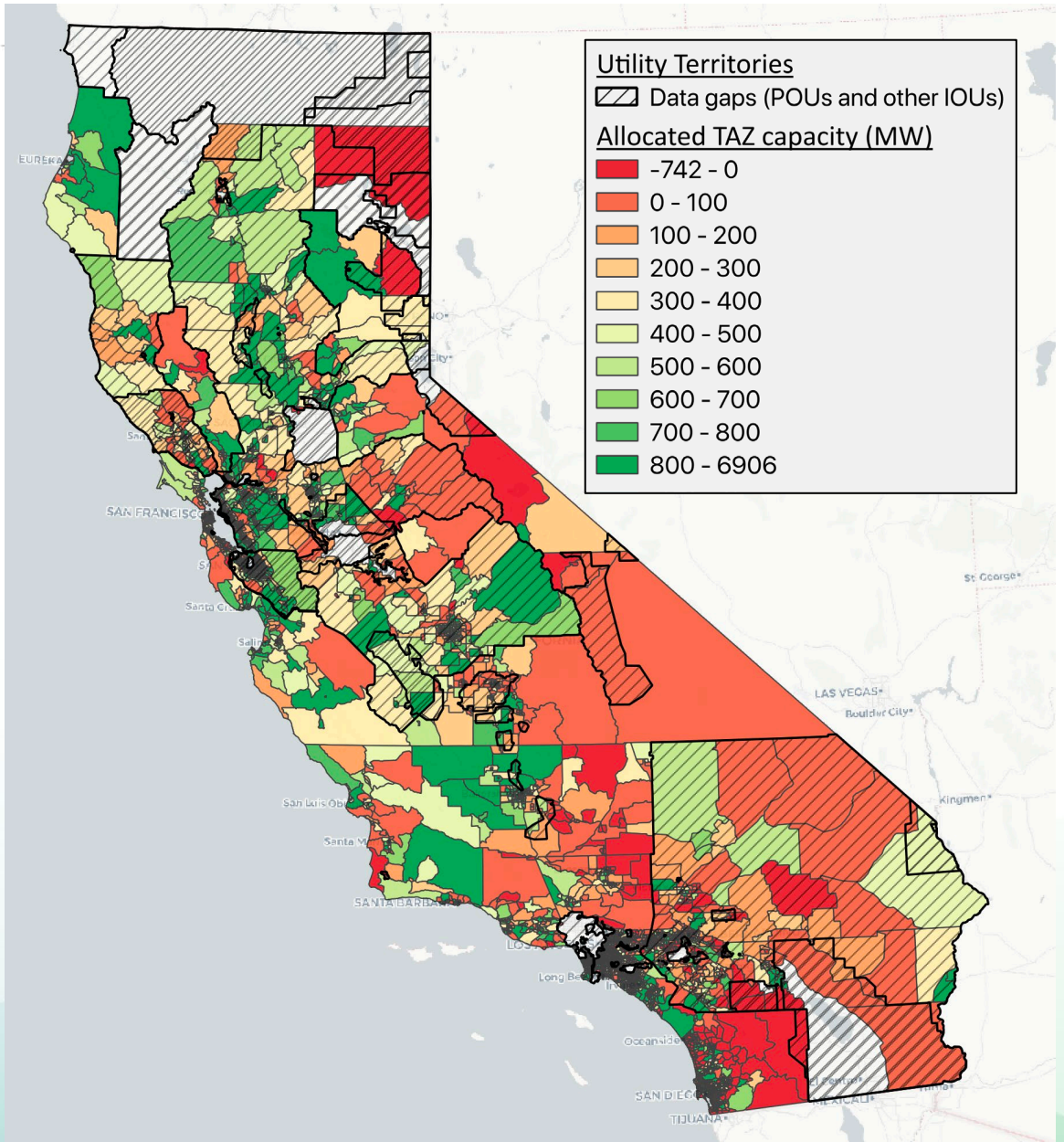


Example EDGE output

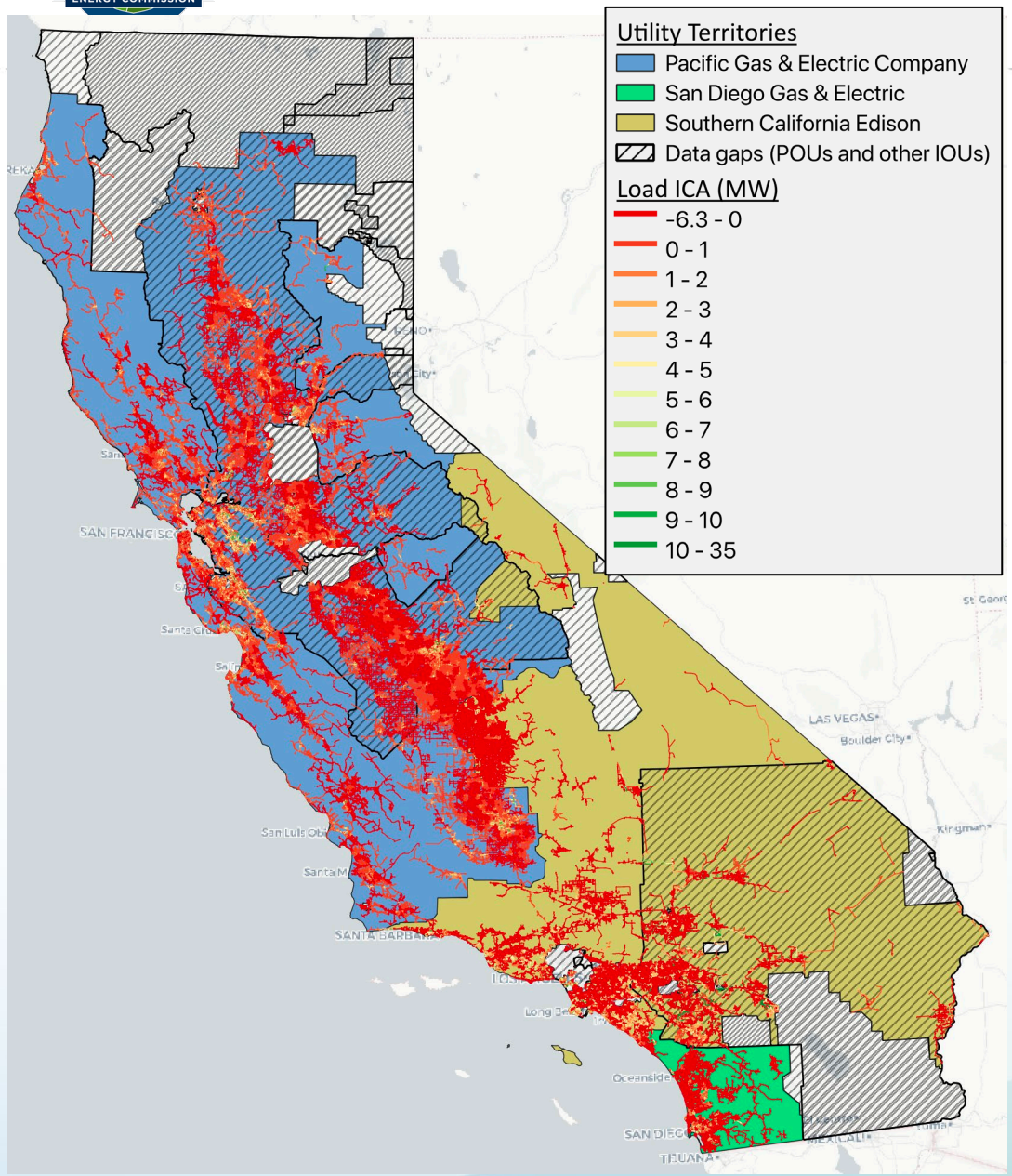
Note: Charger data sourced from AFDC, not actual CEC analysis results

