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Description:	S1 2E. Michael Pimentel, CA Transit Association
Filer:	Raquel Kravitz
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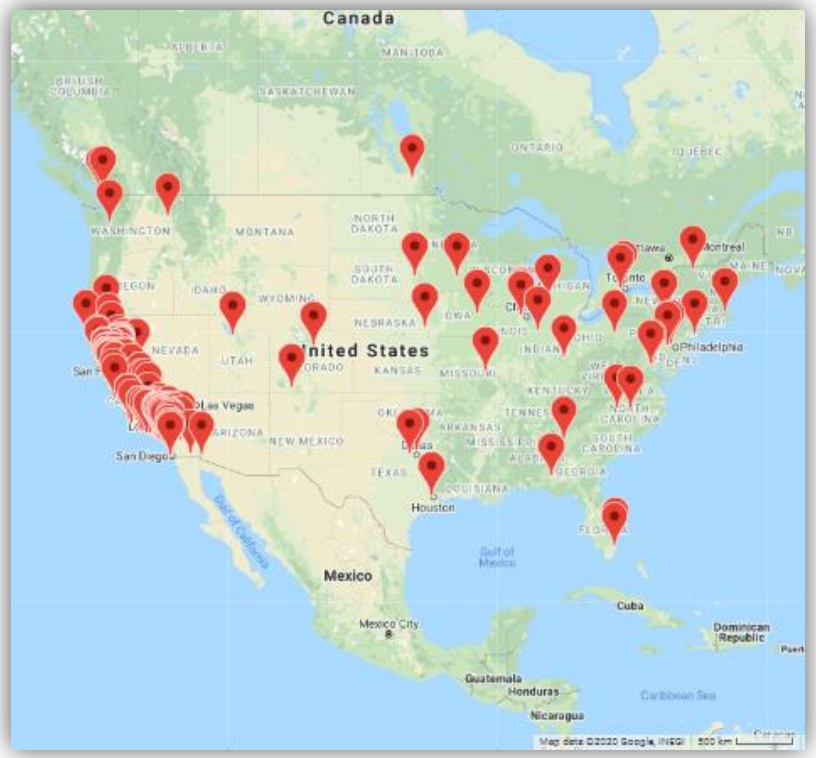
California Transit Association

Planning for Resiliency in Zero-Emission Bus Deployments

July 15, 2020

California Transit Association

- Represents **250+** transit-affiliated organizations
- Advocates for policies and funding solutions that support and advance public transit
- Active at state- and federal-level



Involvement in Electrification

- Led negotiations on Innovative Clean Transit regulation
- Represent transit industry in:
  - CEC Advisory Committee for Clean Transportation Program
  - CPUC Transportation Electrification Framework

Zero-Emission Bus Task Force

- Chaired by Doran Barnes, Executive Director, Foothill Transit
  - Immediate past-Chair of American Public Transportation Association
- Comprised of **25** Association members, including:
  - Transit agencies
  - OEMs
  - Consultancies
  - Technology Providers

Innovative Clean Transit Regulation

- Adopted by ARB in December 2018
- Requires transit agencies to begin to purchase ZEBs as soon as 2023
  - Aims to convert transit bus fleet (approx. 10k buses) to zero-emission technology by 2040
- Includes requirement that transit agencies prepare “rollout plans”
  - July 1, 2020: Large agencies (> 100 VOMS)
  - July 1, 2023: Small agencies (<100 VOMS)

