

# Technical Quality of Service Regulation in Portugal

12 February 2026

# Index

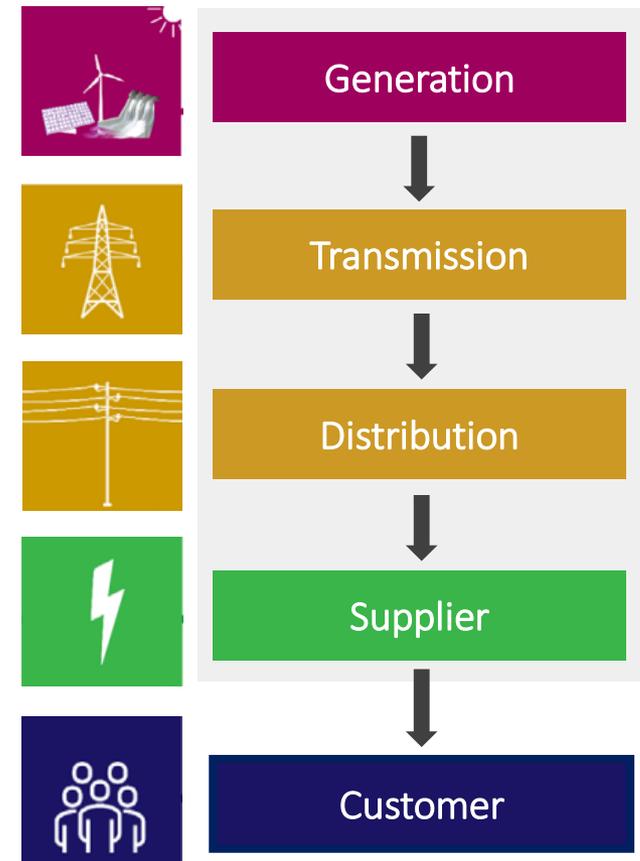
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2. Electricity quality of service regulation in Portugal
3. Continuity of supply
4. Power quality
5. Audits and reports

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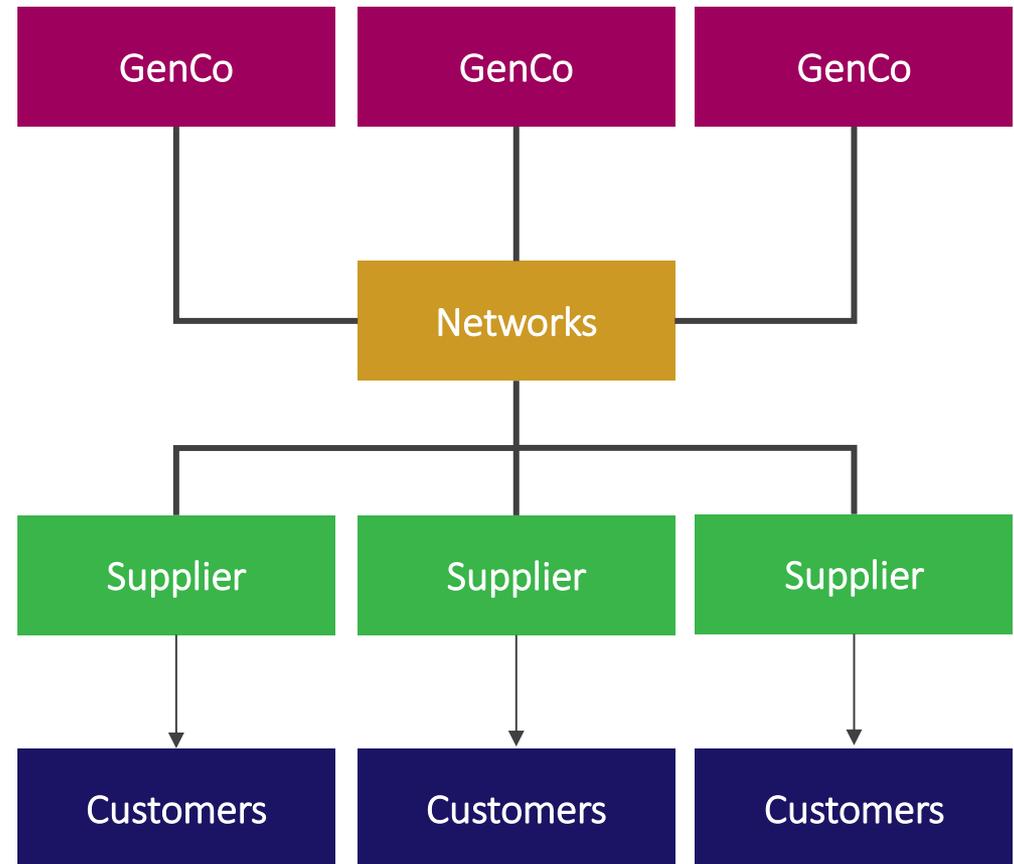
Before 1996, the Portuguese electricity sector was:

- Vertically integrated
- State ownership
- Monopoly
- Consumers pay a full tariff with no choice



From 1996, the Portuguese electricity sector was:

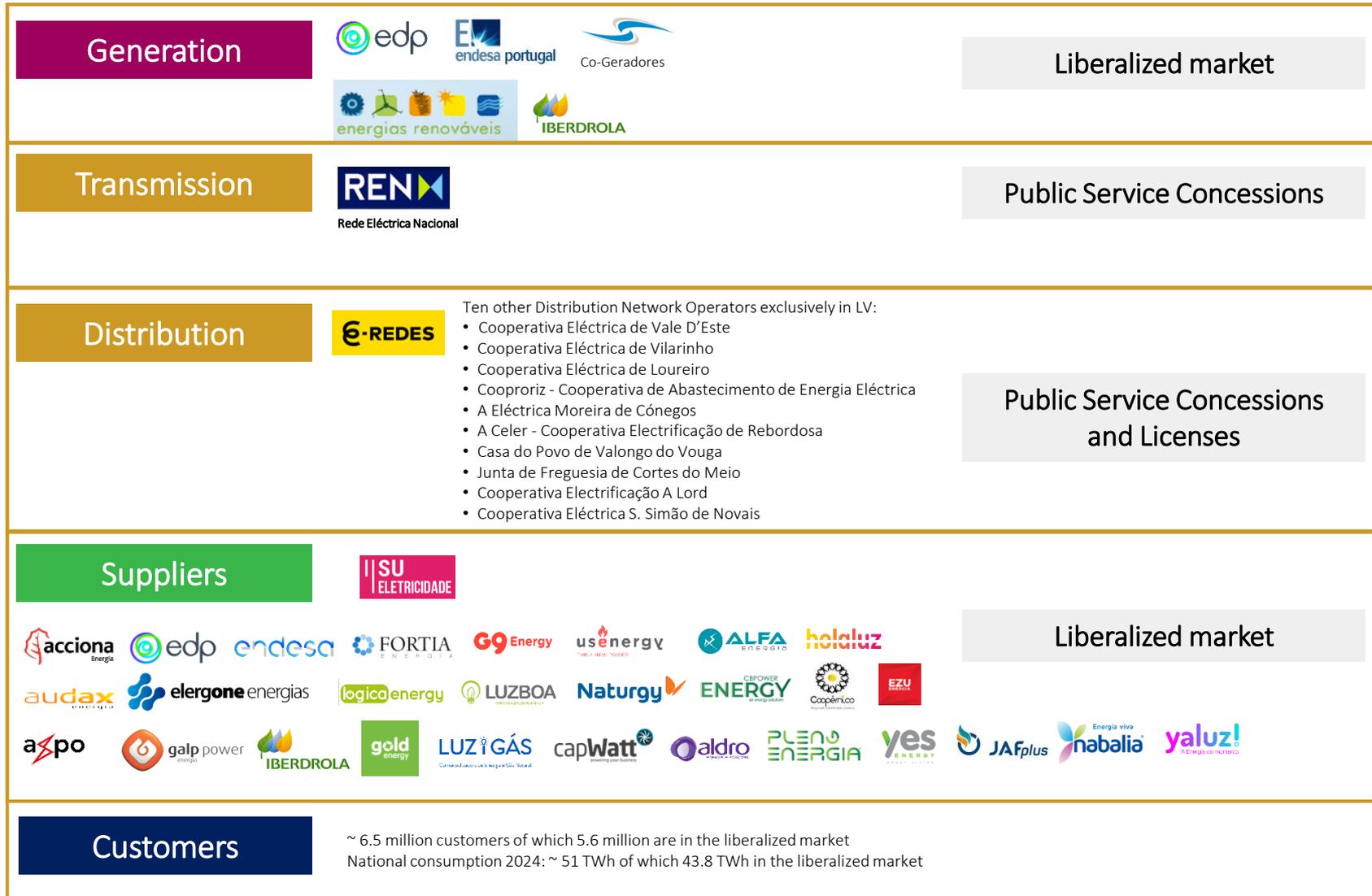
- Competition
- Natural monopoly
- Regulated
- Third party access
  
- Competition
  
- Right to choose a supplier



# Electricity sector organization: unbundled sector



## Mainland Portugal



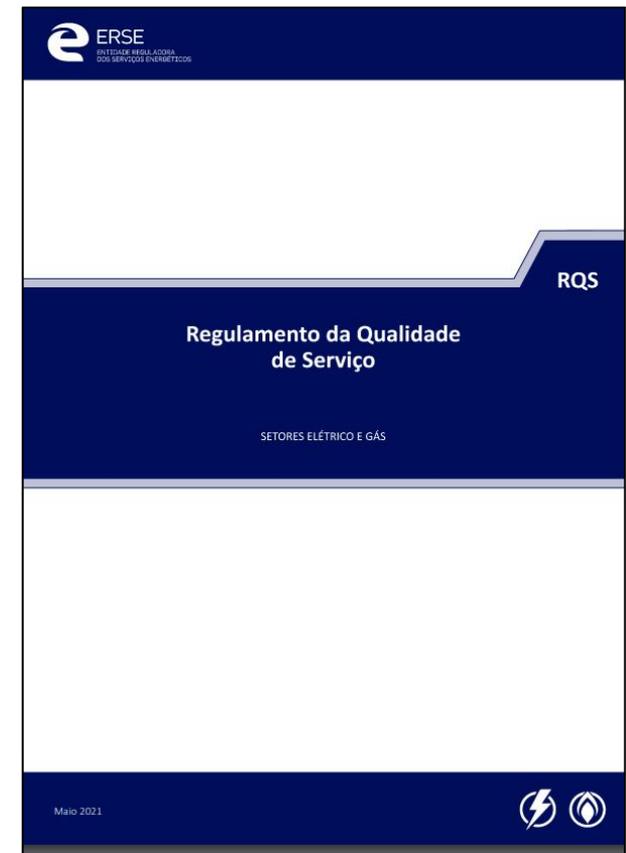
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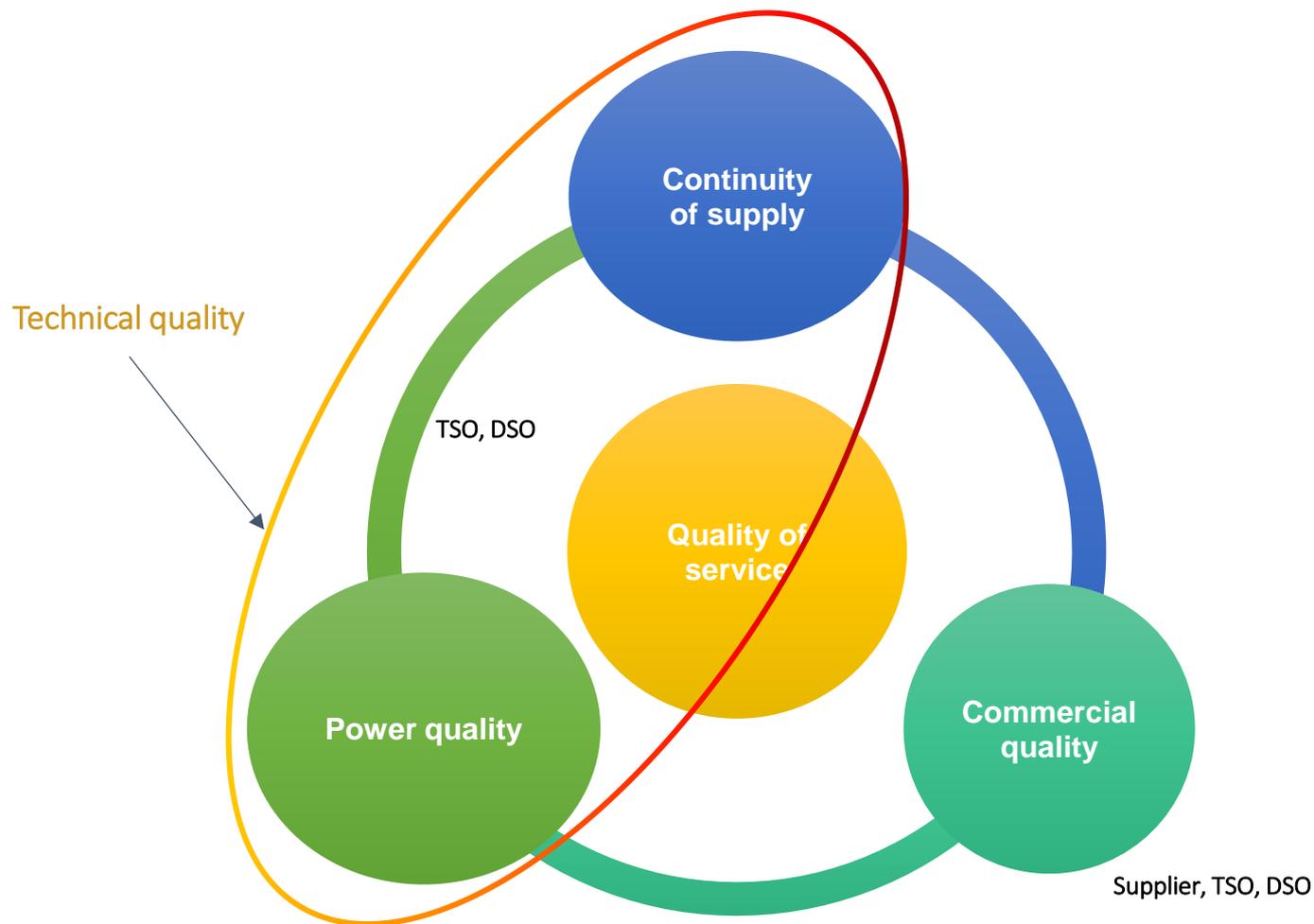
## Quality of Service Code (QSC)

