Managed Expectations

An EV Journey

April 24, 2025

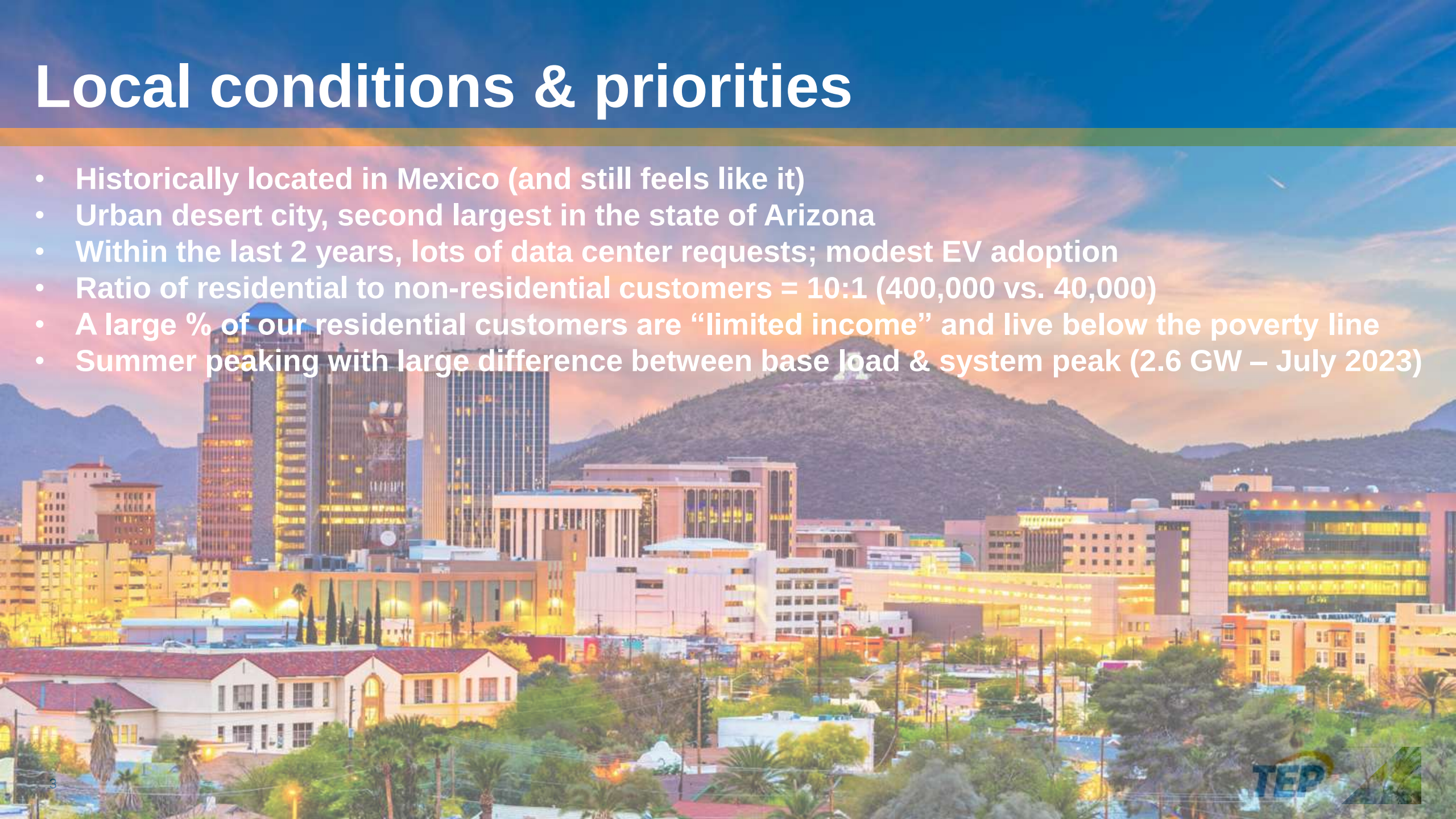
Tucson Electric Power

Section 1

The Best Laid Plans

Local conditions & priorities

- Historically located in Mexico (and still feels like it)
- Urban desert city, second largest in the state of Arizona
- Within the last 2 years, lots of data center requests; modest EV adoption
- Ratio of residential to non-residential customers = 10:1 (400,000 vs. 40,000)
- A large % of our residential customers are “limited income” and live below the poverty line
- Summer peaking with large difference between base load & system peak (2.6 GW – July 2023)



Local & statewide stakeholder engagement

We've been on our EV journey for 6 years…

DERMS Roadmap (2020)

