EVs2Scale™ 2030

OUC Fleet Electrification Ride and Drive Event

"Getting to Widespread Transportation Electrification"

Britta Gross – EPRI, Director of Transportation

8 November 2023

EPRI

Background and Objectives

- Government, Industry, and Fleets are **increasingly aligning on aggressive 2030 vehicle electrification goals**
- The **pace of needed year-over-year action and investment to prepare charging sites and the grid is not clear**
- Consumers and fleet operators **must have confidence in charging availability, reliability, and affordability**
- Consumers and fleets operators are **increasingly looking to the utility industry to scale up efforts** to support charging solutions, ensure the grid is capable of meeting vehicle loads

THIS TRANSITION IS UNPRECEDENTED AND COMPLEX. IT REQUIRES:

- **Extraordinary collaboration and partnering** across all the major EV stakeholder groups
- **Redesigned processes, useful tools, and increased standardization** to simplify the planning and complex interactions between major stakeholder groups
- **An evaluation of regulatory/board oversight** that may not be conducive to driving actions on the pace and scale required to meet 2030 targets

Addressing the Barriers to Achieving EVs at Scale

A Three-Pillar Strategy

EVs2Scale 2030

1 COALITIONS & ROADMAPS

Bilateral Convening Series
- Utility-OEM Forum
- Utility-Fleet Forum

National EV Driver Research Board

50-state eRoadMAP™ to 2030
outlining EV loads, grid impacts, leadtimes, workforce, costs

2 STRUCTURAL SYSTEM REFORMS

Charging Infrastructure
- Reliability: Benchmarking, Standards
- Charging innovation & affordability

Grid Readiness
- Streamlined Grid Interconnect
  - Expedited Interim Charging Solutions
- Managed Charging at Scale
- Interconnect Standards for V2H/V2B/V2G

3 UNIFYING TOOLS & PILOTS

- Approved Product List (APL)
- NEVI/NEHC Coordination with EEI

- GridFAST™ Online Data Exchange
- OEM/Utility V2H/V2B Pilot
- EV Resilience/Evacuation Pilot

Enabling Regulatory and Oversight Framework

Equity Blueprint & Workforce Development

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Collaboration + Partnerships

Ongoing Outreach

EVs2Scale 2030

UTILITY INDUSTRY

EPRI
LPPC Large Public Power Council
EEI
NRECA America's Electric Cooperatives
American Public Power Association
Alliance for Transportation Electrification
NASUCA National Association of State Utility Consumer Advocates
NARUC National Association of Regulatory Utility Commissioners

AUTO & TRUCKING INDUSTRY

Ford
Tesla
BMW
Audi
Toyota
Mercedes-Benz
Volvo
PACCAR
GM
Rivian
Daimler
Honda
Alliance for Automotive Innovation
Volkswagen
NACFE
NADA

FLEET OPERATORS

amazon
Penske
enterprise Fleet Management
US Foods
Uber
Lyft
Walmart Save money. Live better.
Pitt Ohio Supply Chain • Ground • LTL • TL
FedEx Federal Express
J.B. Hunt
element
NAFA Fleet Management Association
LeasePlan

CHARGING PROVIDERS AND FUELING RETAILERS

Circle K
electrify america
flo EV Charging
chargepoint
EVgo Fast Charging
bp
Shell

NGO & STANDARD-SETTING ORGANIZATIONS

NRDC
EDF Environmental Defense Fund
RMI
CHARIN
SAE International
ATLAS Public Policy
Plug In America
Electric Vehicle Association

GOVERNMENT

- Joint Office of Energy & Transportation (JOET)
- US DOE
- US DOT
- National Labs
- FERC/NERC
- State DOEs, DOTs, DEQs
- State PUCs
- League of Cities
- Climate Mayors

EVs2Scale2030 Advisory Board

Chair: **Xcel,** Brett Carter

Co-Chair: **PG&E,** Patti Poppe

AAI, John Bozzella

Amazon, Sujit Mandal

Ameren, Mark Fronmuller

APPA, Paul Zummo

ATE, Phil Jones

ComEd, Gil Quiniones

Daimler Truck, Diego Quevedo

EEI, Kellen Schefter

GRE, Jeff Haase

JOET, Rachael Nealer

LCRA, Khalil Shalabi

NARUC, Katherine Peretick (Michigan PSC)

National Grid, Rudy Wynter

NRECA, Angela Strickland

NYPA, Fabio Mantovani

Southern Company, Chris Cummiskey

EVs2Scale2030™

PROJECT PARTNERS

BROAD INDUSTRY SUPPORT

amazon

AUSTIN ENERGY®

conEdison

CenterPoint Energy®

FirstEnergy®

GREAT RIVER ENERGY.

JEA Building Community®

nationalgrid

New York Power Authority

Your Energy Partner® OPPD Omaha Public Power District

PGE

PG&E®

Seattle City Light

SOUTHERN CALIFORNIA EDISON®

Southern Company

SMUD®

SRP

Xcel Energy®

Regulatory/Board Oversight Workstream:

Why is proactive grid infrastructure build so challenging?

Utilities not confident in the timing/pace of EV adoption across their service territories (demand varies across the U.S.)

Regulators not confident in the timing/pace of EV adoption (hearing only the voice of utilities); want to avoid stranded assets. Unclear on the cost impacts to ratepayers of proactive grid infrastructure build vs. later build

Ratepayer advocates not confident in the timing/pace of EV adoption and the need for proactive grid build; concerns on the cost impacts

EVs2scale2030 data will send clear demand signals, building confidence, and enabling utilities (and regulators) to prioritize "no regret" investments.

EVs2Scale™ 2030

eRoadMAP™

eRoadMAP

EVs2Scale2030

ANALYTICS

EPRI

U.S. DEPARTMENT OF ENERGY

ATLAS PUBLIC POLICY

BERKELEY LAB

icct THE INTERNATIONAL COUNCIL

Environmental Defense Fund

NREL NATIONAL RENEWABLE ENERGY LABORATORY

RMI ENERGY. TRANSFORMED.

DATA

amazon

DAIMLER TRUCK

Enterprise Mobility™

FIRSTstudent

NADA NATIONAL AUTOMOBILE DEALERS ASSOCIATION

PACCAR

VOLVO TRUCKS

WORLD RESOURCES INSTITUTE

Other:

Experian™

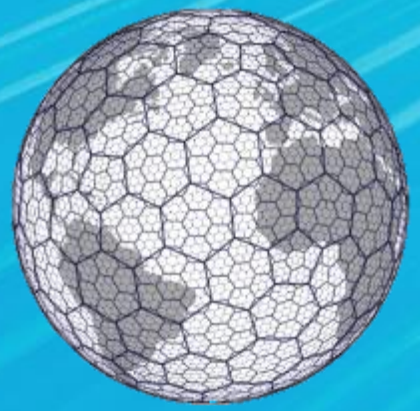
GEOTAB ITS

REPLICA

1 Improved Data Resolution Techniques

Res	Average Hexagon Area (km^2)	Average Hexagon Area (mi2)
0	4,357,449.42	1,682,419.93
1	609,788.44	235,440.54
2	86,801.78	33,514.34
3	12,393.43	4,785.13
4	1,770.35	683.53
5	252.90	97.65
6	36.13	13.95
7	5.16	1.99
8	**0.74**	**0.28**
9	0.11	0.04
10	0.0150	0.0058
11	0.0021	0.0008
12	0.0003	0.0001