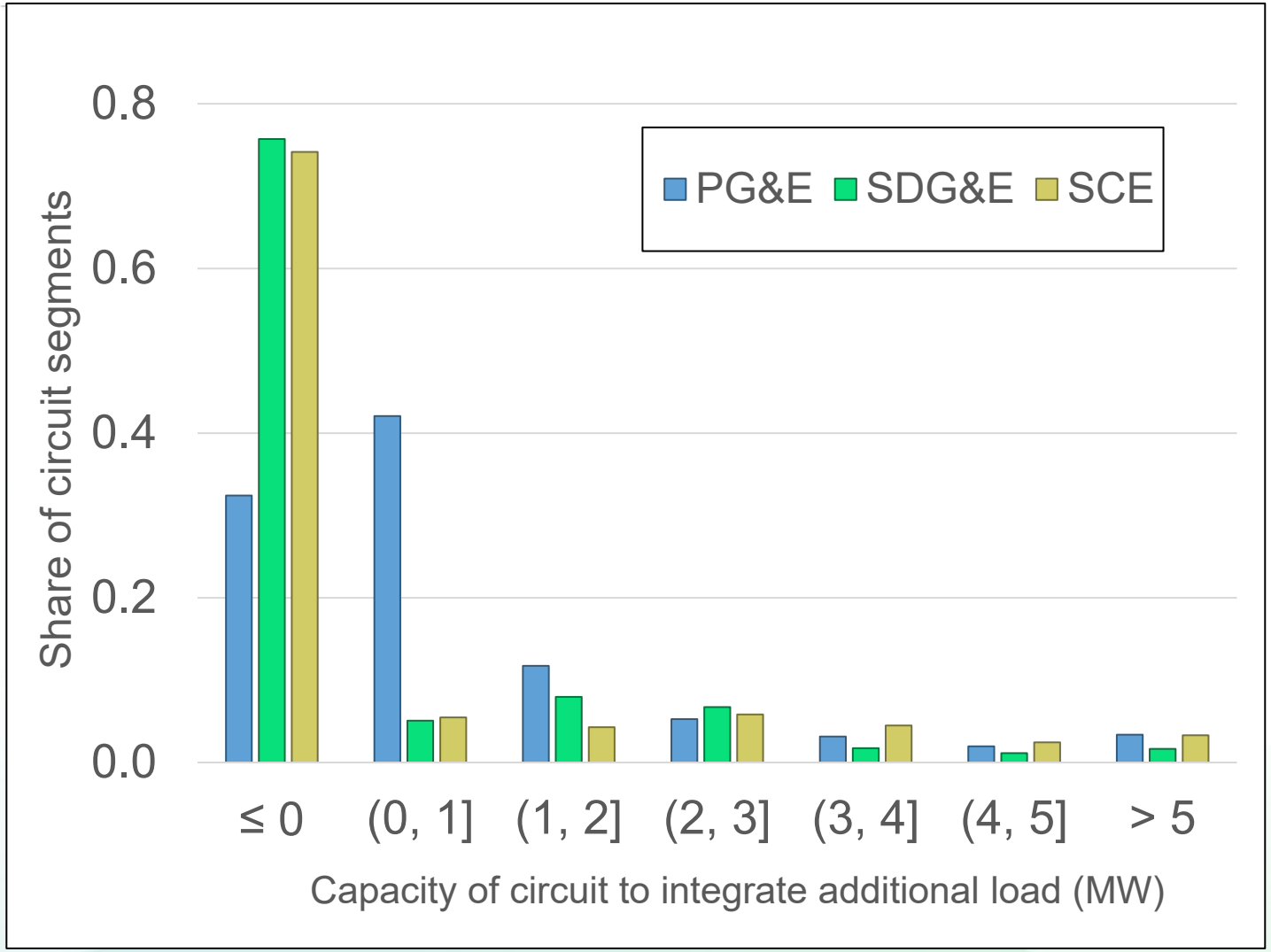
Results: Statewide Capacity Analysis



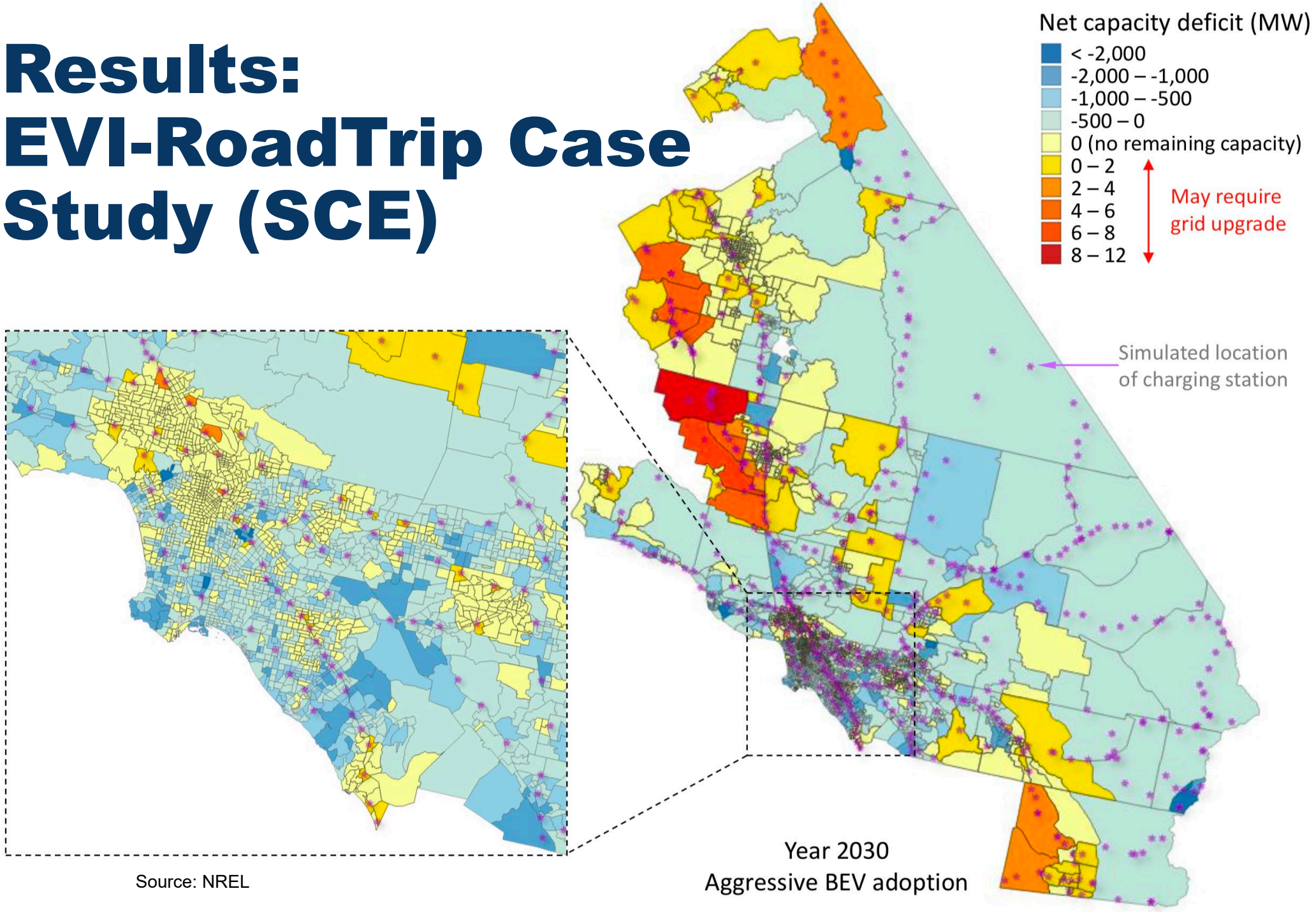


Distribution of IOU Circuit Capacities





Results: EVI-RoadTrip Case Study (SCE)



Source: NREL

Limitations and Future Work

- Analytical Limitations
  - Gaps in available utility data
  - Currently no temporal component
  - Utility data integrity
  - Confidentiality concerns
- What is next for EDGE?
  - Include Grid Needs Assessment (GNA) and Distribution Deferral Opportunity Report (DDOR) datasets into grid impact analysis
  - Explore other domains
  - Develop use cases

Stakeholder Engagement

To improve upon EDGE's development, we welcome stakeholder input:

- Additional data sources?
  - Travel volumes between origins and destinations
  - Grid capacity estimation and validation
- Use cases:
  - Smart charging
  - Air quality attainment
  - Carbon emissions intensity
  - Equitable deployment of infrastructure
- User interfaces – what features would be most user friendly?
- Working with utilities
  - Using the proper data for this work
  - Securing grid infrastructure data