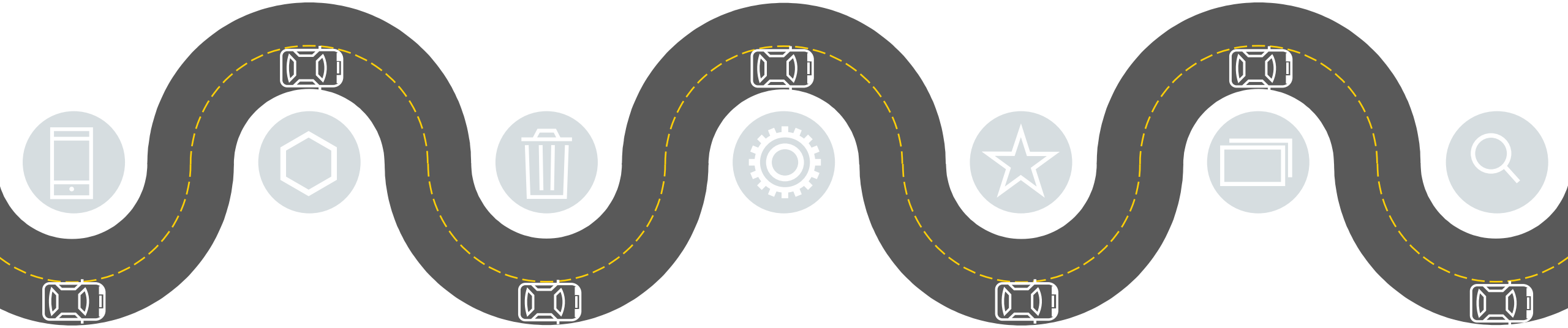
- Crawl, walk, run

Load Mgmt. Pilot (2021)

- RFP for a DER load-management platform (i.e., DERMS)

Residential pilot (2025)

- Bidgely selected for new EV managed charging pilot



Project RAIN (2019)

- EPRI pilot

EV Roadmap (2020)

- 5-year strategic roadmap

EV Portfolio (2023)

- Implementation plan following 2021 statewide TE plan

Ongoing exploration

- Grid-aware managed charging, offline mgmt.

And we hit many roadblocks along the way!

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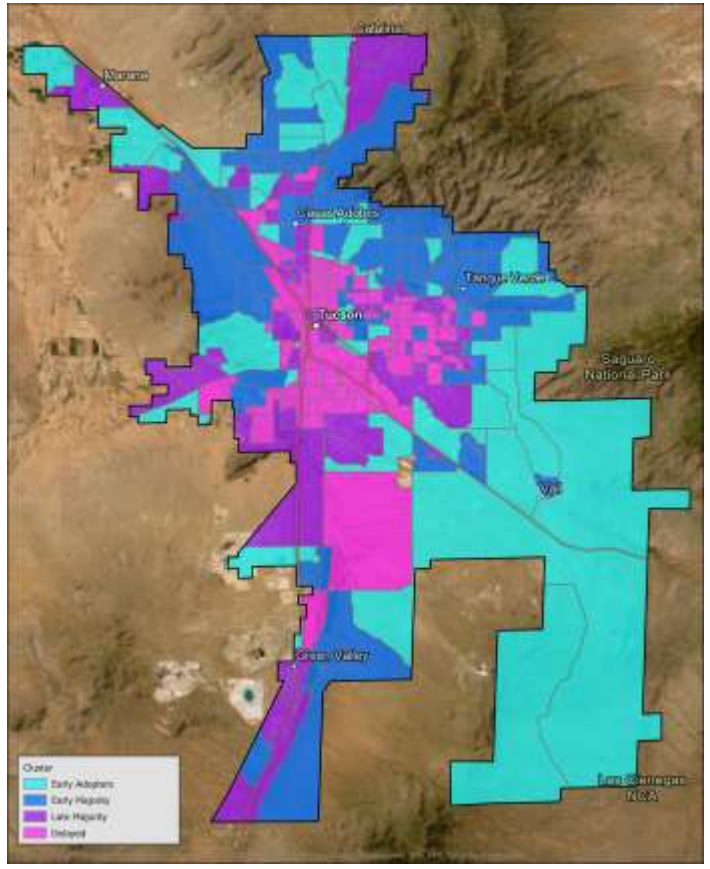
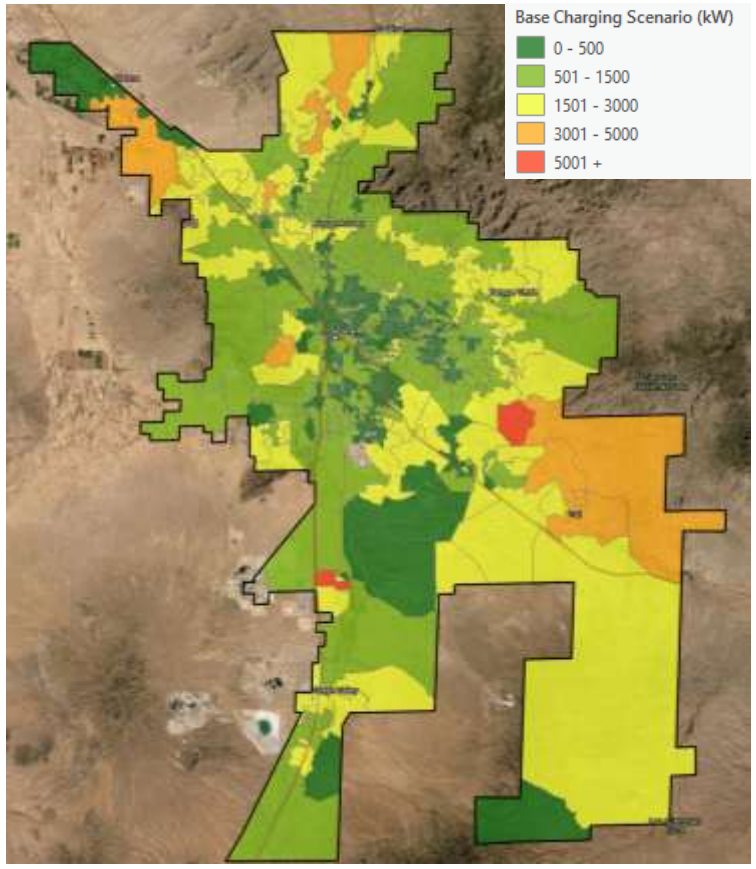
Determining when & where EVs are charging

1. Where is EV adoption likely to occur?
2. When is EV adoption likely to occur?
3. How can we accommodate load from increased EV adoption?

