

# Electrification of Transportation

## Challenges to Puerto Rico's Electrical Infrastructure

By: Ignacio Diaz

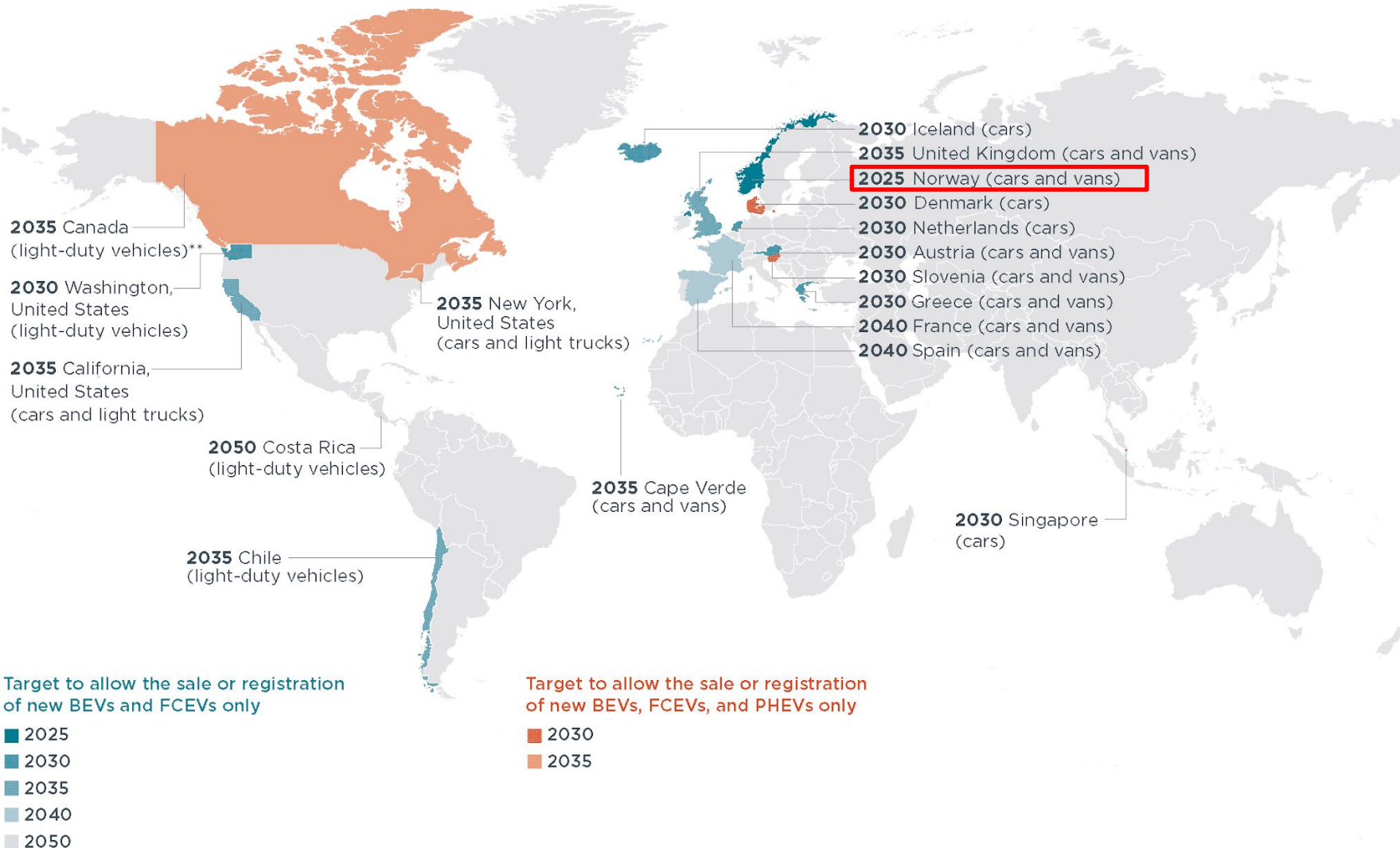


GLENN INTERNATIONAL

# The Electrification of Transportation is happening...

Here are the Countries that have committed to transitioning to ZERO emissions starting in 2025...

Governments with official targets to 100% phase out sales or registrations of new internal combustion engine light-duty vehicles (passenger cars and vans/light trucks) by a certain date\* (Status: Through June 2022)



## All US States committing to Zero Emissions beginning in 2035

- California
- New York
- Massachusetts
- Oregon
- Vermont
- Washington (2030)

\* Includes countries, states, and provinces that have set targets to only allow the sale or registration of new battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), and plug-in hybrid electric vehicles (PHEVs). Countries such as Japan with pledges that include hybrid electric vehicles (HEVs) and mild hybrid electric vehicles (MHEVs) are excluded as these vehicles are non plug-in hybrids.

\*\* The Canadian province of British Columbia has set its 2040 target into binding regulation; the Canadian province of Québec has also set a target for 2035.

