



APPENDIX 1

Porto Santo, a small island with great ambitions

The island of Porto Santo has initiated **a particularly innovative policy to reduce greenhouse gas emissions**: to propose a mobility ecosystem based on 100% renewable energy.

In April 2011, the autonomous region of Madeira signed The Pact of Islands with 11 other European regions representing a total of 62 islands.

Porto Santo has committed itself through this pact to:

- Go further than the objectives defined by the European Union by 2020 by reducing its CO2 emissions by more than 20%.
- Implement an energy action plan for a sustainable island, including through the assessment of its emissions and an action plan to achieve these ambitious objectives.
- Mobilize the necessary investments for sustainable energy in the territory.

In February 2016, the local energy company EEM (Empresa de Electricidade da Madeira) presented its project **"Porto Santo, 100% renewable smart island "**. **The objective: to make Porto Santo one of the first 100% renewable energy islands in the world.**

The Porto Santo project with Groupe Renault

Groupe Renault has been selected by the local energy company EEM for a pilot project to test new forms of mobility on the island of Porto Santo. The concept: **22 vehicles** installed on this 42 km² island and around 5,500 inhabitants integrated **into an electricity distribution network based on stationary energy storage thanks to Renault second-life batteries, smart charging and reversible charging.**

Currently, 20 volunteer residents of Porto Santo use 14 Zoé and 6 Kangoo Z.E. for their daily travel. These vehicles are intelligently recharged: they are charged according to the supply and demand of electricity in the grid, via 40 terminals installed by EEM and Groupe Renault.

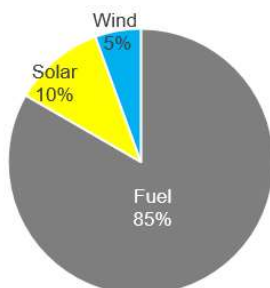
Since the beginning of 2019, two additional vehicles have been testing the reversible charge: the chargers embedded in these cars charge and discharge the battery with alternating current according to the needs and capacity of the network. This system provides more fluidity and optimizes grid efficiency, which is all the more important when the grid is powered by renewable energy.

Promising first models to achieve the island's ambition:

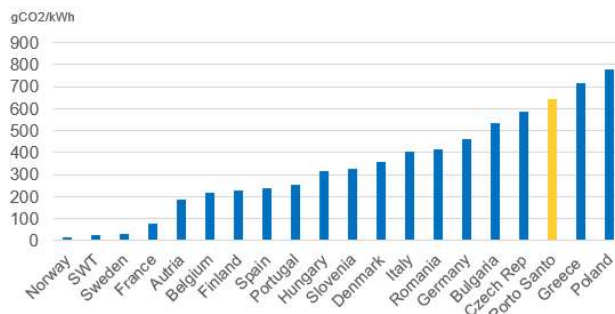
- **On the basis of Porto Santo's current electricity mix, the carbon impact of the electric vehicle and its thermal counterparts has been calculated over their entire life cycles** (from the production of the car and its battery to the end of its life).

In 2018, the electricity mix on the island of Porto Santo will be based mainly on fossil fuels, with 85% of its electricity produced from fuel oil, supplemented by 10% photovoltaic energy and 5% wind power.

Distribution of electricity production
in Porto Santo in 2018



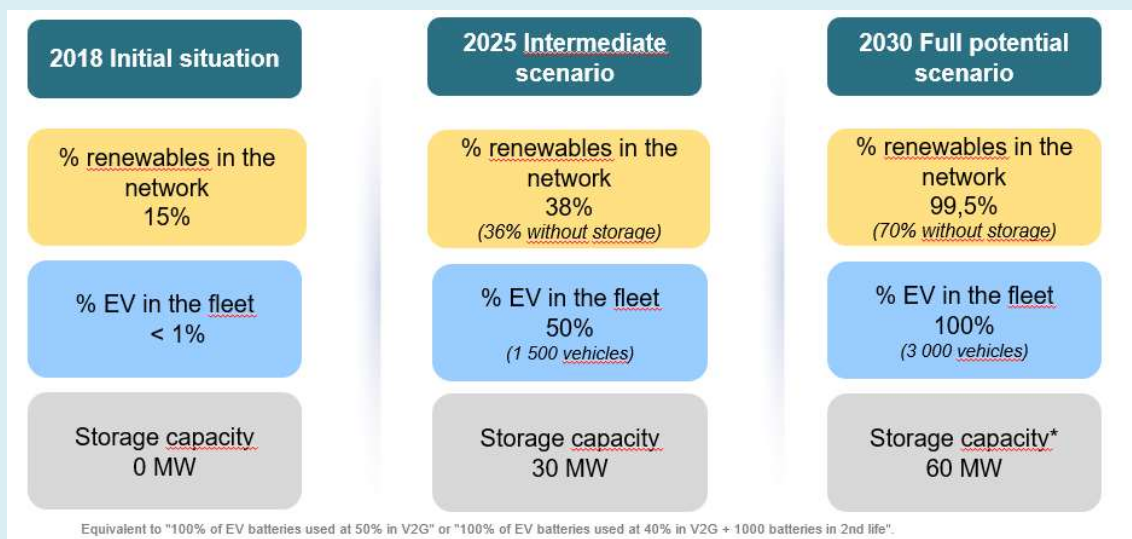
Comparison of carbon intensities of
electricity mixes in Europe