Vehicle-Grid Integration

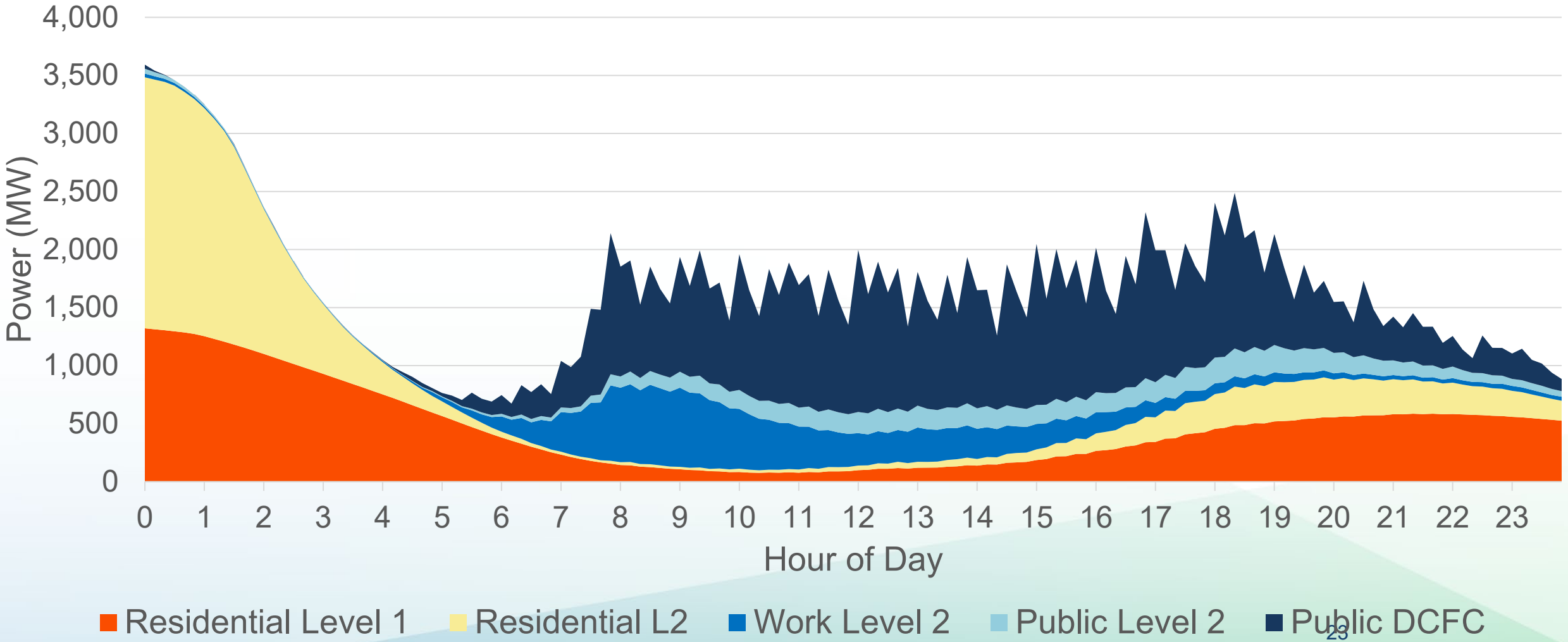
Noel Crisostomo

Air Pollution Specialist

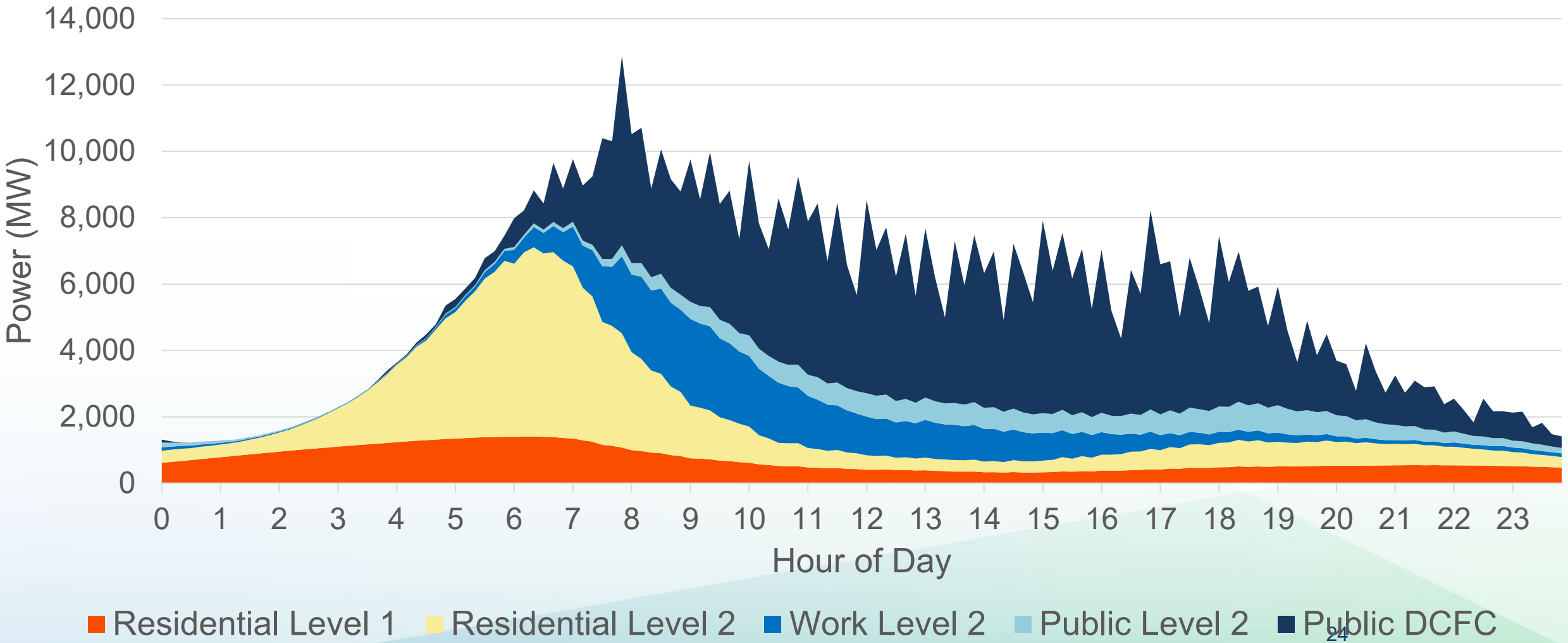
Overview

- Charging Infrastructure Load Profiles
  - EVI-Pro 2 Business As Usual, 2030 and 2035
  - EVI-Pro 2 Alternative Futures, 2030
  - EVI-RoadTrip, 2035
  - HEVI-LOAD, 2020-2030
- Integration Objectives and Measures
  - Utility rate and grid management, via smart vehicles & equipment
  - Energy resiliency and new applications, via bidirectional charging

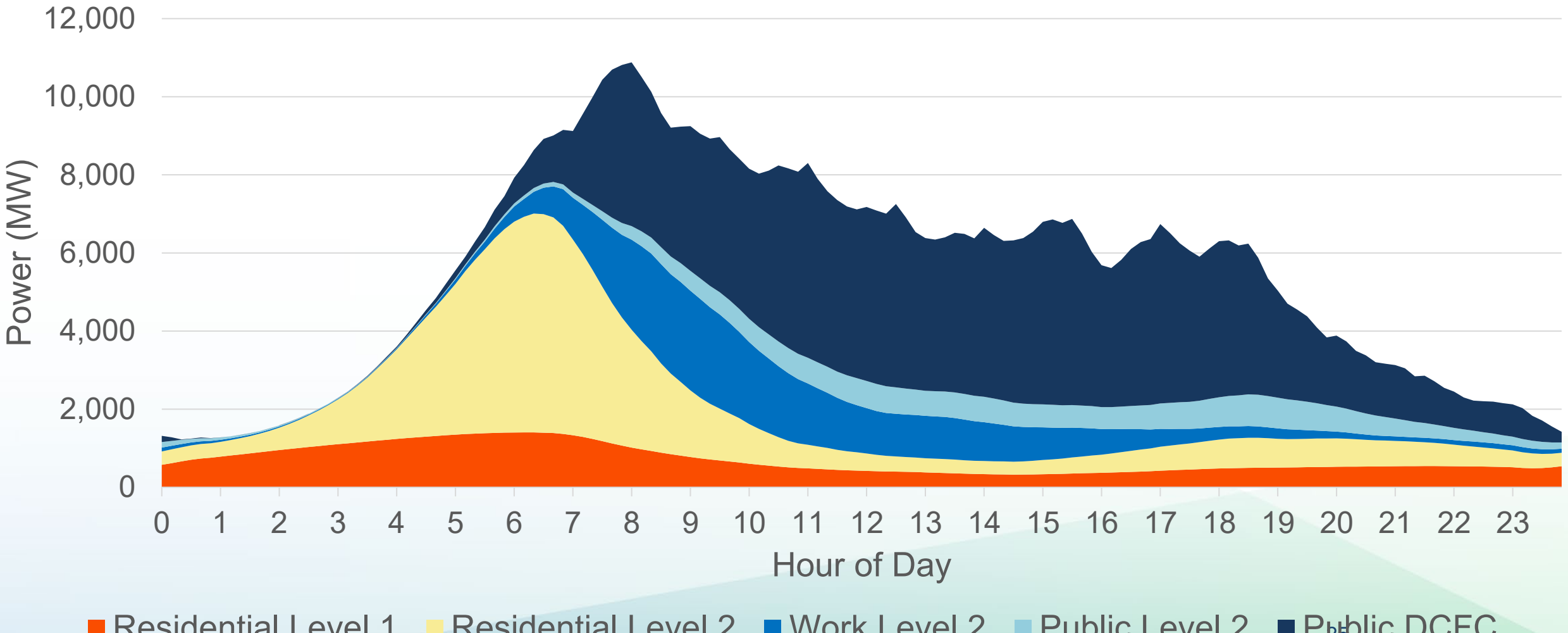
EVI-Pro 2 BAU – 5M ZEVs Midnight Time-Of-Use, 2030



EVI-Pro 2 BAU – 15M ZEVs (CARB) Charge By Departure, 2035



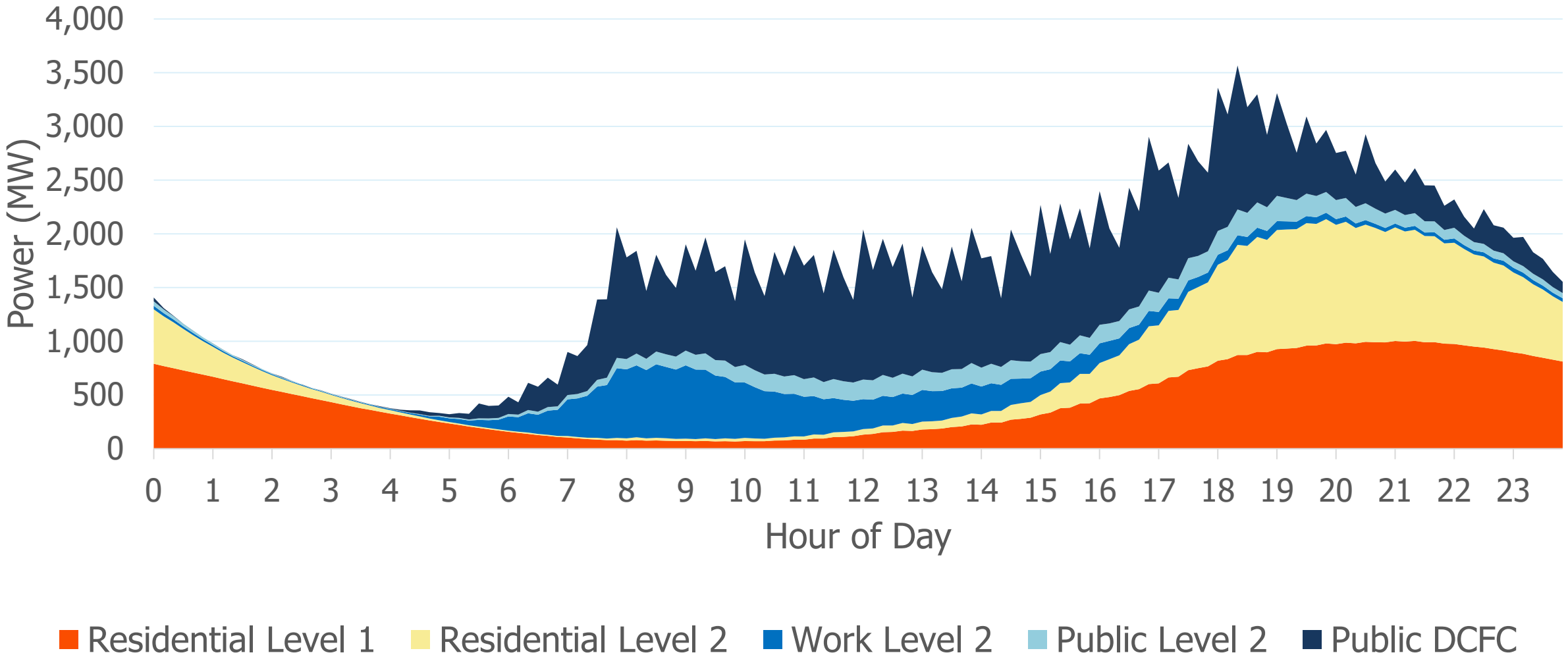
EVI-Pro 2 BAU – 14M ZEVs (CARB) Charge By Departure - Smooth, 2035



