DRAWDOWN GA

Electric Vehicles

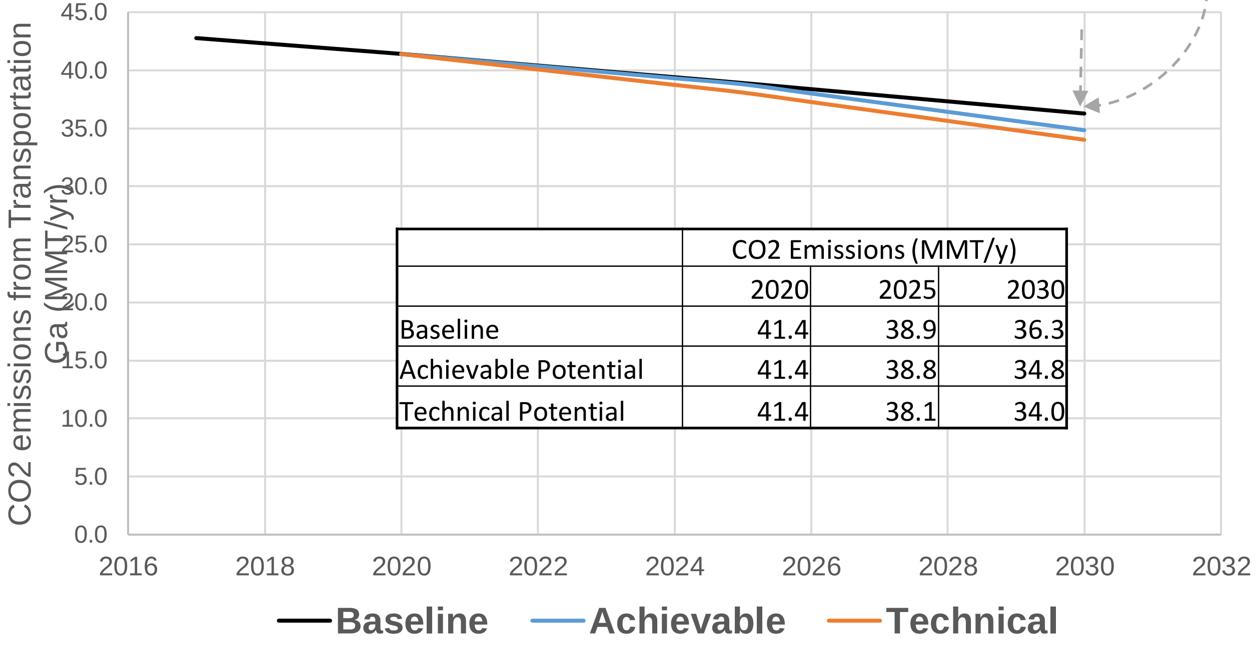
Electric vehicles (EVs) are powered by electric batteries instead of conventional fuels such as gasoline and diesel. The emissions profile of these vehicles is lower, however the exact emissions vary depending on the generation mix providing the electricity.

In this Drawdown GA solution, we assess the CO2 reduction potential of EVs in the light duty vehicle category. However, electrification is an option that can provide CO2 benefits in additional vehicle segments including MD/HD truck, public transit, and aviation groundworks.

Georgia Tech | University of Georgia | Emory University | the Ray C. Anderson foundation

Electric Vehicles

EVs can contribute additional CO2 reductions beyond a favorable baseline trend by 2030



	CO2 Emissions (MMT/y)		
	2020	2025	2030
Baseline	41.4	38.9	36.3
Achievable Potential	41.4	38.8	34.8
Technical Potential	41.4	38.1	34.0

Baseline = Assumes business as usual for fuel economy and CO2 reductions, driven by new vehicle technologies and Federal CAFE regs

Achievable Potential =Approximately **310,000 EVs in** Georgia's Light Duty Vehicle Fleet (i.e., about 4% of the total fleet), and accounting for 15% of new LDV sales in 2030

