WORLD RESOURCES INSTITUTE

ELECTRIC SCHOOL BUS INITIATIVE UTILITY WORKING GROUP

UWG 3RD CONVENING | AUGUST 31, 2022

MEETING GOALS

- Launch a collaborative working group aimed at influencing, supporting and driving the equitable transition to ESBs
- Learn about various ESB-related activities, issues and ideas particularly as they pertain to electric utility interactions, requirements and programs.
- Collectively identify key ESB topics to explore in subsequent meetings and the related resources and support required

WE KINDLY ASK…

- Please rename your ZOOM title with your name and organization
- Please mute yourself during presentations and when not talking
- Please put your questions in the chat box
- Please participate in the surveys to help inform the topics and provide feedback on the value of the materials being presented
- Please be respectful of the meeting participants and the space allowed for input
- The meeting will be recorded and made available to all participants

AGENDA

1:00 – 1:05	**Welcome (Goals, Requests and Agenda)**
1:05 – 1:10	**Initiative Recap and Team**
1:10 –1:25	**Important News and Updates**
1:25 – 2:05	**Topic 1 – *Examining the Electrification Potential of PG&E's Distribution System*** • Presentation from UC Berkeley, Duncan Callaway & Salma Elmallah
2:05 – 2:45	**Topic *2* – *Equitable Microgrid and Electric Bus Deployment for Underserved Communities***
2:45 – 2:55	**Future Topic Survey**
2:55 – 3:00	**Wrap-Up**

WHY ELECTRIFY THE U.S. SCHOOL BUS FLEET?

Electrification can accelerate decarbonization while bringing direct, tangible benefits to every community

- **Improved health** and cognitive outcomes for children
- **Cleaner air**, especially in high-pollution corridors and communities of color
- **Reduced operating expenses** for school districts
- **New jobs** in green manufacturing
- A **tipping point** for MHD + electrification
- Enhanced **resiliency** and **renewables integration** with V2G

OUR VISION INVOLVES MULTIPLE STAKEHOLDERS

Goal: **An Equitable Transition to Electric School Buses**

School Districts

Pillar 1

Manufacturers

Pillar 2

Utilities

Pillar 3

Federal & State Policymakers

Pillar 4

Local Communities

Pillar 5

Foundation: **Equity, Communications, Engagement**

Utilities

Pillar 3

UTILITY ENGAGEMENT AND FINANCING SOLUTIONS TEAM

Sue Gander
Director, Electric School Bus Initiative

Lori Bird
Director, US Energy Program

Gregg Kresge
Senior Manager, Utility Engagement & Transportation Electrification

Michelle Levinson
Manager, eMobility Financial Solutions

Haley Minter
Grants & Finance Specialist

Alyssa Curran
Research & Administrative Assistant

Caitlin Macomber
Research Analyst, Environmental Justice & Equity

Hamilton Steimer
Research Analyst

JUSTICE40 INITIATIVE (J40) TIMELINE

Jan. 2021

Biden signed Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad"

July 2021

The Administration announced Interim Implementation Guidance of J40

Nov. 2021

Biden signed Infrastructure and Investment Jobs Act (IIJA) into law

Apr. 2022

WRI interviewed seven participating ACCC (Climate Challenge) cities to discuss J40 preparation

June 2022

EPA released which early adopter programs will integrate Justice40, including the Clean School Bus Program

KEY FINDINGS FROM WRI'S CITY NEEDS ASSESSMENTS

Challenges:	What cities can do now to prepare:
• **Finding** and applying for federal funding • **Connecting existing plans** with upcoming funding opportunities • Maximizing the impact of federal funding and **making sure it goes to communities** who need it most	• Understand which communities within a city can be **considered disadvantaged** • **Create a plan** to guide equitable infrastructure development • **Assess** whether existing plans are aligned with upcoming federal funding opportunities • **Learn from other cities** that are already directing funding specifically for climate and energy projects within disadvantaged communities

How Prepared Are US Cities to Implement the Justice40 Initiative? | World Resources Institute (wri.org)

UPDATE – EPA CLEAN SCHOOL BUS PROGRAM

- First round of funding (rebate program) closed on August 19th

- We've heard that the vast majority of states submitted applications, there was significant interest for electric school buses, and this first funding opportunity was oversubscribed. The EPA is now reviewing applications and preparing to release selections in October.

