

enel x



**ELECTRIC PUBLIC
TRANSPORT**



SUSTAINABLE, TURNKEY PUBLIC TRANSPORT

Enel X firmly supports the view that **electric mobility** has a key role to play - in both the public and the private sphere - on our journey towards making cities sustainable.





for public administrations and to help institutions and market operators revolutionize the concept of urban transport by leveraging the transition to electric vehicles.

Thanks to its pioneering experience and the substantial investments it has made in electric mobility for private use, Enel X is now in a position to offer integrated green transport solutions

0% CO₂ emissions

The advantages

The transition to electric public transport:

-  **improves air quality** in urban environments, by reducing CO₂ emissions;
-  **reduces urban noise pollution**;
-  **cuts operating costs** compared with diesel (lower servicing costs and economic advantages compared with the use of imported fuels);
-  **provides** the public with a better, more comfortable and more **extensive service**.

Savings of up to 70% on consumption



Offering

Enel X's innovative offering is **flexible and comprehensive**, and ranges from the design of the service - which accurately and efficiently identifies the characteristics of the electric transition project - to the installation and management of the electric infrastructure.

The Enel X offering is **end-to-end** and can include electricity storage systems (batteries) and charging stations, electricity supply (entirely from renewable sources), fleet management and optimization of consumption, using innovative energy management and demand response techniques. Furthermore, thanks to our partnerships with key operators, such as electric bus manufacturers, the solution can be supplied in **turnkey** form, thus including the supply and maintenance of the vehicle fleet.

This enables public administrations to benefit from an **innovative, sustainable service**, with limited impact on investment requirements and effective, optimized management.