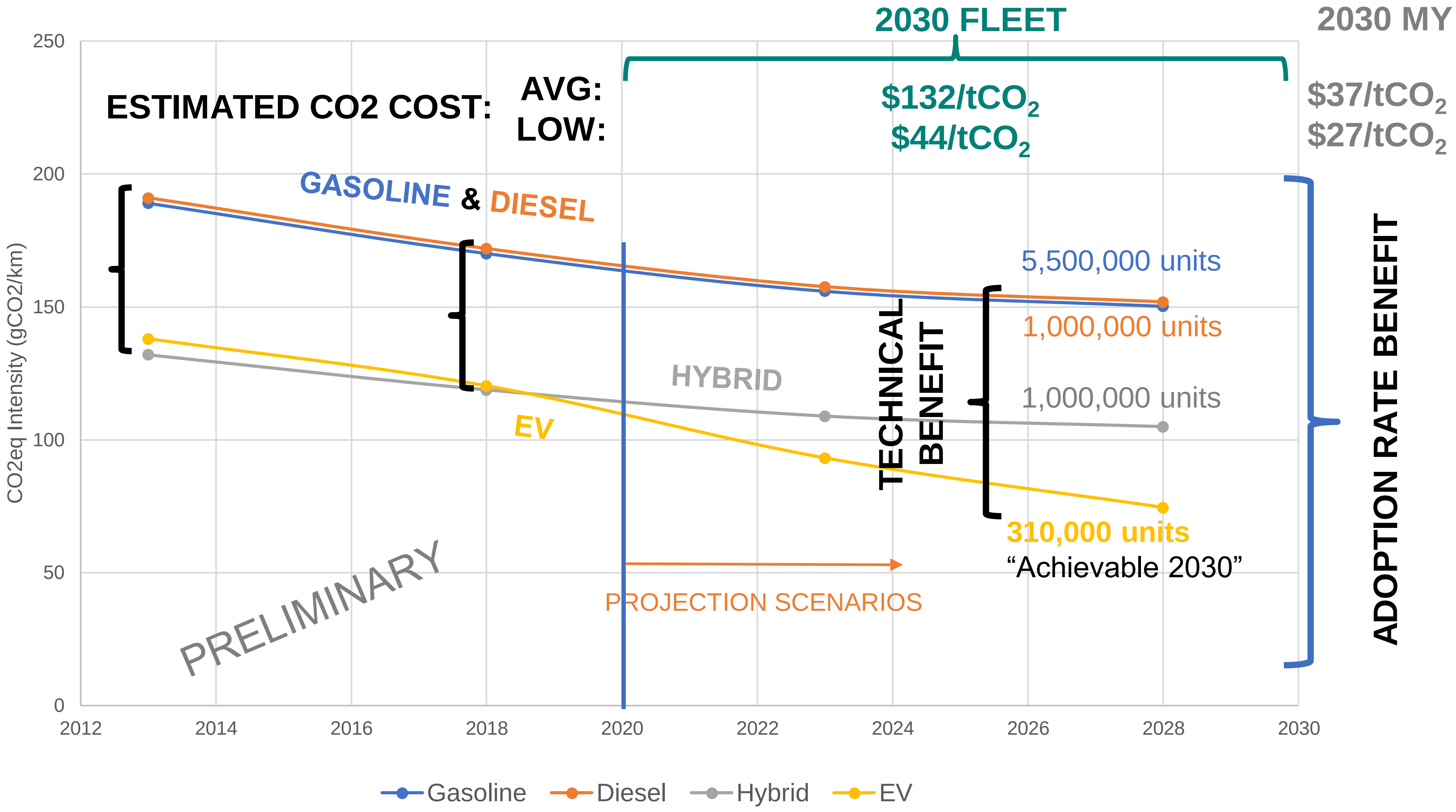
Technical Potential = Approximately **680,000 EVs** in the Georgia LDV fleet (9% of the total fleet), and 35% of new LDV sales by 2030. Contributing **2.3MtCO_2/yr** reductions compared to baseline.

1 MtCO_2e solution in 2030 = an additional 250,000 gasoline cars are replaced with electric vehicles.

+Improved Air Quality
+Approaching TCO price parity
+Lower operating & maintenance costs

-Affordability on capital cost basis

Despite an aggressive baseline, grid CO_2 intensity reductions propel per vehicle EV contributions



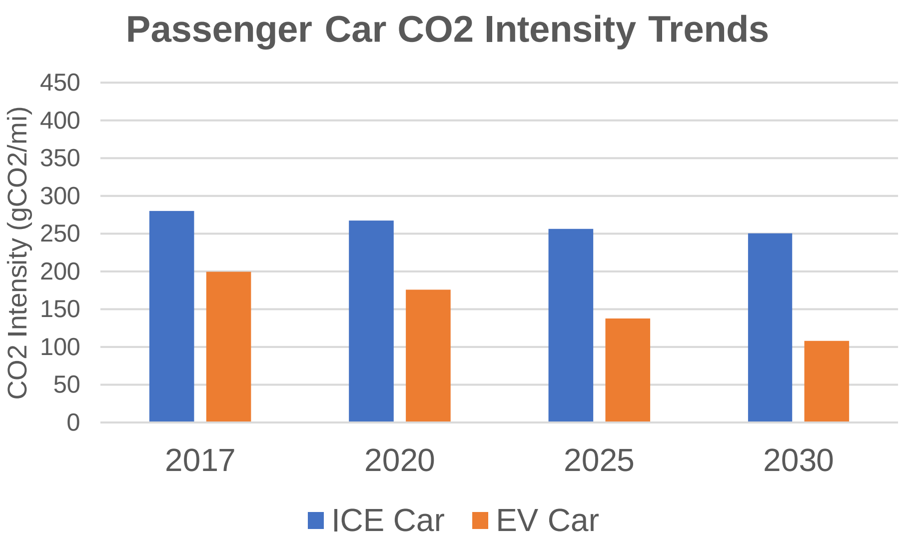
Conventional vehicles improve at 1.5% y/y through 2025

