5th Plenary Meeting Concerted Action for the Energy Efficiency Directive

Efficient distribution grid operation iniatives

October 2019

Efficient distribution grid operation initiatives

1. **Viesgo Introduction**
2. **Dynamic Line Rating**
3. **Other initiatives to improve grid operation efficiency**
4. **Effects of distributed generation on power losses**

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Viesgo Distribution assets

NETWORK
31,300 km

121Substations

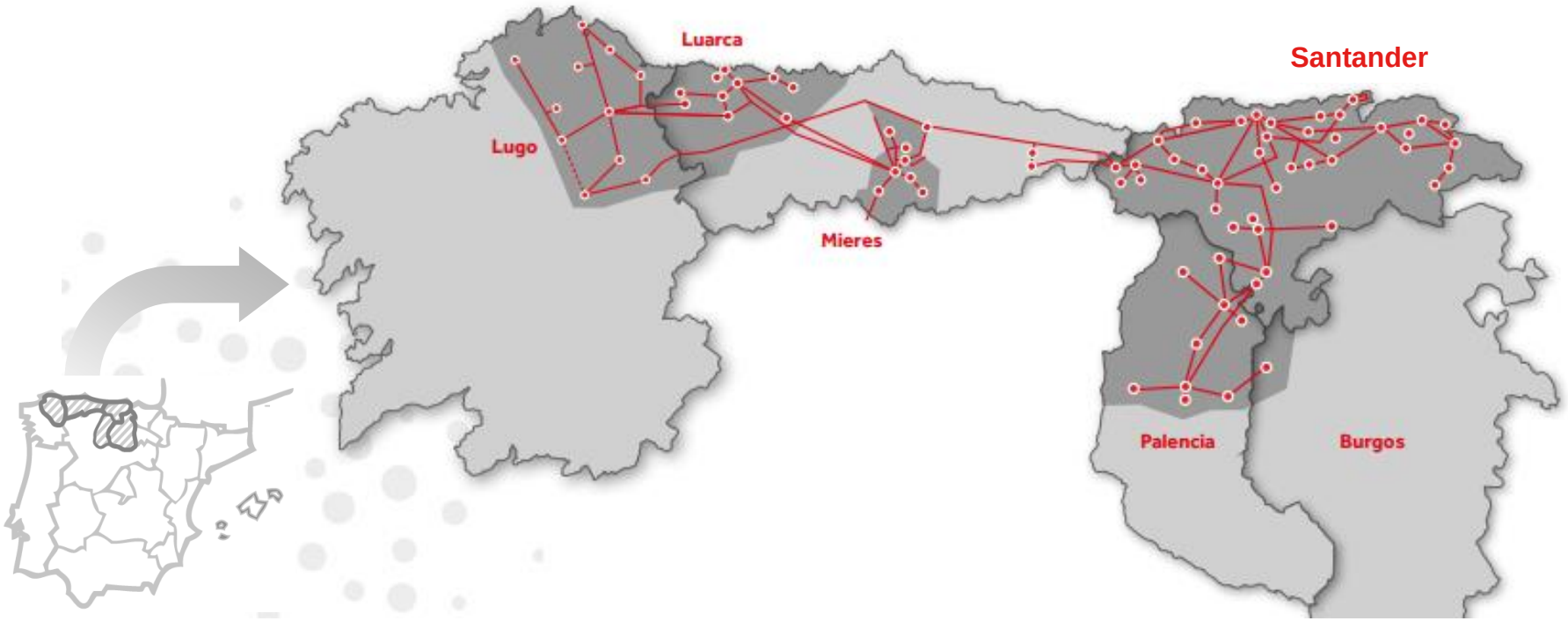
11,048 Secondary Substations

DISTRIBUTES ELECTRICITY TO
695,000
CUSTOMERS

2018 SAIDI
48 min

2018 SAIFI
0.8

1st COMPANY
TO COMPLETE SMART METERS ROLL-OUT IN SPAIN



113