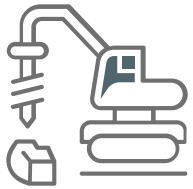




Source: TEP; from 1898 & Co.

Incentives, Programs, and Rates

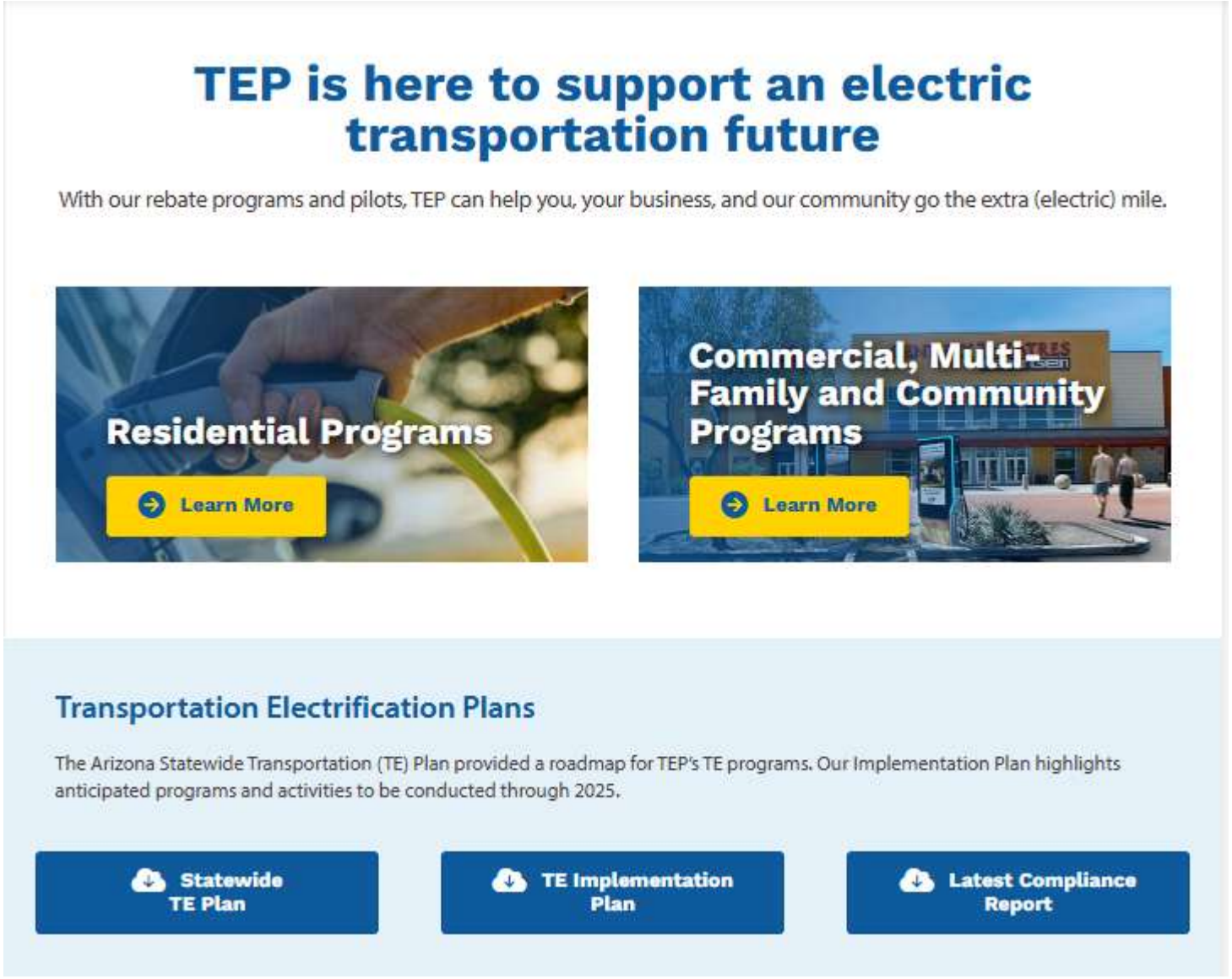
Upgrade Feeder Ratings



Distribution Design Standards

Anticipate Concentrated EV Charging

Our first BE portfolio – 2023 to 2025



Source: https://www.tep.com/electrification/

Moving toward managed EV charging

Identification

"*You can't manage what you aren't measuring*" is true for EE as well as EVs, but we often don't have dedicated circuits or meters.