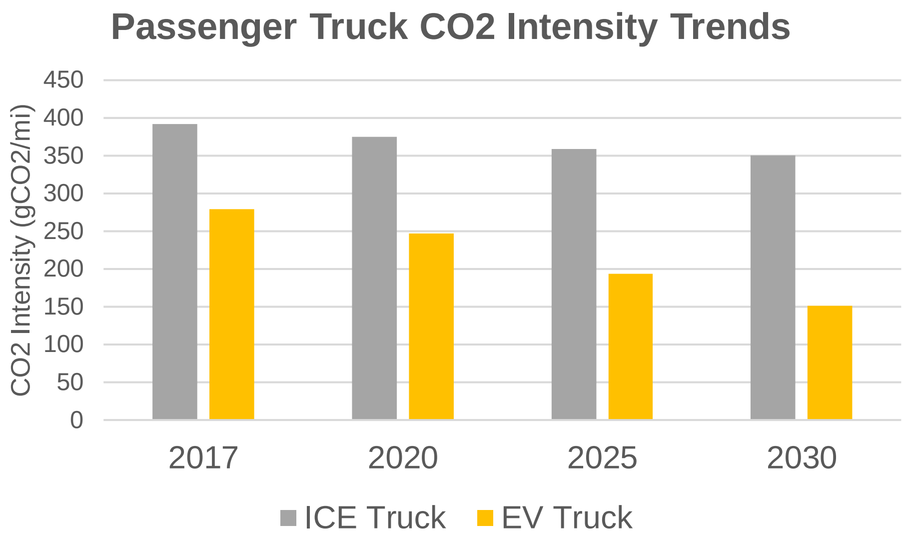
EVs approach a relative CO2 intensity of 50% compared to conventional cars

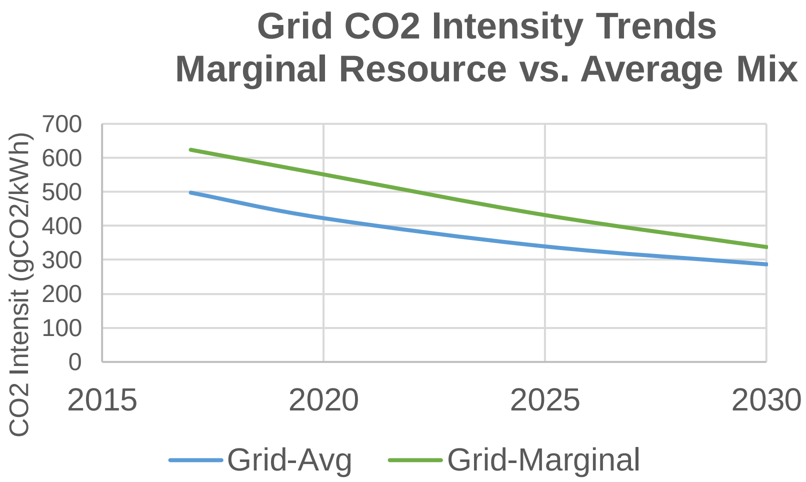
But, adoption rate will dictate overall impact from this solution