Where Hex8 ~ 1 or 2 feeders



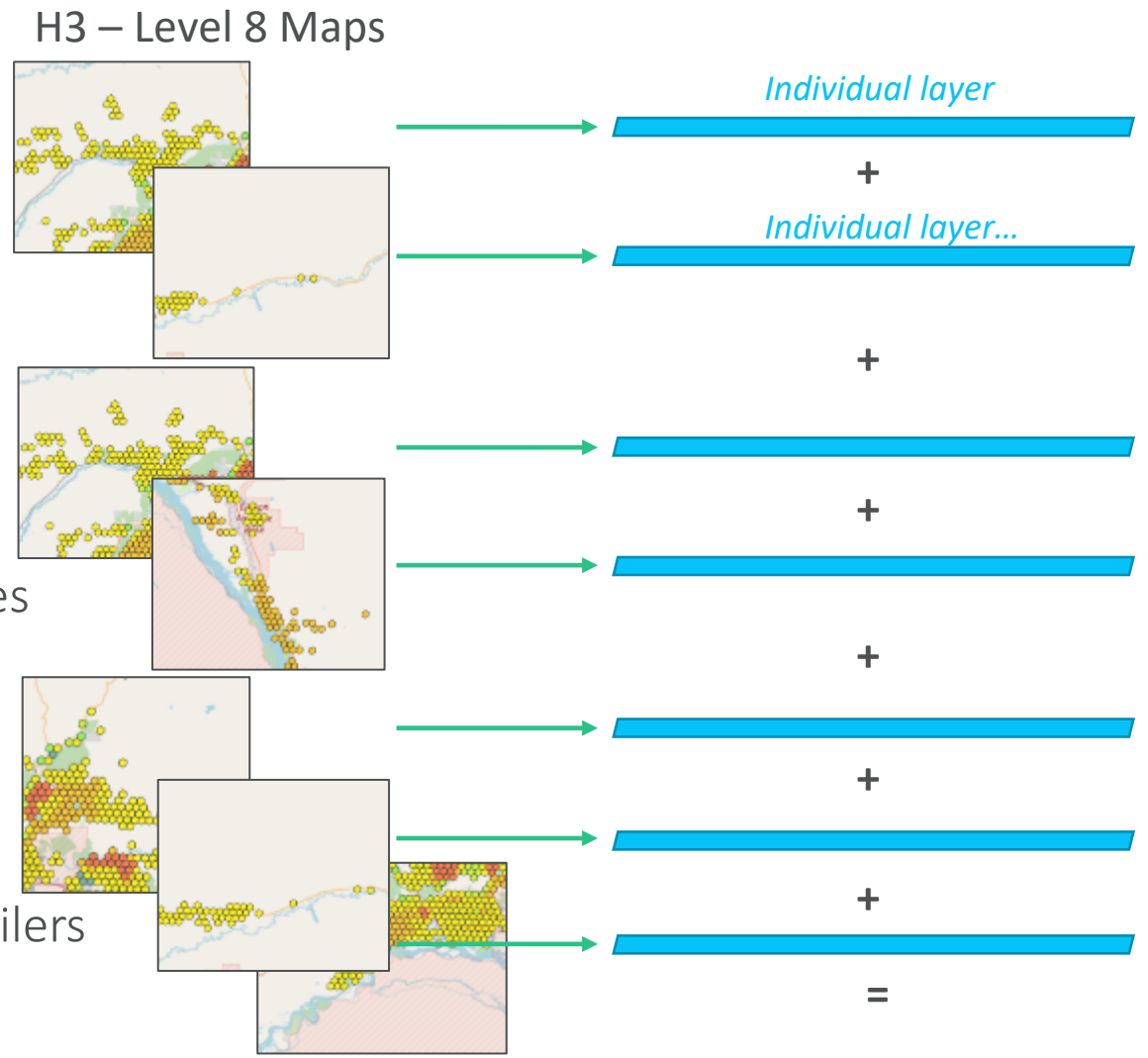
2 LAYERED DATA APPROACH

LD Vehicles
- Registrations
- Travel Models

MDHD Vehicles
- OEM data
- Fleet data
- Travel Data

Other Vehicle Sectors
- Transit/School Buses
- **Government Fleets**
- Ports/Airports
- Vocational Fleets

Other Load Data
- EVSPs/Fueling Retailers

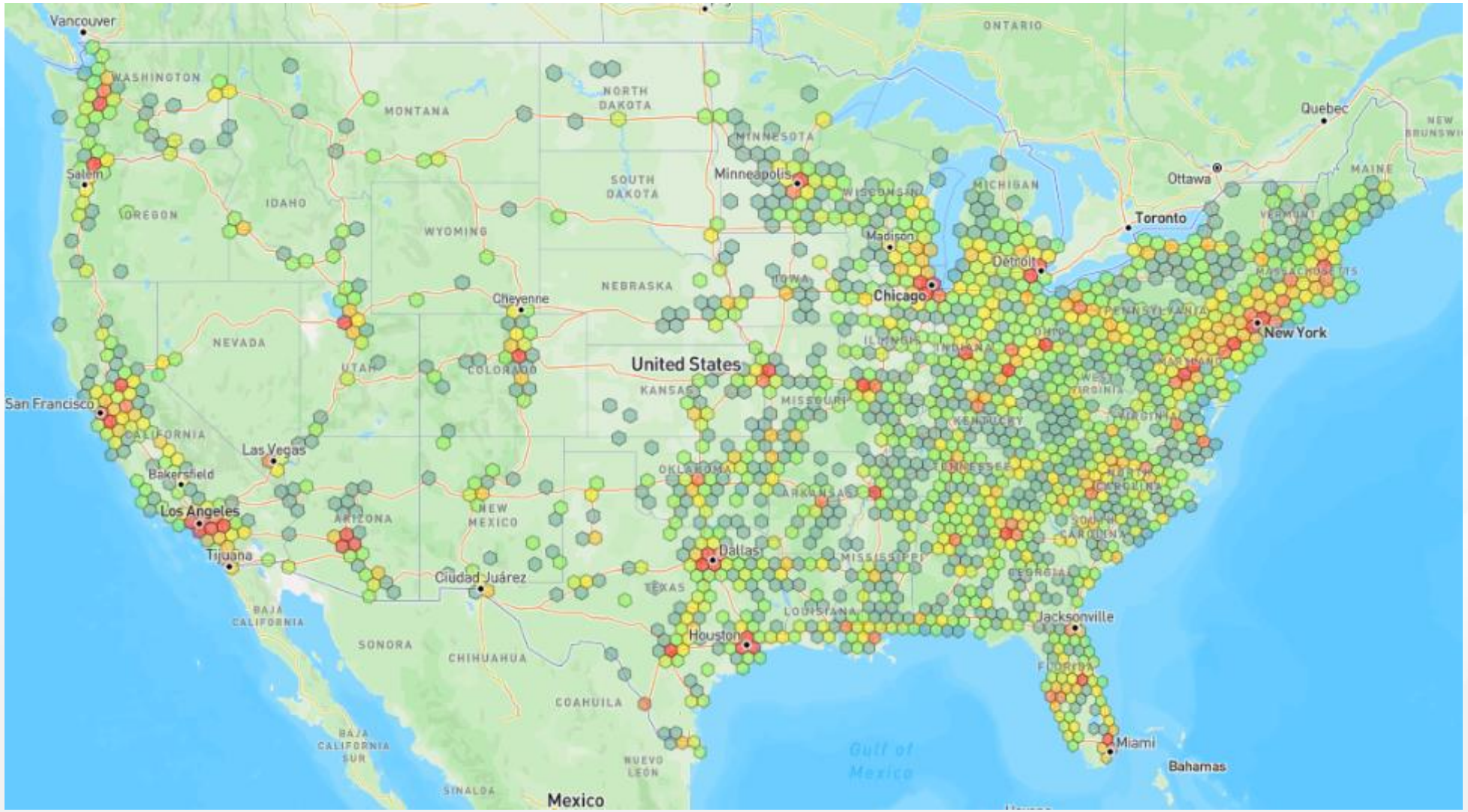


One map with energy + power needs

**EV Service Providers*

LD + MDHD | 100% Electrified

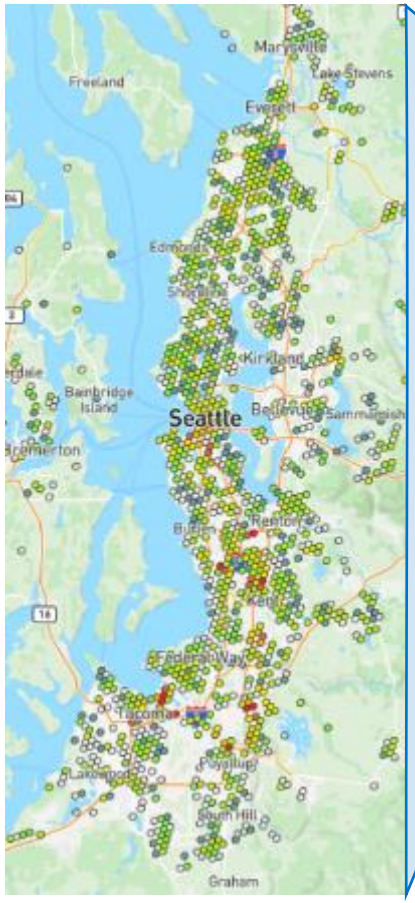
Hex4 (each hexagon is 684 square miles)



