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ENTIDADE REGULADORA
DOS SERVIÇOS ENERGÉTICOS

Regulation and Power System Digitalisation

Jorge Esteves



Regulation and Power System Digitalisation

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1. **Who are we?**

2. Examples of the metrology importance for the Energy Transition
   (Smart Grids, Self-generation and Energy Communities and Electric Mobility)

3. Legal metrology and the Portuguese energy sector

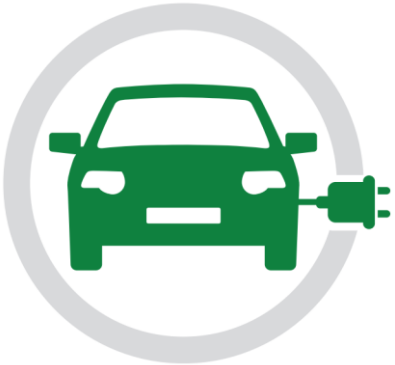
Who are we? Regulated sectors

Mission

Regulating the energy sector defending present and future consumers, promoting the sustainable operation of the sector in a context of energy transition.



Electricity



Electric Mobility



Fuels



Natural Gas



LPG

ERSE's areas of responsibility

Regulation



Approves regulations on quality of supply, commercial relationships and networks access and operation

Regulation



Sets tariffs and prices

Supervision



Checks
Supervises
Inspects

Sanction



Conducts proceedings
Imposes fines and other penalties

Arbitration



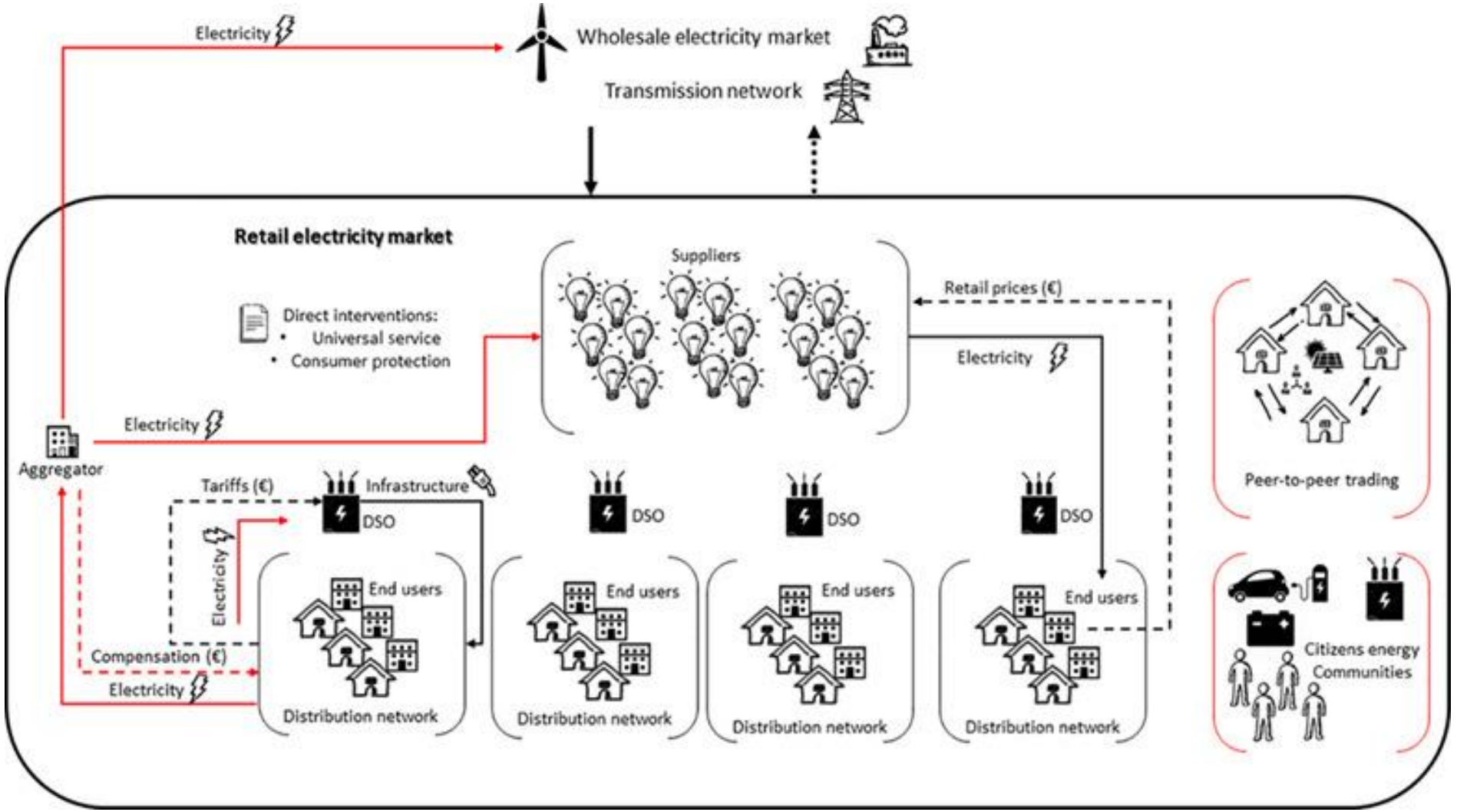
Promotes and makes use of Alternative Dispute Resolution

Institutional Cooperation



Provides opinions for the Portuguese Parliament, Government, General Directorates, among others

The electricity system evolution



Source: https://wires.onlinelibrary.wiley.com/doi/abs/10.1002/wene.359

CEER and ACER

CEER
Council of European Energy Regulators

ACER
European Union Agency for the Cooperation of Energy Regulators

CEER - Council of European Energy Regulators

CEER is the voice of Europe's national energy regulators (NRAs) at EU and international level. Through CEER, the national regulators cooperate and exchange best practice.

Objectives and Functions

The overall aim of the Council of European Energy Regulators (CEER) is to **facilitate the creation of a single, competitive, efficient and sustainable internal market for gas and electricity in Europe**. The CEER acts as a **platform for cooperation, information exchange and assistance between Europe's** NRAs and is their interface at EU and international level.

ACER - The European Union Agency for the Cooperation of Energy Regulators

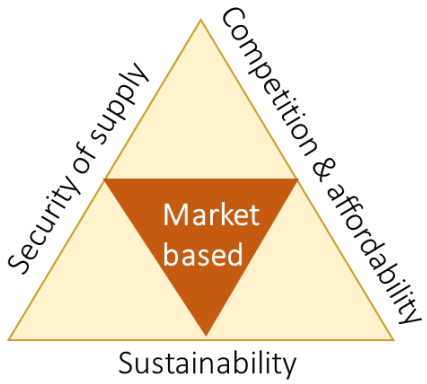
ACER was established in March 2011 (Third EU Energy Package legislation) to foster cooperation among the EU NRAs and help ensure that a single European market for electricity, and similarly natural gas, functions well. ACER's headquarters are in Ljubljana, Slovenia. ACER is one of the EU decentralised agencies

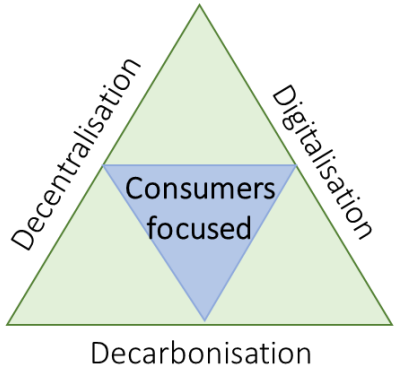
ACER's role includes:

- **Supporting the integration of energy markets in the EU** (by common rules at EU level).
- **Contributing to efficient trans-European energy infrastructure**, ensuring alignment with EU priorities.
- Monitoring energy markets so that they function well, **deterring wholesale energy market manipulation and abusive behaviour**.
- Where necessary, **coordinating cross-national regulatory action.**

Energy Transition: the European vision and strategy

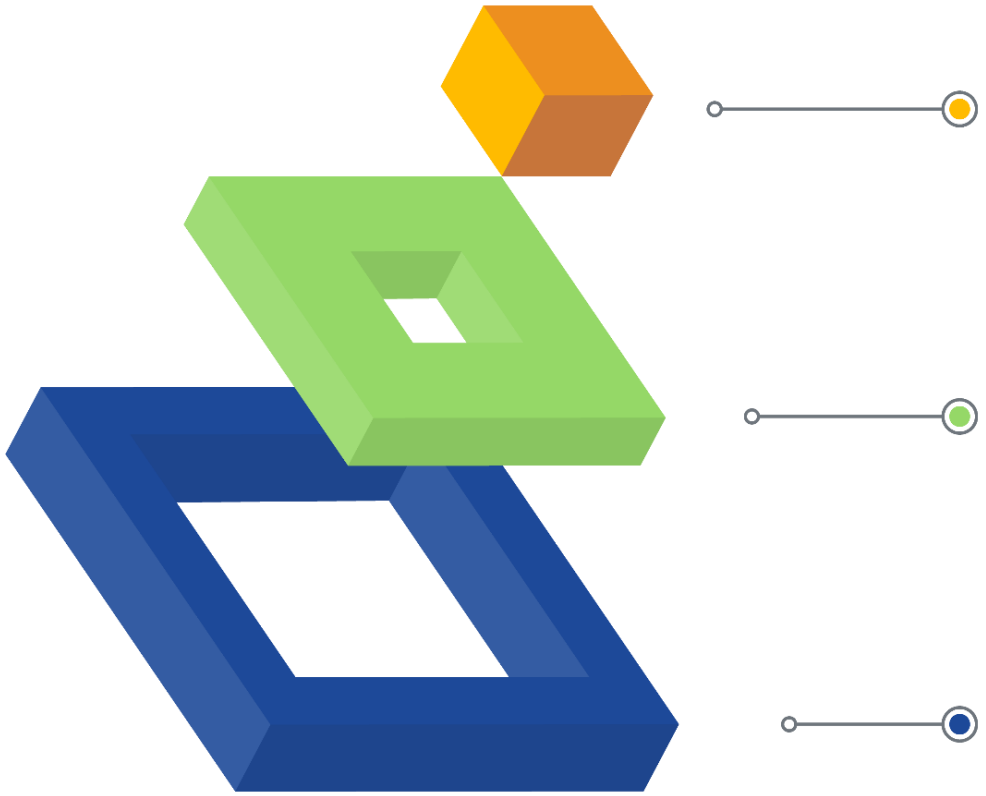






A process that started 30 years ago and is now projected for the next 30 years

Energy Transition: the European vision and strategy



Energy system integration and a CIRCULAR Energy Economy

- Green Deal & H2 & RES gas
- System integration
- New actors, technologies and business models
- Carbon neutral society
- Energy efficiency first!

Local integration and a LOCAL Energy Economy

- Clean Energy Legislative Package
- Consumer empowerment
- Self-consumption
- Energy communities
- Peer-to-peer

Expanding market integration and a GLOBAL Energy Economy

- 1st, 2nd, 3rd EU Legislative Packages
- Liberalisation
- Unbundling
- Internal Energy Market
- New EU level bodies and codes

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   (**Smart Grids**, Self-generation and Energy Communities and Electric Mobility)

3. Legal metrology and the Portuguese energy sector

Smart Grids: Smart network of smart meters

Digitalization in the energy sector is an important tool for the energy transition success



Objective:

achieve 100% implementation of meters integrated into a smart grid in the Portuguese electricity sector by the end of 2024 (DL 15/2022)

[6,4 million costumers]

- Renewables
- Self-consumption
- Communities
- Sharing
- Electric vehicles
- Storage
- Distributed energy resources
- Flexibility Services
- System Services

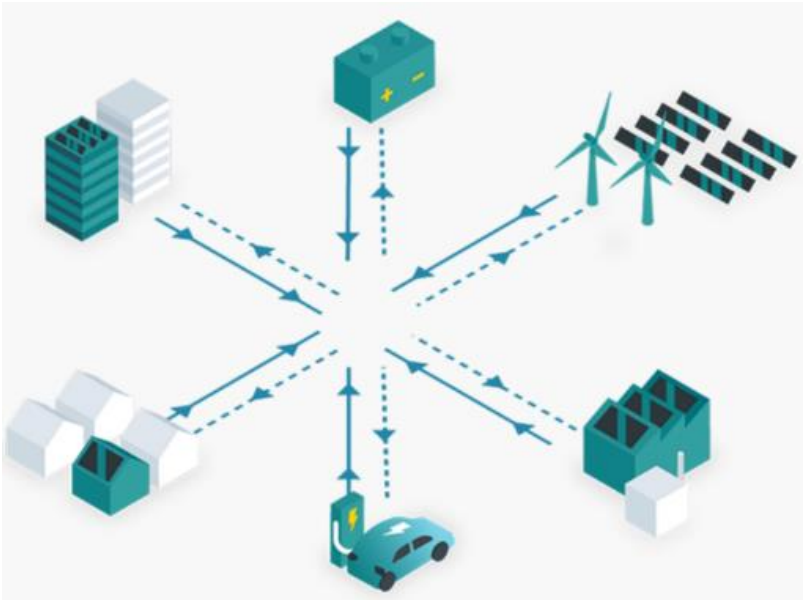
Smart grids indicators

(ERSE Public Consultation # 120)

The smart grid facilitates the integration of renewables and consumers active participation

The smart grid introduces a two-way dialogue where electricity and information can be exchanged between operators and all the network users

Smart grids provide the data and automation needed for solar panels and wind farms to feed energy into the grid and optimize its use



Data and automation provided by Smart grids allow a consumers active participation in providing services to the power system

Smart grids allows the management of electricity generation and consumption in a more precise and predictable way

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Decentralization of commercial relationship

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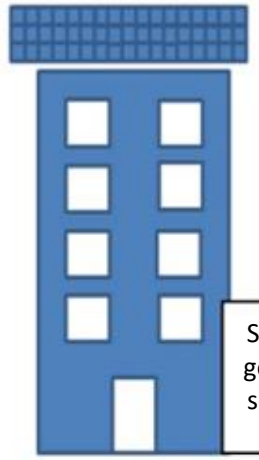
Self-generation and Energy Communities

Individual self-generation



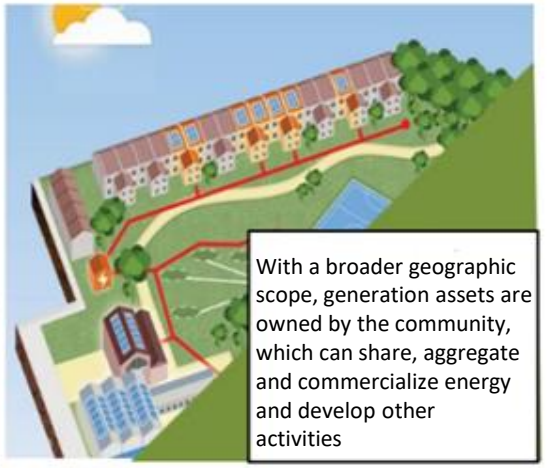
End customer that self-generates the consumed renewable electricity

