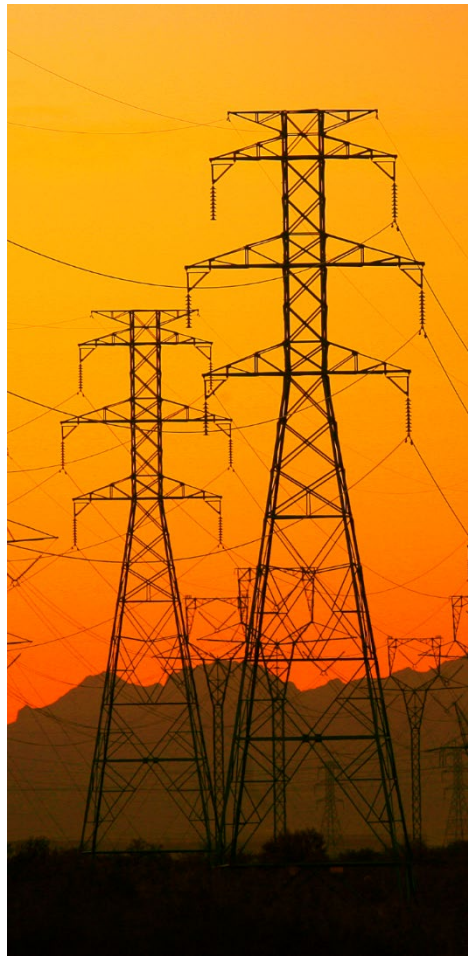
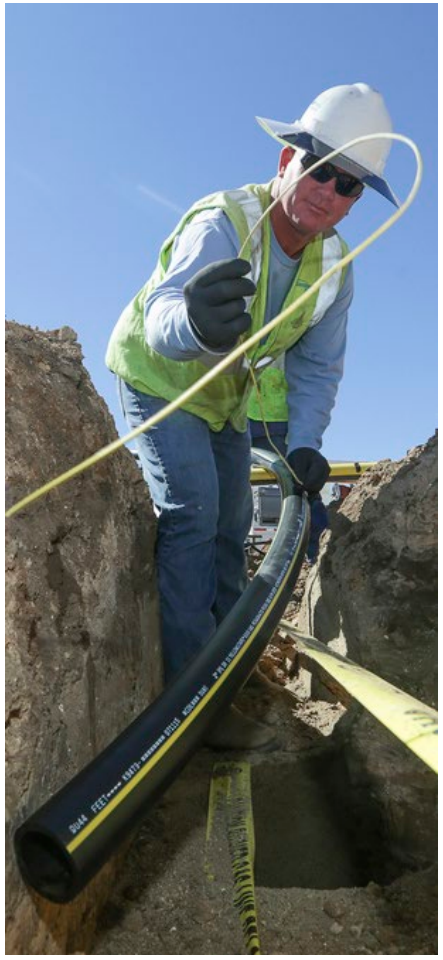

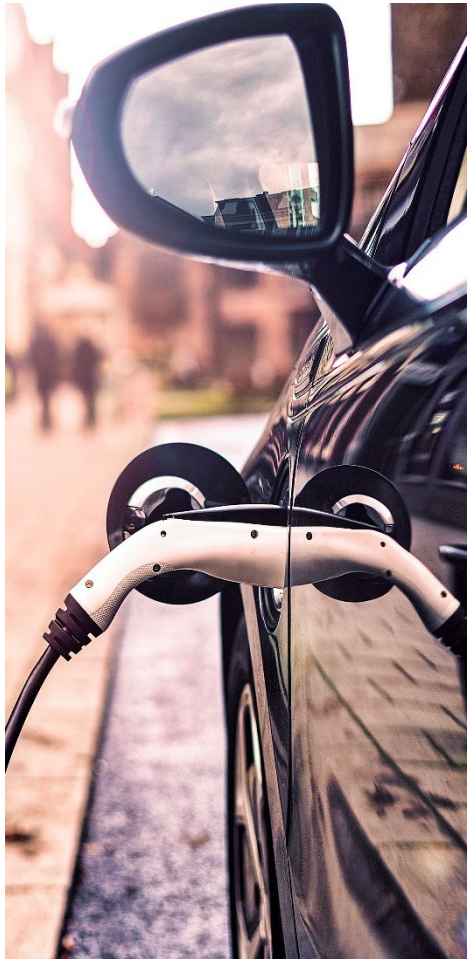

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UniSource Energy SERVICES

Resource Planning Advisory Council Meeting

April 28, 2023

Welcome, Logistics & Introductions

Logistics & Introductions

Presenters will pause occasionally for clarifying questions.