Operations

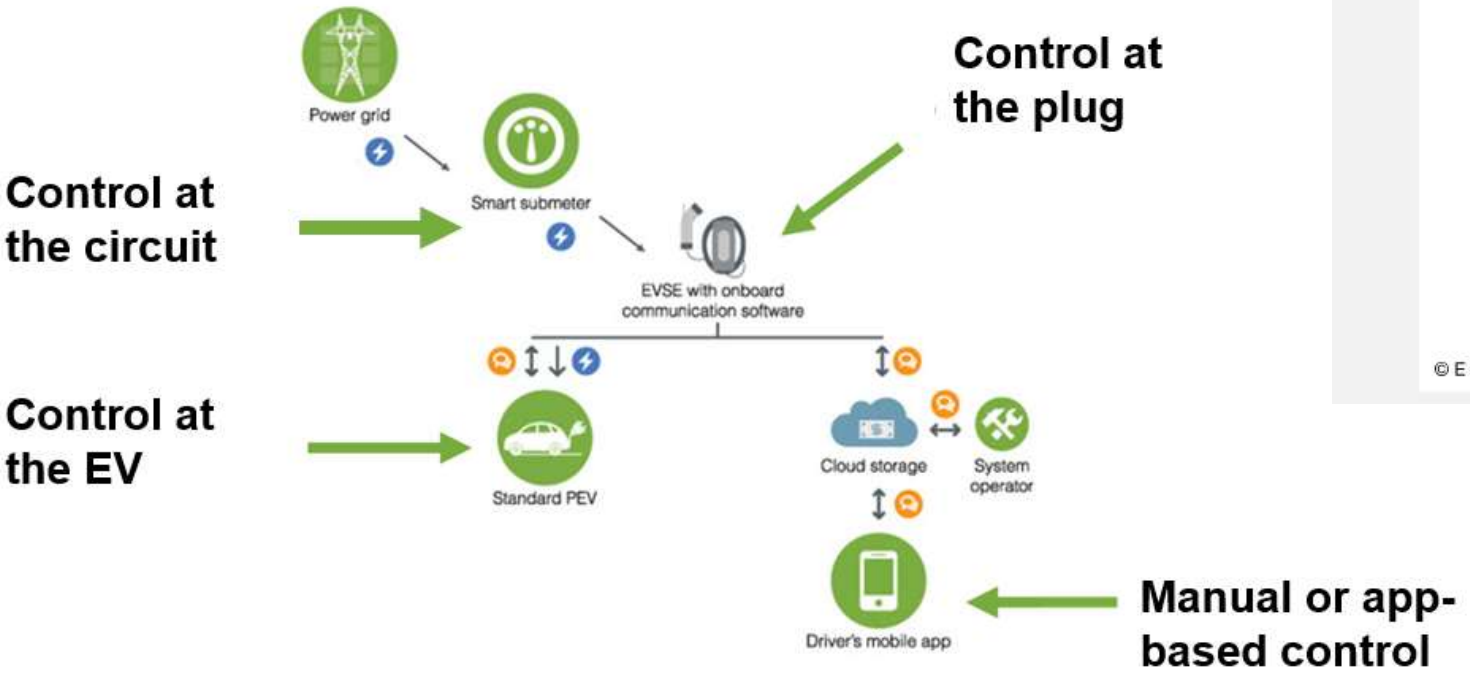
Even where we do know EVs are in operation, we don't necessarily have the means to monitor, control, or influence:

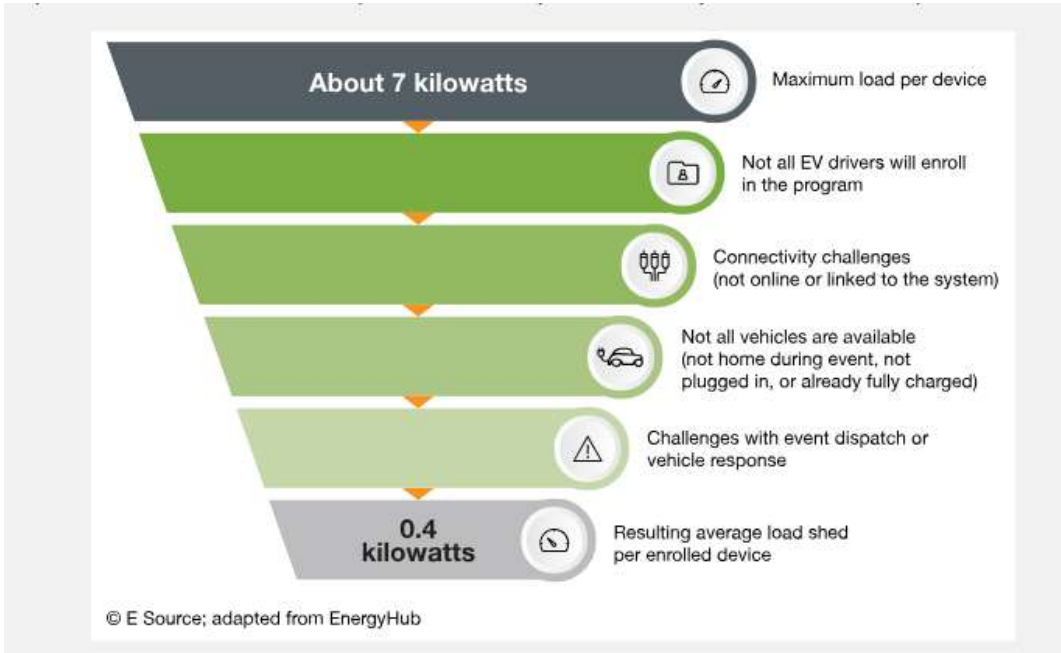
- *Does charging occur coincident peak?*
- *Are the EVs plugged in and available?*
- *Does the customer trust us to manage their EV?*
- *Can we quickly and effectively communicate with the EVs?*