- Electricity sector 
- Gas sector 

The QSC have the same approach but some specificities considering the sectors and the systems.



## Quality of service dimensions



## Quality of service dimensions

### ➤ Commercial quality

- Duties of the supplier and the network operator: Communication, problem solving, contractual issues

### ➤ Technical quality

- Continuity of supply:
  - Number and duration of interruptions
- Power quality:
  - Voltage dips, swells, frequency, flicker, harmonic distortion

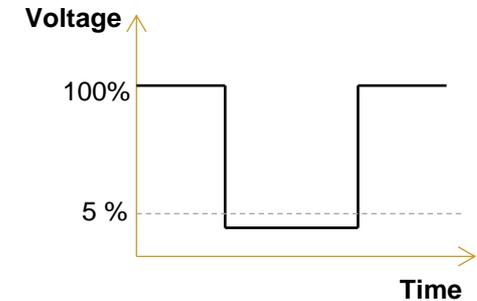
ERSE's regulation contributes to the quality of service

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## ➤ Definition of interruption:

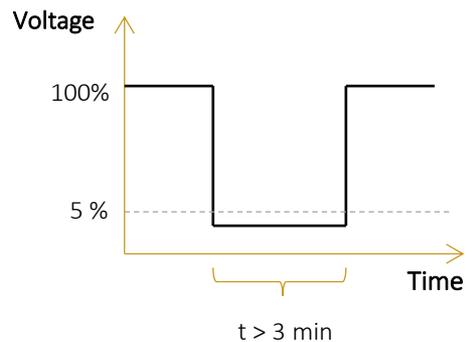
A condition in which the voltage at the supply is lower than 5% of the declared voltage



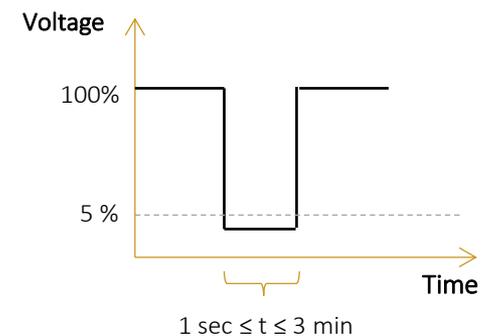
## ➤ Long Interruption *versus* Short Interruption

- Long: interruption with duration greater than 3 min.
- Short: interruption with duration equal or above than 1 second and equal or below than 3 min.

### Long Interruption



### Short Interruption



## Interruption type

### ➤ **Unplanned interruption:**

Interruption without notice (due to faults in the electrical network)



### ➤ **Planned interruption:**

Notice in advance by the network operator to allow the TSO/DSO to carry out scheduled work on the network



Planned interruptions aim to ensure the high performance of the networks



## Interruption type

### ➤ Planned Interruptions - Impact in terms of quality of service:

- interruptions to carry out maintenance work on the networks in order to improve the quality of service
- the maximum number of interruptions is 5 per year and per affected customer and each interruption can only have a duration of less than or equal to 8 hours
- the communication to customers is made at least 36 hours in advance, by individual notice or by means of social communication, to mitigate the impact of its occurrence

## Planned interruption

- Communication of planned interruptions by the network operator

E-REDES

## Notícias

### Interrupções Programadas: 31 de Janeiro

27/01/2021 - 06:24

A EDP Distribuição-Energia, SA informa que para garantir a qualidade de serviço vai efetuar trabalhos localizados na sua rede de distribuição, sendo para tal necessário proceder à interrupção pontual da alimentação de energia elétrica no dia 31 de Janeiro de 2021 (domingo), nos concelhos de Cantanhede e Cascais.

Consulte [aqui](#) os locais afetados e respetivos períodos de interrupção.

🏠 Início

**I Interrupção Programada**

Coimbra/Cantanhede ^

Agendada para 31/01/2021

**União das Freguesias de Cantanhede e Pocariça** 08:00 às 15:00

Localidade: Cantanhede – Lrg. Conselheiro Ferreira Freire, Lrg. do Romal, R. Conselheiro Carvalho, R. S. João, Trav. Lrg. do Romal.  
Conservação e Reparação de Infraestruturas de Rede