YEARS
OF HISTORY

Viesgo Generation assets in Spain and Portugal

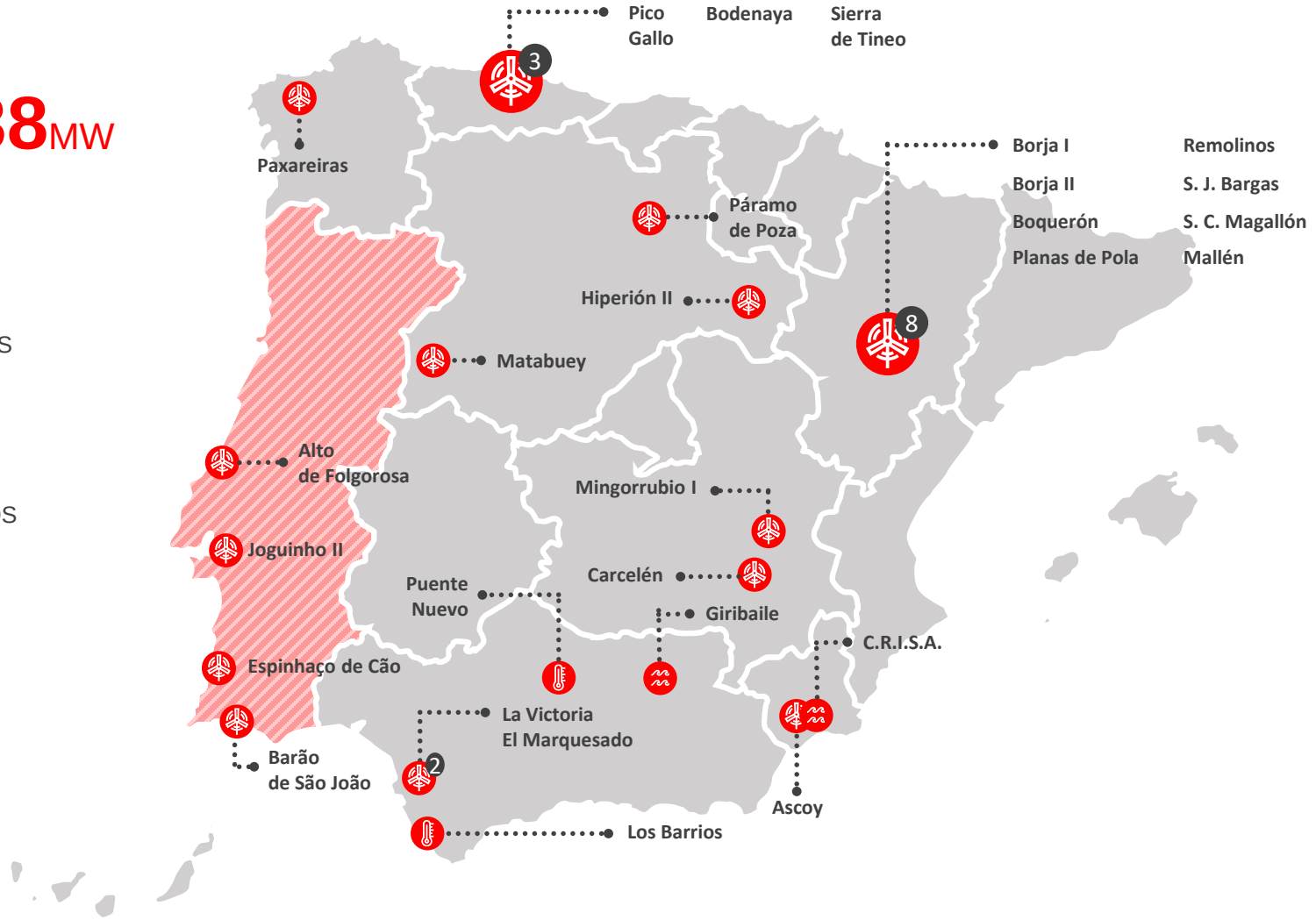
Wind, Mini hydro and Thermal power stations

1,438MW
INSTALLED

24
WIND FARMS

2
MINI HYDROS

2
THERMAL

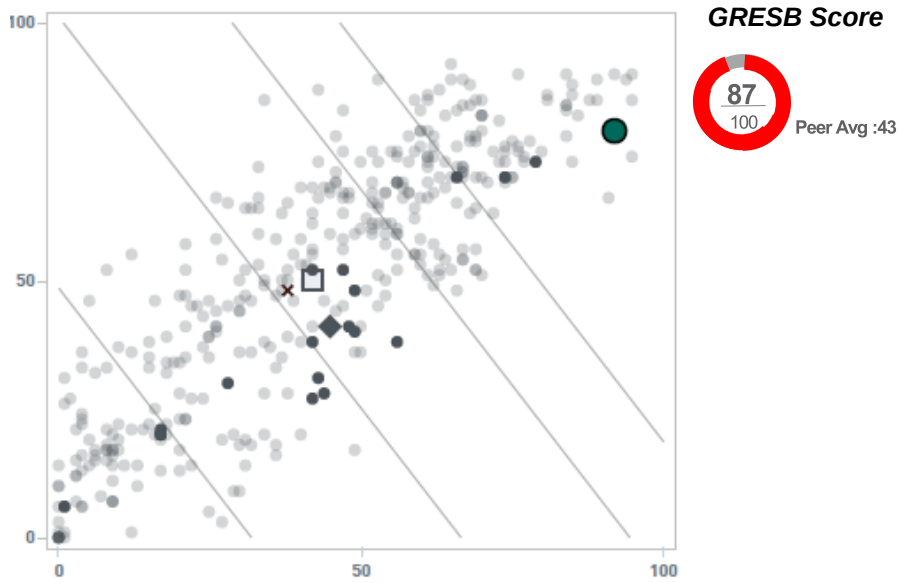


Viesgo first in class in 2019 GRESB ranking

Environmental, Social and corporate Governance Benchmark

	Peer Comparison					
Viesgo Producción	1st	Independent Power Producers / Maintenance & operation — Out of 19	5th	Europe — Out of 236	12th	All Infrastructure Assets — Out of 393
Viesgo Holdco[1]	2nd	Electricity Distribution Companies / Maintenance & operation — Out of 7	4th	Europe — Out of 236	10th	All Infrastructure Assets — Out of 393