Status of ICT Regulation

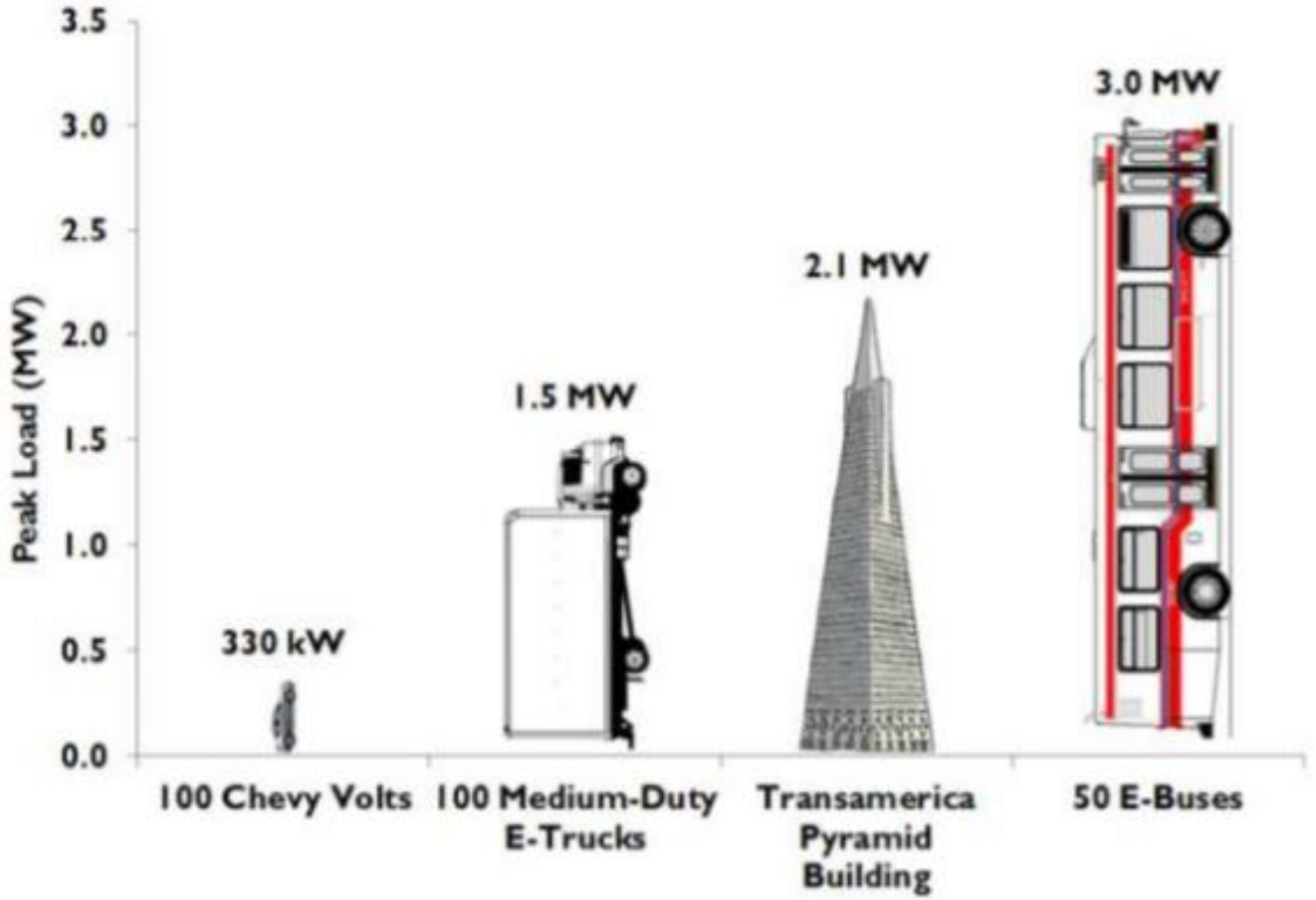
- Strong initial deployments
  - 280 ZEBs in revenue service
  - 470 ZEBs on order
  - Contract execution pending on 80 ZEBs
- Largest ZEB fleets in revenue service
  - AVTA: 49 BEBs
  - Foothill Transit: 33 BEBs
  - San Joaquin RTD: 17 BEBs

Considerations for ZEB Deployments

- Transit agencies are mobility providers first
  - Commitment to zero-emission bus deployment tempered by current limitations
    - Capital costs, operational costs, workforce needs
    - Range, depot space constraints, grid reliability
- Transit agencies play a critical role in emergency response
  - Technology limitations raise serious questions

