

Energy Chile - California
Executive Summary
Session 3: Transportation Transition
 July 21st, 2021

The Chile California Council and the Ministry of Energy of Chile held the third of four working group sessions that will discuss common challenges and opportunities Chile and California face as they transition to more sustainable energy systems. The third session took place July 21st, 2021 and focused on comparing their transportation transition goals, key challenges, and opportunities. The next and last meeting will examine Chile’s and California’s approaches to foster and implement significant transitions to green Hydrogen. A consolidated document will be prepared highlighting the tangible results of these four sessions and next steps to follow.

This executive summary provides an extract of what was discussed in this third session. Participants, sponsors, and organizers all found the session very useful and had positive comments on what was achieved.

This summary highlights the strategy, incentives, and challenges that Chile and California have faced in order to promote and achieve zero emission transportation. The main takeaways include the necessity of coordinated work among different stakeholders to break down technical, political, and social barriers to electromobility. Tax schemes, variable electricity rates and incentives were a common topic in the three discussion groups as a way to fund more projects that promote the use of zero emission vehicles (ZEVs) and help to cover the gap of equity in disadvantaged communities.

The rest of the document showcases participants and the agenda of the meeting before providing a summary of key points that came out of the meeting.

I. PARTICIPANTS

Javiera Aldunate - Head of the International Office, Ministry of Energy of Chile	Orlando Meneses - WEG Chile - Enel X
Gabriel Prudencio - Sustainable Energies División, Ministry of Energy of Chile	Patricia Monahan - California Energy Commission
Daniela Soler - Efficient Transportation Unit, Ministry of Energy of Chile	Alana Sanchez - California Energy Commission
Roberto Araos - DECYTI, Ministry of Energy of Chile	Mona Badie - California Energy Commission
Rafael Friedmann - CCC Chair	Peter Klauer - California ISO
Trinidad Castro - World Energy Council Chile	Dr. Fereidoon Sioshansi - Menlo Energy Economics
Nicolás Westenenk - Generadoras de Chile	Juan Pablo Carvallo - UC Berkeley
Aura Rearte - ACESOL	Merrian Borgeson - Natural Resources Defense Council
Sebastián González - ACESOL	Javiera Canales - UC Berkeley
Teresita Vial - ACESOL	Matías Alcalde - Chile California Council
Gabriel Guggisberg - Agencia de Sostenibilidad Energética	Manuela Díaz - Chile California Council
Juan Carlos Olmedo - Coordinador Eléctrico	Josefina Edwards - Chile California Council

II. AGENDA RECAP

*Times are expressed in Pacific Standard Time (California)

PART 1: Introductory remarks		
9:00 am – 9:05 am	Welcome & general protocols for the meeting	Representative before the CCC Matias Alcalde
PART 2: Chile & California Context		
9:15 am - 9:25 am	Pillars of the “Transportation Plan of Chile by the Ministry of Energy of the Government of Chile	Head of the Efficient Transportation Unit Daniela Soler
9:25 am - 9:35 am	Pillars of the “Transportation Plan of California by the California Energy Commission”	Commissioner Patricia Monahan
PART 3: Discussion groups		
Participants were assigned in advance in the following discussion groups, to work on a “living” document of simultaneous work. These conversations discussed successful and failed experiences of programs, policies, and incentives useful both for Chile and California, including technical and socio-environmental aspects.		
9:35 am - 10:05 am	Group 1: “Electro-mobility alternatives and technologies – electric buses, logistics, residential use, trucks, long distances, storage and “refueling stations”	
	Group 2: “Urban planning and advocacy to reduce the need for physical transportation, promote public transportation and vehicle sharing, remote work, pedestrians, bicycles and other green solutions ”	
	Group 3: “Equity in access to participate in the transportation transition”	
PART 4: Open Discussion, conclusions, and next steps		
10:05 am - 10:15 am	Each group selected a representative to present the main points of view discussed	
10:15 am - 10:40 am	Questions and open discussion	
10:40 am - 11:00 am	Identification of the main actions to work on for the future meetings. Comments to consider for the next sessions	

III. PRINCIPAL FINDINGS AND DISCUSSIONS

A summary of what was presented and discussed in the meeting follows per the meeting agenda presented earlier.