GRESB Model for Viesgo Producción

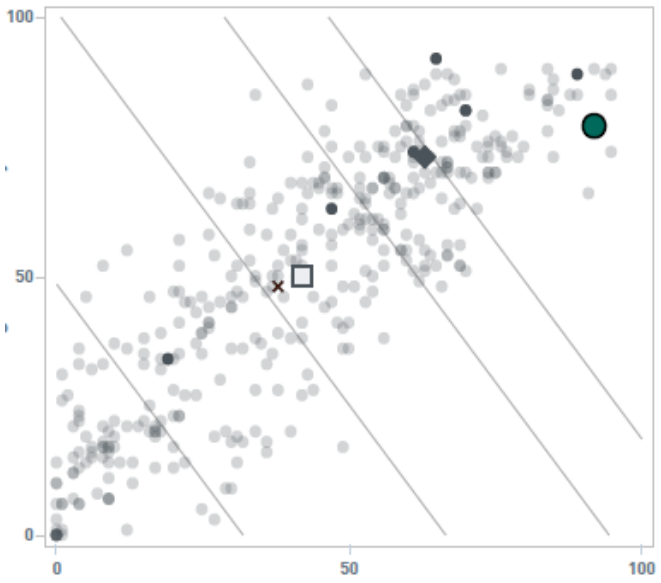


GRESB Score

87 / 100

Peer Avg :43

GRESB Model for Viesgo Holdco[1], S.A.,



GRESB Score

87 / 100

Peer Avg :67

This Entity · Peer Group Avg. · Peer Group · GRESB Average
GRESB Universe · Asia · Europe · Americas · Oceania

1. Viesgo Producción not included

Efficient distribution grid operation initiatives

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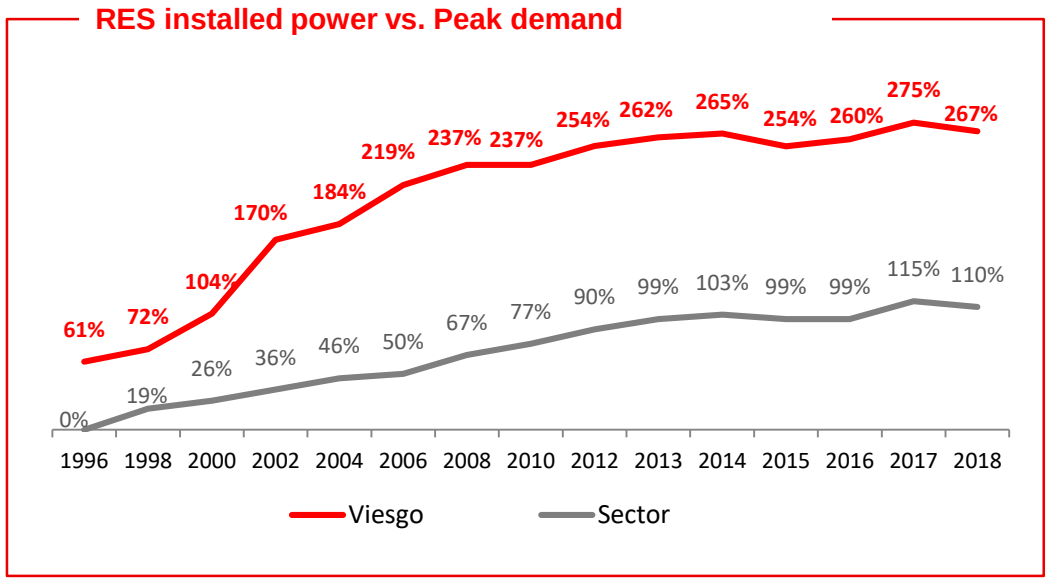
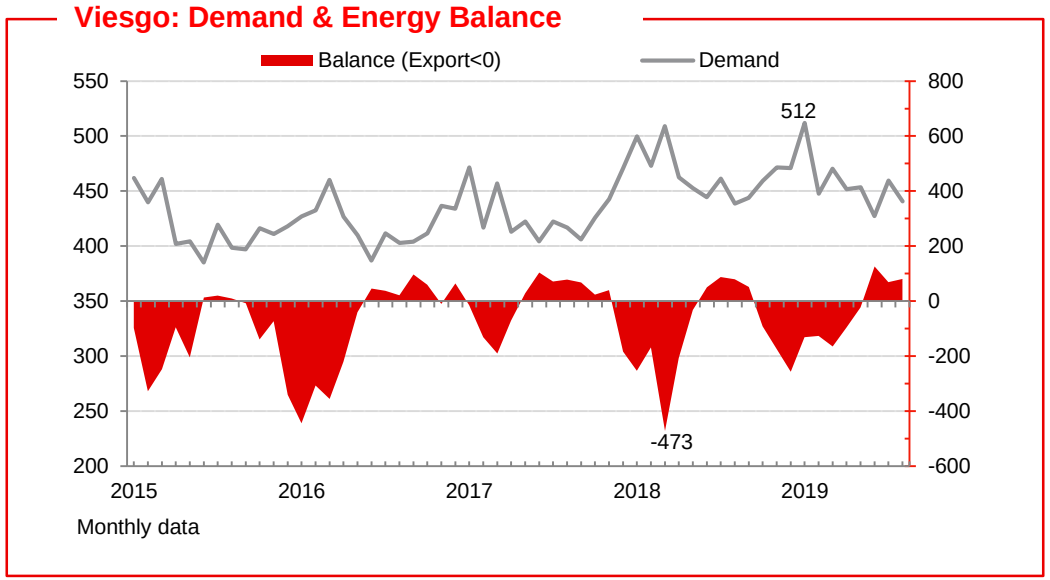
3. Other initiatives to improve grid operation efficiency
4. Effects of distributed generation on power losses