R. Simmons, Strategic Energy Institute, Georgia Institute of Technology, 2020

Summary of CO2 trends for EVs and the Grid, 2017-2030







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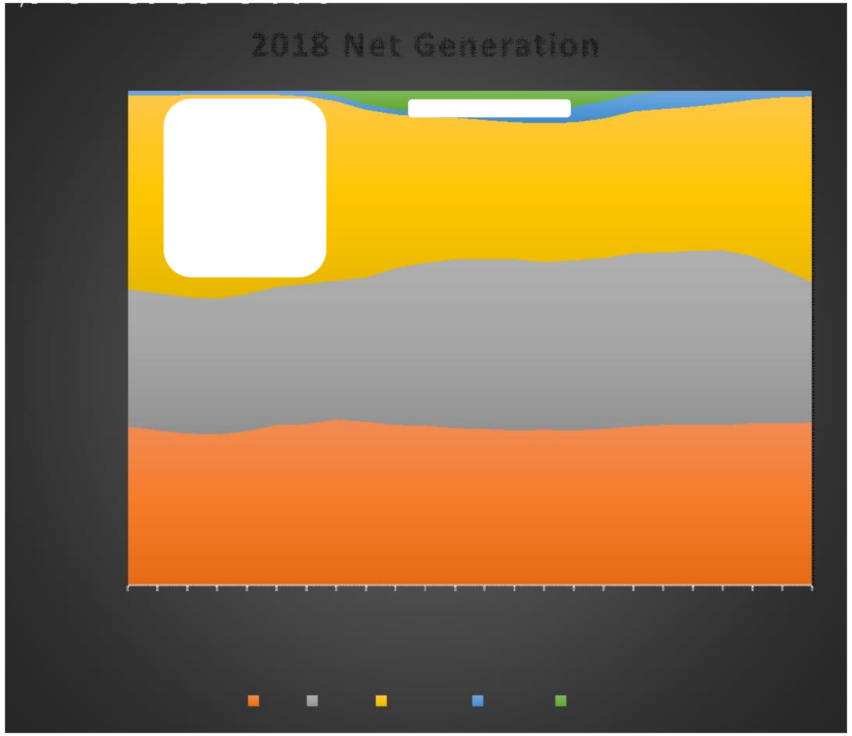
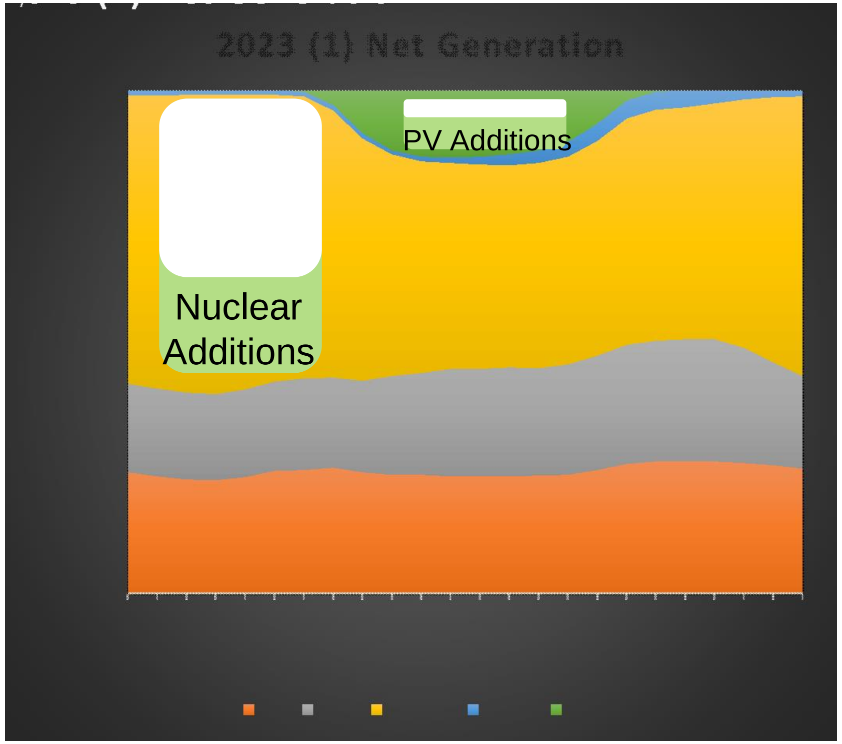
R. Simmons, Strategic Energy Institute, Georgia Institute of Technology, 2020