Clean School Bus Program Funding | US EPA

The next round of CSBP funding is expected to be released later this fall and will award funds via **grant applications**

- The timeline has not yet been announced

NEWS – INFLATION REDUCTION ACT & NATIONAL ELECTRIC VEHICLE INFRASTRUCTURE PROGRAM

- The **Inflation Reduction Act** **(IRA)** was signed into law on August 16th
- The IRA includes an additional $1B to replace eligible Class 6 and 7 vehicles with ZEVs
- It also includes a Qualified Commercial Clean Vehicle Tax Credit for up to $40,000 per vehicle, under which school buses can qualify

- The FHWA/DOT recently solicited public comments on the proposed **National Electric Vehicle Infrastructure (NEVI) Formula Program**
- The proposal included several provisions that aimed to standardize the installation, operation, and maintenance of EV infrastructure.
- WRI submitted a public comment

SURVEY - CSBP

Go to **www.menti.com** and use the code **2598 2480**

Speaker Introductions

Duncan Callaway

Duncan Callaway is an Associate Professor of Energy and Resources at the University of California, Berkeley. He also holds appointments in Electrical Engineering and Computer Science and at Lawrence Berkeley Laboratory. He received his PhD from Cornell University. He has held engineering positions at Davis Energy Group and PowerLight Corporation, and academic positions at UC Davis, the University of Michigan and UC Berkeley. Duncan teaches courses on electric power systems and at the intersection of statistical learning and energy. His research focuses on grid integration of renewable electricity, and models and control strategies for power system dynamics, demand response, electric vehicles and electricity storage.

Salma Elmallah

Salma is a PhD candidate at the Energy and Resources Group at the University of California, Berkeley, and a graduate student research assistant at Lawrence Berkeley National Lab. Salma's dissertation studies the equity and distributional impacts of residential heating electrification policy and planning, focusing on cities in California. Her ongoing and prior research has studied the planning and decarbonization implications for electric distribution systems, large-scale renewable projects, and gas distribution systems. She has an MS in Energy and Resources from UC Berkeley and a BSc in Electrical Engineering from the University of Alberta.

Examining the Electrification Potential of PG&E's Distribution System

Salma Elmallah, Anna Brockway, Duncan Callaway

Energy Modeling, Analysis and Control Lab

Who we are:

- Collection of undergraduate and graduate students, postdocs and a faculty PI
- Housed in Energy and Resources Group, with students from Electrical Engineering and Computer Science, Energy Engineering,

What we do: Research and innovation to support decarbonization

- *Energy Analysis*: evaluating cost and performance of energy systems and technologies
- *Engineering solutions*: algorithms to improve grid operations