Dynamic Line Rating - Rationale





Viesgo RES integration ratio is **1,6 times higher than Spain average. Ratio is expected to achieve 400% in 2024**

Dynamic Line Rating - Fundamentals

Dynamic Line Rating principles

- ✓ The maximum capacity of energy that a line can transport depends on the wires temperature
- ✓ The action of the wind causes the wires to cool down, which allows to transport additional energy without increasing the wires temperature.
- ✓ Dynelec allows to operate overhead lines above its nominal capacity depending on local climatic conditions, increasing wind energy integration

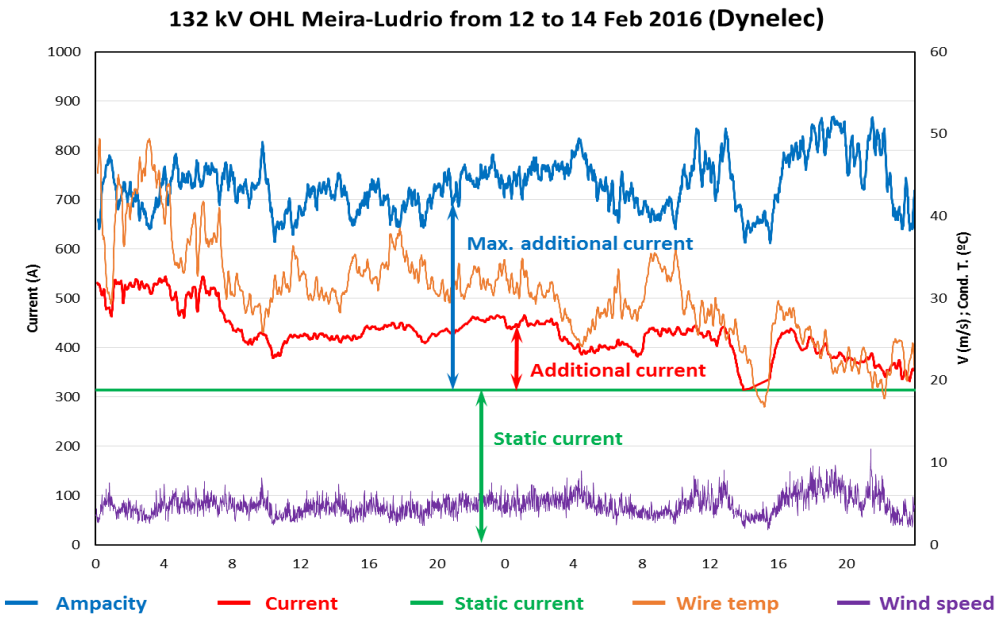
Line sensors

Weather stations

Line temperature sensors

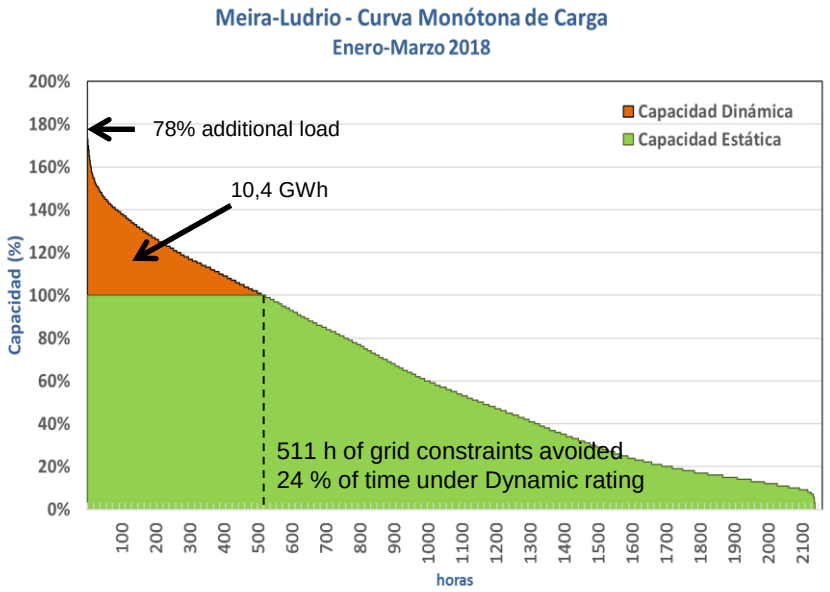
Grid analysers

Line performance



Dynamic Line Rating - Results

