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Rail Transportation and Energy Efficiency

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The California High-Speed Rail Authority (Authority) is the state agency responsible for planning, designing, building and operating the first high-speed rail system in the nation. As a member of the Authority's Board of Directors, I'm pleased to provide an update on the project's status and our plans for an energy-efficient transportation future.

First, the basics: California's high-speed rail system will connect the major metropolitan areas of the state, create jobs, spur economic development, and enhance environmental quality – all while preserving agricultural and environmentally-sensitive lands. By 2029, the system will run from San Francisco to the Los Angeles basin in under three hours at speeds of over 200 miles per hour. The system will ultimately extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations.

We envision high-speed rail as an integral part of a broader state-wide rail modernization program that includes investment in existing urban, commuter, and intercity rail systems throughout the state. Examples of these investments include the electrification of the Caltrain system, new rail cars for the Bay Area Rapid Transit (BART) system, the Regional Rail Connector in Los Angeles, and an upgrade of the Blue Line light rail system in San Diego. These new or upgraded services will connect existing transportation systems to high-speed rail, providing an integrated rail network that will serve as a viable alternative to vehicle and air travel.

California is large: our major economic and political centers are located hundreds of miles apart. As early as 1909, state leaders recognized this challenge and identified the need to develop major infrastructure projects to connect the regions of the state. Throughout the decades as the state's population centers continued to grow, these crucial infrastructure investments served as the foundation for the state's unprecedented economic growth and prosperity over the past century. However, these systems are rapidly aging, and increased demand caused by population growth and tourism require the development of new methods of transportation.

The Authority is committed to developing an environmentally- and economically-sustainable, long-term alternative to the current transportation systems in California, which will increase transportation efficiency, use 100 percent renewable energy, and incorporate additional sustainability practices.



Rail as an Efficient, Clean Transportation Choice for California

Although rail is one of the world's oldest transportation methods, it continues to be one of the most energy efficient ways to move large numbers of people. Experience both in the U.S. and abroad illustrate that rail travel provides an efficient alternative for the traveler who wants to reach key, central destinations without the delay and hassle of air travel, and in a faster, less-polluting, safer and more efficient method than driving.

California's high-speed rail system is designed to transport passengers throughout the state in the most energy efficient method possible. Starting in 2022, the newly completed Initial Operating Section of high speed rail will provide non-stop service from Merced to the San Fernando Valley – with connections via cross-platform transfer to the Bay Area, Sacramento, and locations throughout Southern California. At that stage in operations, the system on any given day will require 0.40 gigawatt hours (GWh) to deliver 11,000 passengers. By 2029, non-stop service from the Bay Area to the Los Angeles area will move 528,000 passengers on approximately 2.30 GWh per day. To move the equivalent number of travelers by car would require nearly twice as much energy.

For operations, we will deploy a traction power system that will rely on two by twenty-five kilovolt alternating current Autotransformer Feed Systems for the main-line operation at each of the substations, located at 30-mile increments along the alignment. The Authority has been hard at work with utility providers to study and provide this critical interconnection.

The system will also capture the energy from the braking and deceleration of the train. This energy, estimated to be 10 to 15 percent of the total power for the system, can be used in a number of ways, including: taken back into the braking train to power electrical systems such as fans or lights; moved along the overhead catenary system to power other trains; or, returned to the electricity grid to bolster the state's overall energy supply.

A Net-Zero Approach to Rail Operations

Energy-efficiency and maximizing recovery of electricity are just parts of the Authority's plans. In 2008, the Authority's Board of Directors adopted a policy goal to run operations with 100 percent renewable energy. Through subsequent planning and coordination with utility companies and regulatory agencies, the Authority has determined that the most effective, feasible way to achieve this goal is to procure or produce enough renewable energy to feed into the grid to offset the amount the train uses.

This net-zero approach means that renewable energy developers can find the most economical locations to develop and distribute energy to the grid. In April 2013, through a formal call-to-industry process, the Authority determined that several companies have the capacity, and the strong interest, to provide renewable energy to the system. In addition, the Authority is exploring solar or other renewable energy generation on high-speed rail canopies, roofs, and maintenance facilities as well as other structures.

In this fashion, California's high speed rail system will be ahead of the clean transportation curve and leading by example.

Rail as Green as We Can Make It

The Authority has also developed a sustainability policy in line with priorities set by Californians as part of their vote for the high-speed rail system (Proposition 1A) in 2008.

Strategies currently deployed by the Authority include items such as requirements for recycling all steel and concrete; diversion of 75 percent of construction waste from landfills through reuse and recycling; use of new, low-emission construction equipment; and replacement of inefficient truck engines and irrigation pumps. The Authority is also working with partners to implement an urban forestry program to offset greenhouse gas (GHG) emissions associated with construction. This program will deliver additional benefits such as providing shade and recreation for communities within the train corridor. The Authority is also actively working with other state agencies to link the design-build contractor with biofuel suppliers

so that a percentage of the fuel used for construction will be clean, renewable, or bio-diesel.

So what's the bottom line for high-speed rail as it relates to California's energy future? Starting in 2022, during the system's first year of operation, the Authority anticipates a ramp-up in usage as travelers begin to make the switch from driving or flying to taking high-speed rail. Every subsequent year, as the system is projected to increase riders, the Authority expects continued reductions in GHG emissions as well as criteria air pollutants.

Cumulatively, by 2030, the high speed rail system will divert between 4.3 million and 8.2 million metric tons of carbon dioxide equivalent (mmtCO₂e). That would be as if an entire 500-mile long lane of auto traffic were removed from California's freeways. By 2050, the system will divert at least 27 million and possibly as much as 44.4 million metric tons of CO₂e. The documented performance of international high-speed rail systems, such as France and Spain, has shown that these numbers are reasonable.

These GHG reductions represent a major component of California's pioneering, statewide efforts to steadily reduce the state's aggregate GHG emissions, in partnership with our colleagues at the California Air Resources Board, Energy Commission and Public Utilities Commission.

As you can see, high-speed rail is a game-changing form of sustainable transportation. I can't express how exciting it is to be part of this cutting-edge technology that will result in a brighter energy future for the state and serve as a model for the nation. While we still have a lot of work, we're moving forward and will begin construction in the coming months.

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