Load electrification: key questions we are studying

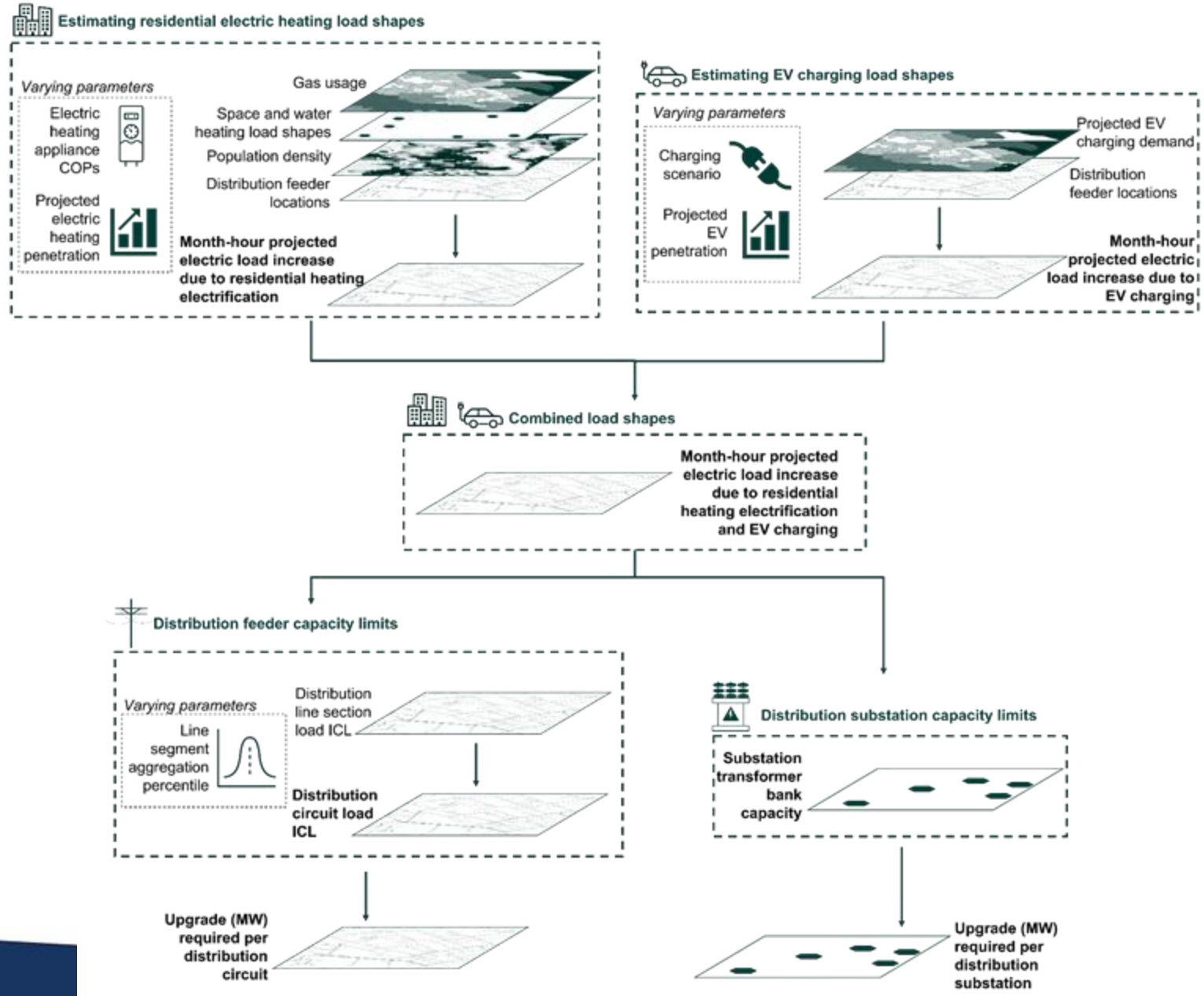
Focus: light duty EV and residential space and water heating

1) How much new *distribution system* capacity do we need to electrify end-uses?
    a) Key takeaway: Capacity needs for scenario for workplace-dominated EV charging is comparable to best-case scenario with demand response and residential charging
2) Can utilities address needs for new capacity as it arises?
    a) Key takeaway: The number of upgrades implies a significant acceleration in pace of projects
3) What will it cost?
    a) Key takeaway: To hit 2050 electrification goals, median cost estimates are $4-6B *total*

Process overview

The bulk of our research effort focuses on integrating existing data within a geospatial analysis framework

We'll zoom in on parts of this process on the next slides.