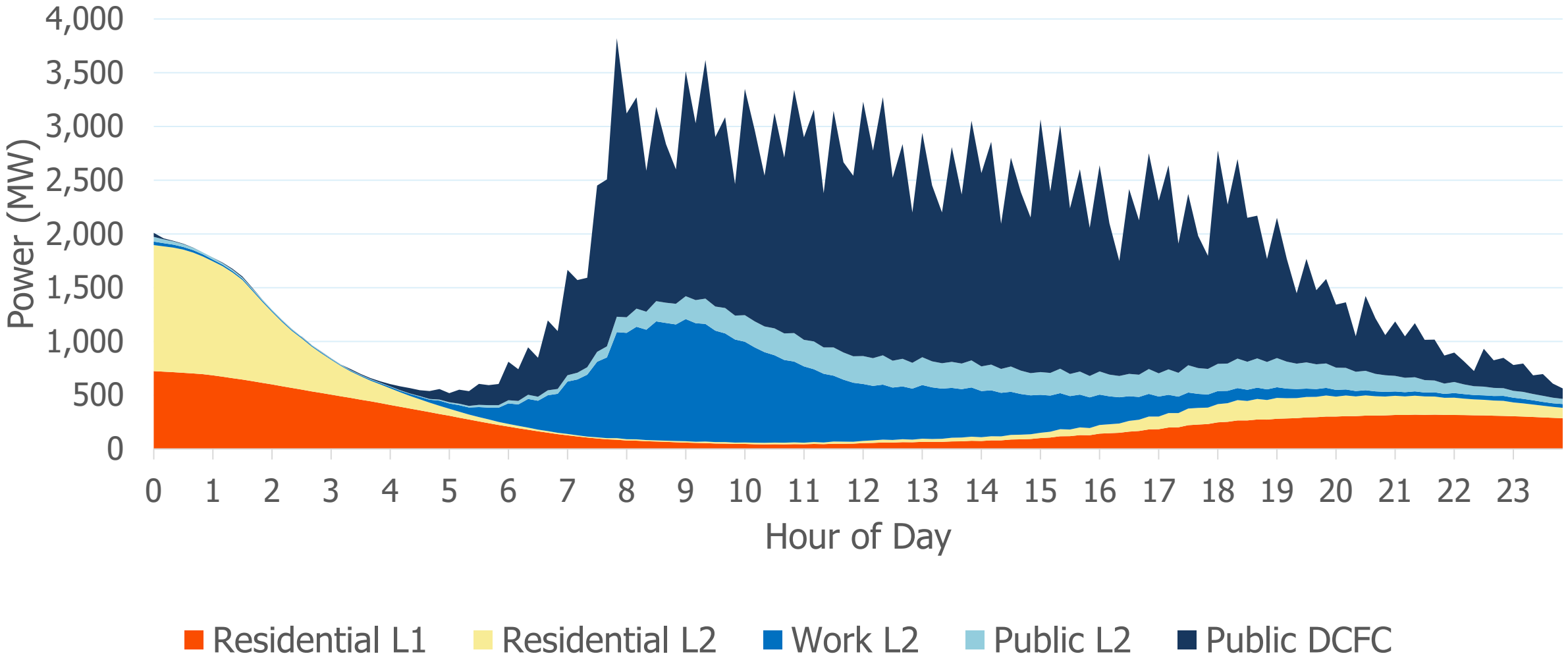
Alternative Futures Overview

	Core Forecast Scenarios		
Values for Year 2030	**Low (1.9M ZEVs)**	**Baseline (5M ZEVs)**	**High (7.9M ZEVs)**
Business as Usual	~375k chargers	~1M chargers	~1.5M chargers
Unconstrained *No TOU Participation*	N/A	~1M chargers	N/A
Gas Station Model *40% w/ residential access*	N/A	~1M + 14.3k chargers	N/A
Level 1 Charging *Enabled at work & public*	N/A	~1M + 251.8k chargers	N/A
PHEV eVMT Maximization *Charge at every stop*	N/A	~1M + 111.3k chargers	N/A

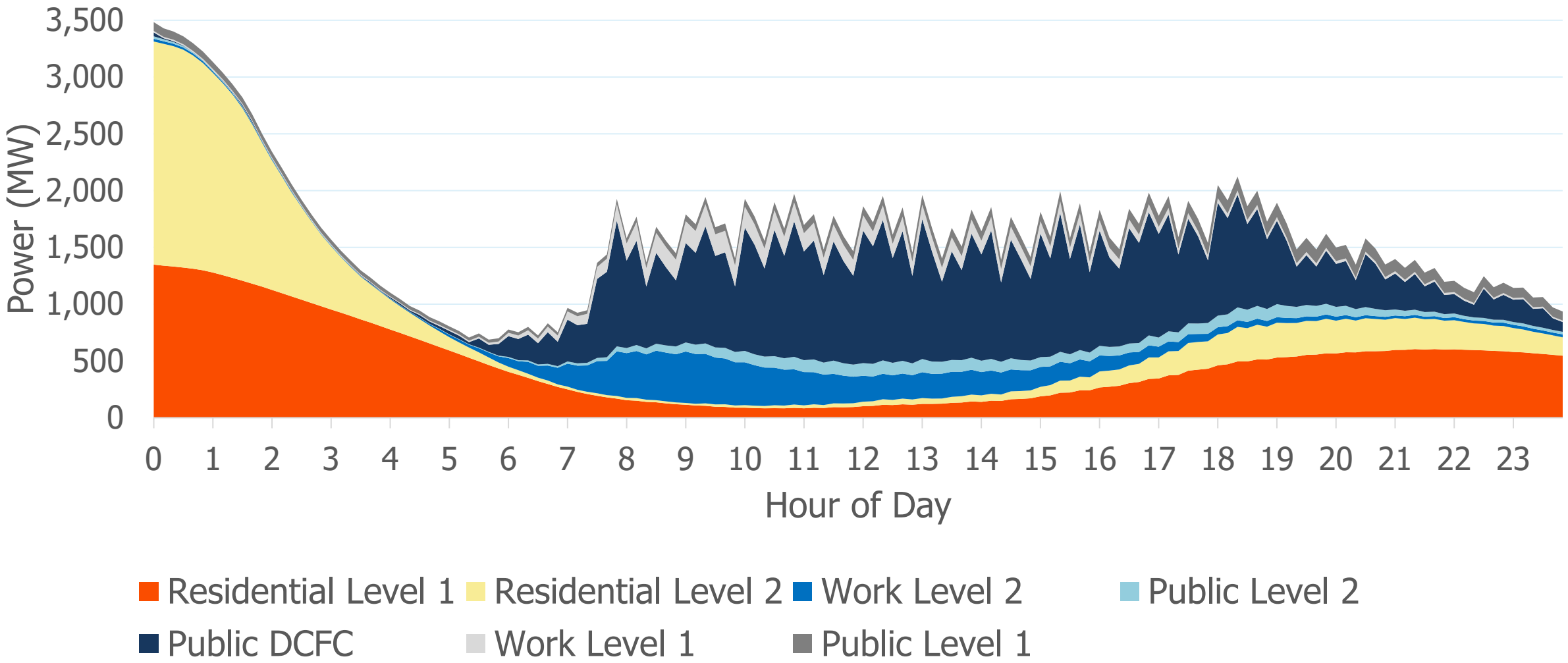
EVI-Pro 2 Alternative Future Unconstrained, 2030