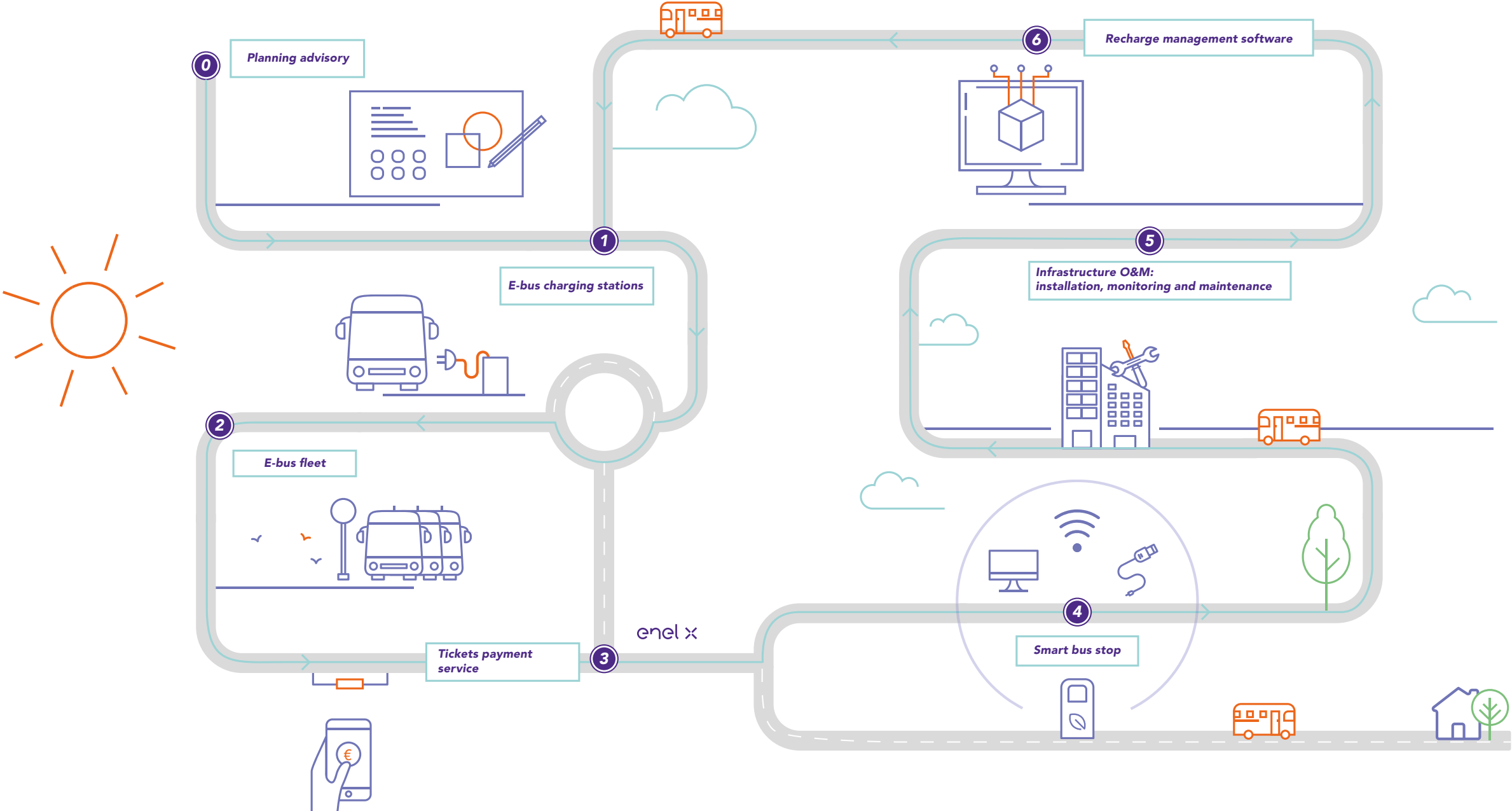
Charging-as-a-Service

Enel X's innovative approach, based on **charging "as-a-service" for electric buses**, offers a wide range of benefits, from removing economic barriers to simplifying the internal management of the service.

How does it work? The costs of design, installation, management and multiannual infrastructure maintenance are borne by Enel X and allocated to each kWh of electricity supplied for charging. This means electric bus service operators do not need to make any initial outlay or take on the complex task of running infrastructures, because they can simply use the charging stations and focus their resources on providing a more efficient and comfortable service.

This business model also optimizes investments, charging fees and public land use, by sharing usage of the infrastructure with other public fleets and/or private vehicles.

END TO END SERVICE



OUR VISION: MUCH MORE THAN JUST ELECTRIC BUSES

Enel X's ambition is to revolutionize public transport by using the electrification of the bus fleet as a first step towards a new model of mobility that is clean, functional, fair and modern. How do we imagine the mobility of the future?

Waiting time becomes free time

The integration of screens, sensors, video cameras, photovoltaic panels and connectivity services will turn bus shelters into sustainable, integrated, efficient, interactive solutions that will redefine our urban habitat and **turn downtime into useful time for users**.

From bus to urban watchman

Who said a bus is just a bus? The installation of environmental sensors, video cameras and other devices on board makes it possible to **collect information in real time** about the state of the bus itself (e.g. cleanliness and safety), the road surface, traffic, waste collection and urban security. This means buses can help optimize a whole host of public services.

No more overcrowded or under occupied buses

Predictive models and real-time data open up new opportunities for fleet management and **optimization of the frequency and capacity** of the buses in circulation. For example, if a bus is overcrowded, a message is sent to the operations center, flagging up the need to deploy or plan a larger vehicle or increase the frequency of the service.

Pay per move

New technologies are giving us access to new **digital payment** systems and these are opening up new horizons in terms of **service models**. How? Imagine paying for bus rides on a per-kilometer basis, like we do for taxis, or not having to buy a ticket but simply swiping the screen of our smartphone as we board. Or converting supermarket loyalty card points into free (and clean) kilometers.

Urban electric corridors

Fast charging points for buses can be opened up for use by other publicly or privately operated vehicles, so as to optimize infrastructure costs and help cities make the transition to sustainable urban mobility. This would turn bus routes into effective electric charging corridors, which would encourage the use of electric vehicles and help make further **reductions in urban CO₂ emissions**.