A closer look at interactions between EVs and the future Ga Grid

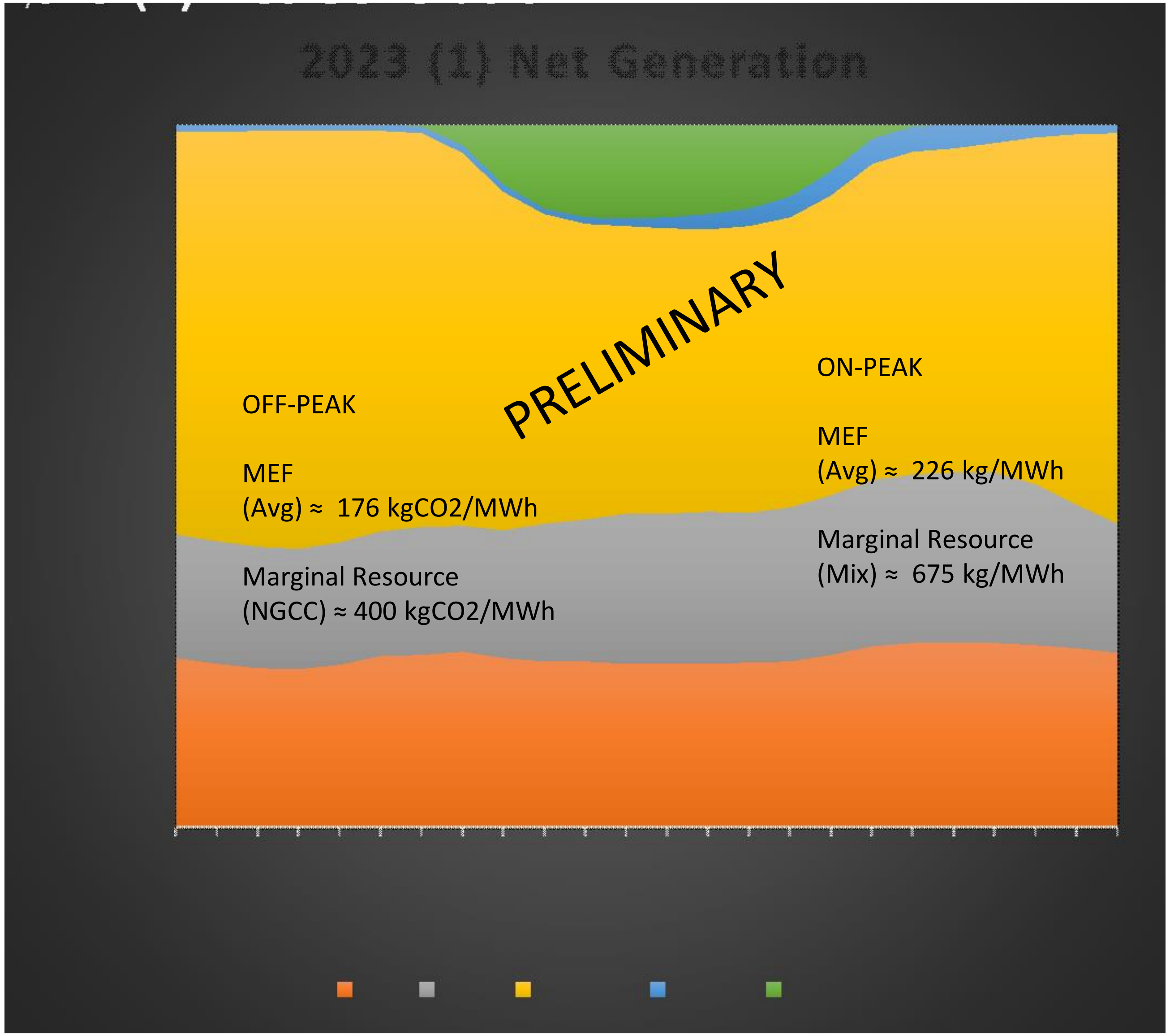




For EV charging, 2018 vs. 2023

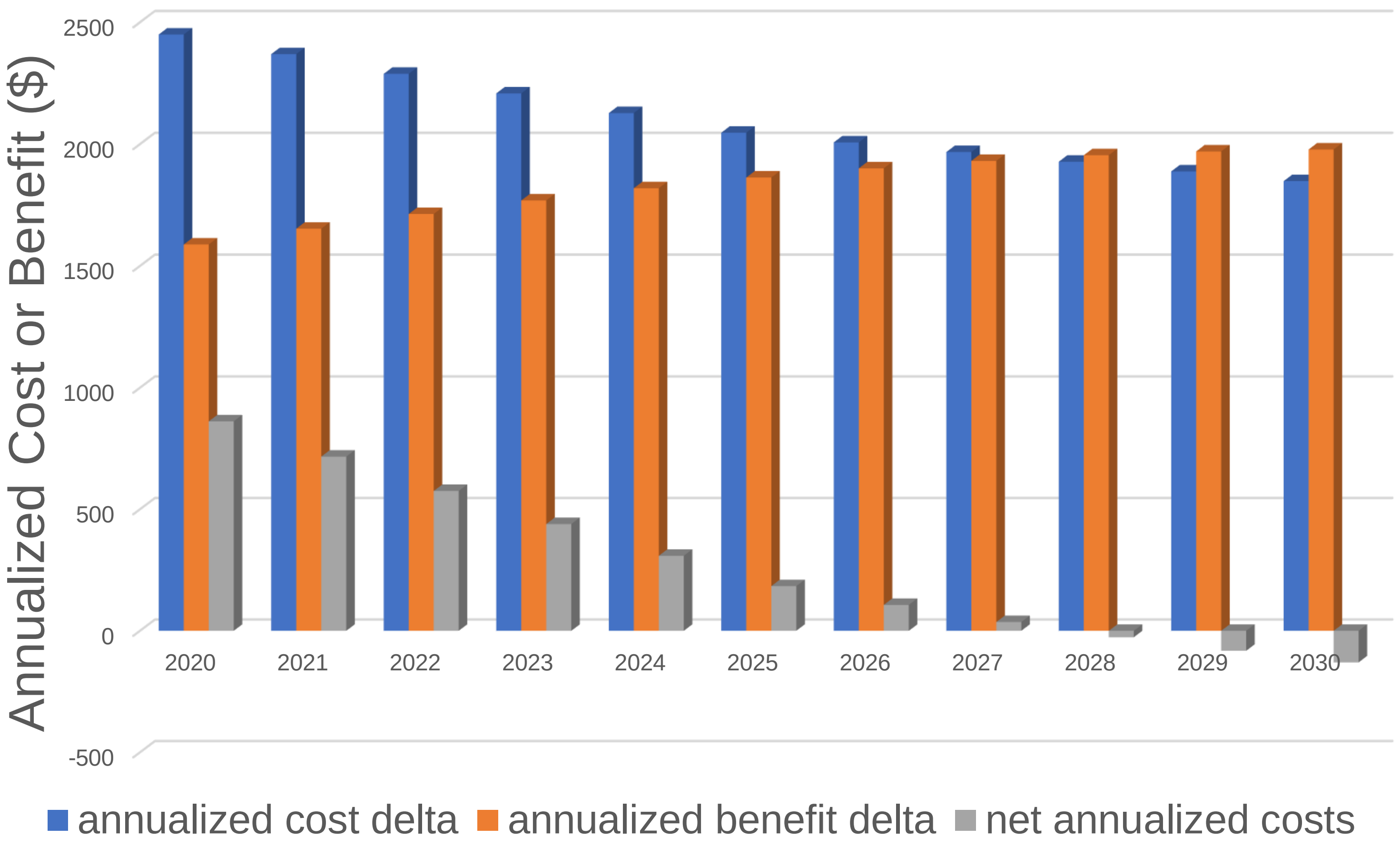
- Nuclear Additions: Enables low CO2 during off-peak recharging
- Solar Additions: Enables lower CO2 for recharging during early afternoon recharging
- Costs can generally be controlled since system has adequate capacity