Save in-depth comments and questions for the Q&A sessions.

During periodic pauses for clarifying questions:

- If joining remotely, raise your “hand” to provide comments or ask questions.
- Identify yourself and your organization.
- Please speak clearly.

The chat box will **only** be monitored for reports on **technical difficulties**.

Agenda

- Updates
  - NDAs/Licensing
  - Upcoming Workshops
- Electric Vehicles
- Q&A
- Break
- Next Steps & Topics for Next Meeting

Electric Vehicles

TEP/UNSE RPAC

Tucson Electric Power

TEP/UNSE RPAC

Tucson Electric Power

Camila Martins -Bekat

Principal Beneficial Electrification

Tucson Electric Power (TEP)

Joshua Loyd

Senior Consultant, 1898 $ Co.

TEP
Tucson Electric Power

Background

Phase 1 Statewide TE Plan Submitted Dec. 2019	Developed in conjunction with APS and stakeholder input	Provided conceptual framework for the STEP	
Phase 2 Statewide TE Plan Approved Dec. 2021	Goal of 95,000 LD Vehicles in TEP service territory by 2030.	1 million LD Vehicles in the state by 2030.	Provided a roadmap for TE in AZ. Outlined TE opportunities, air quality and economic development opportunities
TE Implementation Plan (TEIP) Approved Nov. 2022	Operationalize strategies and opportunities outlined in Phase 2	Plan based on TE collaborative that meets quarterly	Includes programs and associated budgets to address key barriers to electric vehicle adoption. Activation of 2,000 charging ports.