Collective self-generation



Sharing of electrical generation between several neighboring consumers

Energy Communities



With a broader geographic scope, generation assets are owned by the community, which can share, aggregate and commercialize energy and develop other activities

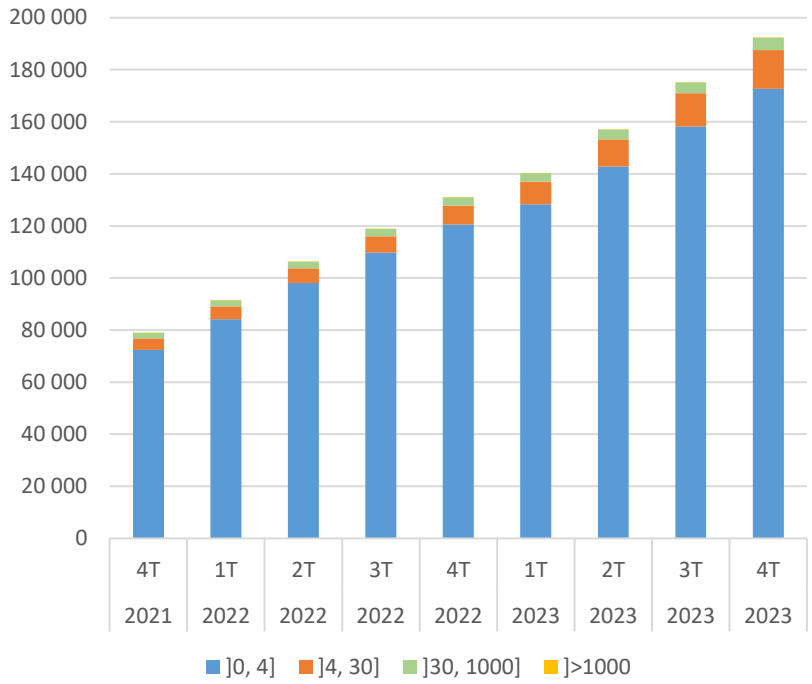
Generation for self-consumption (self-generation) and Energy Communities respond to global macro trends

Introduces the “energy sharing” concept

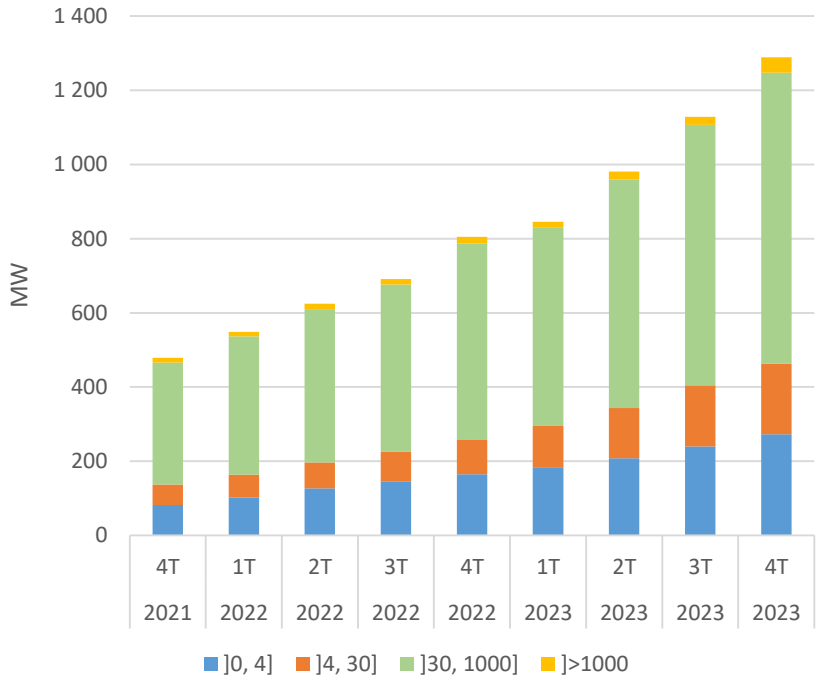
Allows to “democratise” the energy access, as well as the energy transition process!

Self-generation evolution

installations



Installed Self-generation capacity (MW)



15-minute settlement period, between network consumption and injection

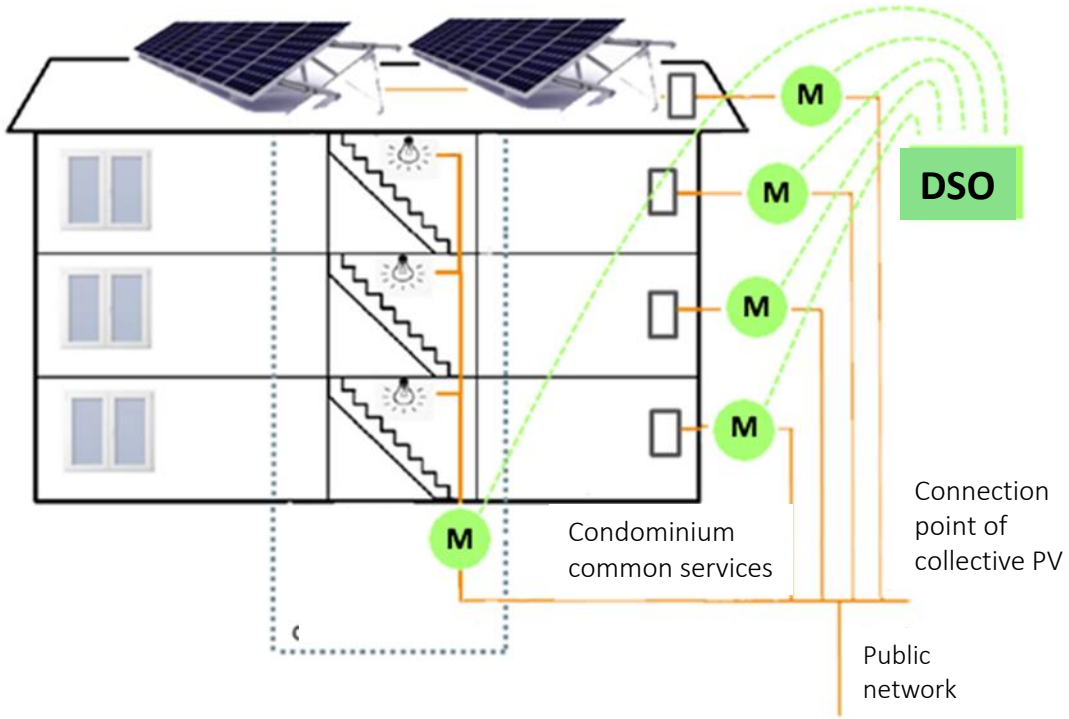
Individual self-generation (2023 compared to 2022):

- Number of installations: +47%
- Installed power: +60%



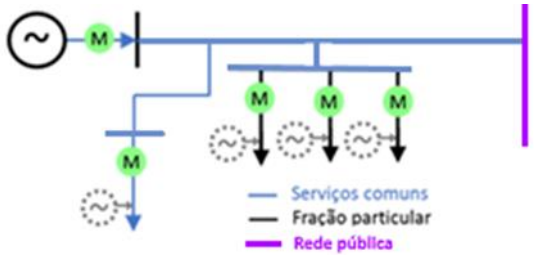
Collective Self-generation and Energy Sharing

Collective self-generation is based on the sharing of energy produced by the collective generation units between the **condominium owners participating at** the collective self-consumption.