Lisboa/Cascais v

1

Google

Oceano Atlântico

Mira

Mealhada Luso Mortágua Santa Comba Dão N234-6 Tábuia

Pampilhosa do Botão N235

Penacova IC6 N17 Coja

Vila Nova de Poiares R2 Arganil Benf

Coimbra

Antanhol IC2 A13 N17 N17

Condeixa-a-Nova Lousã

Miranda do Corvo

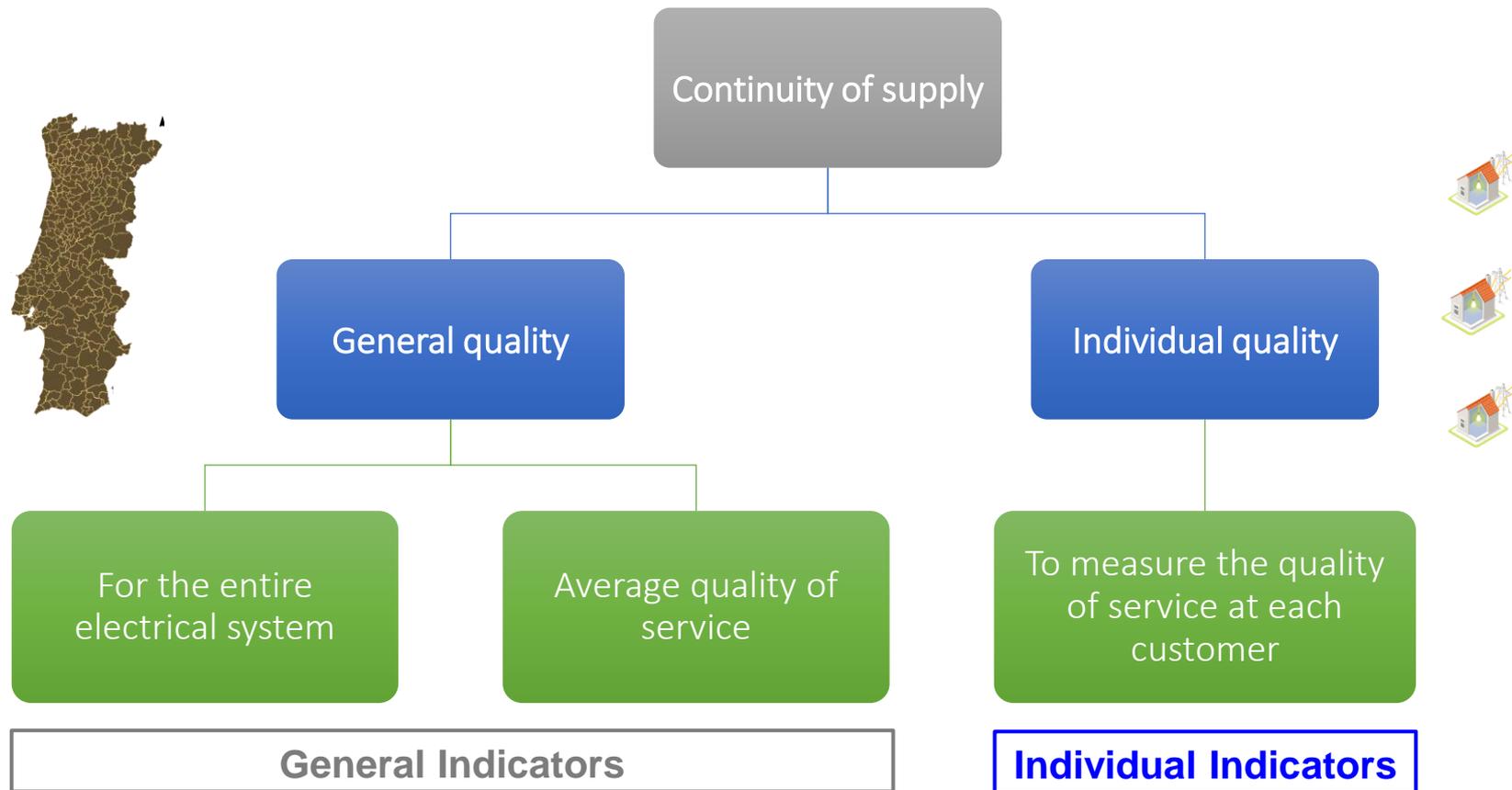
Soure IC3

Pampil

Dados do mapa ©2021 Inst. Geogr. Nacional 5 km

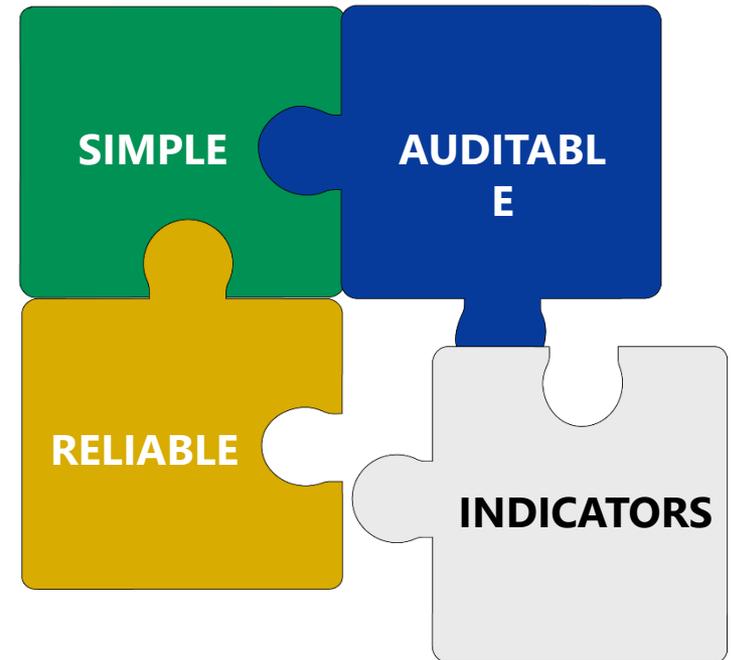
Termos de Utilização

## Continuity of supply indicators



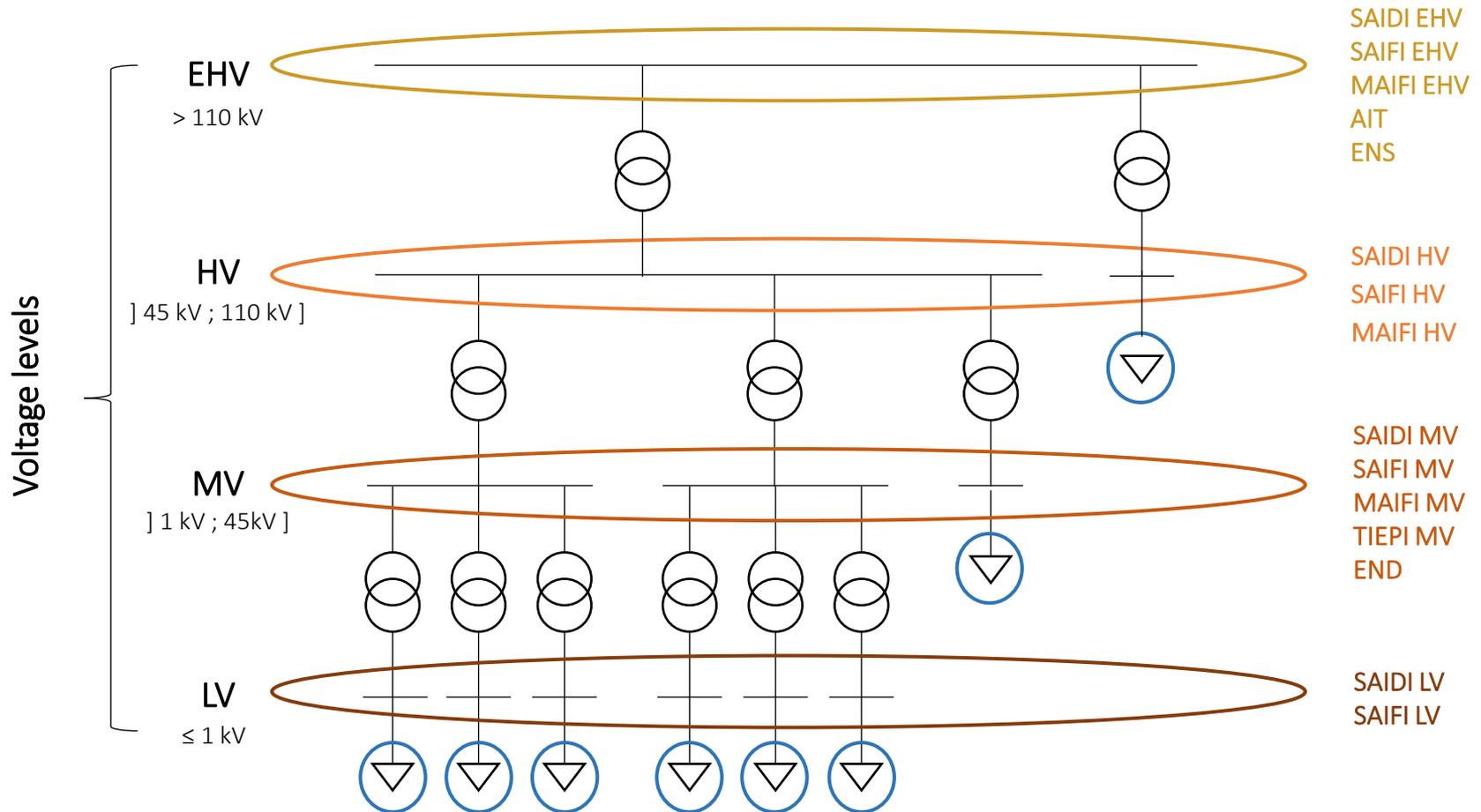
## Continuity of supply indicators

- Quality characterization/quantification
- Properties that indicators must have:
  - **Simple:** ...to understand, ...to determine, ...to implement
  - **Reliable:** the data used for its calculation must be objective and its collection must be highly reliable
  - **Auditable:** possibility to check the data used in its calculation, as well as the calculations performed



General indicators	Quantity	Duration	System	
			Transmission	Distribution
SAIFI	✓ (F – frequency)		✓	✓
SAIDI		✓ (D – duration)	✓	✓
MAIFI	✓ (F – frequency)		✓	✓
AIT			✓	
TIEPI				✓
ENS			✓	
END				✓

- System Average Interruption Frequency Index (SAIFI)