Estimating residential electric heating load shapes

Varying parameters

Electric heating appliance COPs

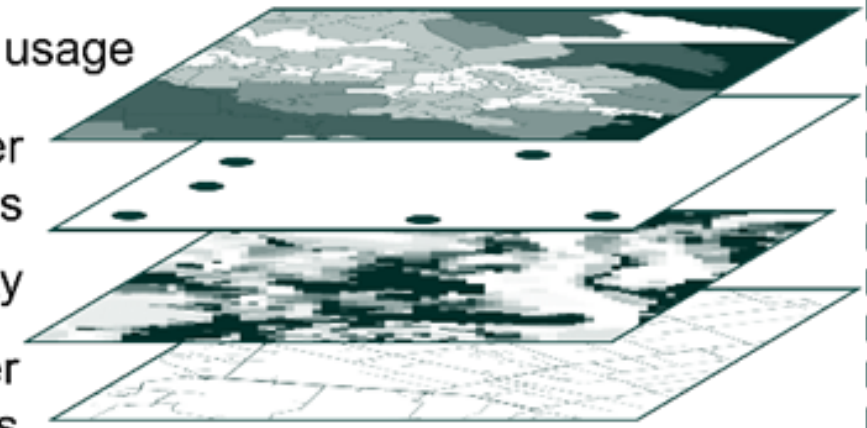
Projected electric heating penetration

Gas usage

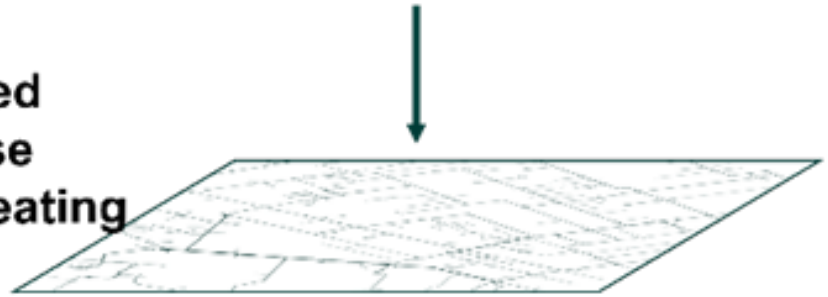
Space and water heating load shapes

Population density

Distribution feeder locations



Month-hour projected electric load increase due to residential heating electrification