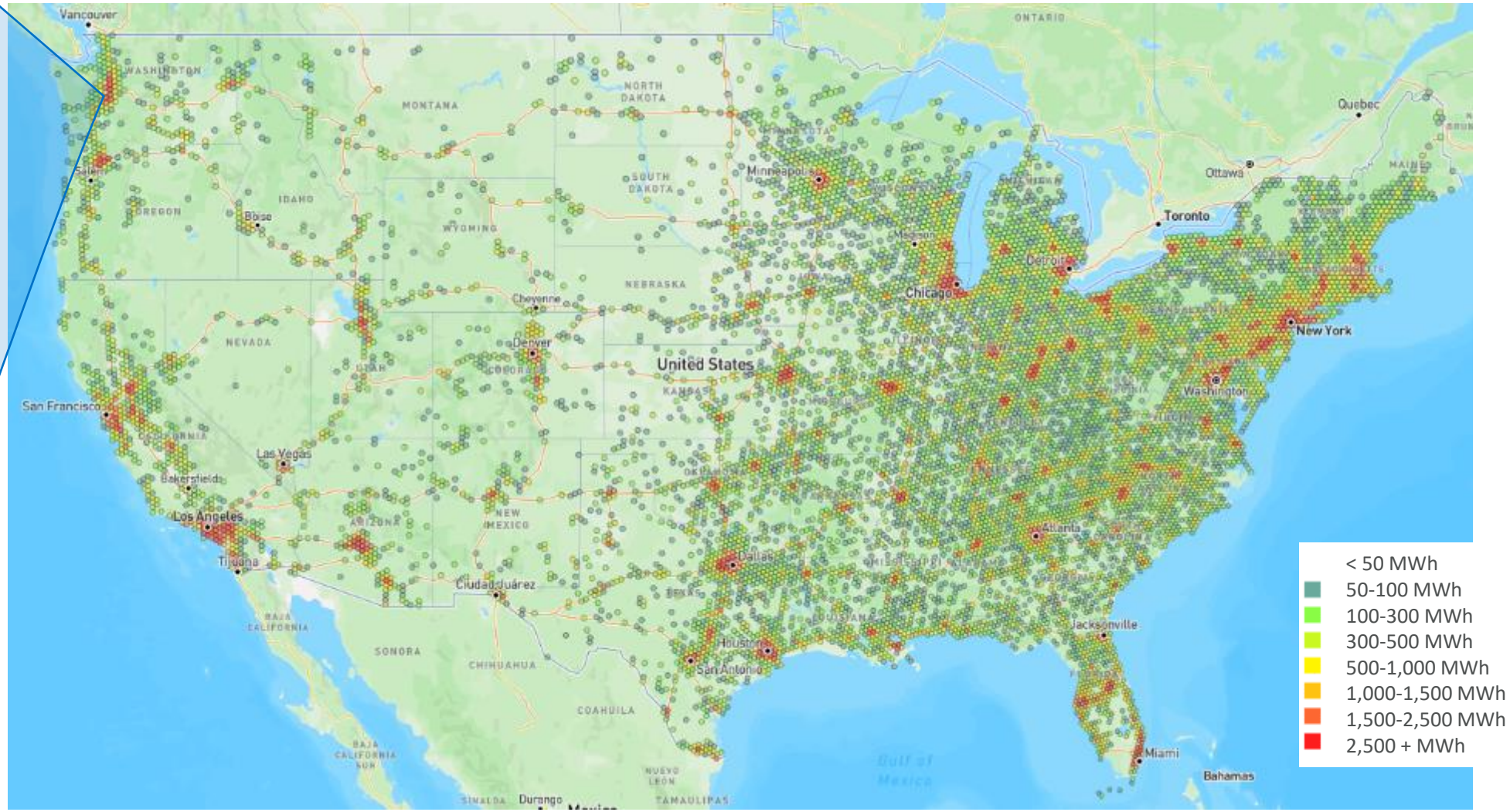
MWh/Day

- <500 MWh
- 500-1,000 MWh
- 1,000-2,000 MWh
- 2,000-3,000 MWh
- 3,000-5,000 MWh
- 5,000-10,000 MWh
- 10,000-15,000 MWh
- 15,000+ MWh