IT IS HAPPENING...

Every car manufacturer is here.. And most of them have already committed to the end of ICE vehicles



# There is no stopping it!

And before consolidation, expect to see an immense number of newer brands!



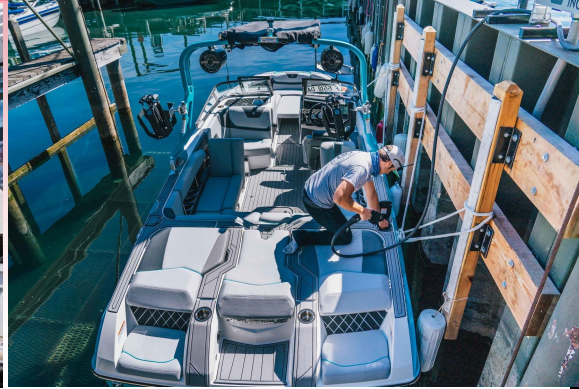
# The disruption is larger than we think! FLEETS are transforming faster than we thought...



Tesla order could double to 200,000 Model 3s



# And the disruption is not stopping at EV's! Marine Electrification has begun...



**A Swedish company that claims to be the 'Tesla of the seas' is building an 'affordable' electric boat that starts at \$100,000. X Shore 1**



# The disruption is exponential!

## Aerospace Electrification has also begun...



**Aerospac eFlyer 800**

This New 8-Seat Electric Airplane Costs 80% Less to Fly Than Conventional Aircraft



What could a future with electric planes look like? \$25 tickets, quieter airports, or even shorter runways. Companies have been betting on battery-powered planes for this cleaner future. EVIATION



**November 2021**

British aero engine manufacturer Rolls-Royce says it has developed the "world's fastest all-electric aircraft. The aircraft -- dubbed the "Spirit of Innovation" -- attained a maximum speed of 387.4 mph (623km/h) in flight, which Rolls-Royce said it believed makes it "the world's fastest all-electric vehicle."



**SureFly**

For \$200K, you'll be able to park this 2-person drone in your garage... 75 miles range at 75 MPH



**ARCHER UNITED**



**Joby AVIATION**

# How does Puerto Rico prepare for this disruption?

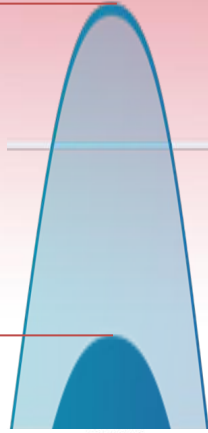




# Puerto Rico's EV Electric Load Impact on Energy Grid at PEAK hours

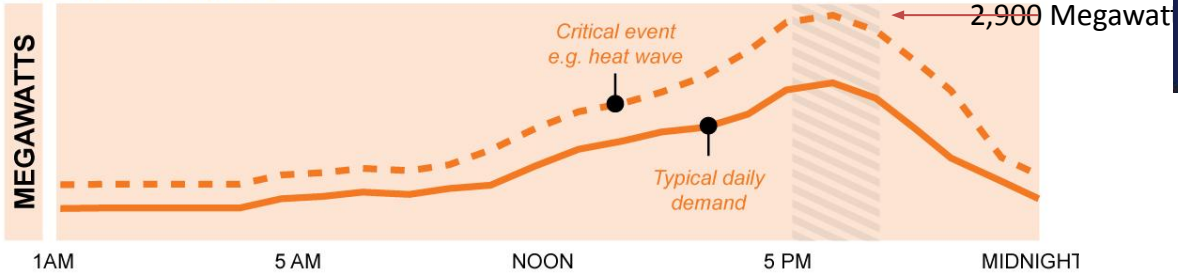
Puerto Rico has an incredible opportunity to build a GRID that can handle what is inevitable...

50% EV's 10,250 Megawatts



10% EV's 4,370 Megawatts

## ENERGY DEMAND




TOU...  
To be covered by Commissioner  
Ramos  
Puerto Rico Energy Bureau

**III. Conclusion.**

For all of the above, the Energy Bureau **DETERMINES** that:

1. The provision of electrical energy through electric vehicle charging equipment to an electric vehicle shall be deemed a “charging service” and thus is not categorized as electric power billing, electric power resale, or any other grid service regulated by the Energy Bureau.
2. Any entity that owns or operates EV charging equipment shall not be deemed an electric power service company, electric power company, or electric service company solely because that entity owns or operates EV charging equipment.