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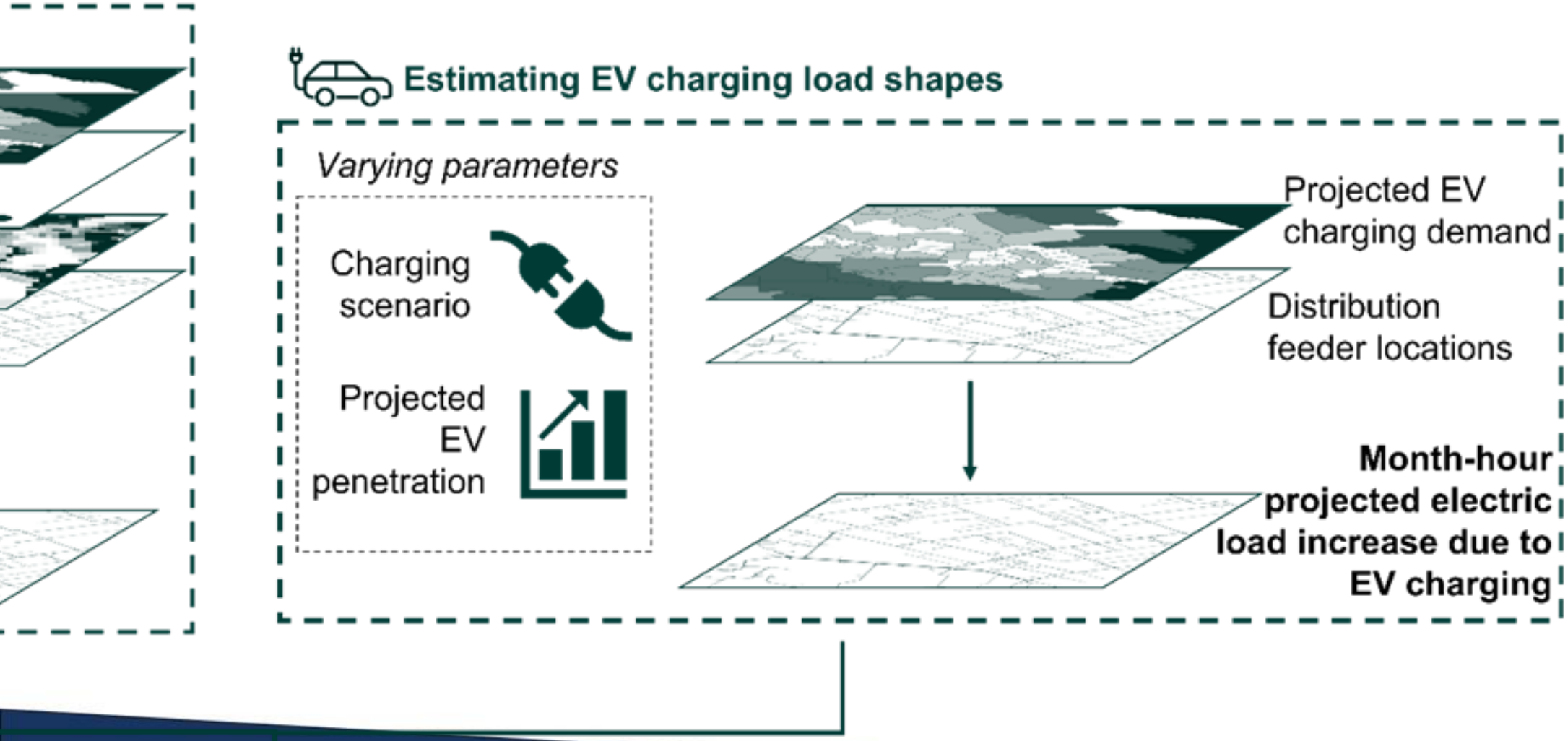
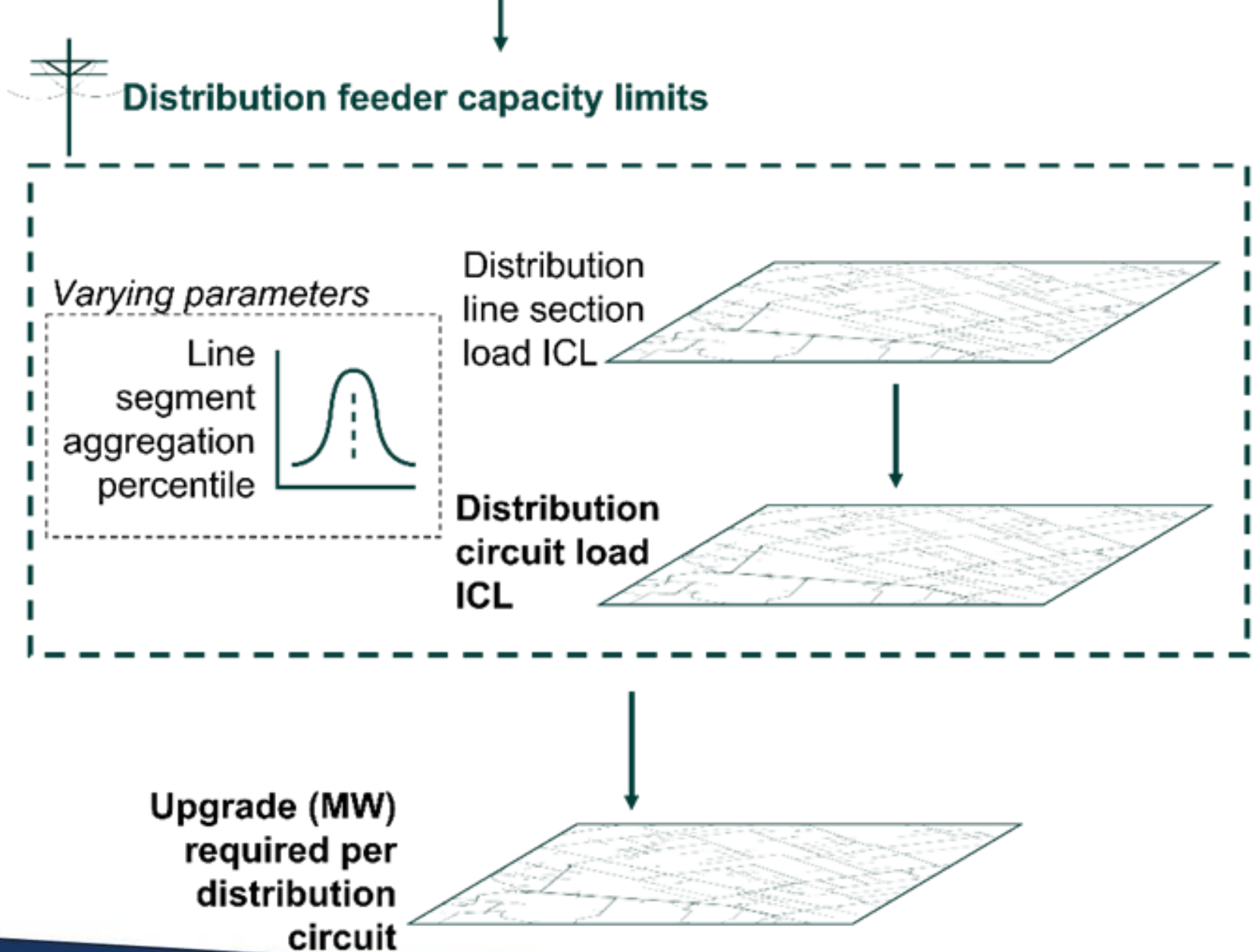