- System Average Interruption Duration Index (SAIDI)
- Momentary Average Interruption Frequency Index (MAIFI)
- Average Interruption Time (AIT)
- Equivalent Interruption Time of Installed Power (TIEPI)
- Energy Non Supplied (ENS)
- Energy Non Distributed (END)



Individual indicators:

- Number of interruptions
- Duration of interruptions

$$SAIFI = \frac{\sum_{i=1}^N N_i}{N_{tot}}$$

**SAIFI:** average number of “long” ( $D_i > 3$  min) interruptions per customer per year

$$SAIDI = \frac{\sum_{i=1}^K N_i D_i}{N_{tot}}$$

**SAIDI:** average duration of interruption per customer per year

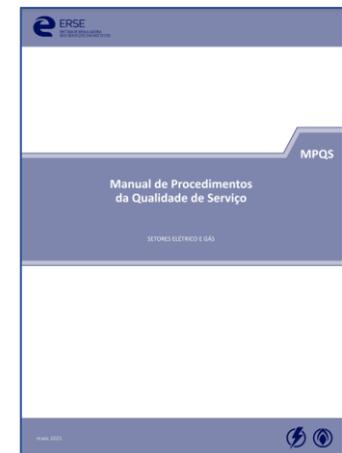
$$MAIFI = \frac{\sum_{i=1}^N N_i}{N_{tot}}$$

**MAIFI** as SAIFI, but for short (“momentary”,  $1 \text{ sec} < D_i < 3 \text{ min}$ ) interruptions

$$AIT = \frac{ENS}{P_{me}}$$

**AIT:** relation between Energy Non Supplied (ENS) and expected average power ( $P_{me}$ ), if no interruptions had been recorded

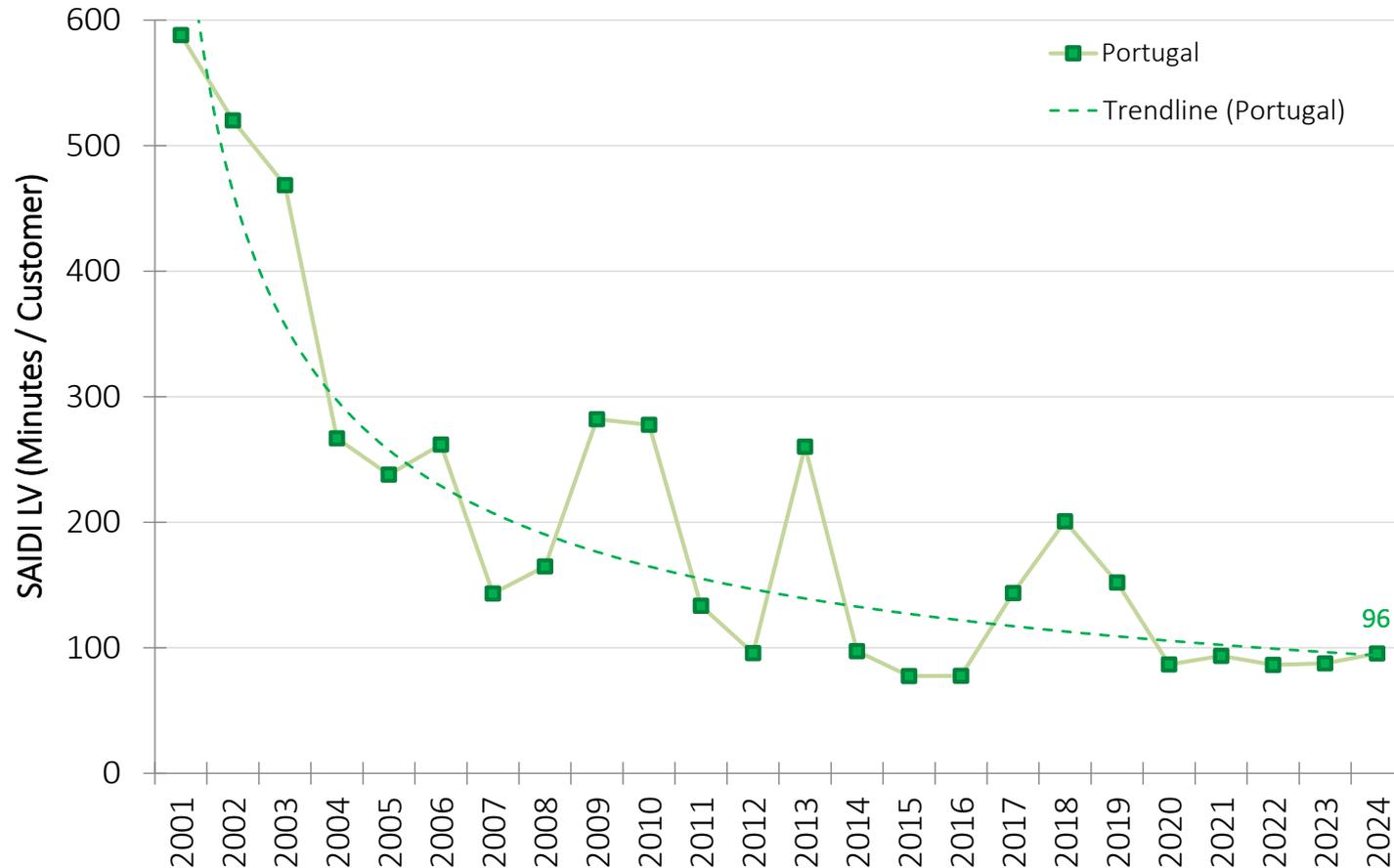
$$P_{me} = \frac{ENS + ES}{T}$$



- The customer is only interested in having information regarding the interruptions that occurred in his installation
  