LD + MDHD | 100% Electrified

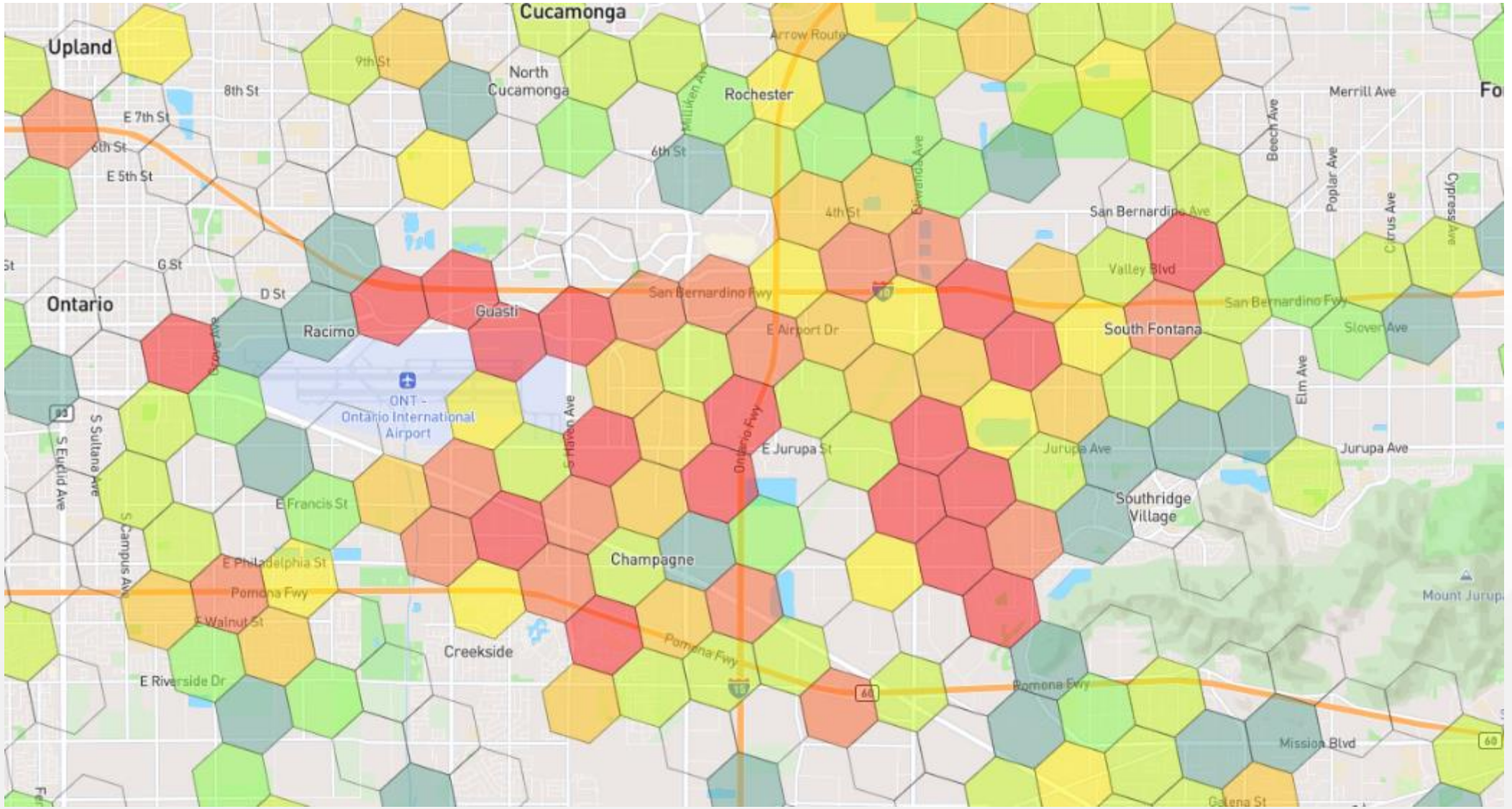


H8 – 0.28 sq miles per hex

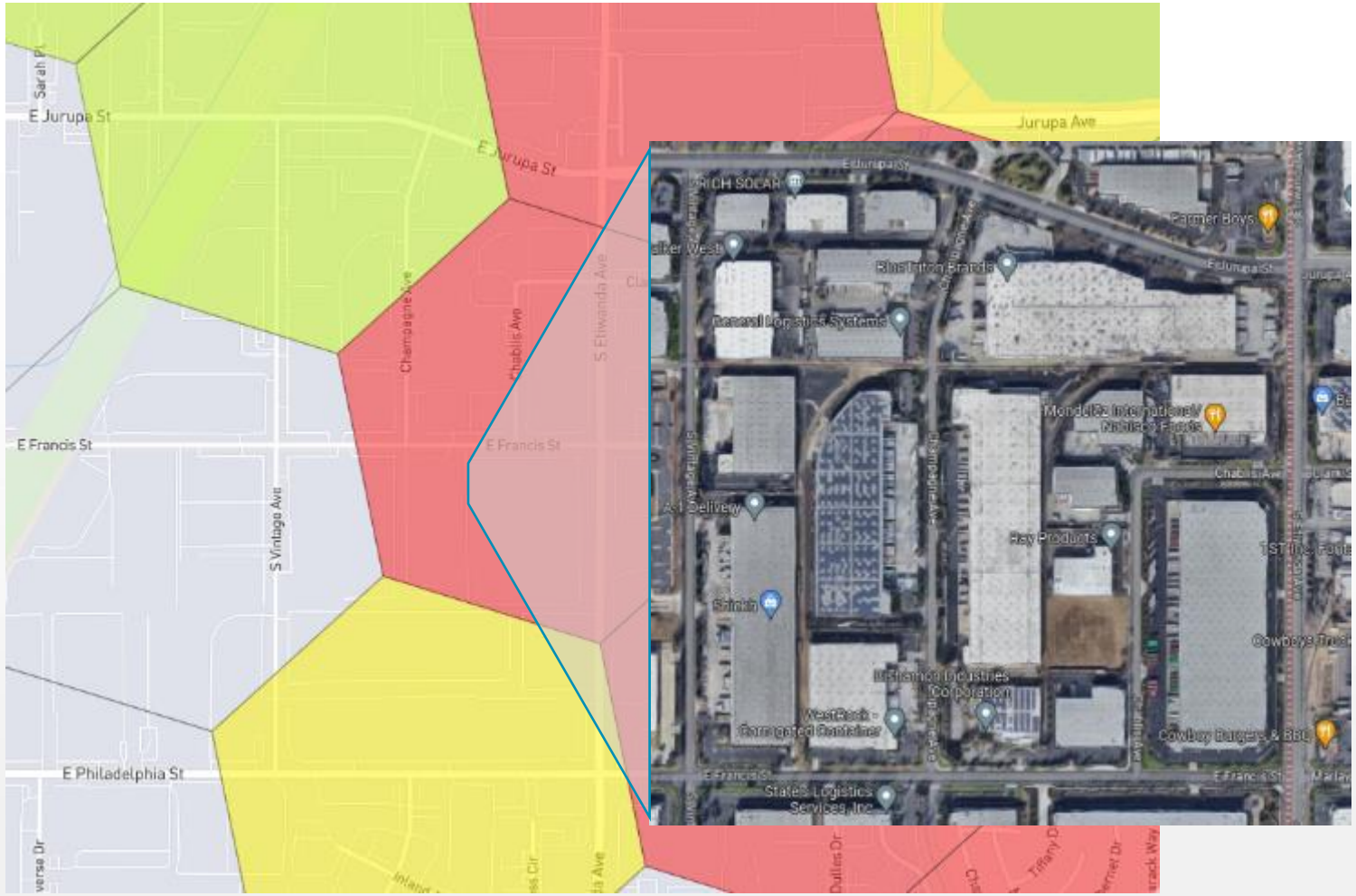


H5 – 98 sq miles per hex

MDHD Depot Case Study - 100% Electrified



MDHD Depot Case Study - 100% Electrified



MWh/Day per Hex

- < 3.0 MWh
- 3.0-5.0 MWh
- 5.0-10.0 MWh
- 10.0-30.0 MWh
- 30.0-50.0 MWh
- 50.0-100.0 MWh
- 100.0-200.0 MWh
- 200.0 MWh+

Companies:

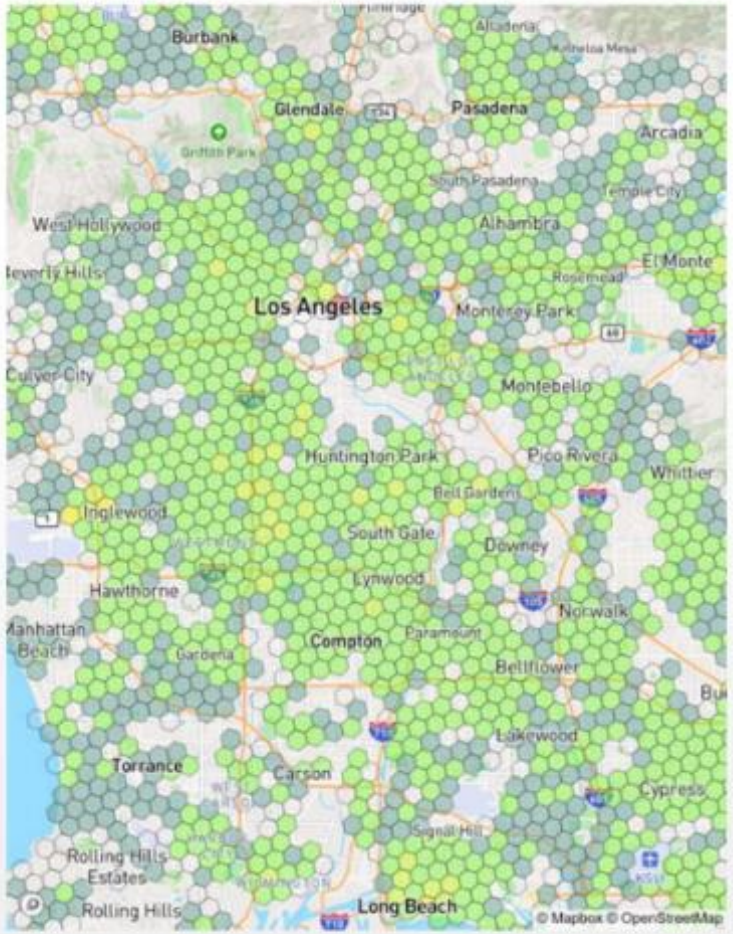
- Pacific Urethanes -
- Blue Triton Brands – drink company
- Nabisco Foods
- West Rock Corrugated Container
- IIT Champagne – Champagne delivery
- Ray Products- Plastic company
- Bishamon Industries – metal handling
- RICH solar
- Coca Cola Co

Light-Duty

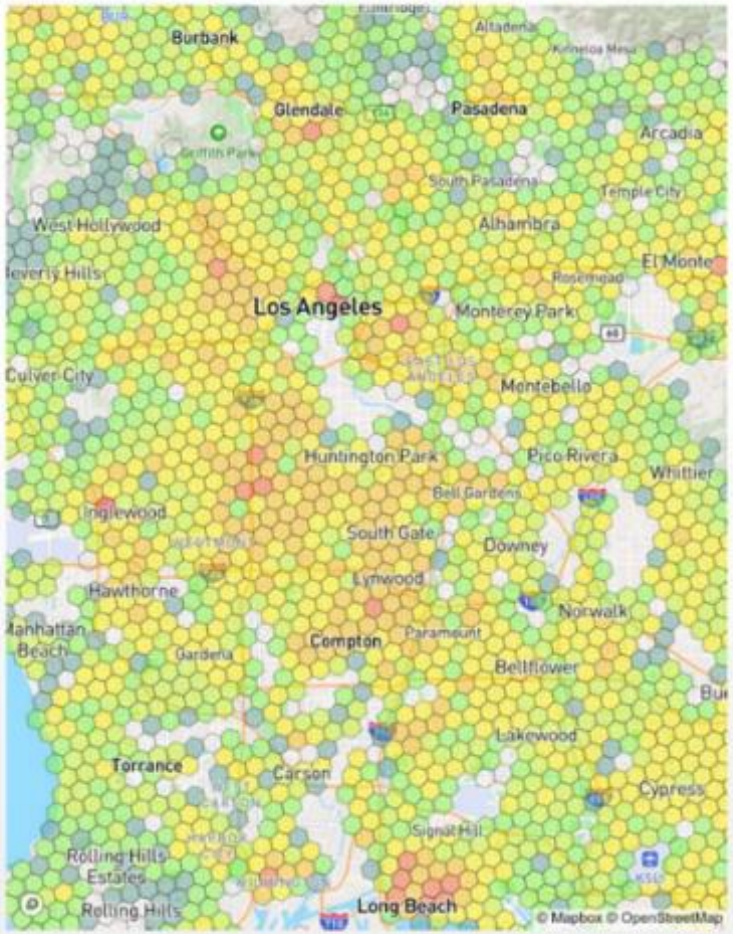
Residential Charging Energy Required Over Time