Be it notified and published,




Edison Avilés Deltz  
Chairman



Lillian Mateo Santos  
Associate Commissioner



Ferdinand A. Ramos Sogaard  
Associate Commissioner



Sylvia B. Ugarte Araujo  
Associate Commissioner

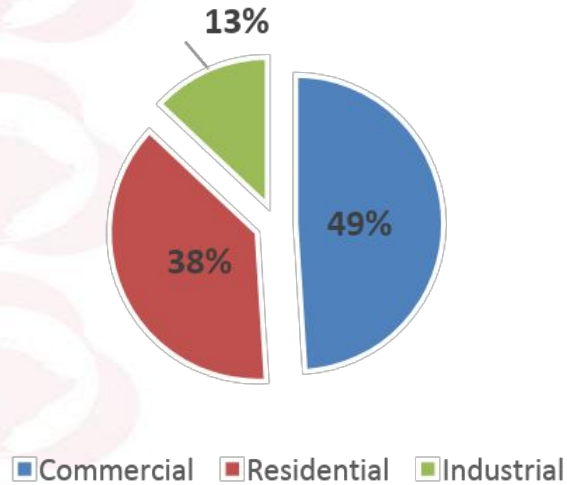


# Puerto Rico's EV Electric Load Impact on Energy Generation

This has serious implications to our IRP planning...

Load based on converting miles driven today (14,710 million miles) to electric equivalent power usage (2.5 miles per kWh) = 5.884 additional tWh  
Over \$1.8 Billion in revenue to be invoiced by LUMA at 100% adoption of EV's

Current State Energy Usage per year (2021)



Today: 16.28 tWh  
(16.28 Trillion kWh)

DATA:

<https://www.worlddata.info/america/puerto-rico/energy-consumption.php>

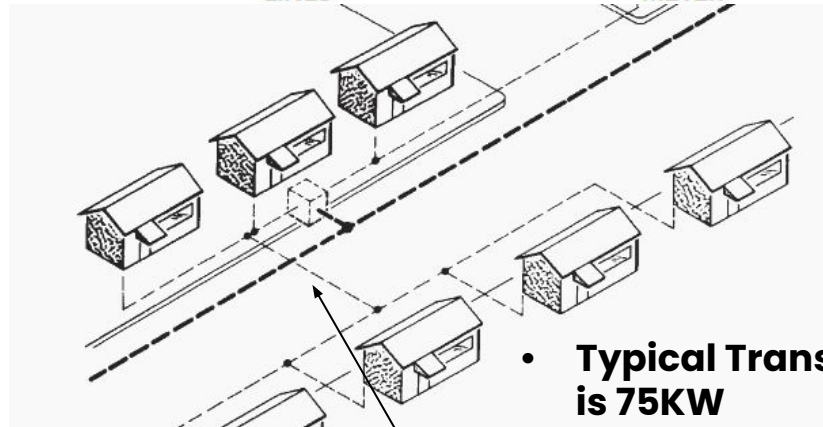
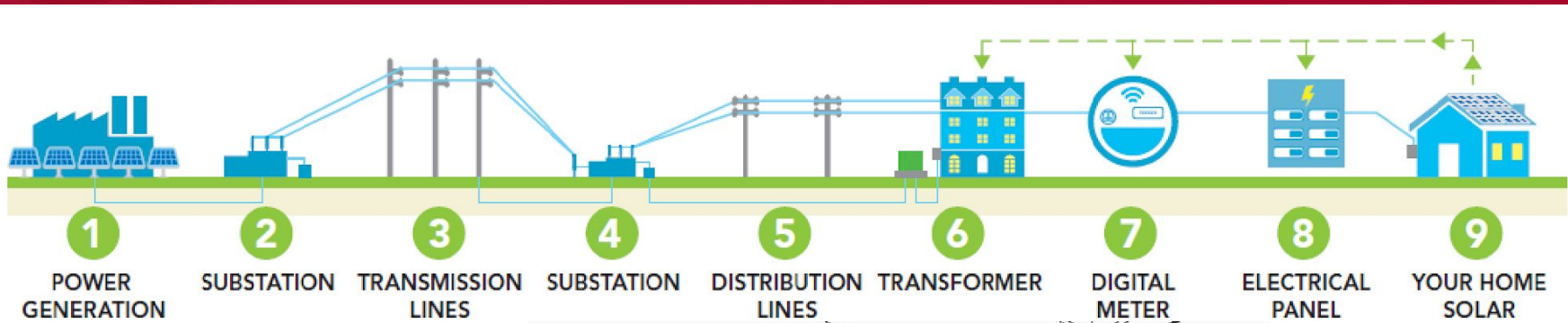
Energy Usage with EV's (2035)  
TOTAL 22.164 tWh



Not considering Marine transportation electrification  
Not considering Aerospace transportation electrification

# Puerto Rico's EV Electric Load Impact on Energy Grid

Even in best case scenarios, we are looking at a distribution problem



- **Typical Transformer specified and installed in residential properties is 75KW**
- **75KW shared by 6 homes provides 12,500W per home**
- **12,500W provides close to 50AMPS per home**
- **Neighborhoods were never designed to consume more than 50% of their capacity**
- **Load Management and the concept of Prosumers must be promoted quickly**



*Thank  
you!*

Regarding the electrification of transportation, to achieve Puerto Rico's energy, resilience and equity goals, a critical obstacle to collectively overcome in 12 months is **EDUCATION**.