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Key Components

DIVERSE CUSTOMER OFFERINGS

TECHNICAL ASSISTANCE

OUTREACH AND EDUCATION

PLANNING

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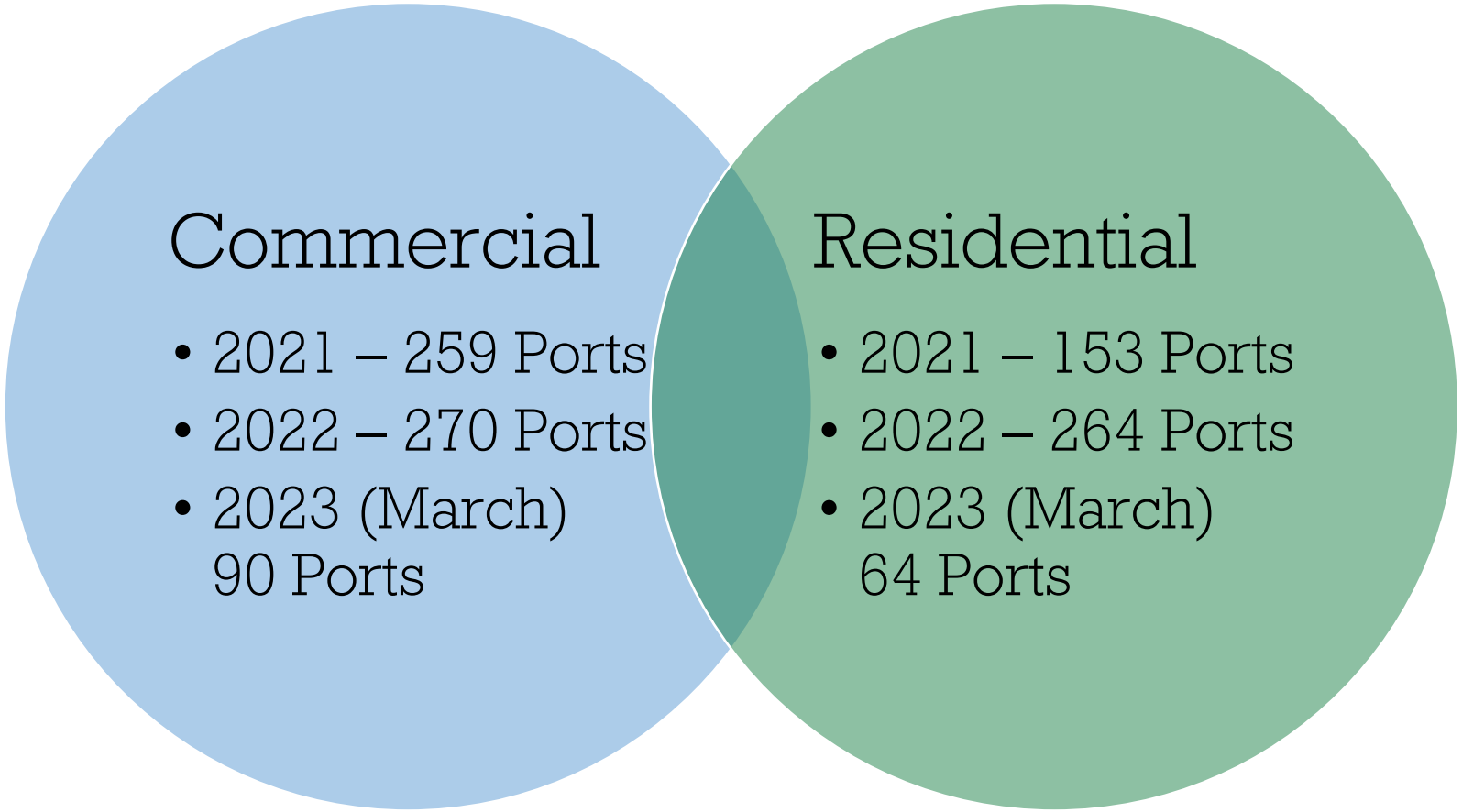
Program Participation



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Plan Highlights

Residential

Implementation years 1-3	
Rebates up to $500	Low-to-moderate income customers (LMI) • Rebates up to $800 • Allowance for panel upgrade - $300 Residential Managed Charging Program

School Bus

Implementation years 2-3

Incremental cost of e-bus purchase incentive – up to $250K for title 1 schools

Charging infrastructure incentive

- Title 1 Schools ($40K - $75K per port)
- Standard Use Case ($35K - $70K per port)

Fleet Phasing Plans

Grid integration study

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Plan Highlights

Retail, workplace, fleets

Implementation years 1-3

Standard Use Case
- $4,000/L2 port and $20,500/DCFC port up to 75% of project costs

Low-to-Moderate Income Customers and Non-profits
- $6,000/L2 port and $40,000/ DCFC port up to 75% of project costs

Internal Fleet TCO

30% of budget set aside for LMI customers

Fleet Advisory Services
- Web-based TCO
- Fleet Phasing Plans

Multi-family

Implementation years 1-3

Standard use case
- $5,400/port up to 85% of project costs

LMI use case
- $9,000/port up to 85% project costs

New Construction
- Pre-wire upgrade incentive
  - $200 per EV parking space pre-wire incentive (only for jurisdictions without a code requirement)

Existing Complexes (LMI only)
- 100% coverage of project costs OR
- TEP ownership of chargers

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Non-Profit Shared Mobility

- Eligible partners: non-profits that provide mobility services to senior and workforce development participants (up to 3)
- Provide vehicle purchase or incremental cost of EV
- EV charging incentive
- It's the right thing to do.
- Incremental cost to purchase EV and Infrastructure

E-Bikes

Connect low-income and disadvantaged populations with clean energy transportation options
Electric bikes can be a viable alternative to vehicles
Reduce air pollutants compared to gas-powered cars
Increase accessibility of TE to all customer segments

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Utility Pole Chargers - Pilot

- Elevated (10 ft) EV chargers attached to wooden and metal utility poles
- Charger has a 25 ft. Cable which drops down once activated on app
- Level 2 charger (9.2kW)
- Pole mounted configuration reduces installation costs.