EVs2Scale 2030

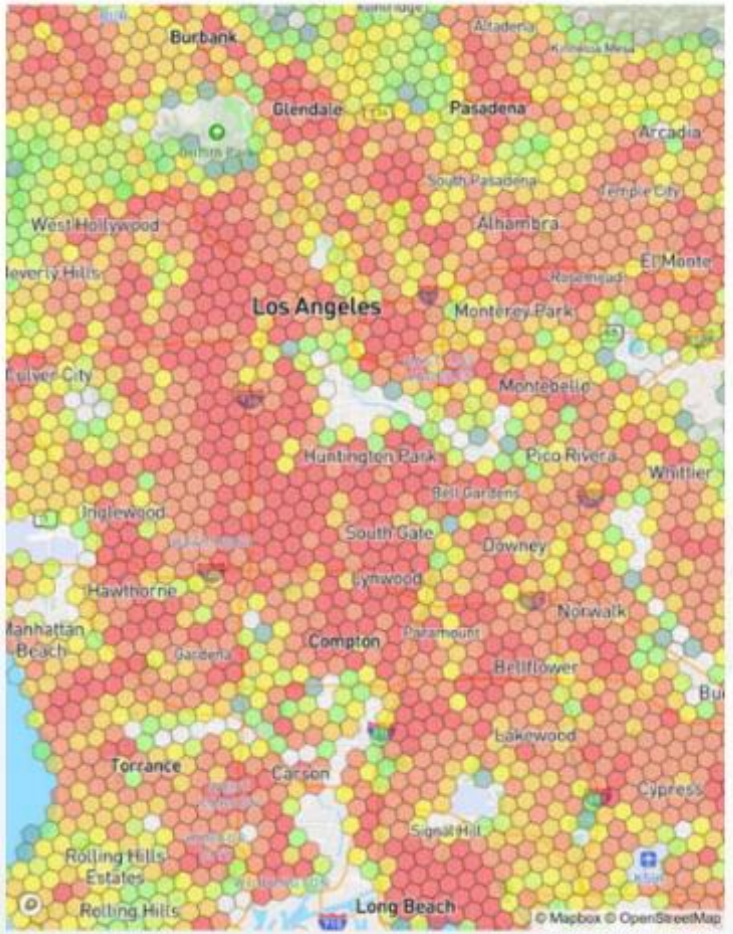
2023



2030 (Policy Compliance)



100% Electrified



Legend (MWh/day) < 1 MWh | 1-3 MWh | 3-5 MWh | 5-10 MWh | 10-15 MWh | 15-25 MWh | 25 MWh +

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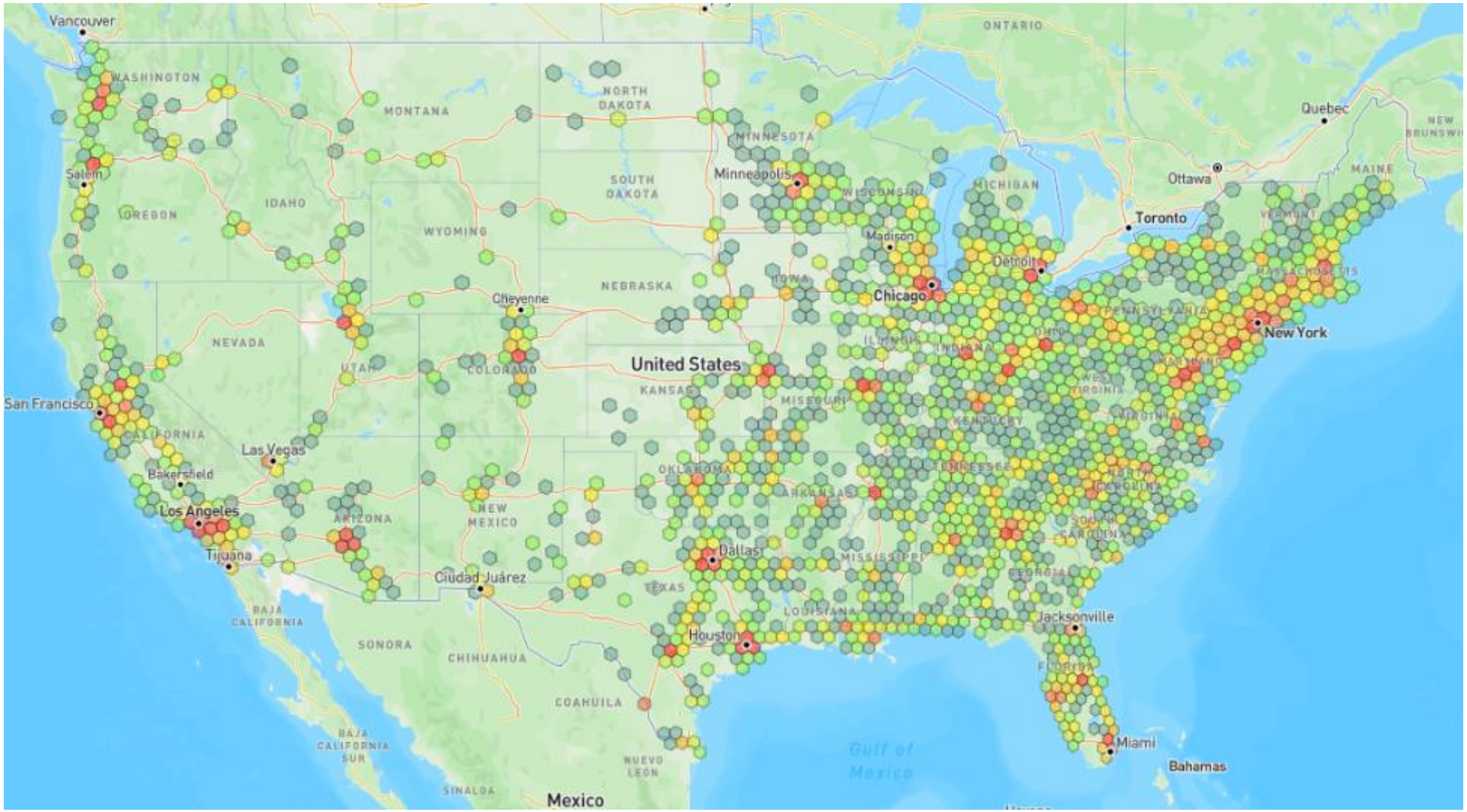
What these Load Forecast Maps Are (and Aren't)

- **Goal**
  - **Provide as much certainty** as possible to utilities, regulators/oversight bodies, and other key stakeholders about where and when transportation loads are arriving on the grid