- **Individual Indicators:**
  - **Number of interruptions:** total number of interruptions experienced by each consumer
  
  - **Duration of interruptions:** total duration of interruptions experienced by each consumer
  
- **Interruptions to consider:** Long (interruptions greater than 3 minutes)
  
- **Calculation periodicity:** Yearly



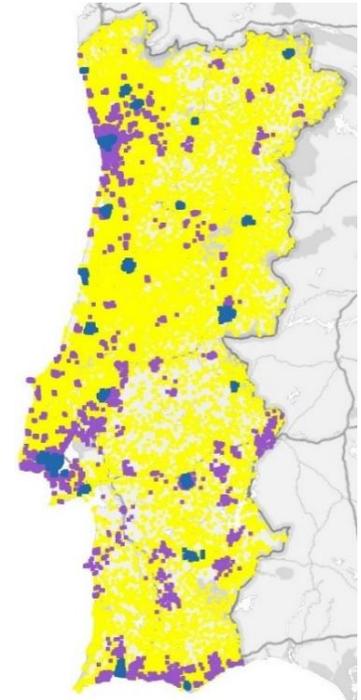
## Evolution of the duration of all interruptions (planned and unplanned) in low voltage



- In mainland Portugal, the SAIDI LV has shown a favorable evolution, with a sustained reduction since 2002 and stabilization at lower levels in the last decade, despite occasional fluctuations.

## ➤ Quality of service zones

- Quality of service zone → set of installation with equal characteristics related to quality of service
- The QSC considers 3 different Quality of Service Zones:
  - Zone A – Places with more than 25000 customers (urban areas);
  - Zone B – Places with customers number between 2500 and 25000 (semi-urban areas);
  - Zone C – Other places (rural areas).



## ➤ Locations with higher customer density



More demanding quality levels

Number of customers per QS zone in mainland Portugal

QS Zone	N.º de customers
A	1 566 008
B	1 995 029
C	2 938 367

## Continuity of supply standards

- Indicators determined taking into account unplanned interruptions
- Long interruptions, not covering interruptions due to Exceptional Events

Exceptional events are deemed to have all of the following characteristics:

- Low probability of the occurrence of the event or its consequences
  - They cause a significant reduction in the quality of service provided
  - It is not economically reasonable for the network operator to avoid all their consequences
  - The event and its consequences are not attributable to the network operator
- An event is only considered exceptional after approval by ERSE, following a request from a network operator or supplier
  - Classification as an exceptional event allows its consequences to be excluded when verifying compliance with standards for general and individual indicators



## Continuity of supply standards

General standards applicable to long unplanned interruptions in MV and LV distribution networks, per year

Voltage level	Indicator	QS Zone	Standard
MV	SAIDI MT (hours)	A	2
		B	3
		C	4
	SAIFI MT (interruption)	A	2
		B	3
		C	4
LV	SAIDI BT (hours)	A	2
		B	3
		C	5
	SAIFI BT (interruption)	A	2
		B	3
		C	4

- Locations with higher customer density
- Higher voltage levels



More demanding quality levels

Individual standards applicable to long unplanned interruptions in HV, MV and LV distribution networks, per year and per customer

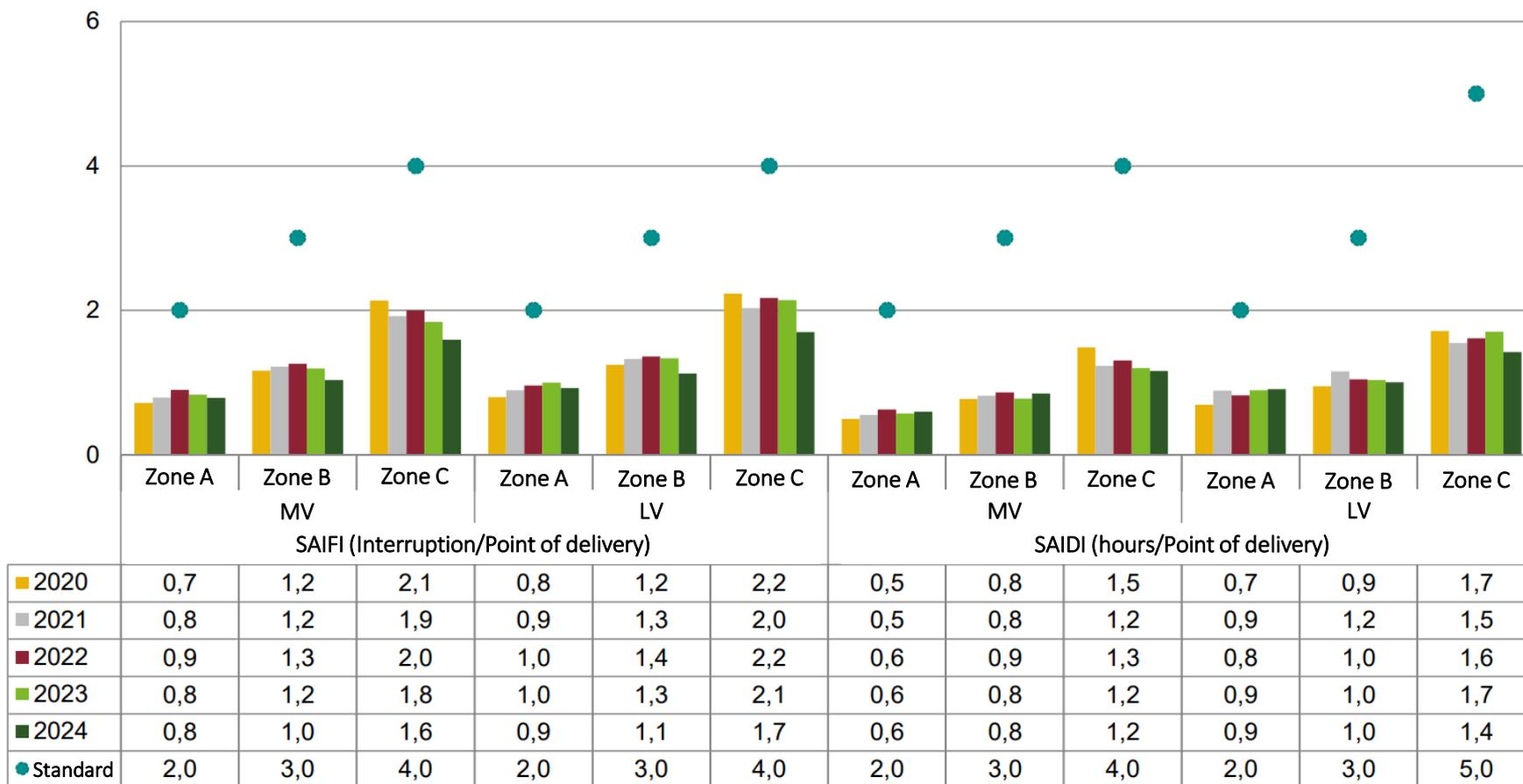
Voltage level	Indicator	QS Zone	Standard
HV	Number of interruptions	A	6
		B	6
		C	6
	Duration of interruptions (hours)	A	3
		B	3
		C	3
MV	Number of interruptions	A	8
		B	9
		C	12
	Duration of interruptions (hours)	A	4
		B	7
		C	10
LV	Number of interruptions	A	10
		B	11
		C	15
	Duration of interruptions (hours)	A	6
		B	9
		C	14