Made-to-measure services

Tourists, families, elderly people, people with reduced mobility: we all have different needs when it comes to getting around town. For example, the origin and destination might be the same, but the ideal route could be different. Tourists might opt for a longer, more scenic route; elderly passengers might want to avoid changing buses and waiting for connections; while people traveling to and from work probably want the quickest, most efficient route, perhaps with a stop-off to do the shopping on the way home. Public transport can now offer **routes and packages** at different prices for different types of user.



"FLEET ELECTRIFICATION MANAGEMENT": SUSTAINABILITY FOR PUBLIC ENTERPRISE FLEETS

Fleet Electrification Management (FEM) by Enel X enables public administrations to **electrify their fleets** by means of a turnkey service complete with consulting, supply of charging infrastructure and management services.

The aim of the consulting stage is to identify the methods, timetables and benefits of fleet electrification by analyzing the actual conditions of use of the vehicles concerned.

How does it work? Our algorithms simulate the actual energy consumption required for each trip, by analyzing the impact of the following factors:

CHARACTERISTICS
OF E-VEHICLES

DRIVING STYLE

WEIGHT
TRANSPORTED

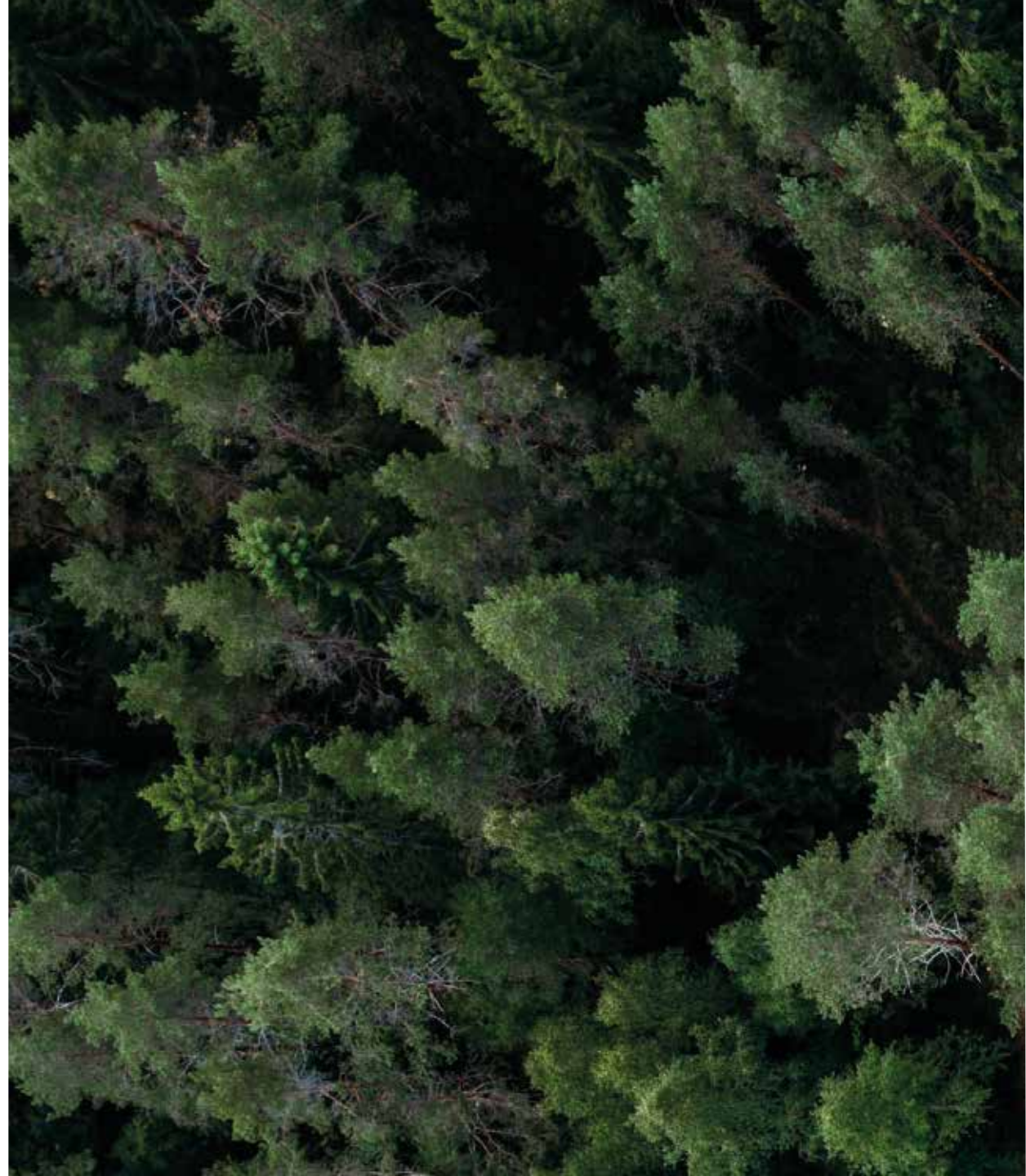
TOPOGRAPHY

WEATHER
CONDITIONS

TRIP
CHARACTERISTICS

Analysis Outputs

- > **Percentage of vehicles** analyzed **that can be replaced** with electric vehicles.
- > **Fleet inefficiencies.**
- > **Financial and CO₂ savings** achieved by electrification of the fleet.
- > **Routes** used by the vehicles.
- > **Stops** made, geo-referenced and clustered by duration.
- > **Number and location of electric vehicle charging infrastructures.**



WITH ENEL X, SANTIAGO PUBLIC TRANSPORT GOES GREEN

The situation

Santiago, the capital of Chile, identified the **electrification of public transport** as a major step point towards city decarbonization. Starting point: 0 electric buses.

The initiative

A partnership between Enel X, BYD Chile (an electric vehicles manufacturer) and Metbus (Chile's public transport operator) gave rise to a public electrified mobility project covering the supply, installation, management and maintenance of e-buses and related charging systems. The scope of the project includes:

- **285 electric buses;**
- **smart control** of load management with real-time monitoring;
- supply of certified **100% renewable** electricity;