Section 2

Managed EV Charging Strategies

Managed EV charging – theory vs. practice



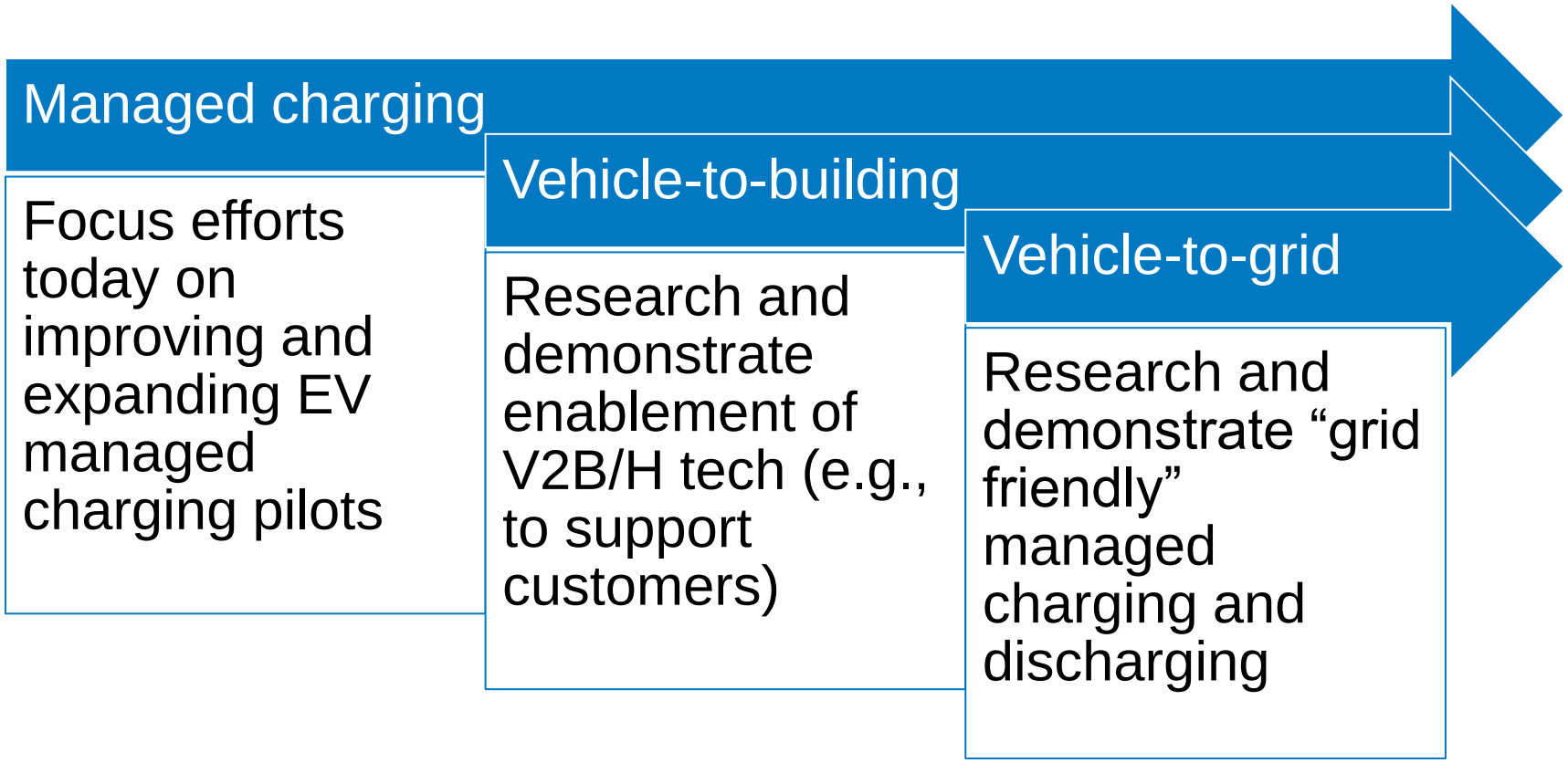


Note: EV = electric vehicle supply equipment; PEV = plug-in electric vehicle. © E Source

Customer verbatim: fear of V2G, love of V2H

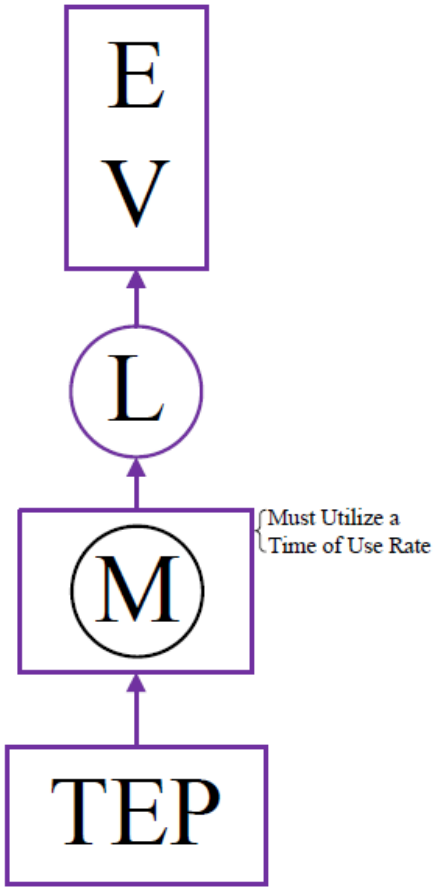
“Don’t let your TEP colleagues steal my electricity!”