Individual standards applicable to long unplanned interruptions in EHV transmission networks, per year and per customer

Voltage level	Indicator	Standard
EHV	Duration of interruptions (hours)	0.75
	Number of interruptions	3

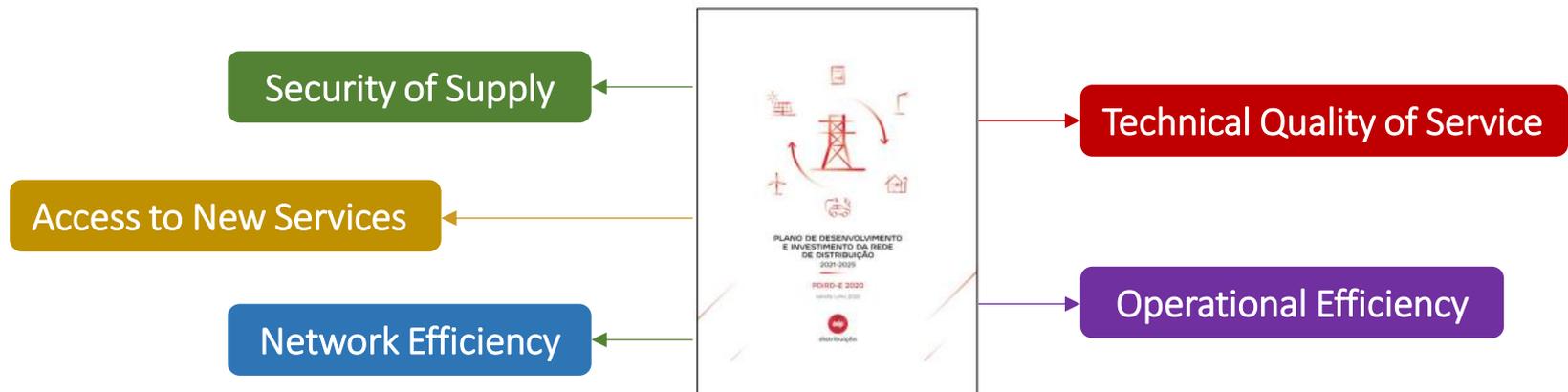
## General standards

General standards and continuity of supply indicators by Zone (mainland Portugal)



## Service Quality Improvement Plan

- Network operators must develop a plan to improve the quality of service when they identify difficulties in complying with power quality thresholds or general standards established in the Code.
- These plans are considered in the **network development and investment plans** (subject to ERSE's opinion, discussion in Parliament and approval by the Government).
- Main investment vectors:

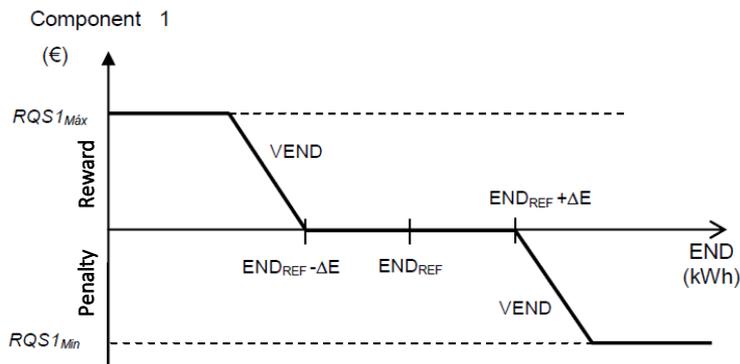


## Compensation for non-compliance with individual standards

- Right to compensation
  - Failure to comply with individual standards of continuity of service
- Payment method
  - **Automatic** payment through the bill (no customer request required)
- When?
  - On the invoice of the 1<sup>st</sup> quarter subsequent to the calendar year to which the compensation relates
- Compensation for non-compliance with individual standards: Number of interruptions and Duration of interruptions
- If, for a given customer, both standards are exceeded, the customer will only receive one compensation (the standard with higher compensation value)

## ➤ Incentive for DSO

**Component 1:** to improve the overall continuity of supply for MV customers



### Indicator used to parametrize the incentive:

Energy not distributed (END)

- $END_{ref}$  = Reference value for energy not distributed (target) (in kWh);
- $\pm\Delta E$  = Dead band, variation of  $END_{ref}$  (in kWh);
- $VEND$  = Valorization of Energy not distributed (Euros/kWh);
- $RQS1_{min}$  = Maximum penalty value (in Euros);
- $RQS1_{max}$  = Maximum reward value (in Euros);

### Which interruptions are taken into account?

- Unplanned long interruptions
- Excluding:
  - Exceptional events
  - Interruptions originating from the network of the TSO