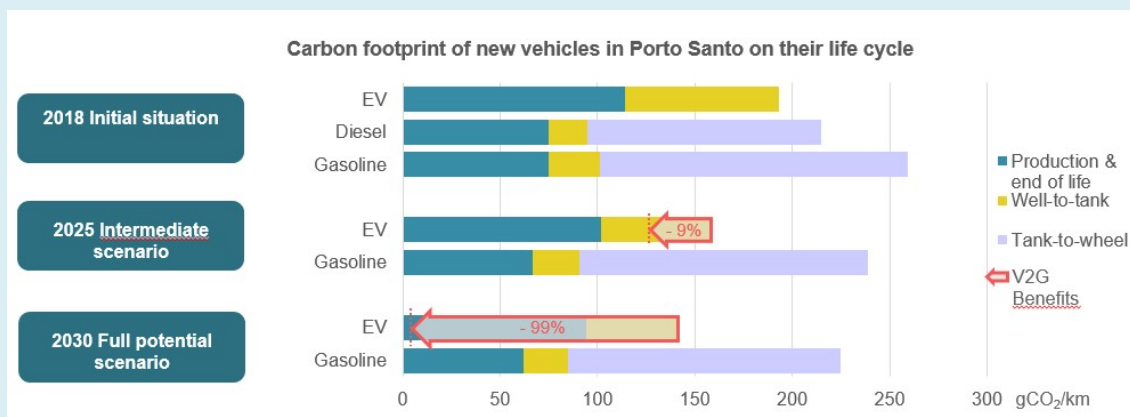
Despite a very carbon-intensive electricity mix, which would rank Porto Santo, as the 3rd most carbon-intensive mix in Europe, if the island were considered a country, **the carbon footprint of an electric vehicle in Porto Santo is already 11 and 34% lower than its diesel and gasoline equivalents.**

The gain is accentuated **when electric vehicles and renewable energies are developed in a combined way**, and thanks to the services provided by batteries.

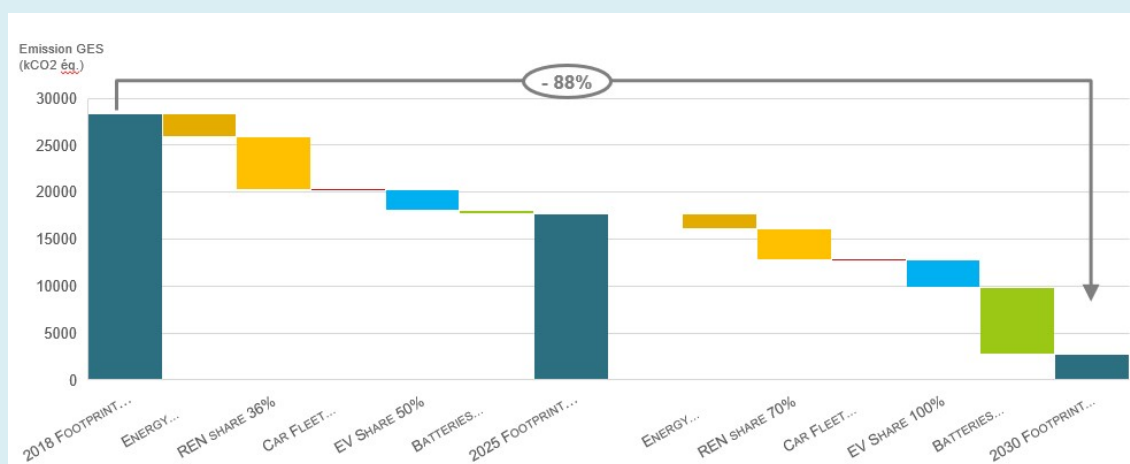
- To this end, **two scenarios were modelled** in order to measure their carbon impact: a first **"intermediate 2025" scenario**, based on a car fleet composed of 50% electric vehicles and an electric mix based at 38% on renewable energies, then a **"max potential 2030" scenario** targeting 100% electric vehicles and 99.5% ENR in the mix.



By simulating the two scenarios, we can see that the gap between the thermal vehicle and the electric vehicle is widening very sharply, until it reaches **an almost zero carbon footprint of the electric vehicle with a decrease of more than 99% in the "Max 2030 Potential" scenario.**



- On an island scale, the development of renewable energies and electric vehicles are the main levers for reducing the carbon footprint: of the 88% reduction calculated by 2030, more than three-quarters are due to the combined development of renewable energies and electromobility



In the "Max Potential 2030" scenario, the storage services provided by batteries are one of the main levers for reducing the island's footprint, avoiding a loss equivalent to 29% of the island's total electricity consumption. This energy, initially lost due to the phase shift between photovoltaic or wind energy production and consumption, is then stored for re-injection. Battery storage allows the island to move from a 70% renewable energy mix without storage to 99.5% renewable energy with storage in 2030, in this scenario.