Impact on wind energy integration capacity



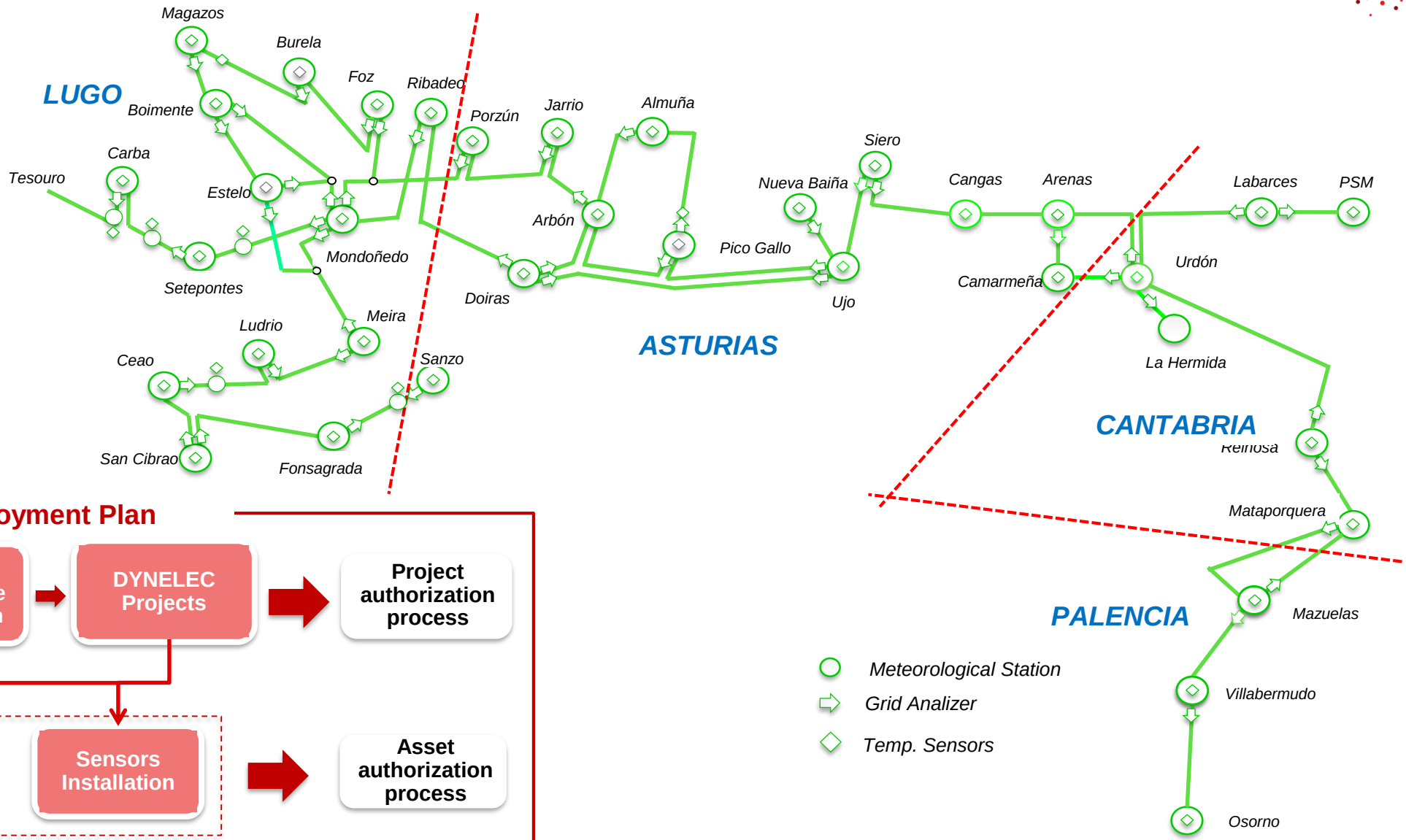
2018

Standard Rate

MES	HORAS (P>70 MW)	>70 (MWh)	Total (MWh)	% ADICIONAL
Enero	158	2.999	30.636	10%
Febrero	116	2.854	17.106	17%
Marzo	303	4.470	44.407	10%
Abril	135	2.639	25.266	10%
Mayo	12	123	17.568	1%
Junio	20	147	9.101	2%
Julio	11	86	10.887	1%
Agosto	5	30	12.174	0%
Septiembre	56	637	15.319	4%
Octubre	28	201	17.824	1%
Noviembre	52	734	21.777	3%
Diciembre	186	3.130	31.339	10%
TOTALES	**1082**	**18.052**	**253.404**	**7%**

- **Continuous +50% line capacity increase** without impacts on wires
- System **cost is 0,5% of equivalent grid** reinforcement solution
- Viesgo reduced grid constraints due to wind generation **from 1155 hours in 2011 to 0 hours en 2017**
- By end of 2019 dynamic lines rating **will be deployed in all the 132 kV grid** (1.111 km)