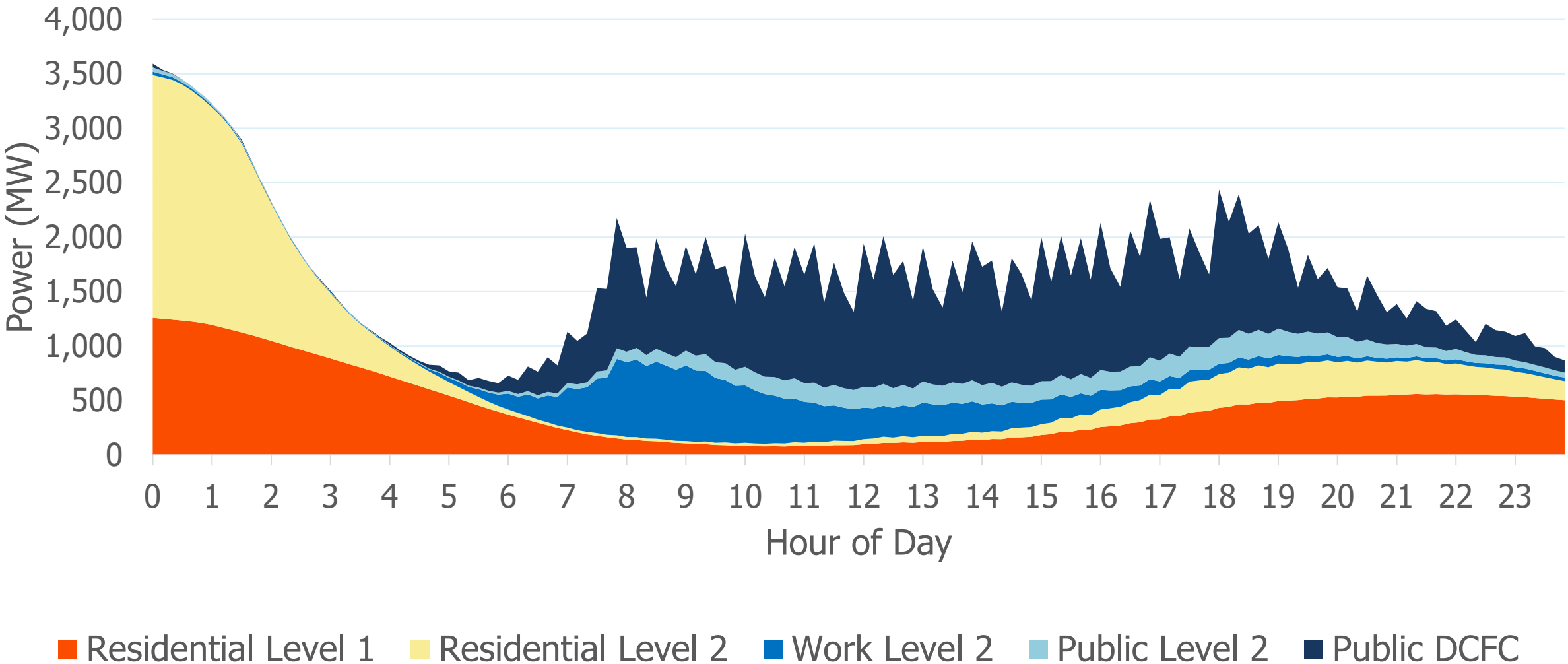
EVI-Pro 2 Alternative Future Gas Station Model, 2030



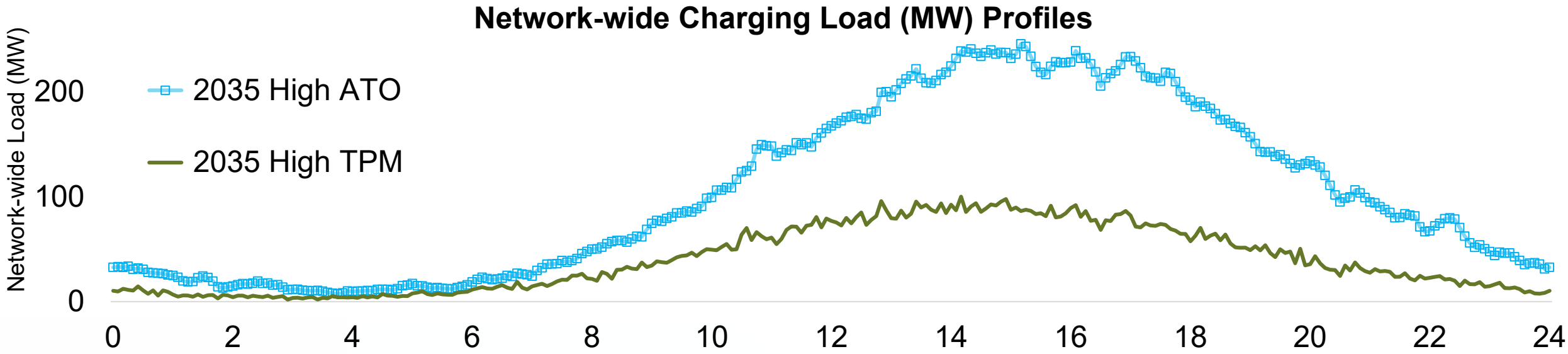
EVI-Pro 2 Alternative Future Level 1 Charging, 2030