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Partnering for Progress

Transit Electrification

Sun Tran

Local Government Fleet Electrification

Pima County

City of Tucson

National Forest Service

Sabino Canyon Tram

Infrastructure Deployment

Public Charging

EV Adoption and Grid Impact Analysis

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Two Phases to the Project

Phase 1: EV Adoption Model

- Develop an EV adoption model to forecast electric vehicle adoption speed (years) and intensity (kW)
- Calculate EV adoption speed and intensity on a per circuit basis
- Provide dashboard to view study results

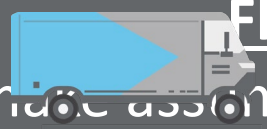
Phase 2: Grid Impact Analysis

- Utilize output from EV Adoption Model to analyze EV adoption on 10 circuits
- Perform power flow analysis using distribution planning models
- Complete a System Improvement Analysis on the 10 selected circuits

Different EV Adoption Forecasts

Residential Model: Census Tract analysis of population combined with different forecast scenarios

Public Model: Based on public EV charging today and forecasted out over time to find potential EV locations



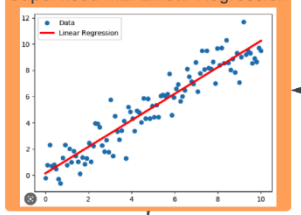
Fleet Model: Identify key companies that could electrify fleet and make assumptions around EV adoption

Example Model: Residential EV Adoption

Data Sources

Demographics	Psycographics	Vehicle Registration	Client Topology
Population Housing Income Education	Consumer behavior Consumer Sentiment	Light, Medium and Heavy vehicle registration	Distribution transformers Circuit Loading Data Customer Counts

Supervised ML: Linear Regression



Features driving EV adoption rate

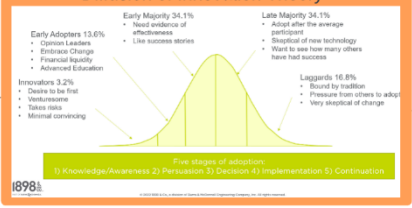
Thieseen polygons

Alignment of EV adoption forecast to circuit boundaries

Unsupervised ML: Clustering

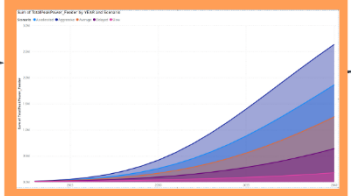
Early adopters	Early majority	Late majority	Laggards
Cluster 1	Cluster 2	Cluster 3	Cluster 4