Combined load shapes


Distribution feeder capacity limits
Varying parameters
Line segment aggregation percentile
Distribution line section load ICL
Distribution circuit load ICL
Upgrade (MW) required per distribution circuit

Scenarios

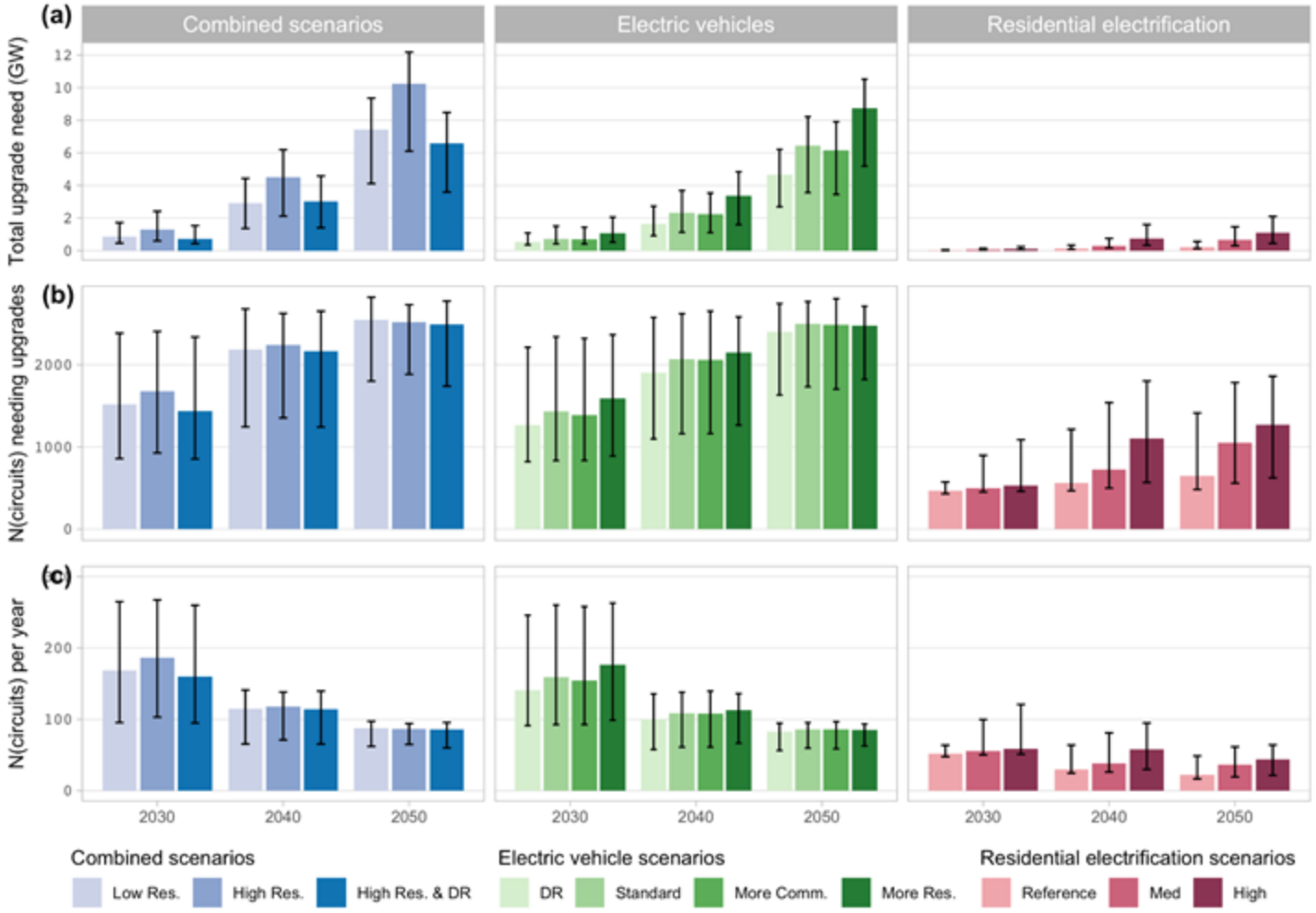
We estimated 2030, 2040 and 2050 load shapes