Chile's Efficient Transport & Electromobility

- **From an energy point of view:** Chile is very dependent on fossil fuel imports. The transportation sector is 36% of total energy, with land transportation responsible for 82% of this and where 99% comes from imported fossil fuels. Air is 12% of transportation energy consumption, maritime 5%, and rail 1%.
- **From an emissions point of view:** The majority of the emissions come from the energy sector. The transportation sector generates 24% of greenhouse gas emissions (GHG).
- **Actions:** Chile has pledged to achieve carbon neutrality by 2050 through 4 major pillars related to the transport industry: phase out coal and increase renewable energy in the electrical grid, energy efficiency, green hydrogen and electromobility.
 - The carbon neutrality plan shows that reaching carbon neutrality has a positive net benefit of around \$37.1 Billion USD.
- **Transportation electrification is a reality:** In 2020, 3 million Electric Vehicles (EVs) were sold worldwide; representing 4.6% of total car sales. The main market remains on those countries that had put in practice highest incentives, like China, Europe, and the United States. Projections say that this number will continue rising with EVs expected to be 12% of all vehicles sold by 2030.
- **National electromobility strategy:** This strategy was developed by Chile in 2017 and is currently being updated to incorporate more aggressive targets to attain carbon neutrality. Currently, Chile has 1,970 EVs and 263 public chargers, making Chile the country with the second most public chargers per electric vehicle as reported in the Global EV outlook (GEVO) by the International Energy Agency (IEA).
- **Public Policies that are in place in Chile:** One of the milestones that is part of the National Electromobility Strategy is Law 21,305 on Energy Efficiency published on February 13th, 2021. This law covers three main topics:
 - Establishment of energy efficiency standards for vehicles. This will increase the variety of efficient vehicles with advanced technology that importers offer to the national market.
 - Regulation of the interoperability of EV charging infrastructure.
 - Accelerated depreciation for company owned EVs, which will allow more companies to incorporate EVs into their operations, which in turn will encourage importers to bring in a wider variety of ZEVs.
- **Programs with focus on high intensity use fleets:** including public transport, taxis, and commercial fleets. The incentives are :
 - **Electric buses in public tender offer**
 - Expand the model for other regions: Arica and Copiapó are going to be fully electric in the next public tenders.
 - Extend the electrocorridor to other cities: main avenues from other cities, apart from Santiago, will be fully electrified.
 - **Taxis**
 - Subsidize electric shared ride vehicles (colectivos) with \$9,400 USD per vehicle. This program comes from the Ministry of Transport. This also includes technical support before the purchase and during the operation of the vehicle.
 - Subsidize wholesale purchase of electric taxis with \$10,700 USD per vehicle and a home charger. This program comes from the Ministry of Energy.

- **Commercial Fleets**
 - Integrating electric fleets into company's business models through an accelerator.
 - Improving the energy efficiency of truck fleets through a volunteer program called “giro limpio”.
- **Measures to enable electromobility:**
 - **Safety and operational regulations**
 - Specific safety regulations for drivers and EV chargers.
 - Charger interoperability: facilitate the access and connection of electric vehicle users to chargers.
 - **Decreasing information gaps**
 - Electromobility platform: website with reliable and updated information regarding the ecosystems that make up electromobility.
 - EcoCarga app: Indicates the geographical position of all public charging stations available in the country and charging time according to brand and vehicle model. Work is in progress to show in real-time the availability of those chargers.
 - Public /private agreements: yearly events where different institutions from public and private sectors declare their intention to promote electromobility. This has led to networking, collaboration, and coordination between different actors.
 - **Human Capital**
 - Capacity gaps: Study human capital gaps and develop new job profiles that can meet needs for electromobility.