A closer look at interactions between EVs and the future Ga Grid



Energy Policy and Innovation Center,
R. Simmons, SEI

EV costs approach price parity by 2030 on TCO basis, with qualifiers



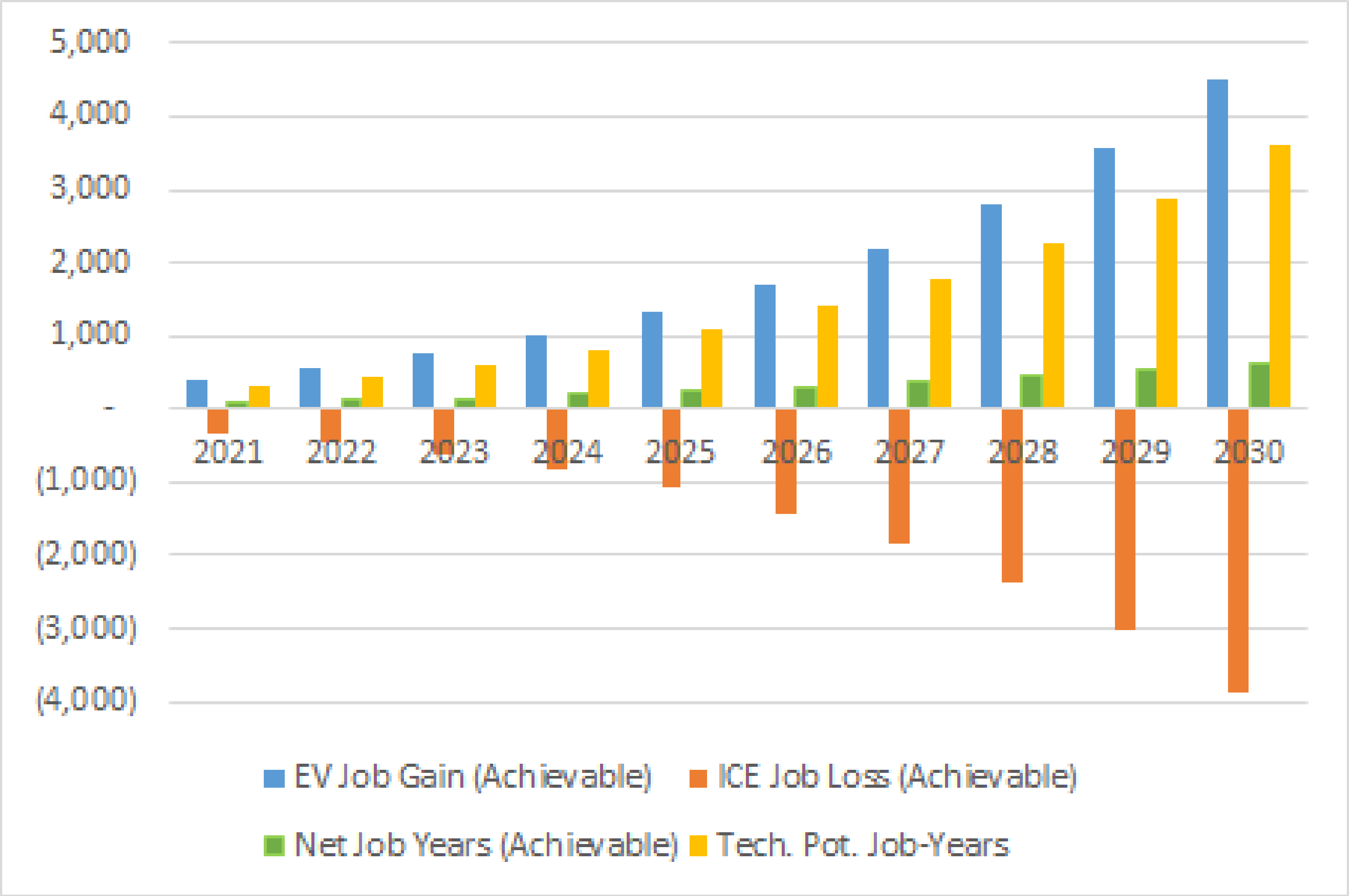
New EV sticker prices are currently more than similar conventional cars.