For residential heating and water, following NREL projections, we studied a reference, medium and high penetration scenario (increases of 17.5%, 33.2% and 43.5%, respectively, by 2050)

For light duty EVs, charging scenarios for

- **(i)** nighttime (home) charging; **(ii)** balanced charging with DR; **(iii)** daytime (commercial/workplace).
- 8M statewide EVs in 2030, 2x in 2040 and 4x in 2050.

Grid impacts of electrification in California (PG&E)

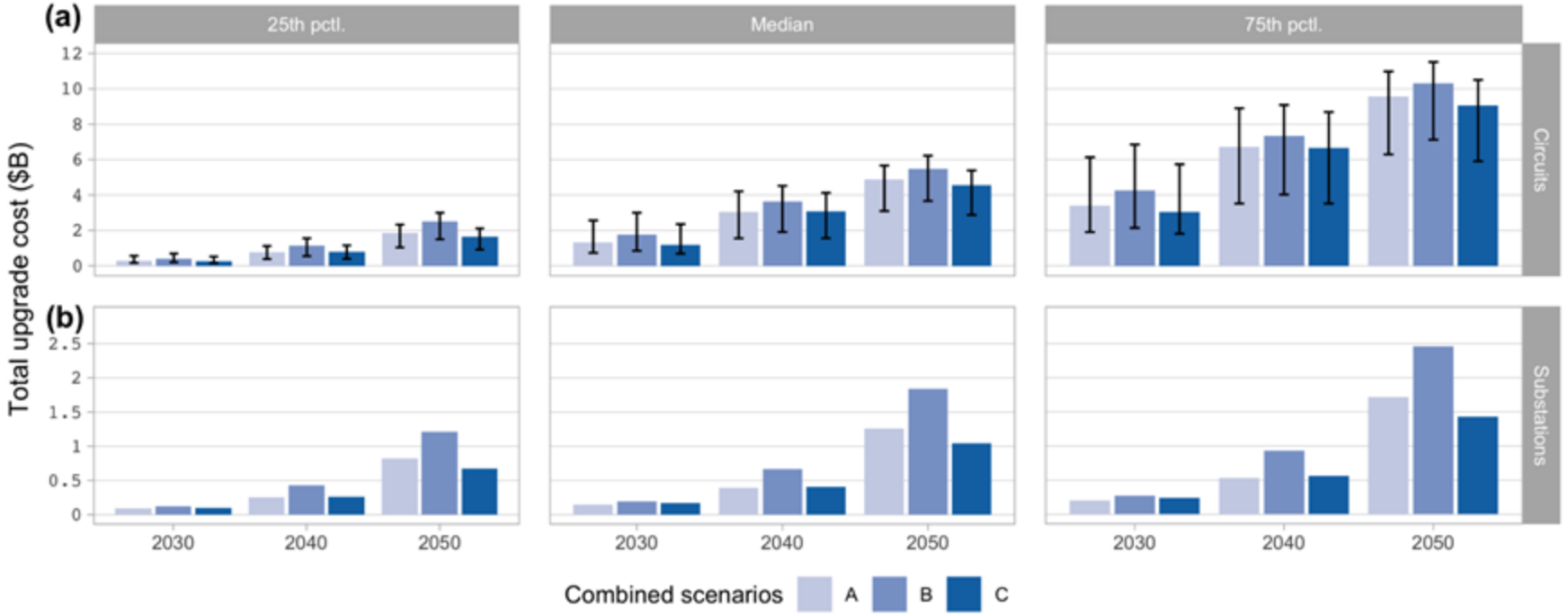


Key takeaways:

- Capacity needs driven by EV demand; biggest impacts with high residential charging
  - Demand response matters.
  - **Workplace charging: low capacity needs *and* favorable wholesale prices**
- The *number* of projects is striking (vs avg of 65/y in recent history)
  - Not impacted by demand response

Berkeley
UNIVERSITY OF CALIFORNIA

What might these upgrades cost?