Diffusion of Innovation Theory



Benchmark Forecvast vs EV expected sales

Forecast scenarios



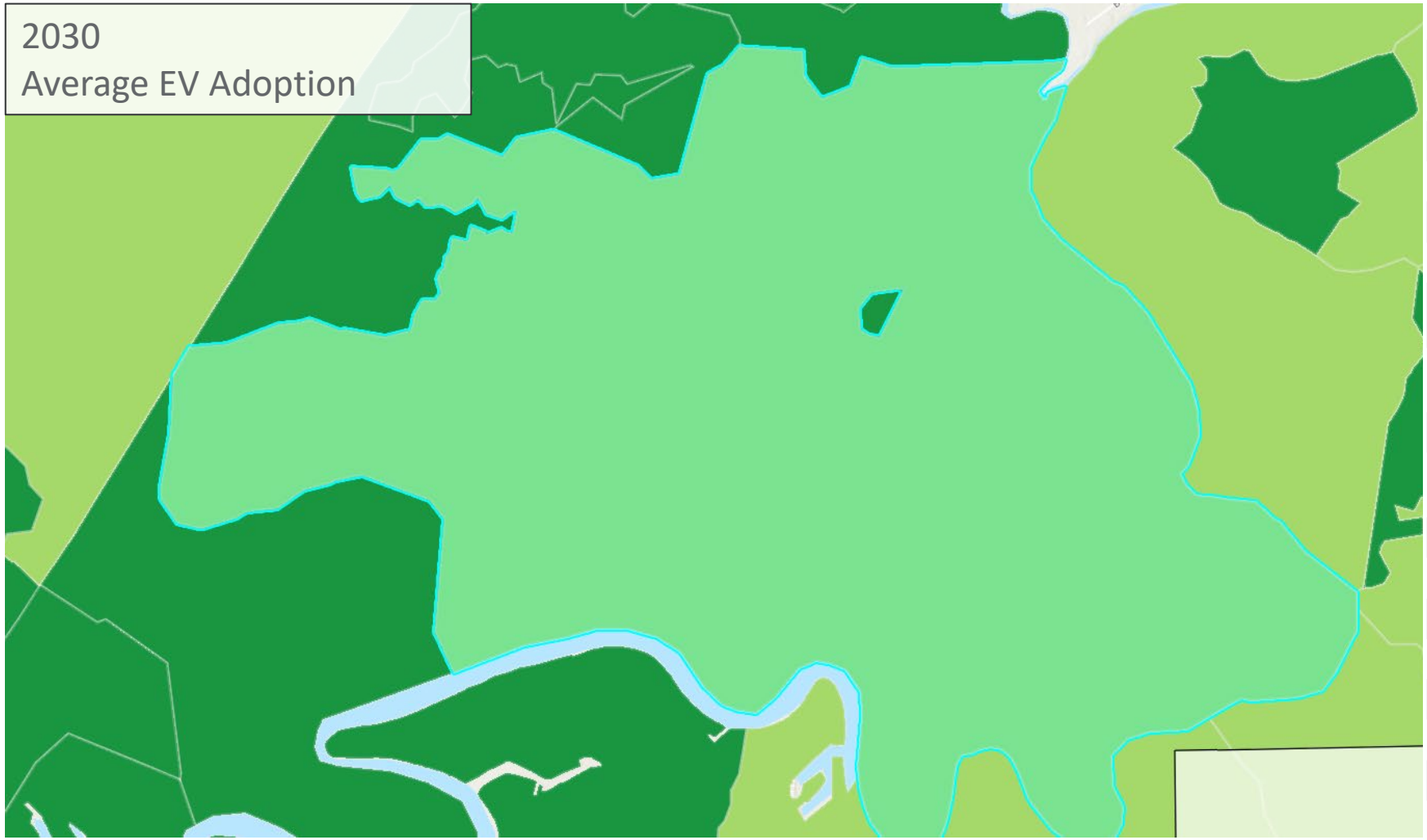
Results

GIS Analysis

Data Output

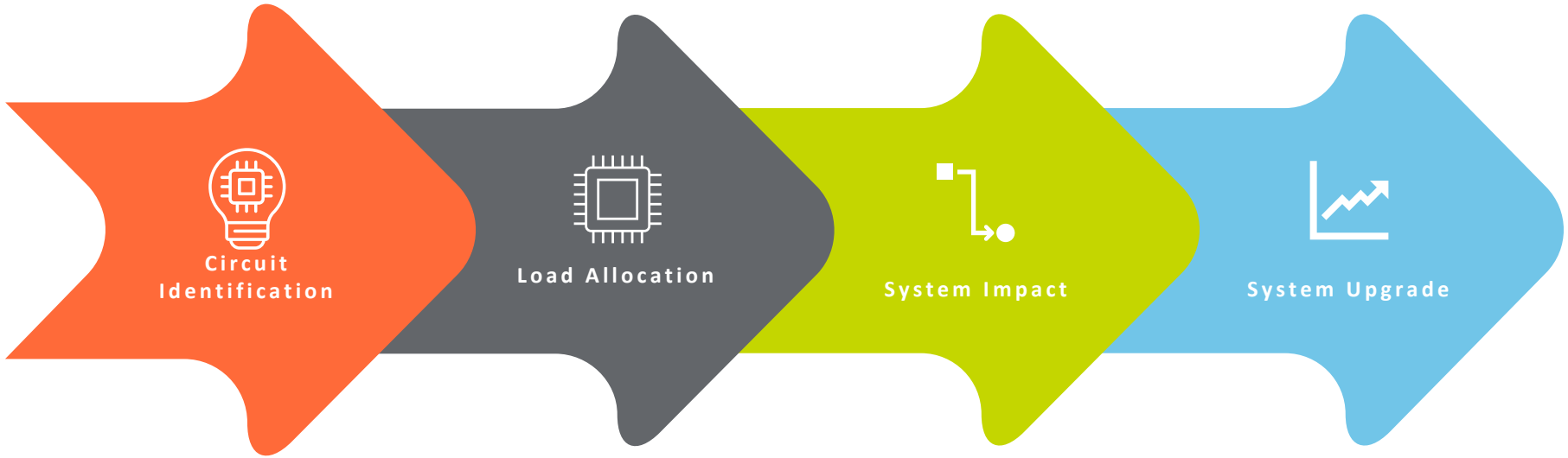
Feeder	Adoption	Total Vehicles	Percent EV	Percent Capacity
3975	2022	1	0	44.96
3975	2023	0	0	44.91
3975	2024	2	0	45.08
3975	2025	7	0	45.49
3975	2026	15	0	46.17
3975	2027	26	0	47
3975	2028	48	0	48.84
3975	2029	77	0	51.16
3975	2030	119	0	54.61
3975	2031	176	0	59.14
3975	2032	245	0	64.79
3975	2033	328	0	71.39
3975	2034	426	0	79.36
3975	2035	532	0	87.94
3975	2036	645	0	97.11
3975	2037	764	0	106.69
3975	2038	883	0	116.26
3975	2039	1001	0	125.77
3975	2040	1115	0	135