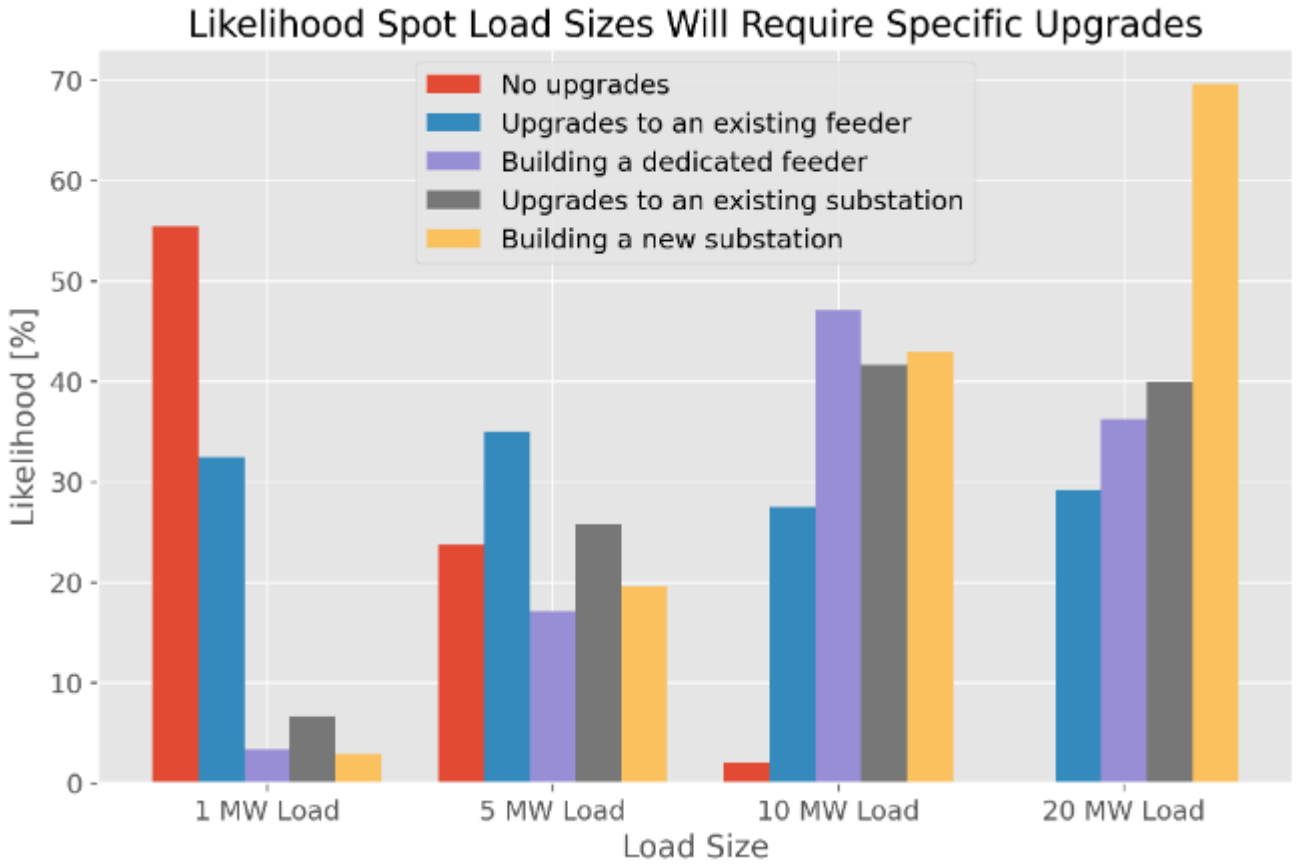
- **Messaging**
  - This is eRoadMAP Version 1.0
  - It reflects a transparent and collaborative process between utilities, fleets, many other data providers
  - It is meant to represent the best data available to date and the means to start communicating, prioritizing, and planning for grid-side, no-regret investments
  - It provides near-term, mid-term, and long-term planning horizons

Load … but what about Capacity?



Utility Grid Survey
Preliminary Responses

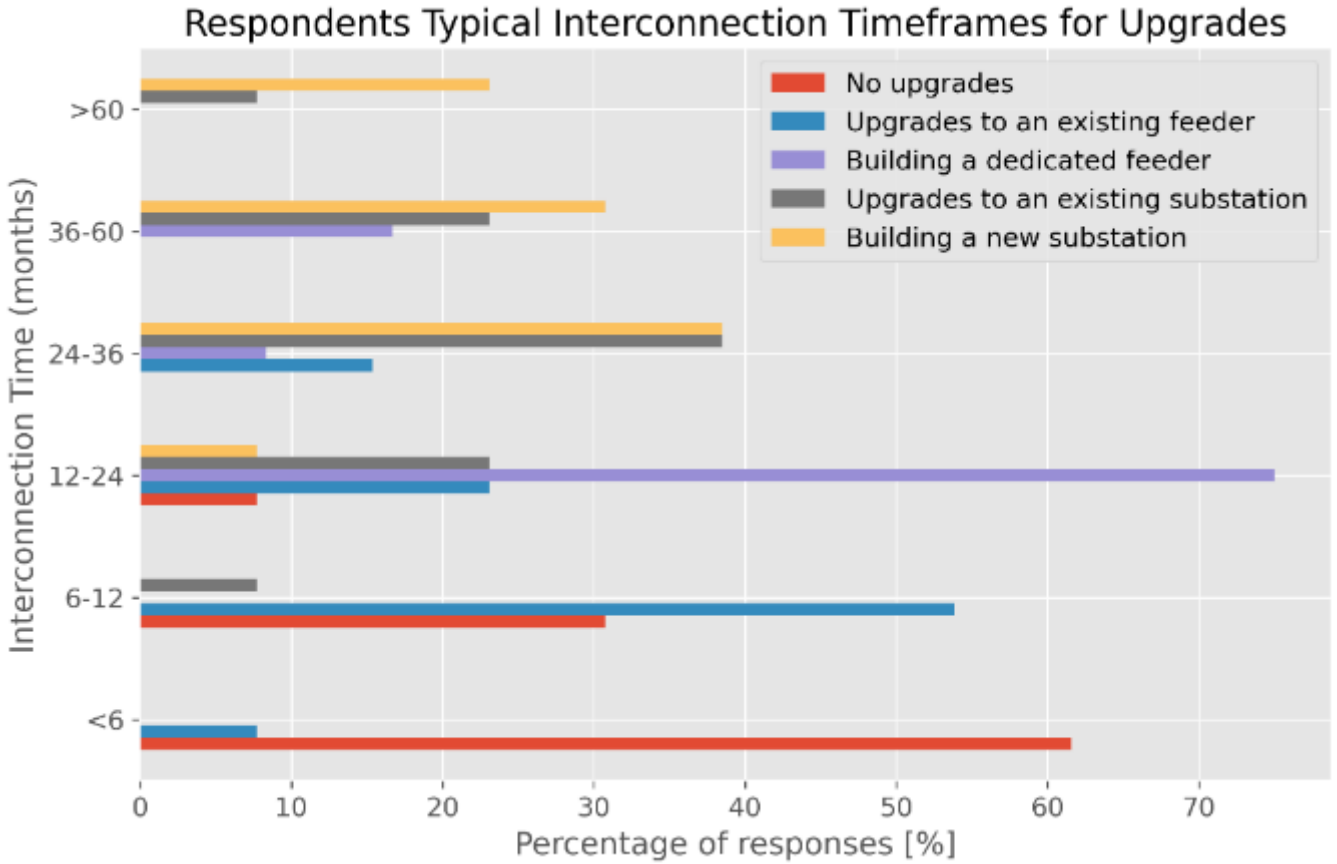
➡ The utility grid, as a system, is relatively well positioned to serve EV charging – however challenges exist in some locations



Preliminary Findings:

- ***5MW load*** – 30% likely to need a feeder upgrade
- ***10MW load*** – 48% likely to need a dedicated feeder, 42% likely to need substation
- ***20MW load*** – 70% likely to need a new substation