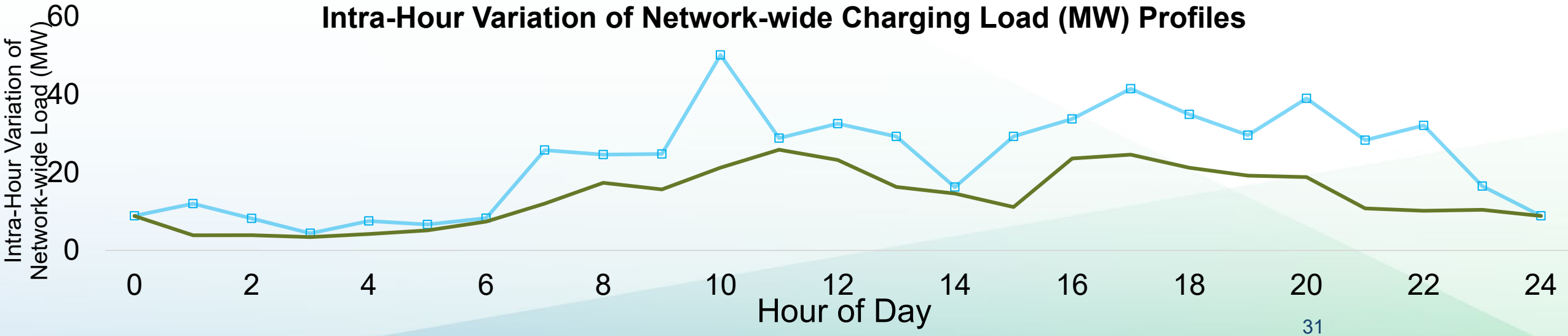


EVI-Pro 2 Alternative Future PHEV eVMT Maximization, 2030

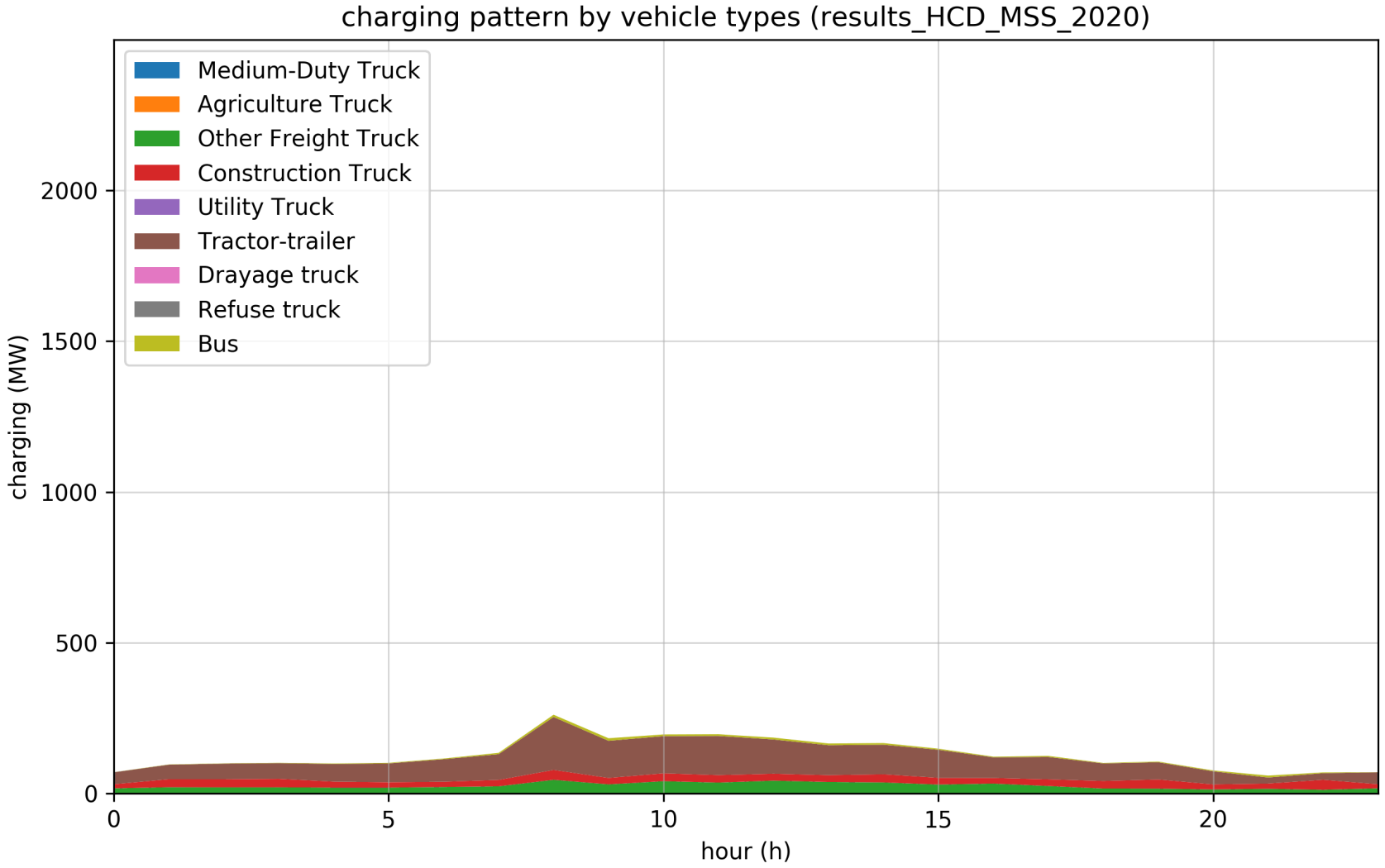


EVI-RoadTrip, 2035 Surges Soak the Sun; Seek Storage



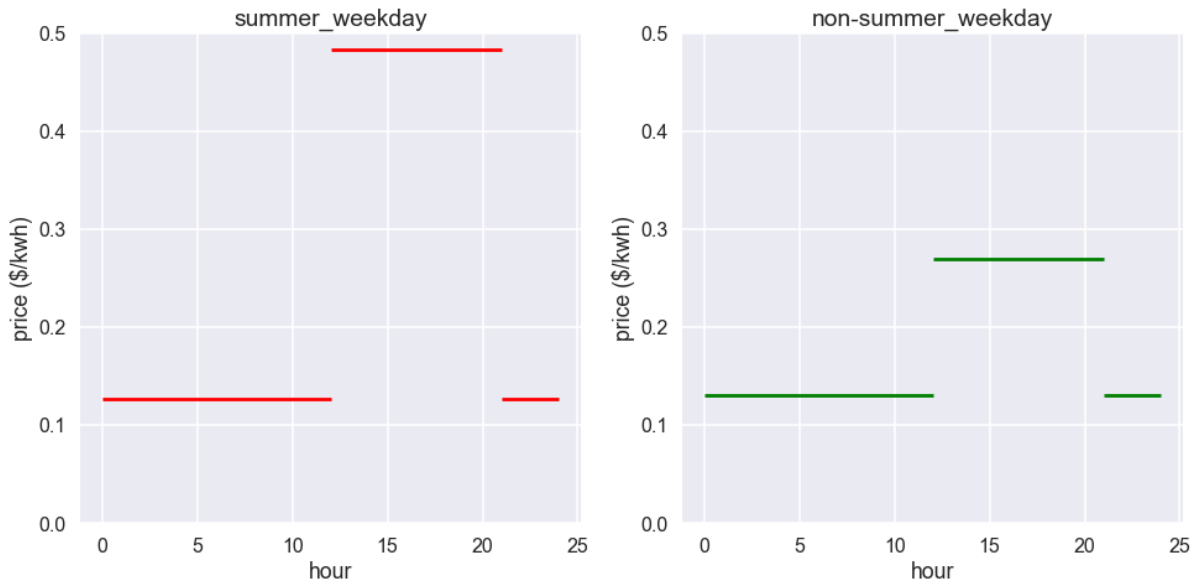


HEVI-LOAD
Mobile Source Strategy, 2020-2030



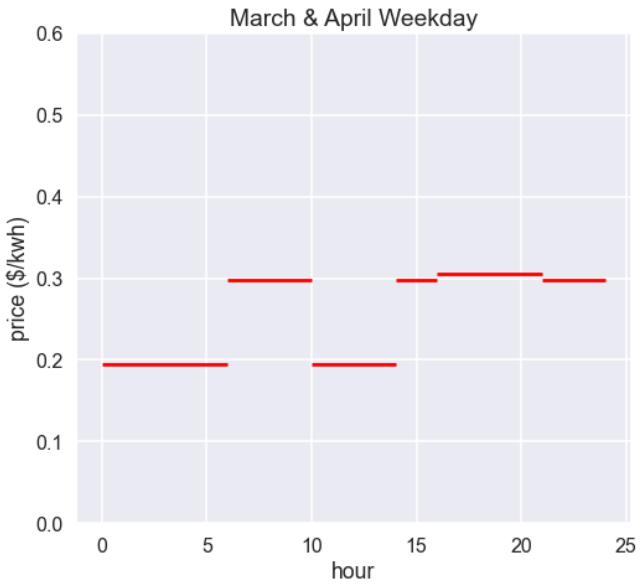
Smart Charging for Reliability, Cost, and Greenhouse Gas Savings