Considerations for ZEB Deployments

- Approx. 3.0 MW needed to charge 50 buses during nightly window
  - 2.0 MW generator costs approx. $1.5 million
  - Battery storage is possible future option



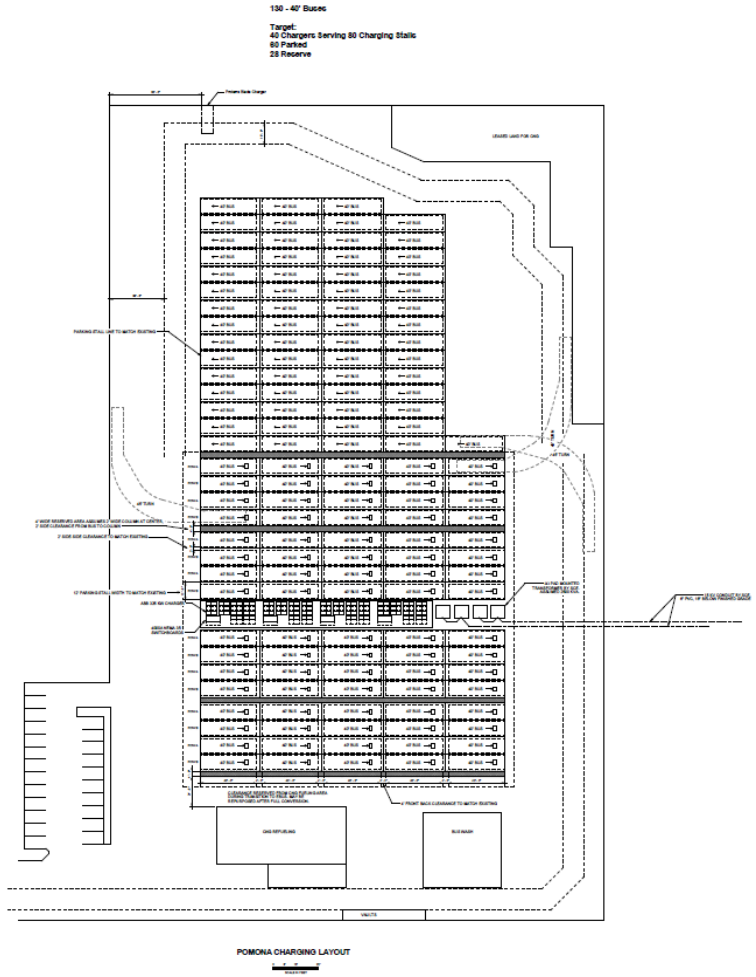
Source: CALSTART

Transit's Approach to Resiliency - AVTA

- Currently relies on backup generators for redundancy
  - Provides up to 1.5 MW of power
- Proceeding with microgrid comprised of solar and storage systems
  - Addresses operating cost, sustainability and reliability
    - Duke Energy will own solar and behind-the-meter storage assets and sell energy to AVTA
    - Depot charging costs could be as low as 4.5 cents/kWh

Transit's Approach to Resiliency – Foothill Transit

- Acknowledges back-up power and power resiliency will be more important in the future
  - Future infrastructure plan includes emergency power infrastructure
- Space for temporary back-up generators has been programmed for the short term
  - Long-term solutions may include mix of FCEBs



Policy Recommendations

- Fund large scale demonstrations
  - Conduct 3rd party analysis, publish best practices
- Increase funding levels for zero-emission buses and charging infrastructure
  - Programs that fund planning should encourage resiliency planning
  - Programs that fund charging infrastructure should be expanded to also fund grid redundant infrastructure – e.g. on-site storage and microgrid development
- Require IOUs to name transit and rail agencies “essential customers”
- Require IOUs to provide transit agencies with earliest possible notice of de-energization events

Contact Us

1415 L St, Suite 1000
Sacramento, CA 95814

(916) 446-4656

info@caltransit.org

caltransit.org

CaliforniaTransit Association

@CalTransit

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