California Zero Emission Transportation

- **From emissions point of view:**
 - Transportation is a major source of harmful air pollution, and the greatest and an increasing source of greenhouse gas emissions in California.
 - California has been working on reducing GHG emissions, with a drop in emissions from electric power as well as total emissions statewide. However, transportation related emissions have been increasing over the last few years, reaching more than half of California’s GHG emissions. Although there was a small drop in transportation emissions in 2018, they are trending up.
 - Disparities in transportation related pollution: One of the big challenges in California is to let everyone stand to benefit from the transition to ZEVs. Residents that live in disadvantaged and low-income communities are exposed to high levels of toxic diesel particulate matter due to proximity to corridors of medium and heavy duty vehicles. Particularly, African Americans, Asian Americans and Latinos are exposed much more to these pollutants.
 - Working to achieve zero emission transportation is the key to breaking down inequality. Governor Newsom has said that by 2035 all new passenger vehicle sales will be 100% ZEV, and that all medium and heavy-duty vehicles including drayage trucks, off road vehicles and equipment will be 100% ZEV by 2045.
- **Electric vehicle goals:**
 - By 2025 sell over 1.5 million EVs, install 250.000 chargers and 200 public hydrogen fueling stations.
 - Over 5 million EVs sold by 2030.
 - All new passenger vehicles and electronic operations vehicles sold will be 100% EV by 2035.
 - All medium and heavy vehicles will be electric by 2045.

- **Regulations:** The primary tool to achieve these goals is regulation, complemented by incentives. California has been regulating vehicle emissions for a long time. The Low Carbon Fuel Policy has been effective at driving investment into zero emissions transportation.
 - Clean Truck: California is the first to rule worldwide that all truck sales by 2045 be zero emissions.
- **ZEV adoption:** California leads the US in EV sales. With only about 10% of the new car market in the US, California has half of all US EV sales. Globally, California is the second largest EV market after China.
 - ZEV Manufacturers: There are 14 manufacturers designing and building cars, buses, motorcycles, and trucks in California. Tesla is the number one seller and a big reason why California is number one in ZEVs exported, with 58% of all the US EVs sales and 78% of battery electric vehicle (BEV) sales. California is trying to encourage more manufacturers to come to the State.
 - Funding for ZEV infrastructure: 1.2 million chargers for light duty vehicles and 150.000 chargers for heavy duty vehicles will be needed by 2030.
- **Budget:** Currently the CEC's 2021-22 budget prioritizes funding for ZEV infrastructure, related workforce development and manufacturing. In order to meet its ambitious ZEV goals, California has budgeted for the next three years 1,165 million USD for ZEV infrastructure and manufacturing grants. This is the biggest budget ever for ZEV transportation and will be distributed as follows:
 - \$250 million for zero-emission drayage trucks.
 - \$25 million for drayage truck and infrastructure research.
 - \$90 million for transit buses.
 - \$50 million for school buses.
 - \$250 million for ZEV manufacturing grants.
 - \$500 million for ZEV infrastructure.

Summary of Group Discussions

Group1 - "Electro-mobility alternatives and technologies – electric buses, logistics, residential use, trucks, long distances, storage and "refueling stations"

- **Challenges and Opportunities:**
 - If optimization and technologies are properly used, electrification in transportation could benefit the electric system.
 - Promoting and accelerating regulations, incentives and optimization are key to electromobility.
 - Inverters do not have the proper technology for synthetic inertia.
 - Current spot price for the energy market won't work for the energy transition.
 - Synchronization is needed. Chile has many renewables that are being connected to the grid without synchronization.
 - EVs still not competitive in Chile for most of uses.
 - Technologies for EV integration on a massive scale are not there yet in order for EVs to be able to provide energy storage for the grid.
 - Incorporate inverters with synthetic inertia into new renewables that are coming onto the grid.
 - Expansion of electric infrastructure: new buildings must have the minimum infrastructure for EV chargers.

Group 2 - "Urban planning and advocacy to reduce the need for physical transportation, promote public transportation and vehicle sharing, remote work, pedestrians, bicycles and other green solutions "