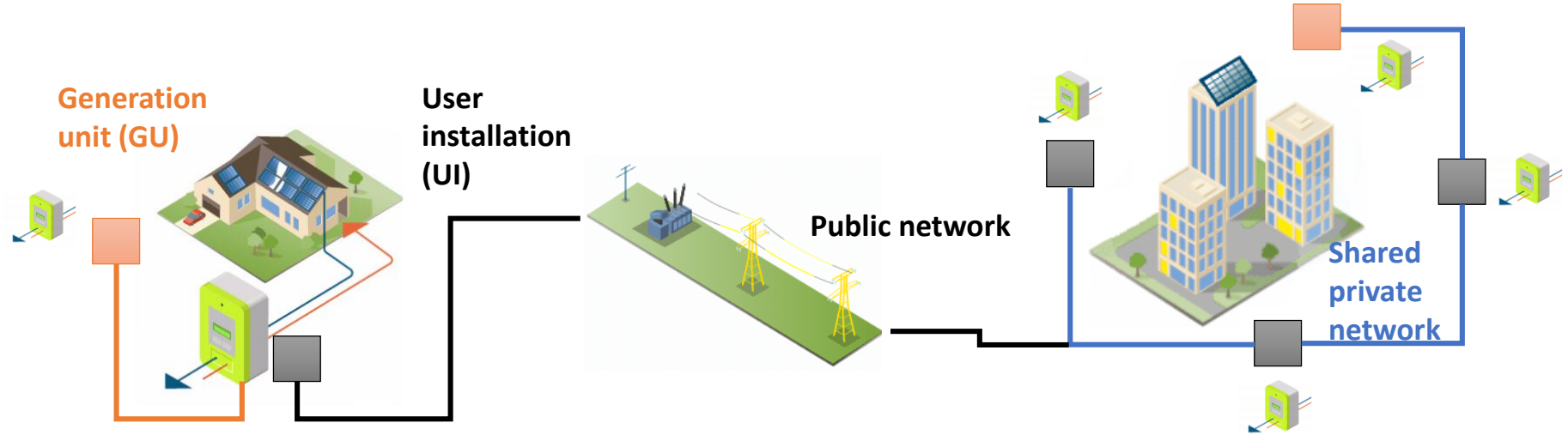
EGAC: Self-generation management entity

Every 15 minutes, the DSO shares the generated energy among consumers adhering to collective self-generation collective, according to coefficients previously informed by EGAC, or based on measured consumption

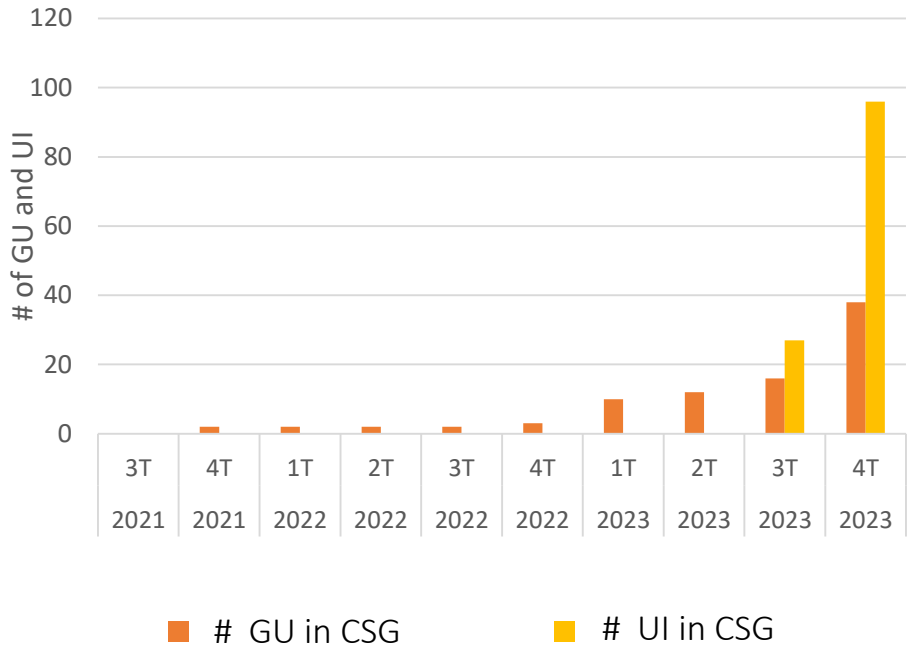


Generation for self-consumption shared collectively between condominium owners
("*Virtual Power Plant*" by condominium)

Energy sharing through Collective Self-generation



- Proximity of generation and consumption
- Use of private or public network
- Smart grid/smart meter required
- Increase of complexity to the network operator systems
- Responsible agents: consumer and network use contracts, access to information, sharing rules…
- Sharing rules: fixed, proportional, hierarchical and dynamic coefficients
- At the end of 2023 there were 32 CSG in Portugal



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Framework for Electric Mobility in Portugal

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Electric Mobility

Electric system

Electric Vehicle User
(UVE)



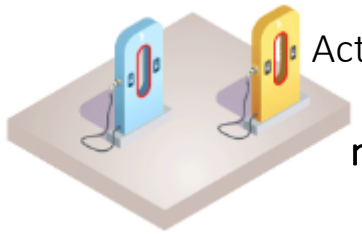
Electricity Suppliers for Electric Mobility (CEME)

Activity carried out under **market regime**

MOBI.E
MOBILIDADE ELÉTRICA

Activity carried out under **monopoly regime**

Electric Mobility Network Management Entity (EGME)



Activity carried out under **market regime**

Point of Charge Operators (OPC)

Private access (car parks, condominiums, etc.)