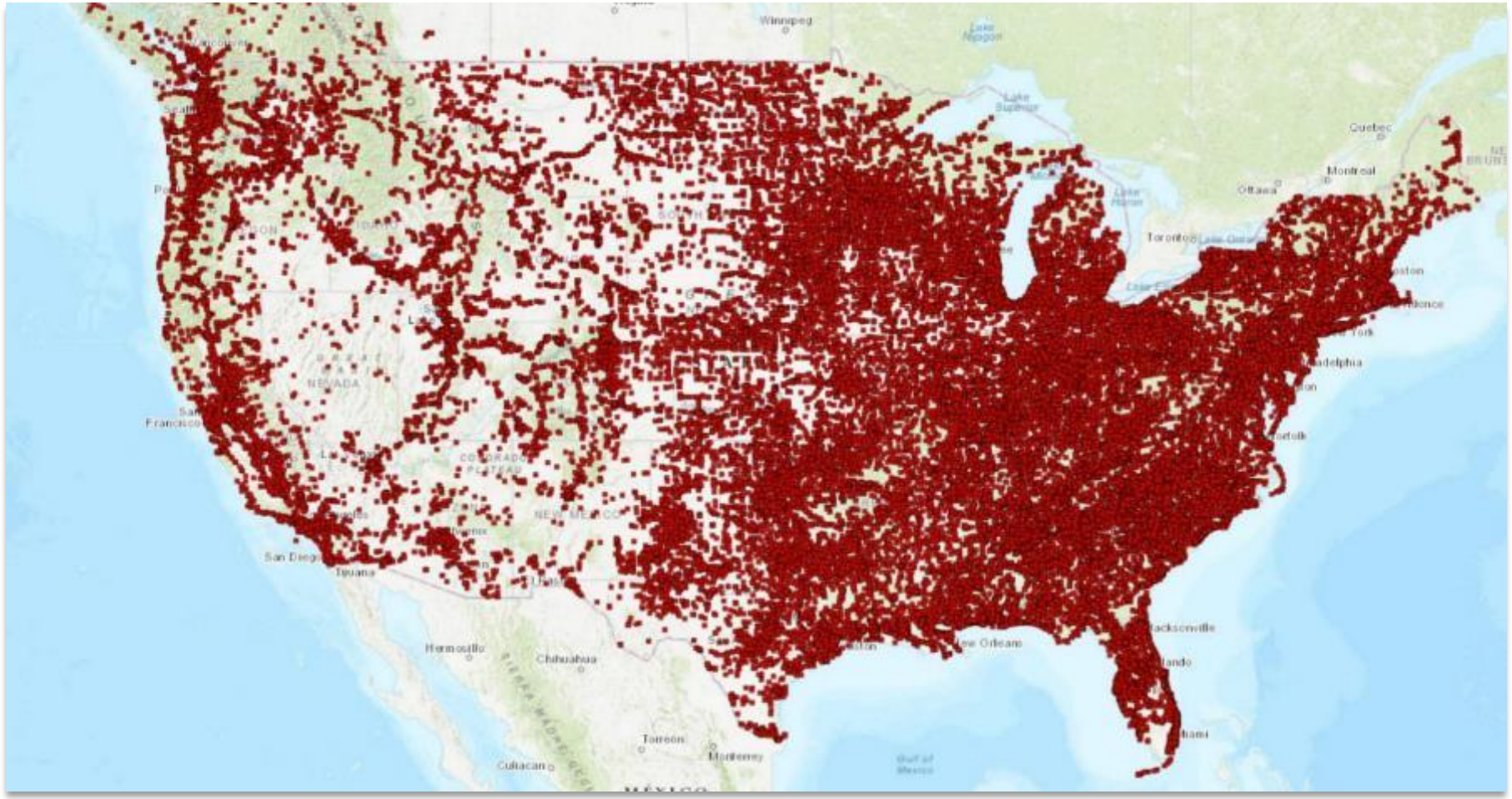
Utility Grid Survey
Preliminary Responses



Preliminary Findings:

- ***Upgrades to an Existing Feeder:*** 6-12 months
- ***Dedicated Feeder Lead Time:*** 12-24 months
- ***Build a new Substation:*** 24-36 months

Database of Substations Already Exists



Geospatial Energy Mapper (GEM), Argonne National Laboratory, https://gem.anl.gov/

Includes

- Substation name
- Lat/Long coordinates
- Max/Min voltage

Estimating Local Capacity?

For each substation:

- Location (lat/long)
- Rated capacity (incl. planning limits)
- Voltage class
- Historical peak load

GridFAST vision

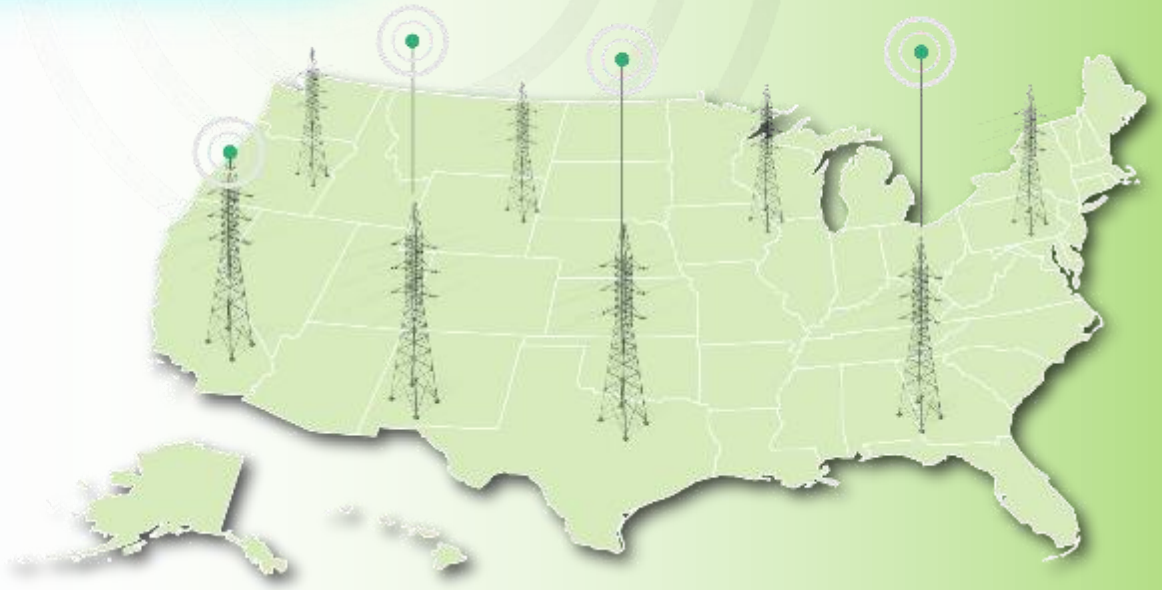
EVs2Scale 2030

Improve transparency in EV charging planning to inform grid investments and accelerate grid interconnects

2023-2035 plans defining loads, locations, timing

GridFAST
Secure online data exchange platform

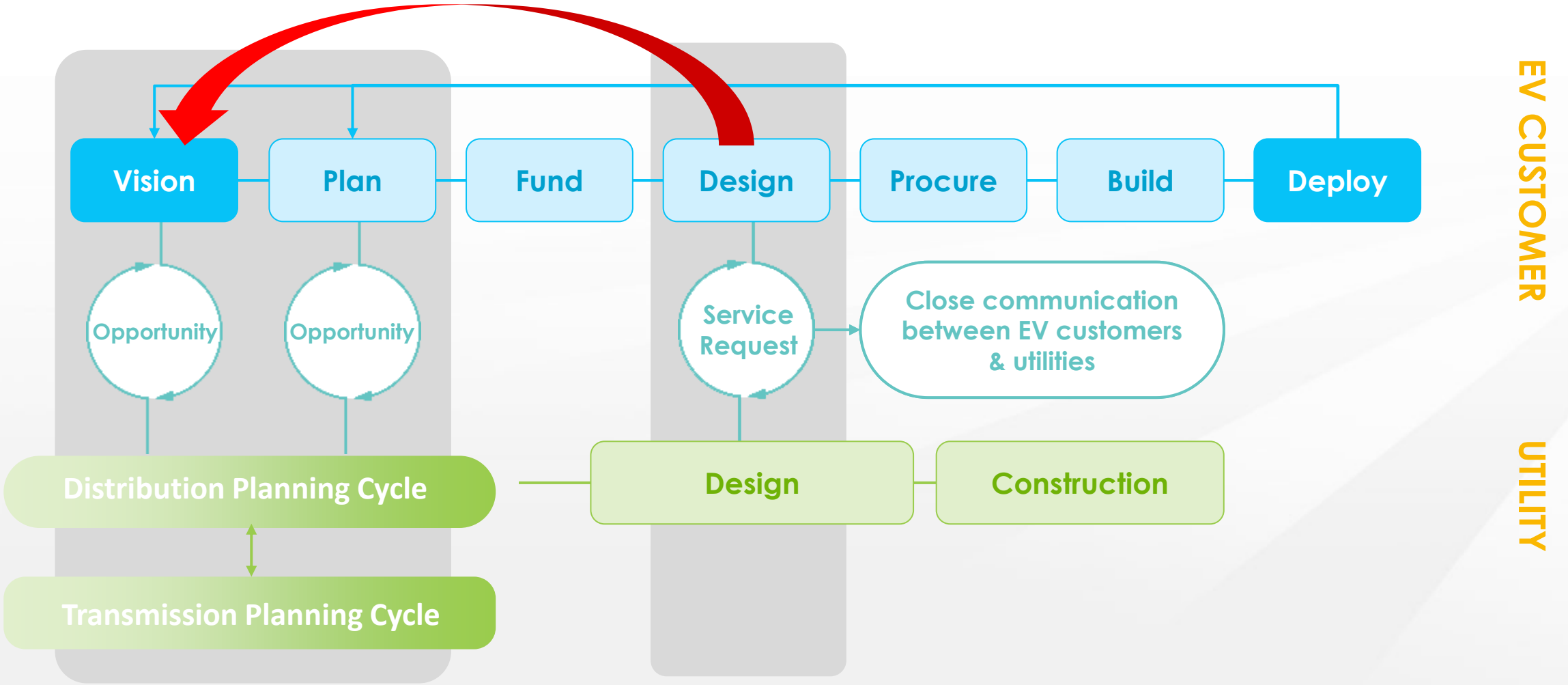
Utility hosting capacity – or proxies – indicating grid readiness, timing to support EV charging loads