Dynamic Line Rating – Deployment Plan



VIESGO Deployment Plan

- Technical Studies to classify and prioritize our Deployment Plan
- DYNELEC Projects
- Project authorization process
- Assets Adaption
- Sensors Installation
- Asset authorization process

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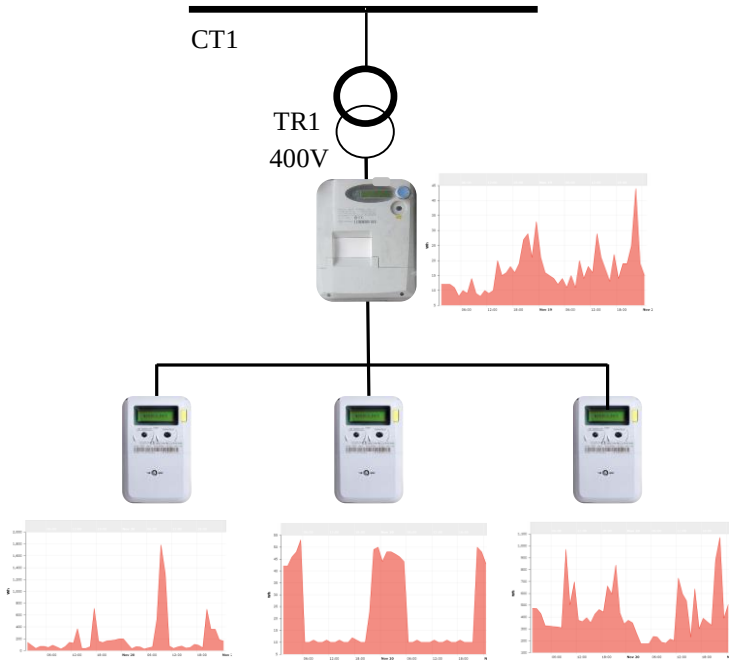
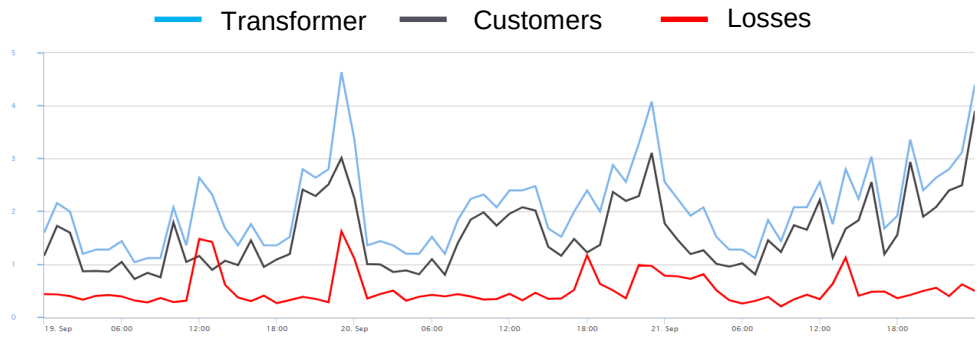
Low voltage energy balances to reduce non – technical losses

Leverage smart meters deployment



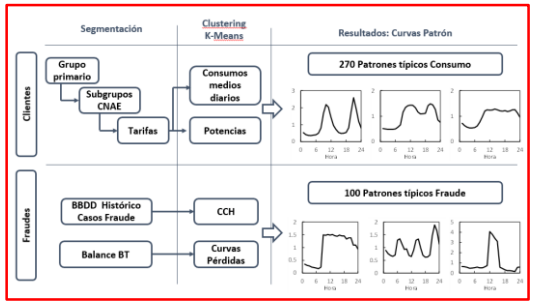


Inicio: 01/09/2018 Fin: 30/09/2018 Comparar con: Medias % Umbral (+/-): 0 Código CT N.A. Filtrar Descargar

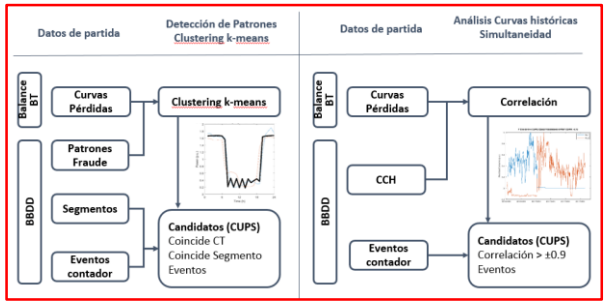
							Energía (kWh)		Pérdidas				
SUBSISTEMA	EMPRESA	PROVINCIA	MUNICIPIO	CT	TRAFO	LVC	Energía GISS	CLI - PRE	kWh	%	% ORIGEN LVC	% VALIDACIÓN	H. MED. IN SEG.
VIESGO							159.653.523,048	157.115.478,713	2.538.044,333	1,6%	92%/2%/7%	0%/3%/1%	2.589
	VIESGO						115.841.079,792	116.529.284,281	-688.204,488	-0,6%	94%/1%/4%	0%/3%/1%	1.968
		CANTABRIA					91.379.472,639	92.451.868,240	-1.072.395,604	-1,2%	93%/2%/5%	0%/3%/1%	1.373
			CABUERNIGA				155.638,240	151.807,500	3.830,739	2,5%	95%/0%/4%	0%/0%/0%	3
				10000 - ASILO			13.627,360	13.334,842	292,521	2,1%	93%/2%/5%	0%/0%/0%	0
					TR1		13.627,360	13.334,842	292,521	2,1%	93%/2%/5%	0%/0%/0%	0
						400	13.627,360	13.334,842	292,521	2,1%	93%/2%/5%	0%/0%/0%	0