Phase 1:Example output for Residential EV Forecast

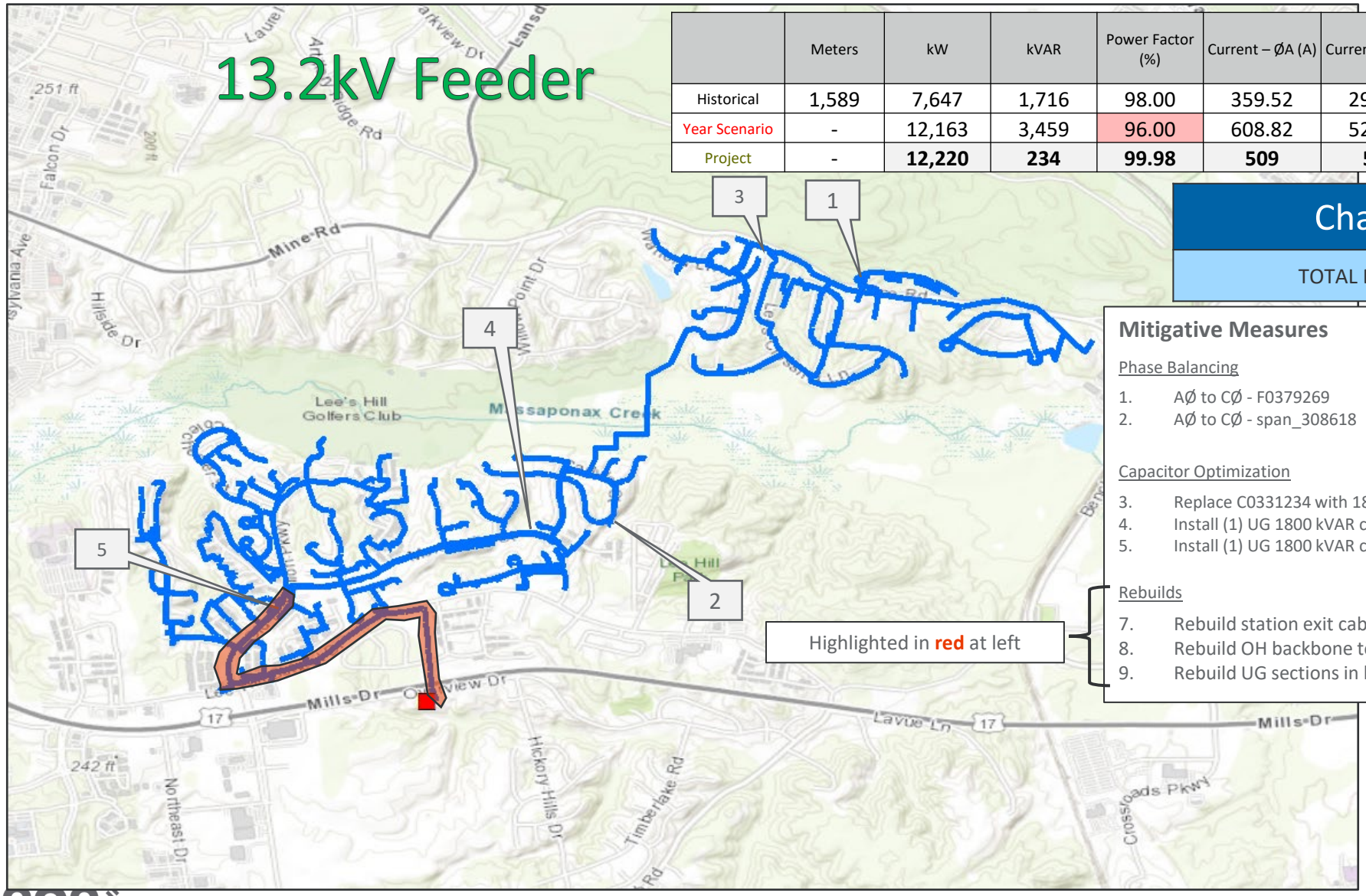


Adoption Group	1 - Early Adopters
Adoption Scenario	Average
Adoption Year	2030
Circuit Voltage (kV)	12.5
Estimated Circuit Limit (kVA)	8294.4
Existing Circuit Load (kVA)	4912.5
Summer or Winter Peak	
Total Sm. Trucks and SUVs, Minivans	470
Forecasted Sm. Trucks and SUVs, Minivans	26
Total Full Size Trucks, SUVs	642
Forecasted Full Size Trucks, SUVs	37
Total Passenger Cars	442
Forecasted Passenger Cars	24
Peak EV Charging Load (kW)	988.8
Base Charging Scenario (kW)	204.4
Passive Charging Scenario (kW)	185.3
Active Charging Scenario (kW)	147.1
Feeder Capacity Utilized %	71.2
Adoption Year (As Date)	2029

Phase 2: Model top 10 circuits for impacts



System upgrades to mitigate EV load



	Meters	kW	kVAR	Power Factor (%)	Current – ØA (A)	Current – ØB (A)	Current – ØC (A)	Min. Element Voltage (V)	Max Element Voltage (V)	Max Element Loading (%)
Historical	1,589	7,647	1,716	98.00	359.52	293.56	339.23	119.49	124.52	154.00
Year Scenario	-	12,163	3,459	96.00	608.82	522.21	467.26	114.99	125.06	381.21
Project	-	**12,220**	**234**	**99.98**	**509**	**501**	**527**	**118.5**	**125.44**	**97%**

Charging Load - 2030 "High"	
TOTAL EV CHARGER LOAD (kW)	**4,493**

Mitigative Measures

Phase Balancing

1. AØ to CØ - F0379269
2. AØ to CØ - span_308618

Capacitor Optimization

3. Replace C0331234 with 1800 kVAR bank
4. Install (1) UG 1800 kVAR capacitor bank
5. Install (1) UG 1800 kVAR capacitor bank

Rebuilds

7. Rebuild station exit cables to parallel 1000MCM
8. Rebuild OH backbone to UG transition to 795 ACSR
9. Rebuild UG sections in backbone to 1000MCM (**loaded at 95%**)

Highlighted in **red** at left

ROM Cost Estimate
(using latest CWP unit costs)

$709,084


1898 CO SM
PART OF BURNS McDONNELL

Q&A

???

Conclusion and Topics for Next Meeting

- NDAs
- Aurora Training
- Models, Portfolios, Sensitivities
- IRP Timeline