Subsidies currently offset most of this differential. In the next decade, price parity is anticipated on a total cost of ownership basis.

However, a few significant unknowns remain:

- Continued decline in battery prices
- Cost of conventional fuel
- Cost of charging equipment
- Federal/State EV tax credits
- Interest rates and financing costs
- Carbon policy
- CAFE regulations

EVs can contribute to modest favorable gains in jobs

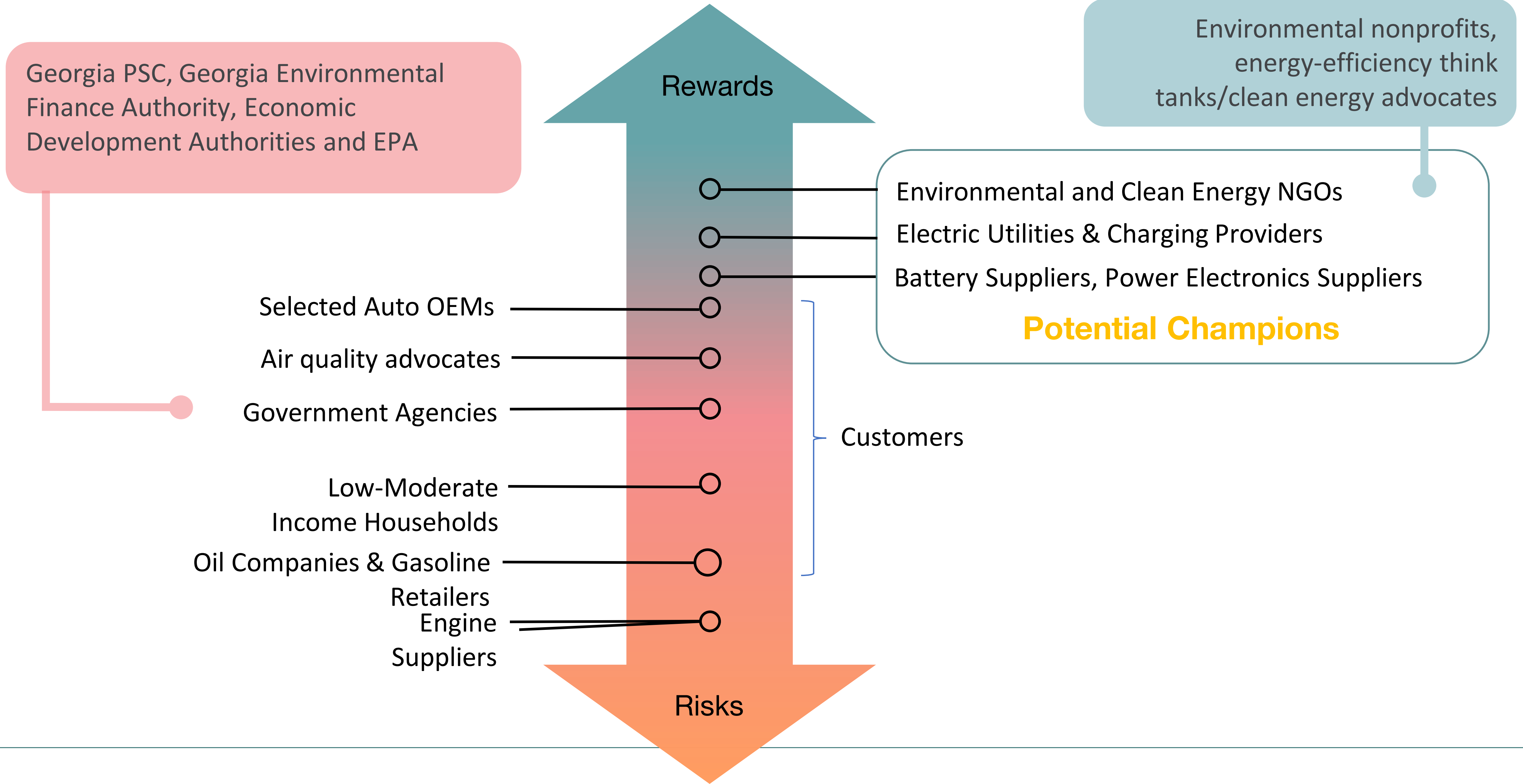


EVs generally require fewer parts than conventional cars. But have additional requirements for external infrastructure.