### How to determine the END?

$$END = ED \times TIEPI / T$$

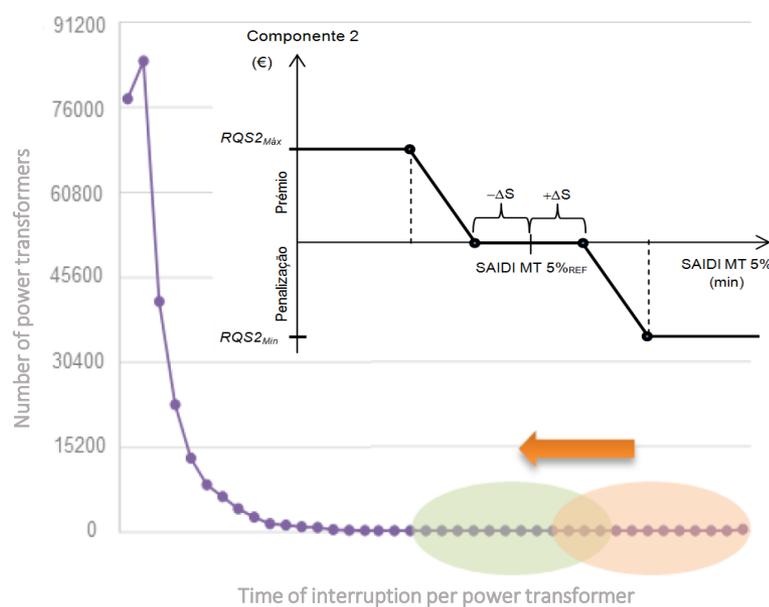
- ED – Energy delivered to the MV (kWh)
- TIEPI – Equivalent Interruption Time of Installed Power (h)
- T – Number of hours per year

$$TIEPI = \Sigma ( Paf_i \times D_i ) / \Sigma Pinst$$

- $Paf_i$  – Installed power in the power transformer affected by the interruption i
- $D_i$  – Duration of the interruption i
- $Pinst$  – Sum of the installed power in the power transformer

## ➤ Incentive for DSO

**Component 2:** to improve the continuity of supply of the worst-served 5% of MV customers



For the worst-served customers, the goal is to reduce existing disparities by introducing incentives to help them recover.

### Indicator used to parametrize the incentive:

System Average Interruption Duration Index (SAIDI)

- SAIDI MT 5%<sub>REF</sub>: SAIDI MT 5% reference (min)
- $\Delta S$ : Variation value of SAIDI MT 5%<sub>REF</sub> (min)
- V SAIDI MT: Valorization of SAIDI MT 5% (Euros/min)
- RQS2<sub>min</sub>: Maximum penalty value (Euros)
- RQS2<sub>max</sub>: Maximum reward value (Euros)

### Parameters (2022-2025):

Parameters	Values
SAIDI MT 5% <sub>Ref</sub> (min)	470,00
$\Delta S$ (min)	30,00
V SAIDI MT (€/min)	33 333,33
RQS2 <sub>min</sub> (Euros)	3 000 000
RQS2 <sub>máx</sub> (Euros)	3 000 000

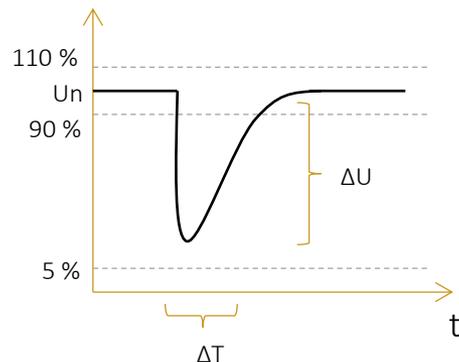
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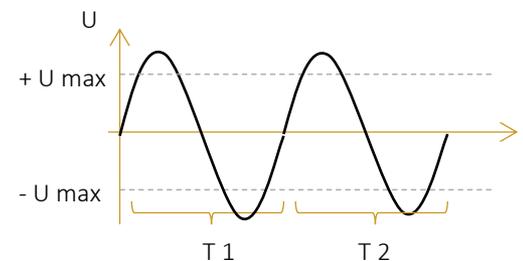
- Characteristics of the voltage wave are defined in the standard NP EN 50160

Low voltage supply characteristics			
Disturbance	Limits	Evaluation range	Percentage of measurements within limits during the range
Frequency	$\pm 1\%$	year	99,5%
	+ 4% / - 6%		100,0%
Amplitude	$\pm 10\%$	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%

### Voltage dips



### Swells



## ➤ Power quality monitoring plans

- **Network operators** must **develop power quality monitoring plans** to characterize the performance of the networks and verify compliance with the limits established for the different characteristics of the voltage waveform.
- Power quality monitoring may be carried out through **permanent monitoring** or **periodic campaigns**. The selection of points to be monitored must consider a balanced geographical distribution and ensure the coverage of customers identified by the network operators as being more susceptible to variations in power quality.
- The power quality monitoring plans have a **time horizon** of **two consecutive years** and must be sent to ERSE.

## ➤ Information available for customers

**E-REDES**

**Qualidade de energia elétrica**  
Resultados de monitorização  
Conforme requisitos RQS

**Alentejo Litoral**  
Concelhos: Alcácer do Sal, Grândola, Odemira, Santiago do Cacém, Beja, Évora, Faro, Lagos, Sagres, Tavira, Vila Real de Santo António

Escolha uma Subestação ou Posto de Transformação

Voltar

Subestação (SE)  
Posto de transformação (PTD)

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<https://e-redes-qualidade.wntech.com/>

**REN** ABOUT REN WHAT WE DO INVESTORS MEDIA SUSTAINABILITY CAREERS

**WHAT WE DO**  
- HOME - WHAT WE DO - ELECTRICITY - POWER QUALITY

**Power Quality**

The Portuguese Quality of Service Regulation (RQS) establishes that the concessionaire of the National Transmission Grid (RNT) will proceed annually to the characterization of voltage waveform quality in accordance with a monitoring plan, performing measurements for this purpose, on the selected delivery points, of the following:

- Voltage magnitude;
- Flicker;
- Harmonic distortion;
- Unbalances;
- Frequency;
- Voltage sags (dips);
- Voltage swells.

Monitoring Results:

DELIVERY POINTS	VOLTAGE (UN) -KV	MONITORING RESULTS
	NORTH	
Vila Rica (PR)	150	VLF
Vila Rica (PR)	60	SH
Frades (SPRC)	60	SPRD
Valpaços (SVPC)	60	SVPC

[https://www.ren.pt/en-GB/o\\_que\\_fazemos/eletricidade/qualidade\\_de\\_energia\\_eletrica](https://www.ren.pt/en-GB/o_que_fazemos/eletricidade/qualidade_de_energia_eletrica)

Mapa da área de concessão da CEVE

PT018

Morada  
Avenida da Estação  
Codigo Postal  
4775-251  
Freguesia  
VIATODOS  
Concelho  
Barcelos  
Ano de Entrada em Serviço  
1977  
Latitude  
41.45125  
Longitude  
-8.55277  
Potência Instalada  
250

Relatório de Monitorização 2017

Relatório de Monitorização 2016

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

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## ➤ Quality of Service Reports

- **Network operators** and suppliers must send to Portuguese Regulator by email and publish on their websites the quality of service **report**.
- The **Portuguese Regulator** annually publishes the quality of service **report** for the electricity sector.

Until May 31<sup>nd</sup>



Until October 15<sup>th</sup>



## ➤ Audits to verify regulatory compliance

- The Portuguese Regulator may carry out audits to verify compliance with regulatory provisions.
- Audits may focus on all or part of the regulation's provisions.





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