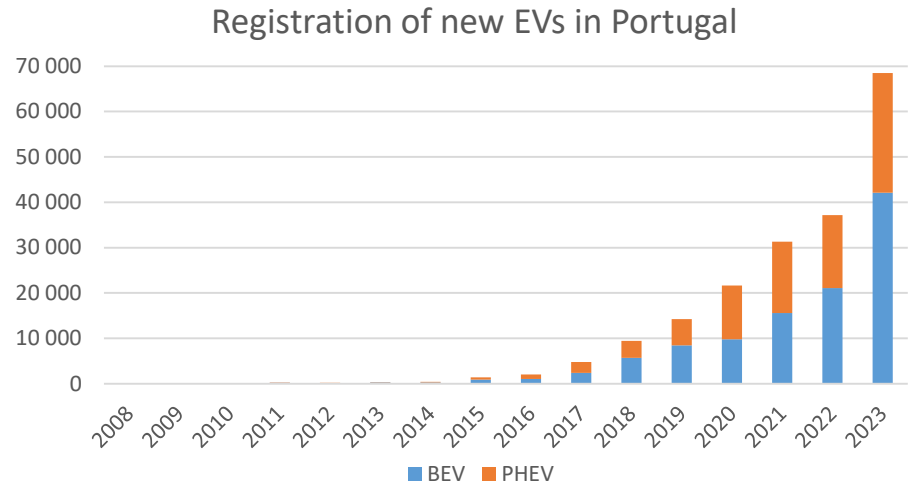


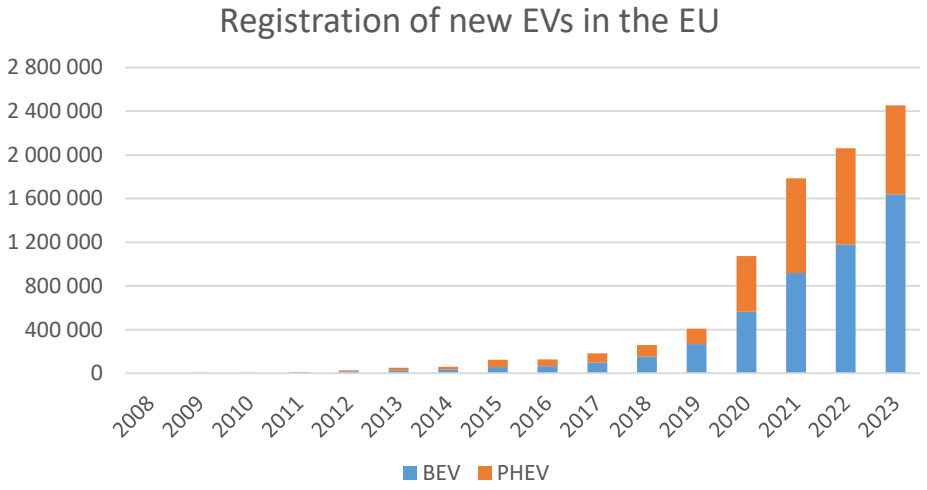


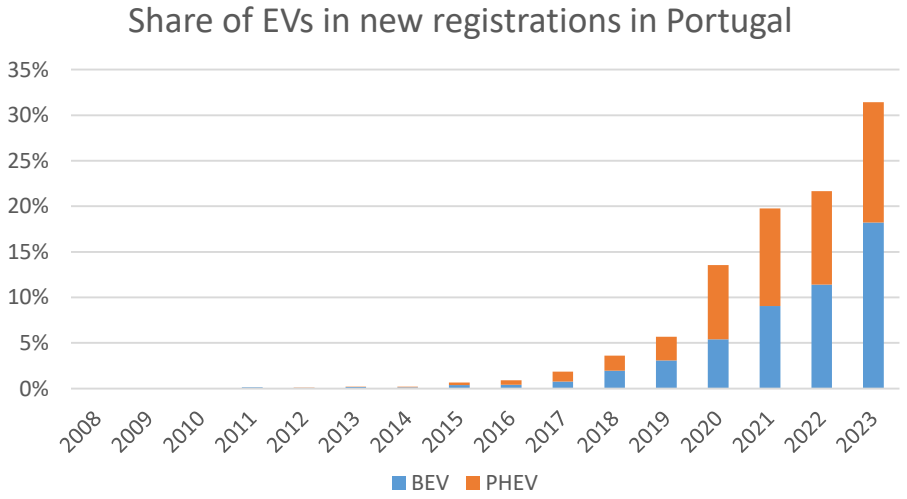
Meters and metering data provision is fundamental for achieving energy transition in the road transportation sector

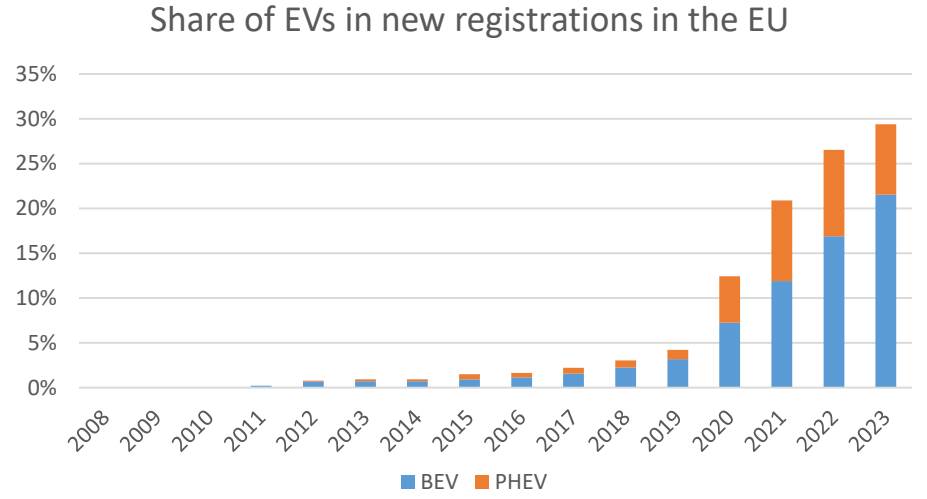
Some evolution is expected on the Portuguese legislative framework after the recent publication of the **AFIR Regulation** (Regulation (EU) 2023/1804) on the deployment of alternative fuels infrastructure

Electric vehicles in Portugal and European Union (M1 + N1)