A reasonable path forward?



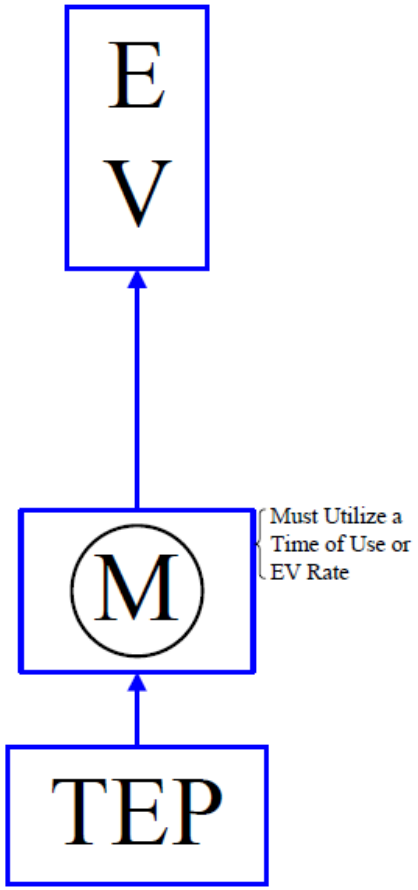
Smart EV Charging – requiring TOU rate enrollment

Scenario 1
Customer Adding EV to Existing Load



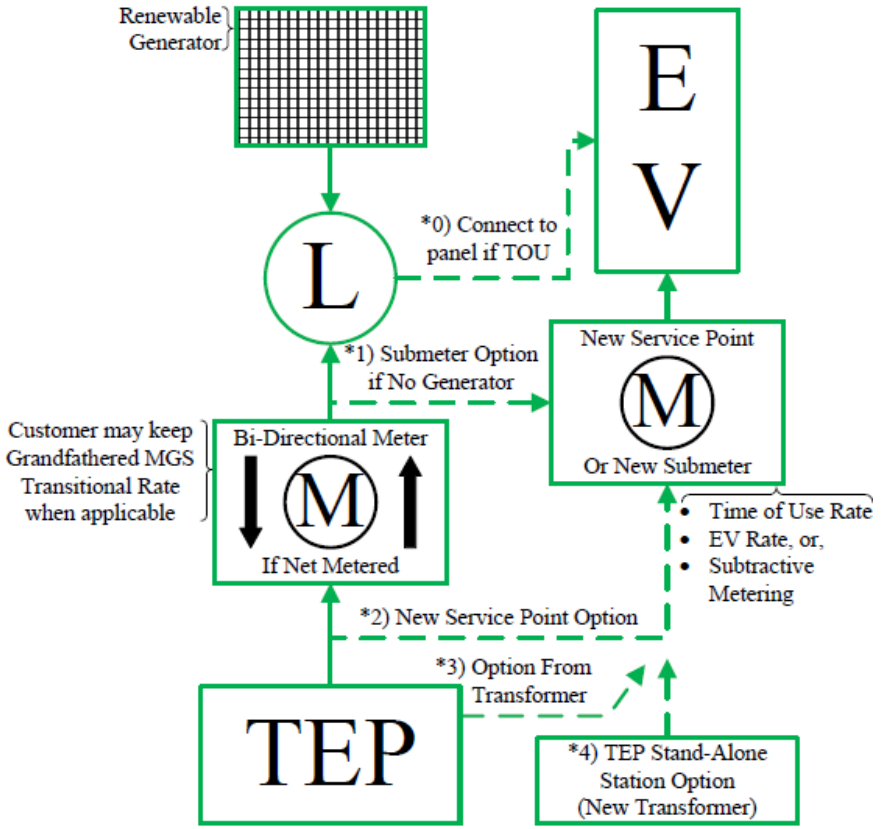
- If electric system has capacity for EV, may only require D/B review
- Free transformer upgrade with incremental load

Scenario 2
New Stand Alone EV Station



- Requires D/B involvement
- Possible Small & Unusual Load
- 500 ft. free (SGS & MGS)
- 2-yr revenue waiver if LGS

Scenario 3
Other Options for Existing Customers



- Requires D/B involvement
- If Net Metered and TEP upgrades are required due to the addition of solar generation, customer must submit a new interconnection application and the Grandfathered MGS Transitional Rate no longer applies.
- If Net Metered and TEP equipment upgrades are required only due to added electrical load, a new interconnection application is NOT required and customer may keep Grandfathered MGS Transitional Rate.

How we want to incentivize EV charging

- ✓ **Take advantage of daytime solar production; avoid RE curtailment**
- ✓ **Mitigate ‘artificial’ peaks created in response to TOU rates**
- ✓ **Shift/shed/shimmy EV loads in concert with other DERs**
- ✓ **Don’t ‘cost shift’ between customer or rate classes**