● **Challenges and Opportunities:**

- Have a business model that matches with the existing model, including new companies to bring electric systems without affecting the current transportation system.
- Visit the regions to see where to deploy EVs, see how to transition current areas with diesel buses to EVs.
- The limitations for bringing enough electricity to electrify transportation are at the transmission level, not the distribution level. Chile's Sustainable Energy Agency needs to begin conversations with the National Energy Commission (CNE in Spanish) and other stakeholders.
- Convince people who operate buses to switch to electric.
- The biggest challenge for light vehicles is the initial price. Most common car is Chevy at \$8,000 USD which is much lower than the cheapest EV at \$32,000 USD. This makes it hard to get lots of EVs in light vehicles.
- Hydrogen vehicle is still not ready, but good to plan/pilot it.
- A pilot Project to promote electric taxis is planned for 2022. Due to the Covid pandemic, the amount of cars purchased went up 30%, because of people being afraid of getting infected by using public transportation.
- Learning how people use public transportation is key to promoting the use of it and redesigning the system. Since Chile has a use-centered public transport design, focusing on why people don't use public transportation will be a better way to fit the market with people's needs, instead of only focusing on the efficiency aspect of transportation.
- Significant work in education is needed in order to promote the adoption of EVs.
- Increase the coverage of public transportation: many families live far from public transportation or in places with low bus frequency where commuting by bus will take 3 to 4 times longer than using a car.
- Expand the subway: the subway is one of the best ways to commute in Chile, it typically runs on schedule and is efficient.
- Use electric trains: Chile used to have many miles of train rail 20 years ago. Due to the lack of chargers and the geography of Chile, an electric train could be more efficient than an EV for driving through the country and to avoid cars and planes.
- Distributed energy generation (DG): an important tool in urban planning to promote E-transport. In Chile it is used for small projects of 1 to 9 MW (20 hectares or less), usually placed near consumer centers and can be done hybrid with wind and hydrogen.

● **Urban Planning:**

- Add requirements for new buildings to have EV infrastructure built in. Work with affordable housing developers to put in EV chargers.
- Study shows that as EVs are added to the grid, cost per kWh decreases because of increased usage.
- Vehicle manufacturers don't show an interest in letting customers manage their EV charging.
- California needs to figure out how to allow utilities/CAISO to control the charging of EVs.
- Work on a policy where municipalities that don't have urban planning get a reduced transportation budget.

- **EV implications:**
 - EV is a godsend to renewables. In the European Union and the United States 30GW of storage would be available thanks to EVs that absorb the free solar energy in the middle of the day. With technologies to do this and reduce the duck curve, EVs have the best flexible demand possible.
 - It isn't clear how much stress EVs can put on the grid, but definitely buses and trucks that become electrified will have local impacts as go from kW to MW. This will affect the local utility investment needs.
 - In the US public transportation is essential for low-income communities. Comparing prices of two different types of mobilization can be disturbing. For example, a bus that goes from a hotel to the airport in Houston can be around \$1.75 USD, while a taxi would be \$50 USD.
- **Changing incentives:**
 - Fossil fuels and petroleum have been subsidized instead of penalized, especially in the US: Many states and countries are trying to subsidize EVs, when over 200 years they have supported the opposite. US taxes paid for highways, promoting and making it easy for people to use fossil fuels.
 - California is now subsidizing EVs but reducing or eliminating fossil fuel subsidies is also needed. Globally, the EU has lower subsidies and in the Middle East, the oil is almost free.
 - Changing the mindset: Globally, there are places where the incentives go in the wrong direction. In Germany, people can drive every day from one city to another and get a free car every 3 years and free parking. This is a status symbol and getting the best parking spot reflects how high the worker is in the organization. Changing the paradigm by giving workers EVs and taking away the free parking will change the mindset.

Group 3: “Equity in access to participate in the transportation transition”

- **The California Energy Commission (CEC) Overview:**
 - The CEC has been working on the detection of the most affected communities by greenhouse gas emissions (GHE) and other pollution (especially PM2.5). The results show that communities that live in areas with a strong focus on transportation (industrial areas close to ports, highways, and railroads) are mostly communities of color (or POC) and lower income levels. This has become a key driver to push towards zero emission vehicles (ZEVs).
 - The CEC is working with different NGOs and communities to find out what those communities need and help them with solutions that fit what they want. They are raising the bar on equity through grants to populations and school districts that are places with high unemployment or disproportionately affected by pollution. Currently the CEC funds zero emission school buses.
 - The cost of ZEV remains high, hence the focus on public transportation. Interdisciplinary work is key for crafting good proposals that reduce GHE. The CEC works closely with leaders in the energy sector, the California Governor, the California State Transportation Agency, the Governor's Office of Business and Economic Development and other agencies. These joint efforts have brought ideas to set up zero emission corridors, alternative ways to travel, bike lanes, etc.