Lithium Ion batteries and energy storage in general is a growing industry, with major implications on jobs and natural resources.

While attention must be paid to lifecycle sustainability, a simplified analysis suggests EVs can have a positive net impact on jobs, in particular for the SE automotive sector.

Stakeholder Analysis of Electric Vehicles



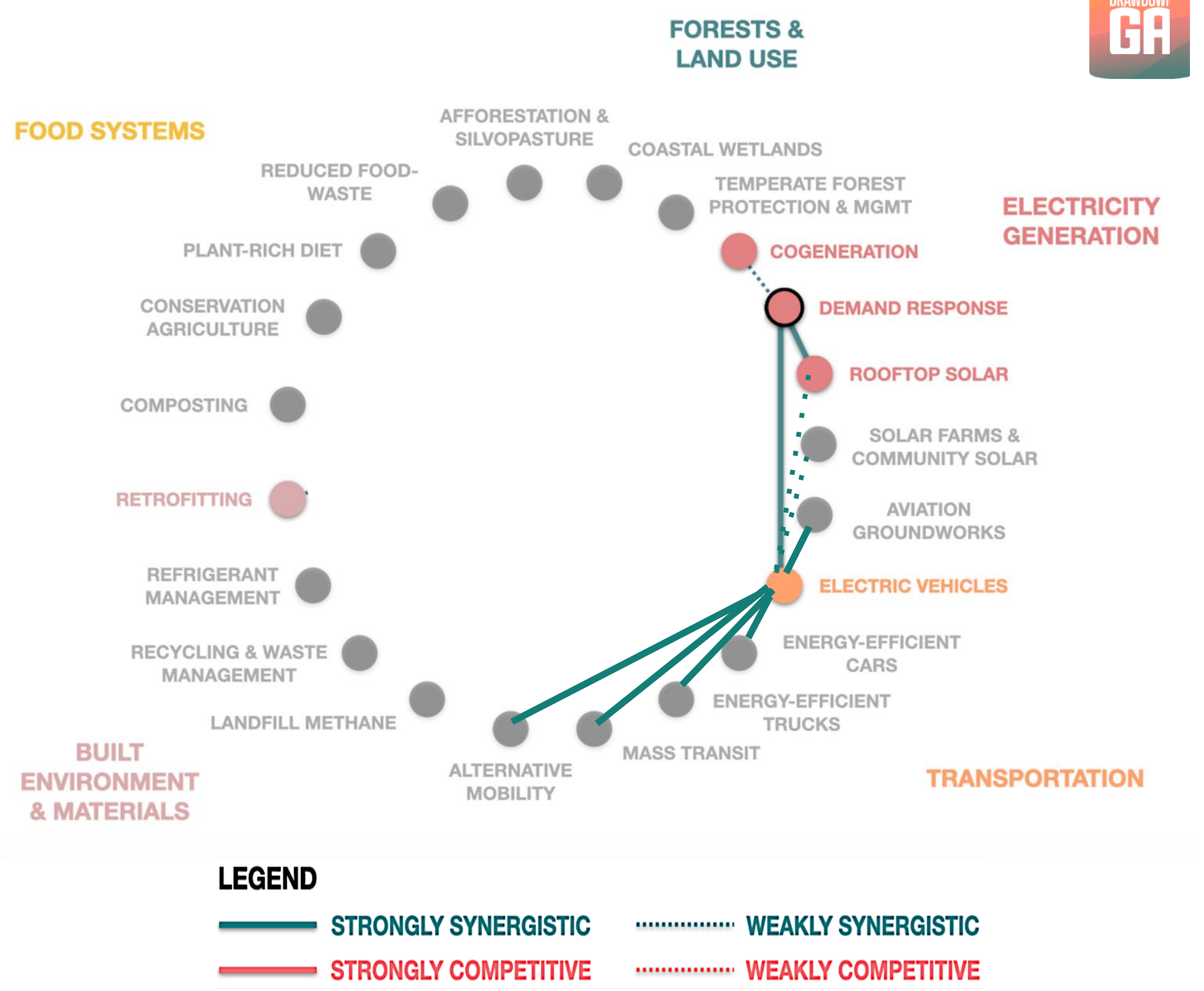
Electric Vehicle Solution Interactions

Electric Vehicles & Transportation
Electrification of LDVs can have a synergistic effect on other transit modes, including buses, MD/HD trucks, and alternative mobility.

Electric Vehicles + Grid
Managed EV charging will permit utilization of generation assets during off-peak periods, and incentivize low cost charging.

Solar
Addition of solar may help reduce the CO2 intensity in late afternoon

Nuclear
Addition of nuclear capacity bumps coal off the margin, resulting in lower marginal CO2 during all times of the day



Electric Vehicles

A solution for Georgia that:

- Reduces carbon emissions
- Is synergistic with a cleaner grid
- Results in air quality benefits
- Helps diversify transportation energy resources
- Can generate new jobs

Georgia Tech

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