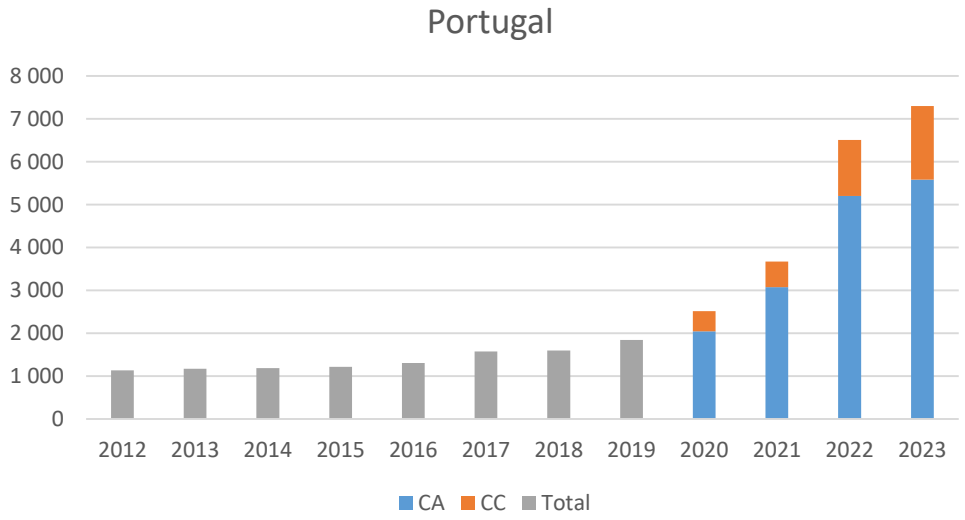


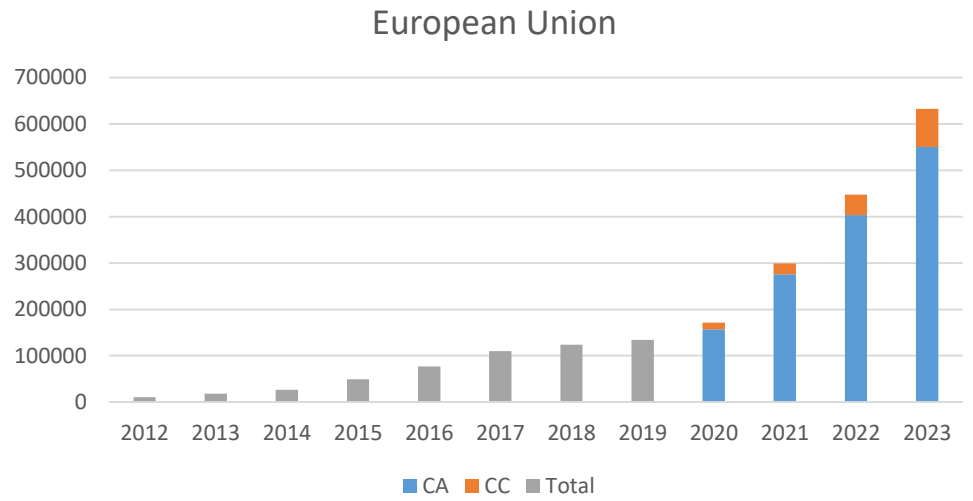


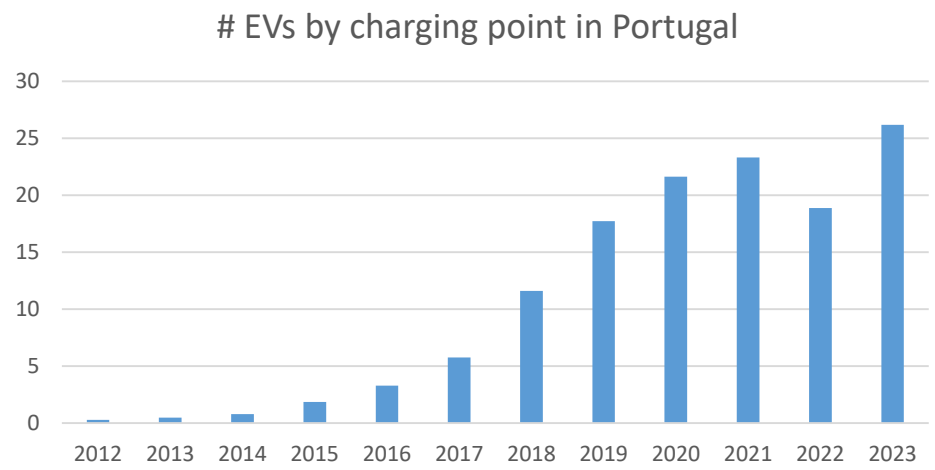


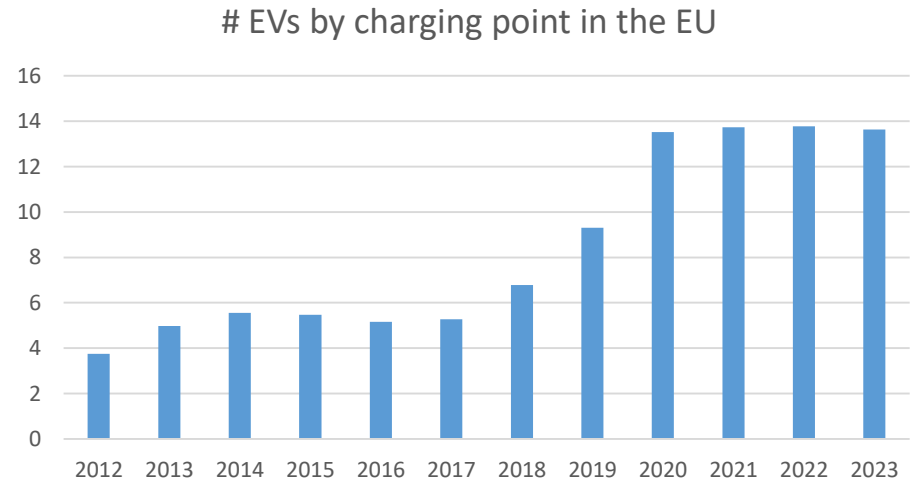
Source: "European Alternative Fuels Observatory", https://www.eafo.eu/ (31/05/2024), M1 – Passenger vehicles, N1 – Light goods vehicles

Number of EV public charging points in Portugal and the EU









Source: “European Alternative Fuels Observatory”, https://www.eafo.eu/ (31/05/2024)

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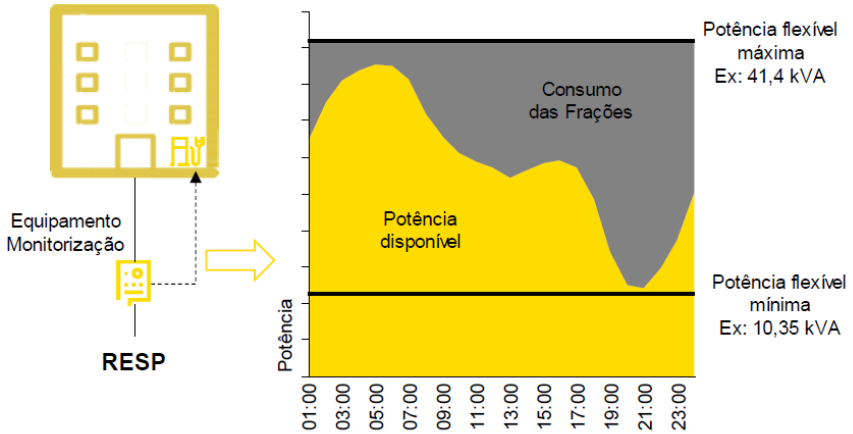
Pilot project in preparation

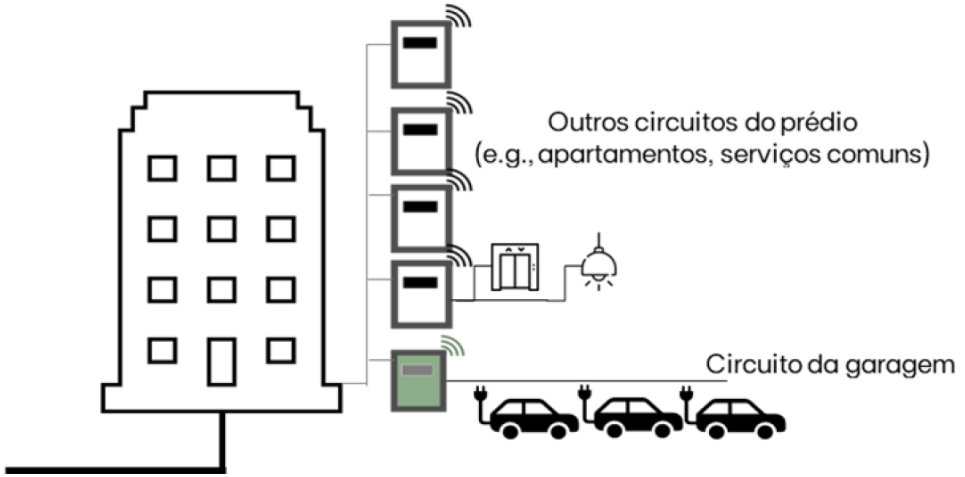
Challenges

- Maximum power available in buildings is insufficient
- Need for network reinforcement

Opportunities

- Flexible consumer connections (FlexC Project)





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Legal metrology and the Portuguese energy sector

In Portugal

- Decree-Law No. 29/2022 approves the general regime for legal metrological control of measuring methods and instruments
- Decree-Law No. 45/2017 establishes the rules applicable to the making available on the market and putting into service measuring instruments)
- Ordinance (“Portaria”) no. 211/2022 approves the General Regulation on the Legal Metrological Control of Measuring Methods and Instruments
- Ordinance no. 321/2019 approves the Regulation on the Legal Metrological Control of Measuring Instruments)
- Ordinance No. 231/2013 approves the technical and functional requirements of smart meters)
- Decree-Law No. 15/2022 approves the organization and operation of the National Electric System and defines that measurement, reading, and provision of data at the power sector by network operators to network users are subject to regulation by ERSE

IPQ – Instituto Português da Qualidade is the National Competent Authority on legal metrology

Cooperation between IPQ an ERSE is essential for assuring the correct development of the metrology regulations to the energy sector