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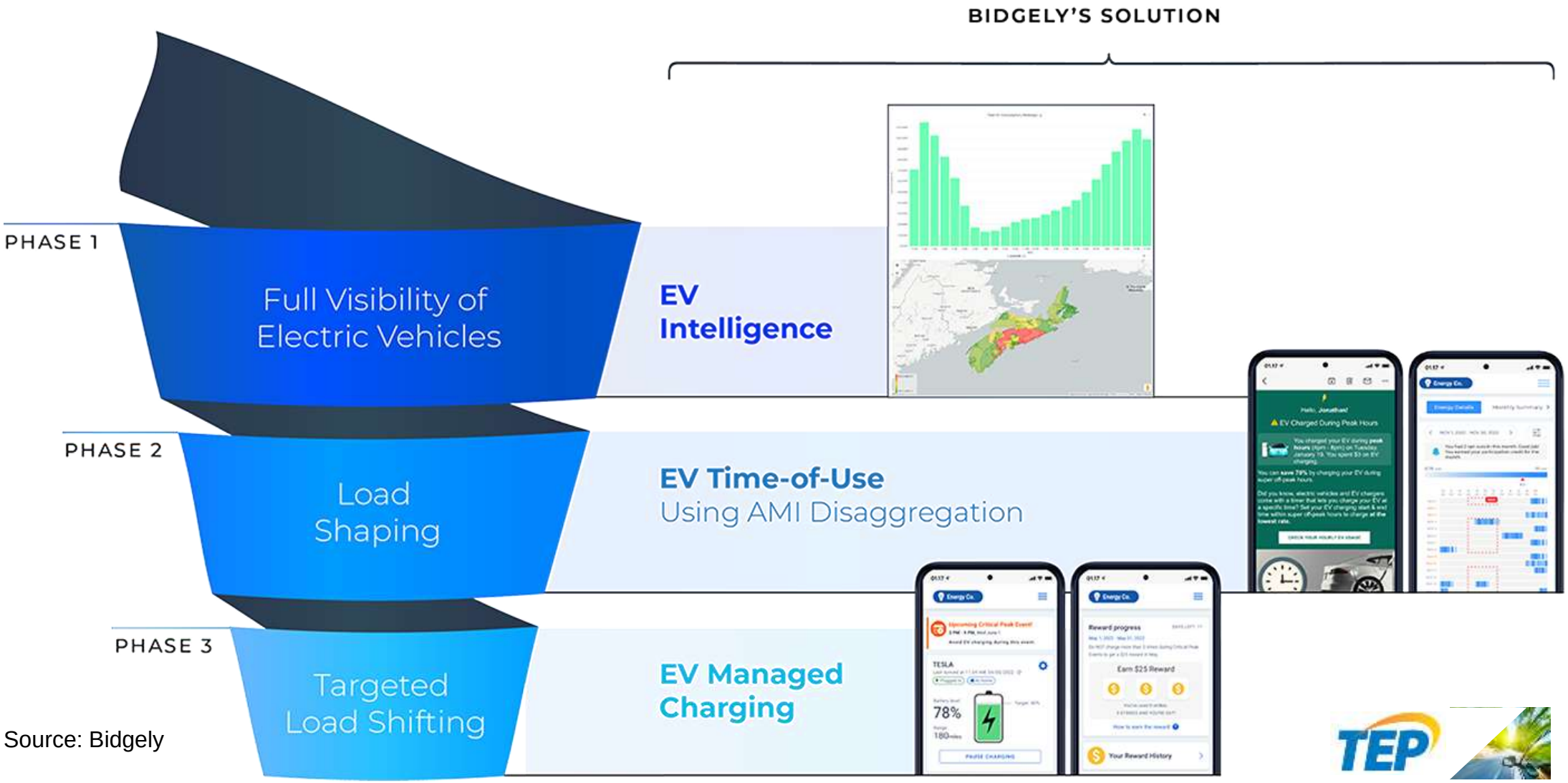
Section 3