- electricity terminals with over **120 charging points;**
- car parks with **photovoltaic panels** designed to generate **60kW of power**, used to supply auxiliary consumption.

Results

- The newly introduced green vehicles consume **70%** less than their polluting predecessors.
- **The only technological innovation of its kind worldwide**, making Chile a beacon for the whole of Latin America.

"Today we are celebrating a major step forward for electric mobility. This project has been made possible by the joint efforts of businesses and institutions, and it makes Chile a beacon in electric mobility for the whole of Latin America. Enel X gave the project the full benefit of its international experience in integrated solutions for electrified mobility and charging systems, thereby testifying to its firm commitment to the development of technology designed to make public transport efficient, eco-sustainable and emissions-free".

Paolo Pallotti
General Manager of Enel Chile



USE CASES

ULTRA-FAST CHARGING FOR ELECTRIC BUSES IN BARCELONA

The situation

To optimize the management of its electric bus service and meet unexpected needs and demand for charging, the city of Barcelona decided to install **ultra-fast charging systems** capable of handling unexpected needs and demand.

The initiative

Working in conjunction with TMB, the local public transport operator, Enel X installed **Pantografo**, an innovative ultra-fast charging system for electric buses, at the bus terminus. This system works by combining two elements - the charging point and the retractable arm fitted on the roof of the bus - and has the following characteristics:

- **400kW** of power;
- 40% to 80% battery charge in **5-8 minutes**;
- **real-time data** sharing with TMB's control center for optimized fleet management;
- **complete safety** for passengers, who can board and alight at any time, even during charging;
- fast charging sessions **synchronized** with drivers' breaks, so as not to disrupt the bus timetable.

Results

Within a few minutes, the Pantografo gives the battery enough **charge for the vehicle to complete** its return route of about 12 km and get back to the main depot, where - as part of the **ZeEUS** project (an EU project for promoting electrified urban mobility) - two overnight chargers have been installed, which top the buses' batteries up to full charge in two or three hours.



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For further information visit the section dedicated to City on our website www.enelx.com

