Electric Fleet Adoption Strategies – Storage/Infrastructure Needs

Evaluate mid- to long-term energy storage needs of the electric grid for select fleet electrification scenarios.

WHAT IS THE NEED?

Significant electrification of the transportation sector is necessary for the State to achieve several important greenhouse gas (GHG) reduction and renewable energy targets. These targets include the Governor’s pillar goal of reducing petroleum use in vehicles by up to 50% by 2030. Current and proposed GHG emission targets (ex., reducing GHGs by 80% below 1990 levels by 2050 - Executive Order S-3-05) also require electrification to play a central role among the mitigation strategies.

Fleet electrification places new demands on the electric grid, which are further complicated by increasing renewables integration into the grid as mandated by Senate Bill 350, with a target of 50% renewables percentage in the State’s electricity mix by 2030. Significant short- and long-term energy storage along with load flexibility will be necessary to manage increased renewables to the grid as mandated by Renewable Portfolio Standards (RPS) while also meeting the supply and infrastructure demands of the growing electric fleet.

Achieving these complex and sometimes divergent goals requires the ability to understand the nature of long-term demands, technology and market developments, resource and infrastructure requirements, and other factors.

WHAT ARE WE DOING?

The goal of the proposed project is to evaluate mid- to long-term energy storage needs of the electric grid for select fleet electrification scenarios. The research team will compare grid-tied, behind the meter, and smart grid storage options, and will examine the feasibility of long-term storage through the ‘power to gas’ approach. The project will identify cost effective and practical solutions to manage the increasing renewables
integration in the fleet electrification context.

The Resolve model, an advanced power system planning model developed for the California Public Utilities Commission, will be used to conduct the core analysis. Designed to answer planning and operational questions related to renewable resource integration, Resolve co-optimizes investment and dispatch over a multi-year horizon with one-hour dispatch resolution for a study area, and solves for the optimal investments in renewable resources, technologies, and energy storage options.

The deliverables will include cost and electric infrastructure needs for anticipated transportation electrification trends, and energy storage and responsive demand strategy recommendations.

WHAT IS OUR GOAL?

During the current project period, the researchers are conducting an assessment of fleet electrification and RPS scenarios. The goal of this task is to calculate the energy storage required to achieve the 50% renewables percentage in the grid by 2030, and a scenario of 80% RPS by 2045 while adopting to increased fleet electrification through 2030 and 2045.

WHAT IS THE BENEFIT?

California has ambitious renewable energy goals including a 100% renewable portfolio standard. Increasing renewables integration into the electric grid along with changing demand patterns place new requirements on the electric infrastructure. Significant short- and long-term storage will be necessary to manage increased renewables to the grid as mandated by RPS, while also meeting the supply and infrastructure demands of the growing electric fleet.

This project will help address these challenges by evaluating mid- to long-term storage needs, compare grid-tied, behind the meter, and smart grid storage options, and will identify cost effective and practical solutions to address the above-mentioned challenges.

This project also directly addresses the following key Caltrans priorities:

1. Critical societal and technological trends for consideration in the California Transportation Plan and subsidiary Caltrans modal plans;
2. Meeting transportation system performance measurement requirements of the FAST Act and California Senate Bill 1.

WHAT IS THE PROGRESS TO DATE?

Data Management Plan has been developed.