Manage System or Circuit Capacity

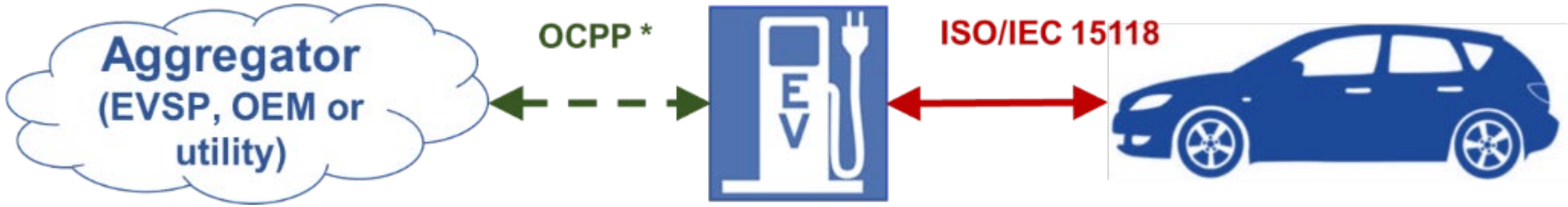


SCE T018-EV1

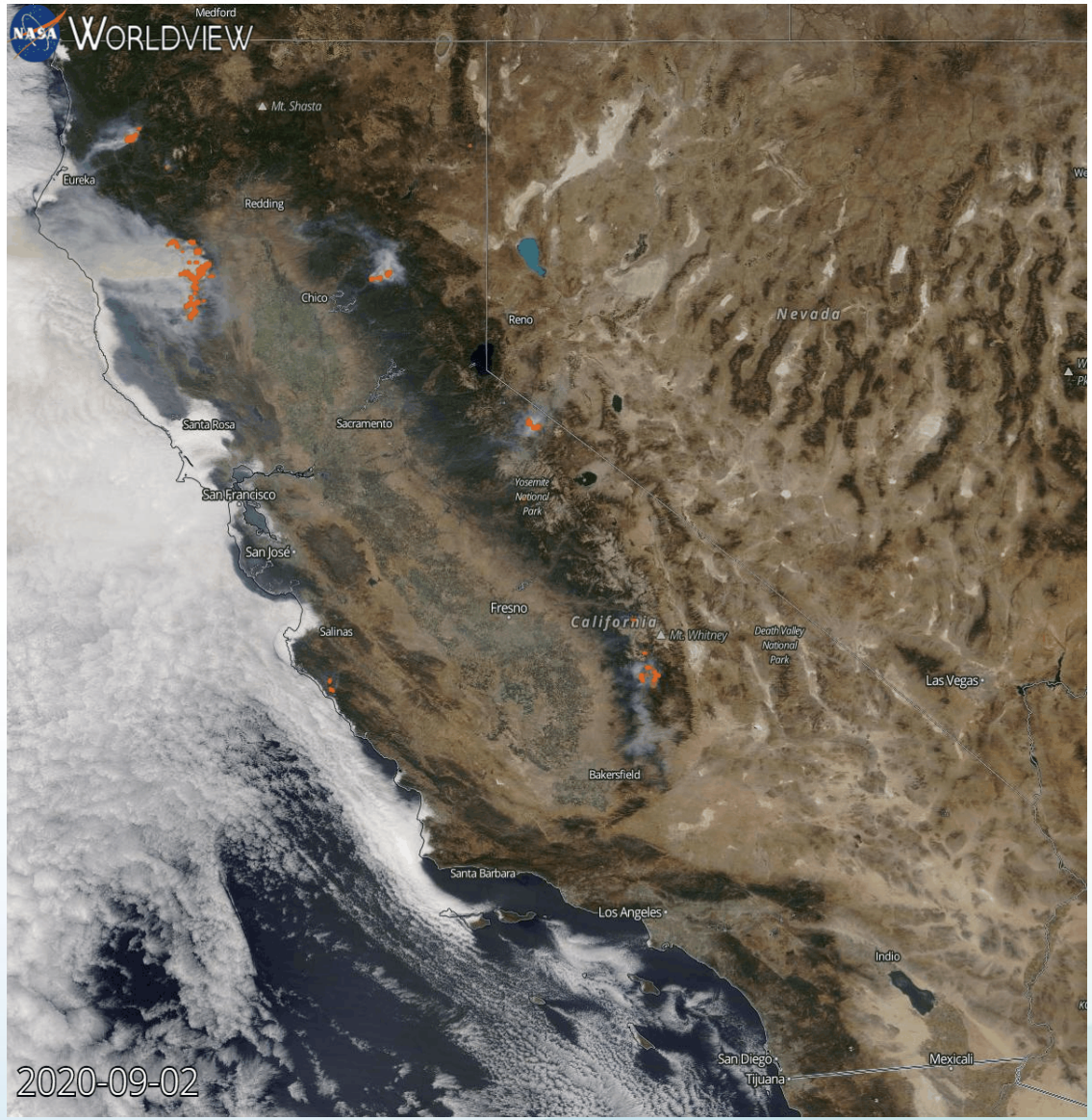
Integrate Renewable Energy



SDG&E TOU18

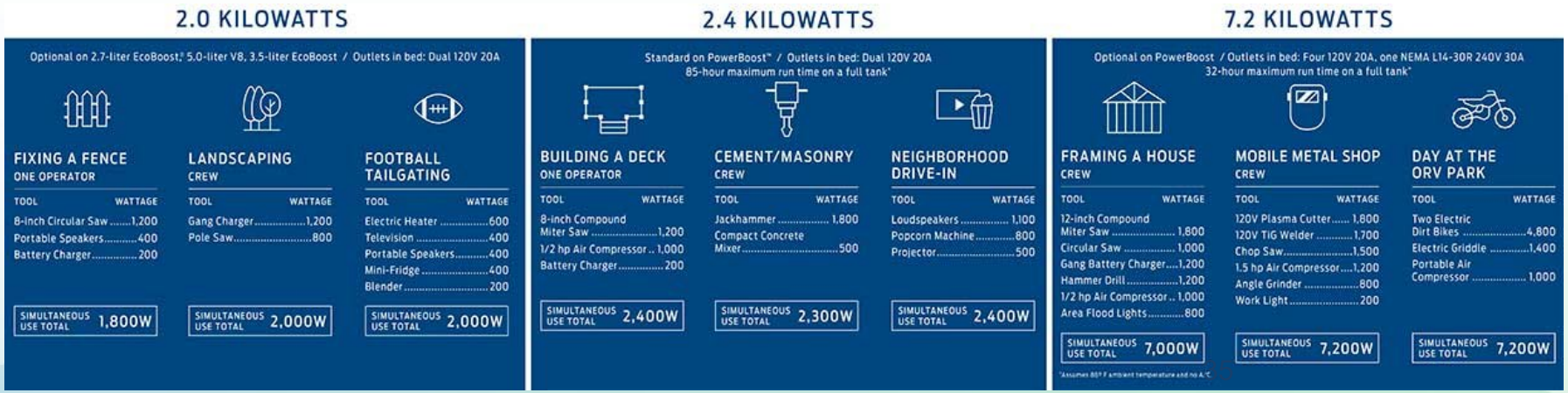


Increase Energy Resiliency



- August 27, 2020: 2/3 of portable gasoline generators <18 kW noted online at Home Depot sold out
- September 2-9, 2020: -37% in CAISO solar generation (v. 2019) due to wildfire smoke
- Need zero-emission alternatives during emergencies that are also extensible for other vehicle-grid integration benefits

Bidirectional Charging: Vehicle-to-Home Building Grid



Vehicle-to-Grid Recommendations

- Support bidirectional charging by confirming paths for inverters designed for mobile energy storage
- Possibly leverage the CEC's Solar Equipment Lists
- Streamline interconnection pathways that accommodate AC and DC discharge

- Unlock greater revenue generating opportunities with bidirectional technologies
  - Alleviate local congestion
  - Switching from grid to V2B during extreme demand

- ***More to come in the 2021 Vehicle-Grid Integration Roadmap Update…***

Charger Connectors and Communication

Jeffrey Lu

Air Pollution Specialist

Subpar Existing Conditions

Lots of siloes
- Multiple **connectors**
- Physical **keycards**
- Lots of **apps**

▶

At best, **not maximally convenient**
At worst, **confusing and discouraging**

I can use any charger, right ?

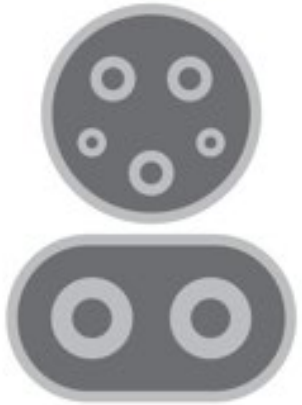
Can't I just get a universal adapter on Amazon ?

All I need to do is plug in ?

Wait, do I have to download another app ?

Multiple Fast Charge Connectors

CHAdeMO



Combined Charging System

Tesla

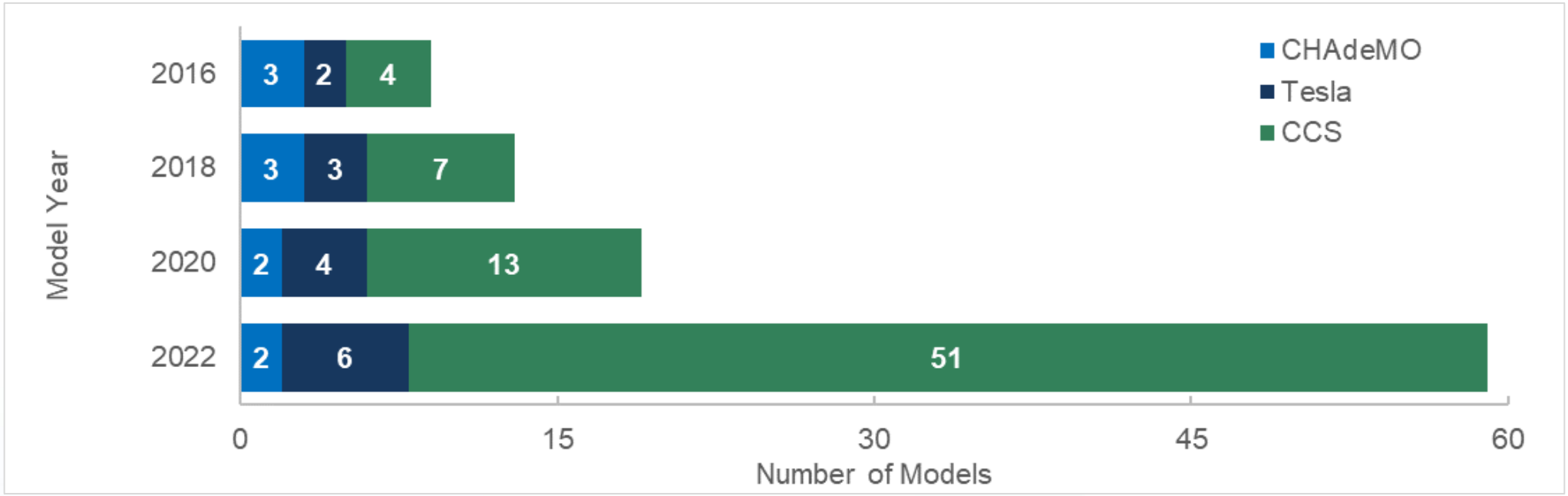
Similar primary purpose, three different implementations

Fragmentation will necessitate **even larger charger network size**

- More money, more time, **no tangible climate or air benefits!**

The Market Has Decided

Source: September 2020 analysis by CARB



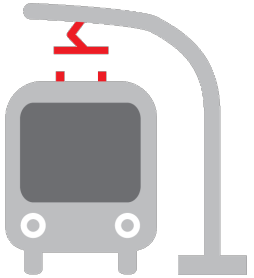
By MY 2022, **51 of 59 EV models** available in California will use **CCS**

→ Align technical requirements with **market** and **CARB rulemaking**

Emerging MD/HD Standardization

- Early adopters complain of **widespread incompatibility**
- Some repurposing of light-duty connectors (such as CCS)

- Standards for different form factors
  - **Conductive** – Megawatt Charging System
  - **Pantograph** – J3105
  - **Wireless** – J2954



➔ Prioritize chargers which conform to **existing and pending** standards

Ensure Hardware Readiness for Future Charger-Vehicle Communication

LOW-LEVEL COMMUNICATION

- Widely used today
- No authentication, billing, departure time, or grid signals
- Driver responsible for **baseline knowledge** and **manual inputs**

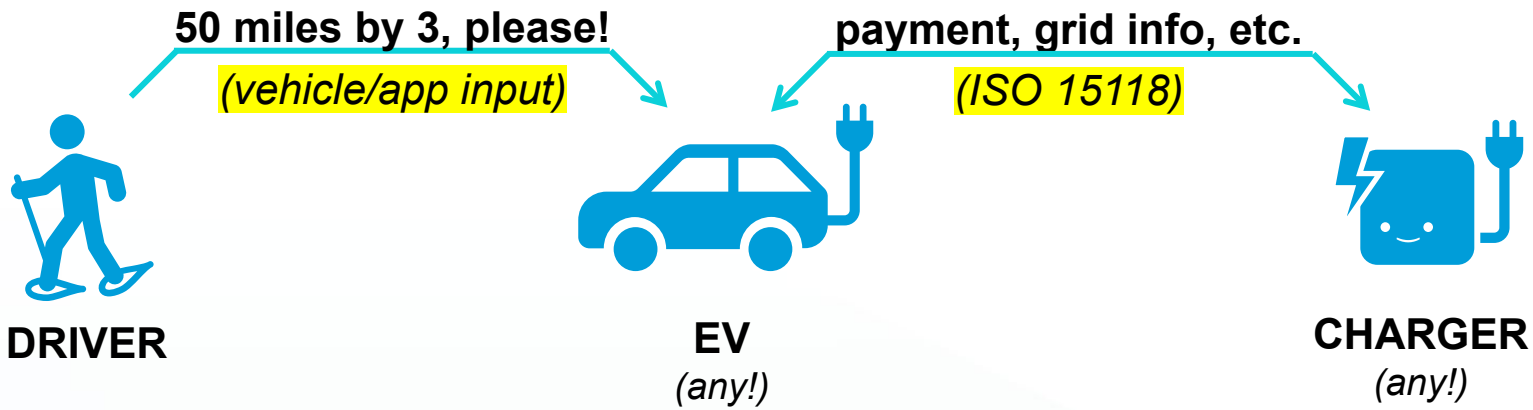
HIGH-LEVEL COMMUNICATION

- Growing use of **ISO 15118**
- Broad market direction
- **Plug and Charge** in near term
- Supports **smart, bidirectional, wireless** charging too

→ Prioritize **charger hardware readiness** for ISO 15118 communication

ISO 15118 Critical to Widespread VGI

→ Widespread VGI is **predicated on the ability of vehicles and/or chargers to receive information** about driver needs, electricity rates, power availability, demand response, carbon intensity, and so forth



- Standardizing around ISO 15118 **maximizes VGI opportunities**
- ISO 15118 can also **complement** other technical implementations!