- **The Ministry of Energy of Chile Overview:**
 - The electrification of public transportation has positively affected the passenger experience.
 - The new energy efficiency standard for vehicles is expected to promote the adoption of ZEVs in Chile and will increase imports of ZEVs or EVs from a wider variety of manufacturers.
 - Chile has few incentives that promote ZEVs. However, there are two new programs promoting electric transportation. The first one is a subsidy of USD 9,400 for electric vehicles used for shared rides (colectivos), and the second one is a subsidy of USD 10,700 plus a free home charger for EV taxi owners.
- **EV Charger Availability:**
 - California: In existing multifamily housing, the feasibility to install EV chargers is low. Creating opportunities to provide convenient charging for EVs for people in multifamily housing is key to promoting equity. The big question is, who covers that?
 - Chile: Charging infrastructure isn't currently subsidized by the government. Discussions with builders about adding electrical chargers in new residential buildings has not shown positive results, mainly because of the added cost to the construction budget.
 - There is an opportunity with local governments. The governments can use the funds they collect from circulation permits (car registrations) that they issue to pay for electric chargers in public places. However, they lack tools and knowledge to create sustainable budgets for public EV charging programs. The Ministry of Energy is currently working to provide these tools.
- **Challenges and Opportunities:**
 - Minimize the carbon footprint of how people move and holistically reduce the use of transportation:
 - Reduce carbon intensity aspect of the economy in general, by reducing vehicle miles traveled.
 - Understand why people have to commute through the city and whether it can be avoided. In Chile, poor communities are the ones who pay the most for transportation.
 - Promote the implementation of separate bike lanes in places where people commute and areas with disadvantaged communities.
 - Promote telecommuting.
 - Promote the use of ZEVs on fleets and different types of delivery services, like food and grocery delivery, that can dramatically reduce carbon emissions.
 - Tax higher polluting vehicles to generate incentives:
 - Raising taxes on internal combustion vehicles effectively promotes the purchase of EVs or ZEVs and gives manufacturers confidence that there is a market for EVs which pushes forward technology and market development.
 - Use vehicle registration, low carbon standards or cap and trade programs to set aside funds that can be reinvested in communities most in need.
 - California is looking at low rolling resistance tires, which could be worthwhile for Chile too.
 - Incorporate a new policy that forces the implementation of electric chargers in each new residential unit in Chile and in each multi-family unit in California. Similar to what the CEC does on energy efficiency standards, with solar panels in all new residential buildings.
 - Though rebates and incentives initially go to early adopters that probably could afford EVs without them, these create market confidence and accelerate its maturation.

FINAL DISCUSSION

- Use variable electricity rates as a climate strategy to promote EV uptake: variable electricity rates are a way to reduce the overall system cost as we lower emissions. How to integrate technology with rates to make EV drivers pay less money and charge in a way that benefits the grid, charging during plentiful sunshine hours rather than plugging in at night. Capitalizing on mid-day solar energy is needed.
- EV as dynamic devices: EVs can provide services to the consumer and to the distribution system and potentially to the transmission system, recognizing that the further you move up in the system there will be more challenges in technical and regulatory aspects. Providing opportunities that best match the different use cases is key for the transition.
- Example of coordinated work: During California's wildfire crisis in 2020, fire management coordinated with electric utilities and Tesla sent a message to their customers requesting that they avoid charging their cars during certain hours. If that coordination continues and gets stronger by 2030 when there will be 5 million of EVs, the charger hours can be well managed through a flow of information between car companies and customers.
- The technological aspects are mostly solved, but to get real e-mobility the problems go further than the technological aspects and governance and coordination must be improved.
- Incentives and coordination with regional governments: local governments are the ones that need to have all the information about technological and regulatory perspectives, they need to be convinced that everything will be electrified, either electric or hydrogen. This collaborative work will be the key for the next 5-10 years.
- Put a lot of EVs on the streets as soon as possible, but this needs to be in combination with:
 - Good information for people.
 - Proper regulations.
 - Proper electricity rates that incentivize people so that EVs are a benefit for users and the grid.
 - EV integration with the grid, avoiding higher cost in transmission and distribution or raising prices sustainably.
- Chile is updating their national strategy for EVs, which was launched in 2017, via a participatory process with stakeholders. This will create a roadmap on how to accelerate the transition to EVs.