Parallel Pilot Projects

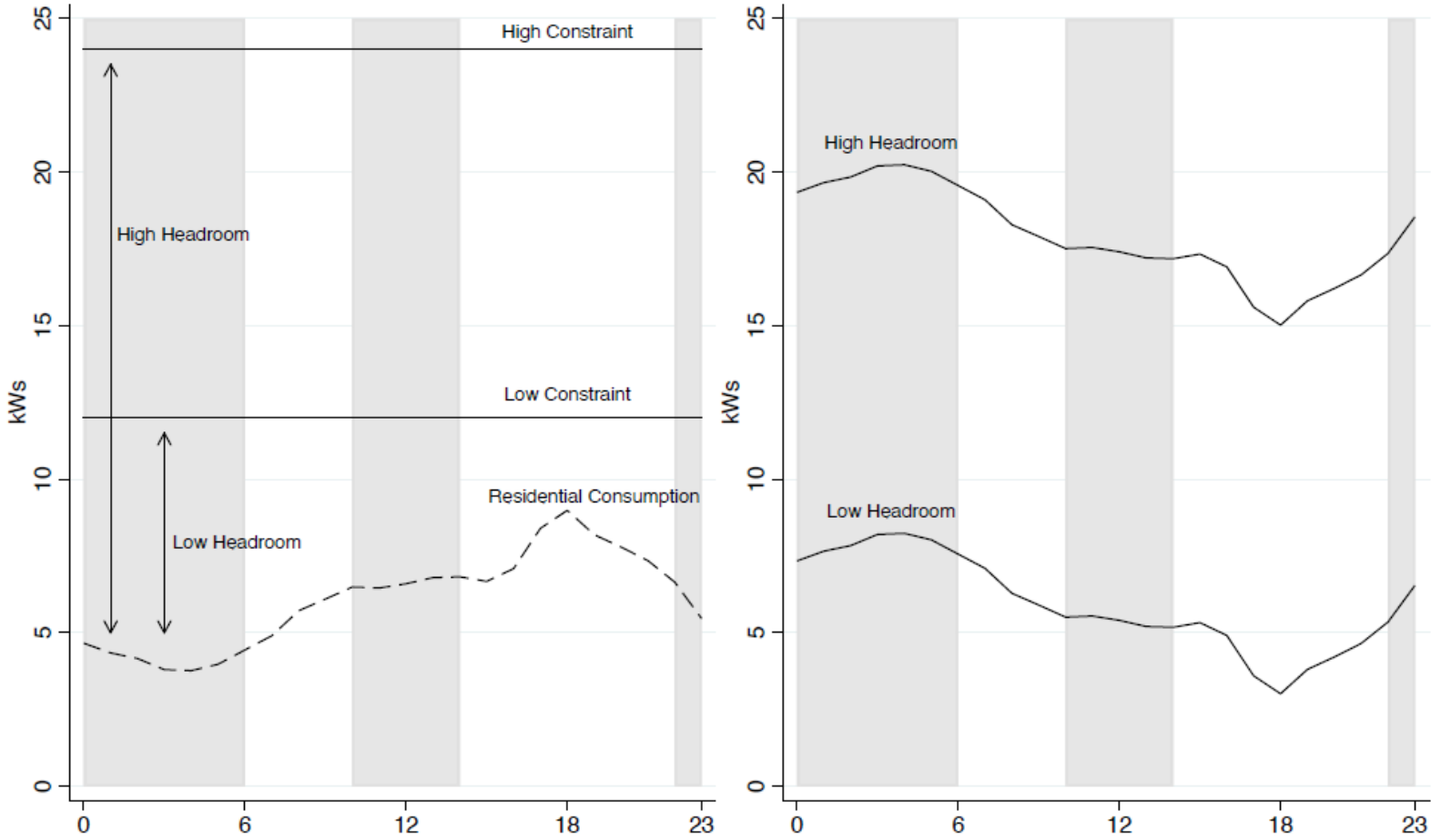
Enhancing our HEM/HER program – Bidgely



Source: Bidgely

How ‘grid aware’ do we need to be?

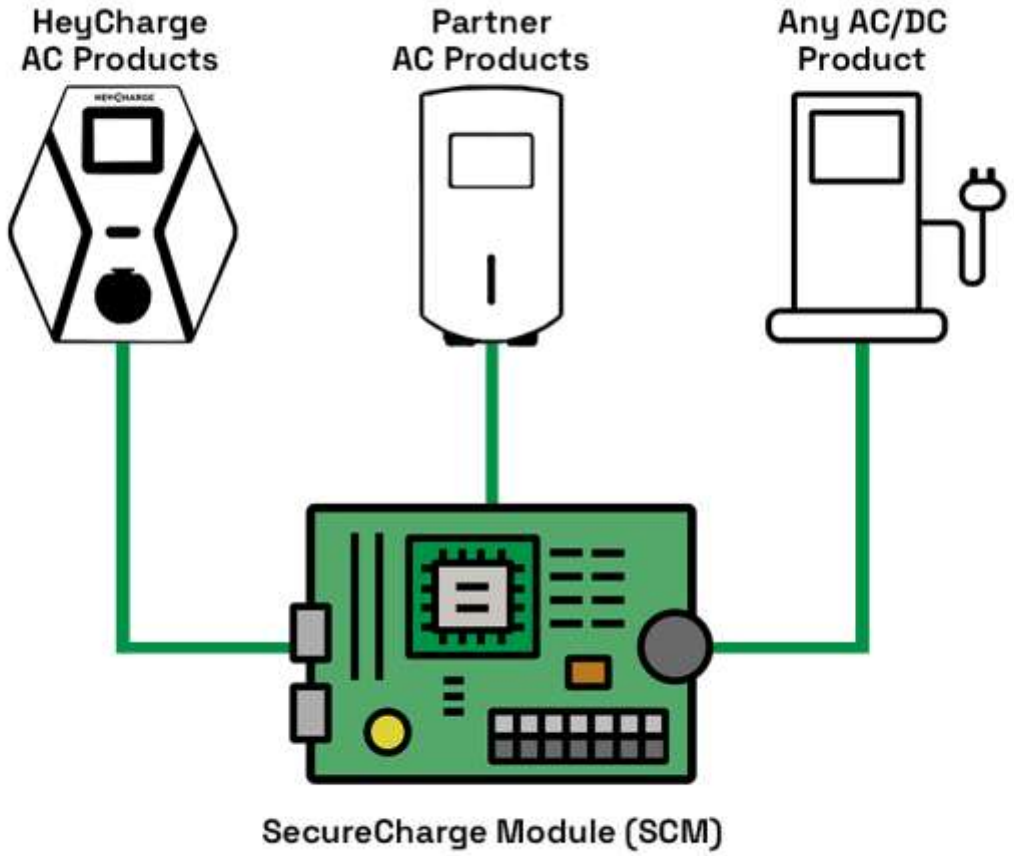
Figure 1. Illustration of Virtual Transformer Capacity



- Still unsure if existing vendors can truly really deliver on grid awareness
- Also, not sure yet how much this is worth to us
- Arizona utilities oversize service transformers to account for summer peaks
- May be worthwhile as we move into Markets+

Source: University of Calgary

“So, what happens when we lose connectivity?”



Source: https://www.heycharge.com/

Thank you!

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