→ Prioritize ISO 15118-ready chargers for **all drivers in all communities**

Networked Chargers with OCPP Maximize Choice and Management Features

Open Charge Point Protocol **avoids lock-in** and **enables greater choice**

- Site host can pick mix of chargers to use with their management solution
- Site host can pick management solution to use with their mix of chargers

Networking enables **rich management features**

- Access and priority
- Billing and payment
- Reservations
- Grid signals

→ Prioritize **OCPP-compliant** chargers

Questions & Answers

Please raise your hand and the moderator will unmute you.

Break

Return at 2:35

Tailoring Charging Solutions to Local Constraints

Raja Ramesh

Air Pollution Specialist

How do we ensure charger deployment is equitable and effective?

‘Best Fit’ Approach

Community- and Equity-Centric Planning

- Greenlining Institute's Participatory Budgeting
- CARB's Community Outreach Guidance
- CEC's EV Ready Community Blueprints

MOVING CALIFORNIA
cleaner transportation for all communities

CALIFORNIA CLIMATE INVESTMENTS
Cap and Trade Dollars at Work

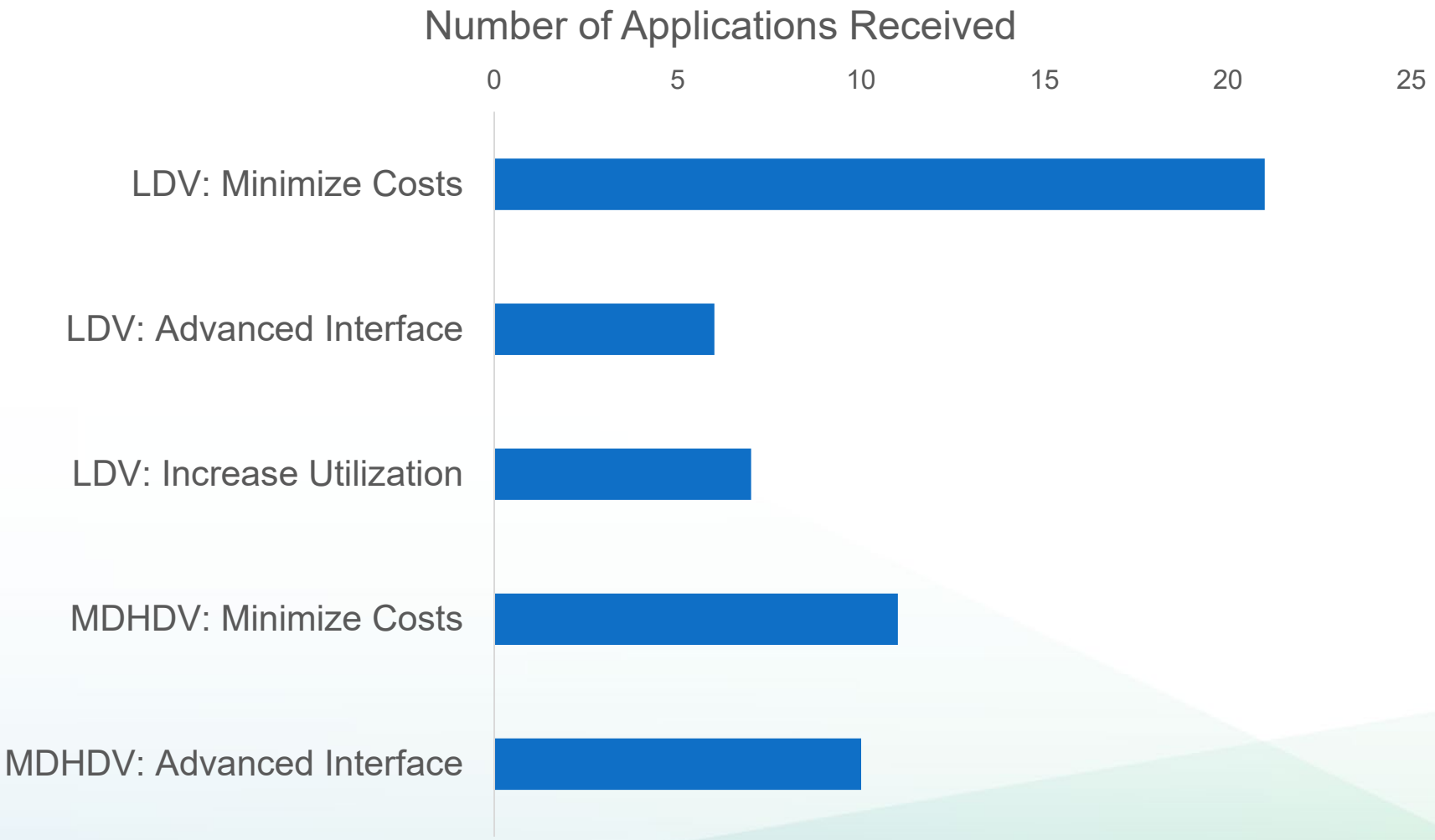
What Tools Can We Use to Achieve this Vision?

- Building Codes
- Streamlining Permitting
- Public Funding

CALGreen®

Streamlined Jurisdictions (Numbers of cities and counties)		
Streamlined:	Streamlining in Progress:	Not Streamlined:
123	155	262

BESTFIT Phase 1 Applications



Workforce Training and Development

Larry Rillera

Air Pollution Specialist

EV Chargers and Workforce

1.5 million chargers are needed to support the nearly 8 million ZEVs required under the new Executive Order.

Photo: KIGT Inc.

157,000 chargers are needed to support 180,000 medium- and heavy-duty vehicles needed in 2030.

Clean Transportation Program: Workforce Portfolio

Workforce Portfolio

- Approximately $35 M invested
- State Workforce Partners
- Over 20,000 trainees: transit agencies, municipal fleets, independent repair shops, car dealerships, freight sector, schools, Electric Vehicle Infrastructure Training Program, and charger infrastructure contractors
- Equity

Manufacturing Portfolio

- Approximately $55 M invested
- About 14,000 jobs across 34 ZEV-related companies
- Electric vehicle infrastructure manufacturers

atl Advanced Transportation and Logistics

FREEWIRE

chargepoint

PROTERRA

AB 2127: Workforce

- Develop workforce to support charging infrastructure deployment
- The State must seek to align PEV charging with renewable energy generation
- Growing electrification of the medium- and heavy-duty sectors
- Planning for California's local and community charging infrastructure needs
- Consider whether any incremental workforce training is needed to support the scale of transportation electrification infrastructure installation

Photos: KIGT Inc.

AB 2127: Workforce (cont.)

Project Milestone Activities

Site Design / Engineering	Project Review / Approval	Demolition / Construction	Installation	Commissioning	Operation	Maintenance

Inspection

Key Occupations

Private Engineer	Municipal Engineer	Project Contractor	Construction Apprentice	Electrician	Electrician Apprentice
Technician	Environmental Planner	Land Use Planner	Building Code Enforcement	Utility Engineer	Inspector

Workforce Considerations

- Equity: Geographic, Population, Economic, Environmental
- AB 841: Electric Vehicle Infrastructure Training Project
- CARB Clean Transportation Regulations
- Putting California on the High Road: A Jobs and Climate Action Plan for 2030
- Just Transition Roadmap
- Market and Technology Advancements

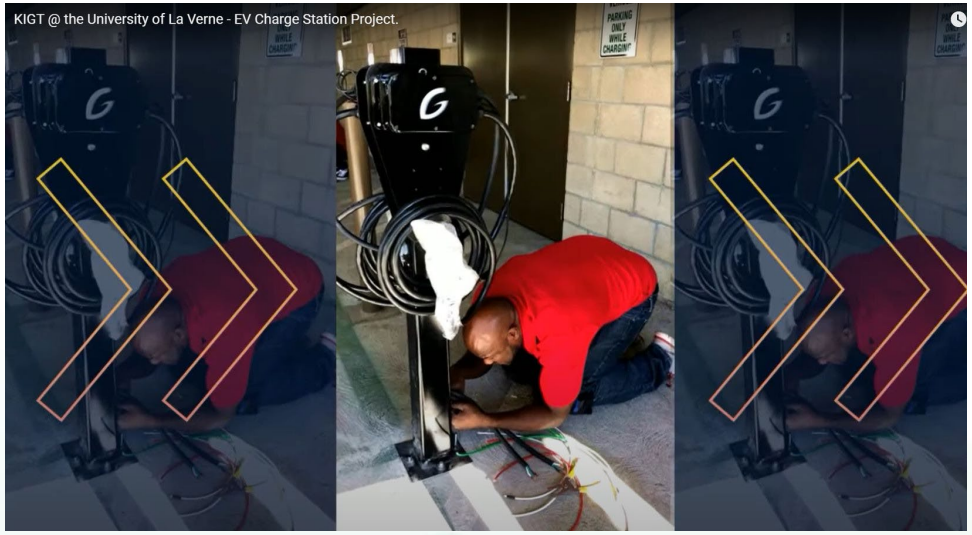


Photo: KIGT Inc.

Questions & Answers

Please raise your hand and the moderator will unmute you.

Submit Comments to Docket 19-AB-2127

Electronic Commenting System

Visit: https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-AB-2127

Comment by E-mail

E-mail: docket@energy.ca.gov

Subject Line: "Workshop on Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment"

All comments due by 5:00 pm on February 26, 2021

* If answering or providing comments on a specific matter included in this presentation, please reference the workshop session (date) and slide number.