Questions and comments



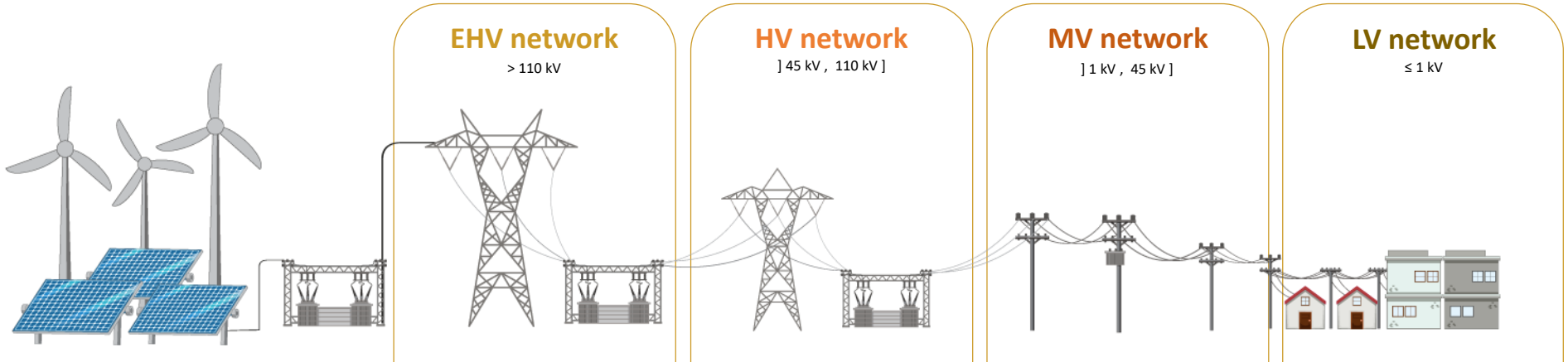


Thank you!

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Monitored delivery points



The **characteristics of the supply voltage wave** at delivery points to consumer installations **must comply** with:

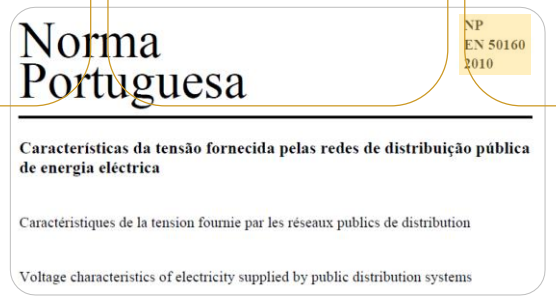
Monitored delivery points:

- Transmission substations and delivery points connected to transmission network
- Distribution substations
- Transformers

Proc. n.º 8 do MPQS

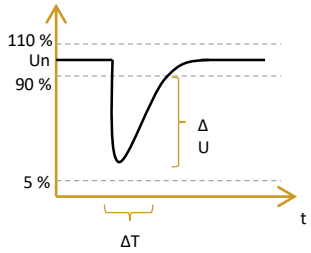


Standard NP EN 50 160

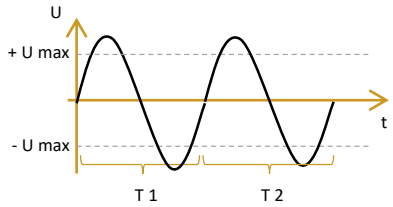


Characteristics of the supply voltage wave

- Voltage dips

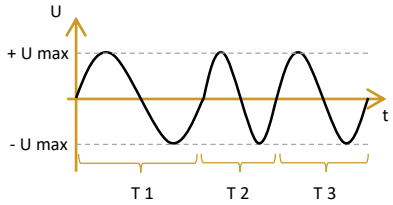


- Voltage swells

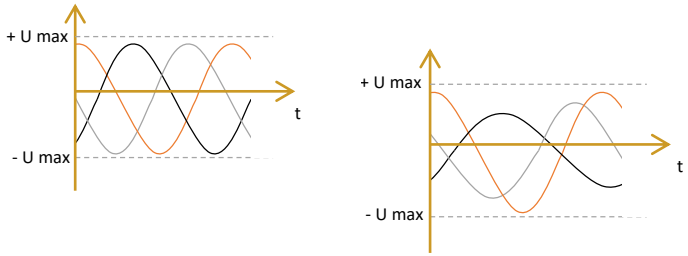


Voltage events

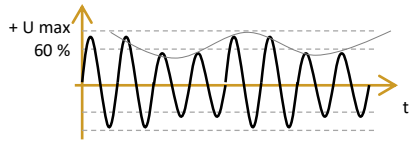
- Frequency



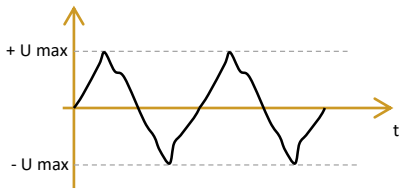
- Voltage unbalance



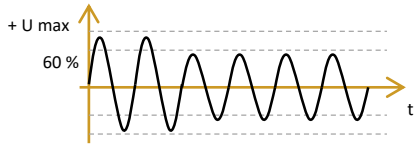
- Supply voltage variations



- Harmonic distortion



- Flicker



Continuous phenomena

Limits of variation of voltage wave characteristics in LV

The characteristics of the voltage wave are defined in the standard NP EN 50160

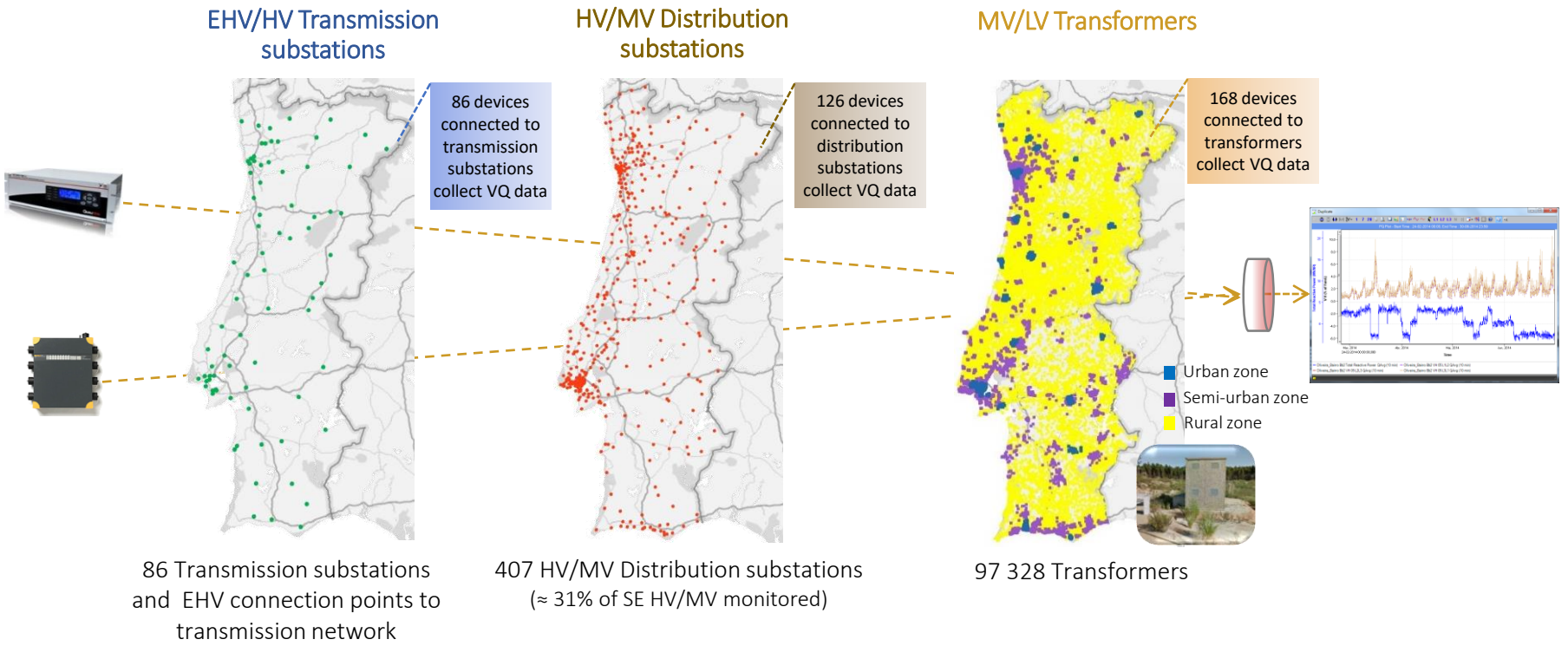
Low Voltage power supply characteristics