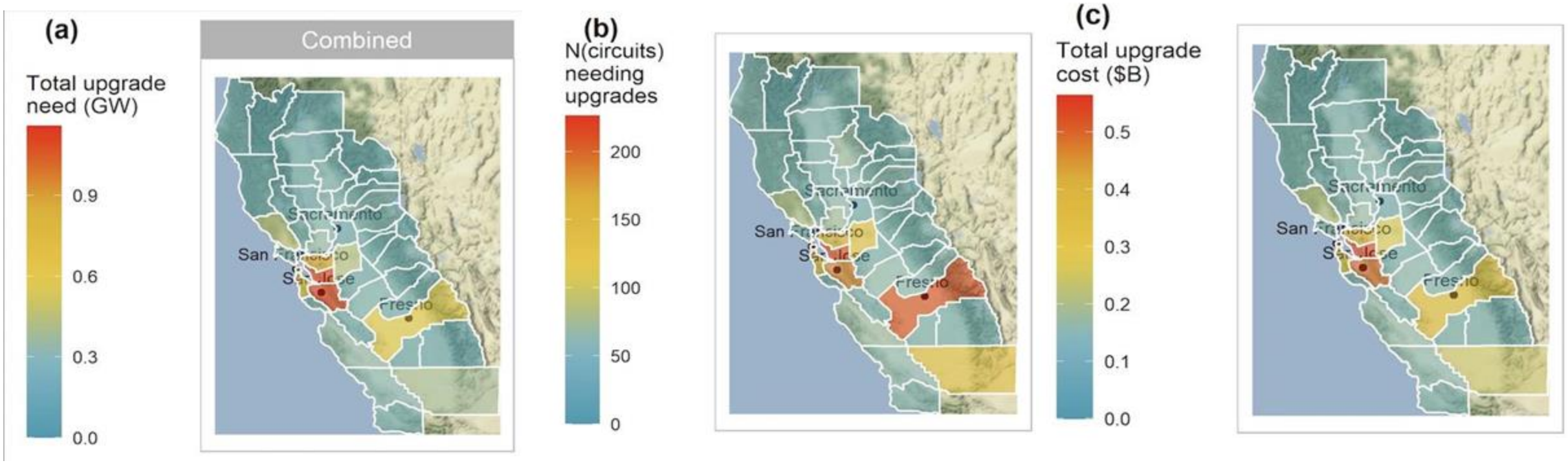


Cost numbers come from DDOR data, partitioned by size.

Key takeaway

- **Costs large but not outlandish.**
  - Reference: $2.23B in 2020 (approved)

Spatial results



Key result: Project requirements concentrated in Bay Area and southern PG&E territory. Important implications for regional offices or possible breakup of PG&E

Wrap-up

- Cost numbers are small in total, but the *number* of projects is quite large
- Residential electrification has smaller impacts on circuit upgrade needs than EVs
- Demand response helps on cost and capacity but not number of projects
- Commercial EV charging has comparable impact to best-case scenario with demand response.
- Work effort concentrated in Bay Area and Southern territory

Recommendations and next steps

- Our key recommendations:
  - IOUs should consider these types of electrification scenarios more carefully in their ICA modeling.
  - Advance policies to support workplace / daytime charging.
  - Expand PG&E workforce and begin upgrades now.
- Future directions to take
  - NWA: We see limited benefit from solar, but more to examine with storage and demand response

Electric School Bus INITIATIVE

QUESTIONS?

SURVEY-TOPIC 1

Go to **www.menti.com** and use the code **2598 2480**

TOPIC 2 – EQUITABLE MICROGRID AND ELECTRIC BUS DEPLOYMENT FOR UNDERSERVED COMMUNITIES

Slides are not included due to permission not received from the presenter.

Electric School Bus INITIATIVE

QUESTIONS?

SURVEY-TOPIC 2

Go to **www.menti.com** and use the code **2598 2480**

FINAL SURVEY

Go to **www.menti.com** and use the code **2598 2480**

THANK YOU

Please contact Gregg Kresge at
Gregg.Kresge @wri.org