New methodology based on Data Analytics

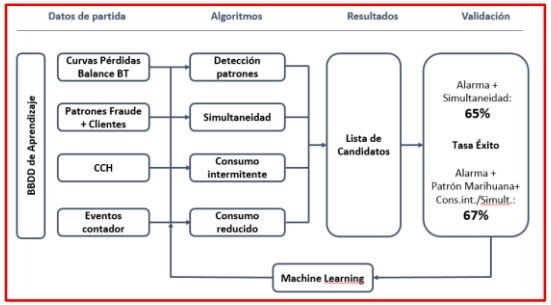
Customers segmentation



Algorythms



Algorythms training



Low voltage energy balances to reduce non – technical losses

Next steps

Developing

MATHEMATICAL METHODS APPLIED TO LOSSES PROFILES ANALYSIS

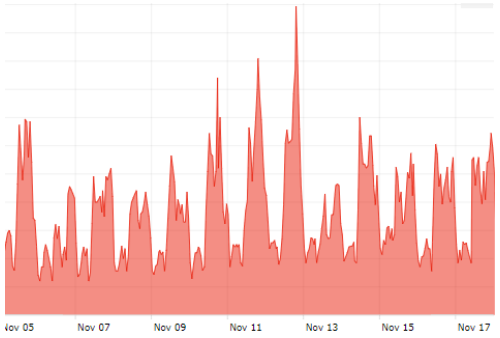
- Finding customer responsible for losses profiles shape in every MV/LV transformer.
- Determine changes in customer consumption behaviour which are not perceived by the transformer meter.

Customer Segmentation → Master Profiles → Compare Losses Profile with Master → Coincidence Analysis

Next steps

SEPARATE TECHNICAL AND NON-TECHNICAL LOSSES IN LOW VOLTAGE GRID

- Isolate technical losses from fraud to increase the hit rate of fraud detection



Non-technical losses Fraud

Technical losses

→ **Increase hit rate**

Self-consumption for auxiliary services in primary substations

Improve grid resiliency and reduce technical losses

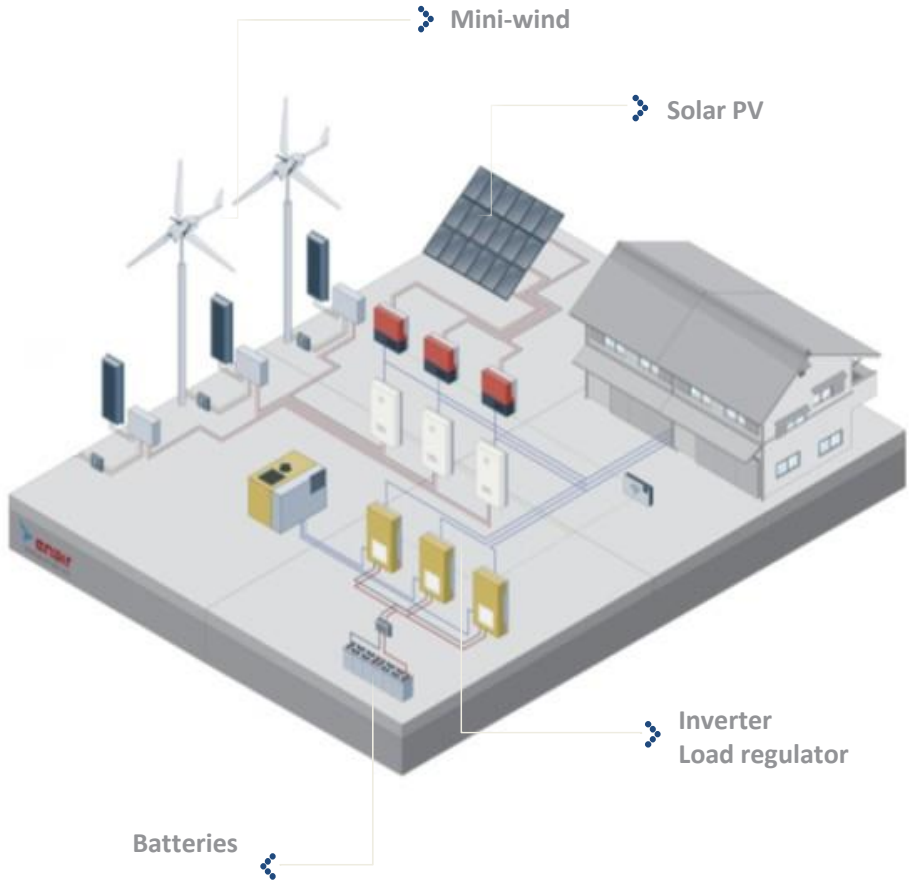
LOCATIONS

- Pilot in 4 Primary Substations

	Status	Go - Live
PCTCAN	Finished	October
PICO GALLO	Under construction	November
BOIMENTE	Under construction	November
MAZUELAS	Under construction	December