VQ indicator	Limits	Evaluation range	Percentage of measurements within limits during the range
Frequency	± 1%	**Year**	99,5%
	+ 4% / - 6%		100,0%
Supply voltage variations	± 10%	**Each week**	95,0%
	+ 10% / - 15%		100,0%
Flicker	$P_{lt} < 1$	**Each week**	95,0%
Total harmonic distortion	THD < 8%	**Each week**	95,0%

Power Quality monitored installations in Portugal mainland

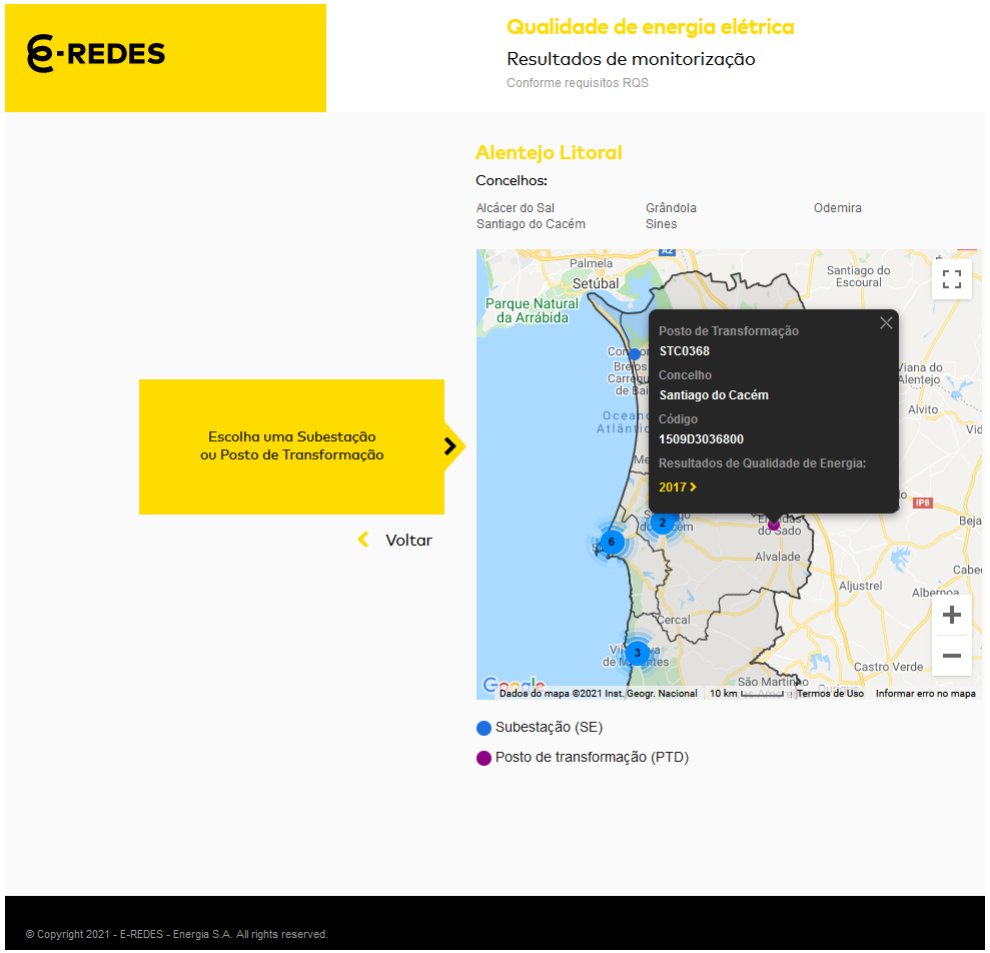
Georeferencing of monitored delivery points

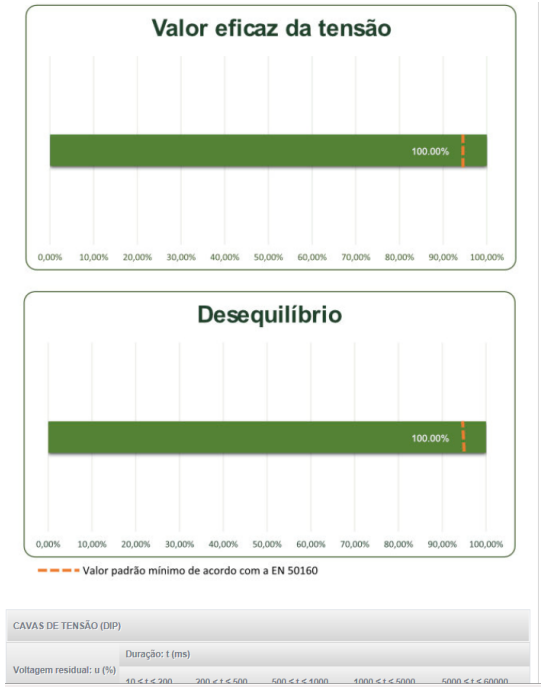
- Network operators already monitor several delivery points (PdE) in EHV, HV and MV distributed across the country, allowing the performance of the networks to be characterized.



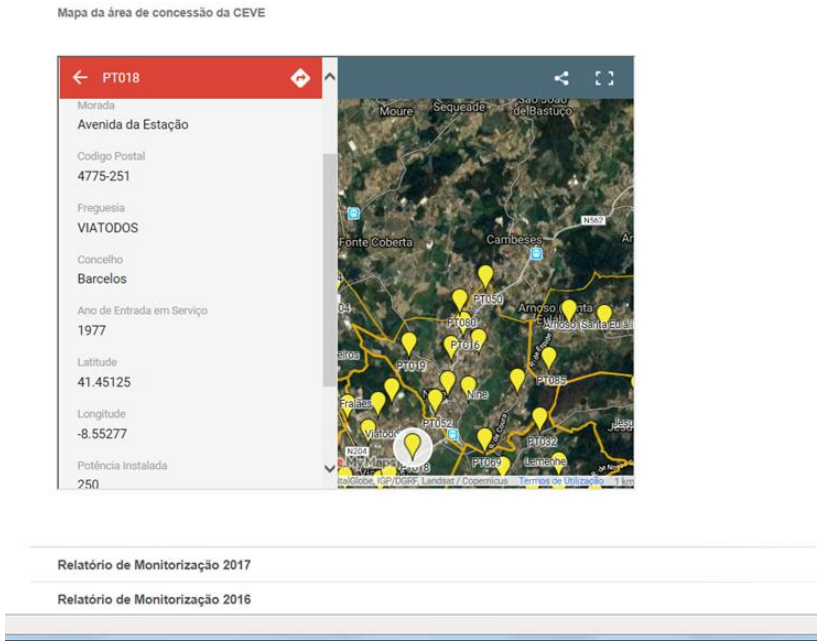
Power Quality

Information available to customers





https://www.celoureiro.com/seccao.php?s=qualidade#tabs-monitorizacao2017_2018



http://www.ceve.pt/index.php?id=156