EPRI

Role of GridFAST

How might we help EV customers and utilities get *actionable* transportation load information, *earlier* into the utility planning process?



EVs2Scale™ 2030

EXPEDITED INTERIM CHARGING SOLUTIONS

The Challenge

- Electric Trucks (and other vehicles) can be ordered and delivered in **4-6 months or less**
- Utility infrastructure upgrades to serve the new charging load can take **18 – 24 months** or longer
  - **This mismatch in timelines is affecting adoption of EVs, especially Class 6-8 trucks**
- Due to policy drivers and market forces, this will become more prevalent in 2024 and beyond
  - **This will increasingly position utilities as a "barrier" to MDHD vehicle adoption**
- **What can be done to bridge this timeline gap?**

The Premise of Interim Charging Solutions

- Full power requirements are typically not needed when first vehicles arrive
  - Vehicle deployment typically occurs in stages
  - The ability to provide 200 – 300 kW for charging is enough to bridge the gap in most situations and enable the customer to begin deployments

Draft concepts from Daimler Truck

Solutions That Enable Some Charging While Permanent Grid Infrastructure is Being Built

Distribution Operations

A. Switch existing loads to nearby feeders, opening up capacity
B. Return to former configuration when permanent grid is built/energized

Interim On-site Options

A. Does panel in existing building have spare capacity?
B. If Yes, run conduit outside, terminate to Hubbell receptacle(s)
C. Connect portable DCFC with Hubbell plugs

Interim Power from the Grid

A. Secure 480V, 3-phase, 400A service from utility (typically temp or construction power)
B. Standard offer in utility ESR book
C. Mobile power block connection, terminating to Hubbell receptacles
D. Connect portable DCFC with Hubbell plugs

Flexible Interconnections

A. Utility offers Depot to use existing feeder capacity but curtail charging when feeder loads approach capacity limits
B. Probably a more robust interconnection than Interim Power
C. Contract or Rate Schedule Needed (maybe)

No Power Available from Grid

A. Depot leases Portable Generator, which already has Hubbell output receptacles
B. Connect portable DCFC with Hubbell plugs
C. Run generator (powered by NG or diesel) to charge MHD e-trucks

Interim Charging Solution Options (Phase I)

- Of these options, **the most promising and highest priority is the utilization of "construction" or "temporary" power service to enable charging of 5-10 trucks** (depending on use case)
  - EVSE connection to a 480V, 400A, utility temporary service
  - Moveable, so could be used at other locations?
  - Variations based on distribution voltage?
  - What approvals would be needed (regulatory, AHJ)?
- Tentative deliverables
  - Creation and vetting of a "reference design" across utilities and customers
  - Field demonstration
  - Education/Promotion plan for establishment as a best practice (incl. AHJ, regulatory,…)

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Red: Expected to heavily inform the regulatory workstream

Enabling Regulatory and Oversight Framework

Equity Blueprint & Workforce Development

Regulatory/Policy Outreach

PROPOSED DELIVERABLE:

A **50-State/National Outreach Package** for regulators, legislators, consumer advocates, and federal agencies that leverages eRoadMAP™ and GridFAST™ to build a case for proactive grid investment that enables timely scale

+ Economic Opportunities *(battery plants, assembly plants, EVSE,…)*
+ In-State Revenue Opportunities *(electricity sales/taxes, downward pressure on rates)*
+ Industry Support *(letters of support, PUC hearings,…)*
- Load Forecasting Data Analysis *(near-term priorities)* ***eRoadMAP™***
- Grid Impact Analysis *(substation and feeder level priorities)* ***eRoadMAP™***
- Leadtime Impacts
  - Costs (potential solutions and approaches to who pays)

+ Supply Chain Impacts (transformers, switch gear,…)
+ Grid-Side Costs (potential solutions and approaches to who pays)
+ IOU vs. Public Power vs. Rural Coop

Released Reports + Tools

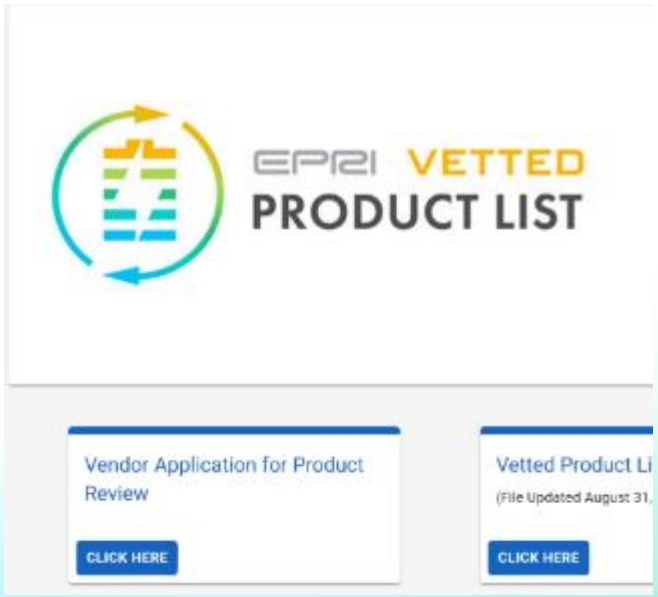
1

EVs2Scale Website

[EVs2Scale2030 | EPRI](https://msites.epri.com/evs2scale2030) --
https://msites.epri.com/evs2scale2030

2

VPL (Vetted Product List)



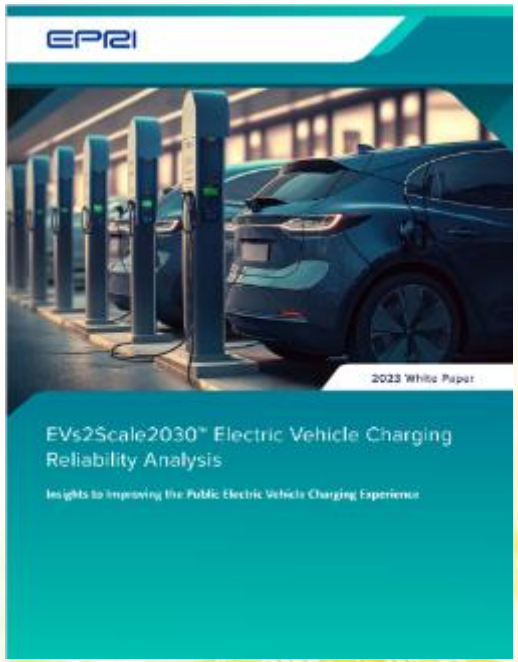
https://www.epri.com/vpl

3

Grid Primer

4

EV Charging Reliability Analysis



Mark your calendars:

EPRI's "Electrification 2024" Conference in Savannah, GA 12-14 March, 2024

EVs2Scale 2030

Thank You

www.epri.com

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