CONFIGURATION OF WIND + PV INSTALLATION

- Hybrid self – consumption installation with Storage
- Real time remote monitoring of each

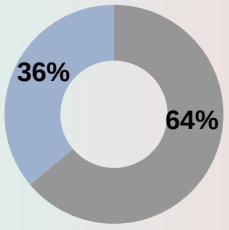


Electrification of distribution operations fleet

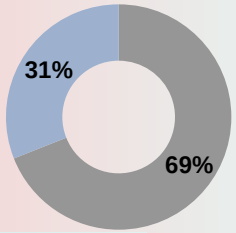
ELECTRIC VEHICLES

Plan Targets

% Electric vehicles



% Electric kms



Mot. Comb. VE+PHEV

65	25	12
ICEs	EVs	PHEVs

NUEVOS VEHÍCULOS

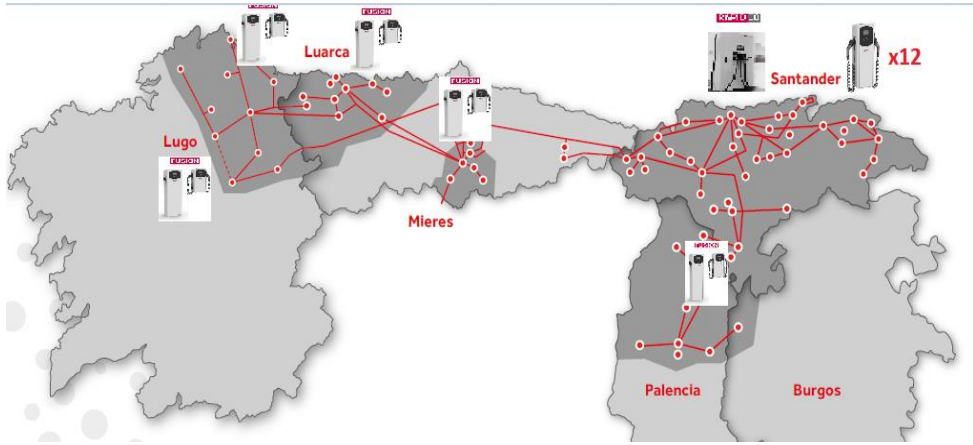
EV	EV	PHEV
		
Renault Kangoo ZE	Hyundai Kona Elec	Kia Niro PHEV

CHARGING POINTS

		Ch. Points	Vehicles
Begasa	Lugo	6	5
	Foz	4	2
Viesgo Distribución	Mieres	4	4
	Aguilar de Campoo	4	1
	Jarrio	4	2
	Santander	26	23
	TOTAL	48	37

Semi - fast

Fast 50kW



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Effects of distributed generation on power losses

Viesgo Case study included in CEER Report on Power Losses – October 2017

Figure 11: Absolute value of losses compared with distributed generation capacity in network

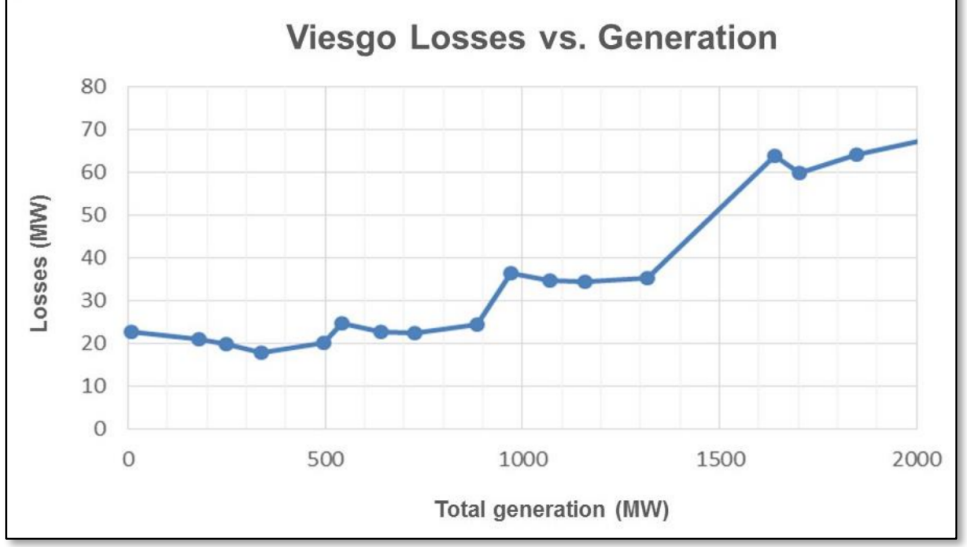

Figure 12: Absolute value of losses in percentage based on power demand + net export. Comparative representation with export power demand

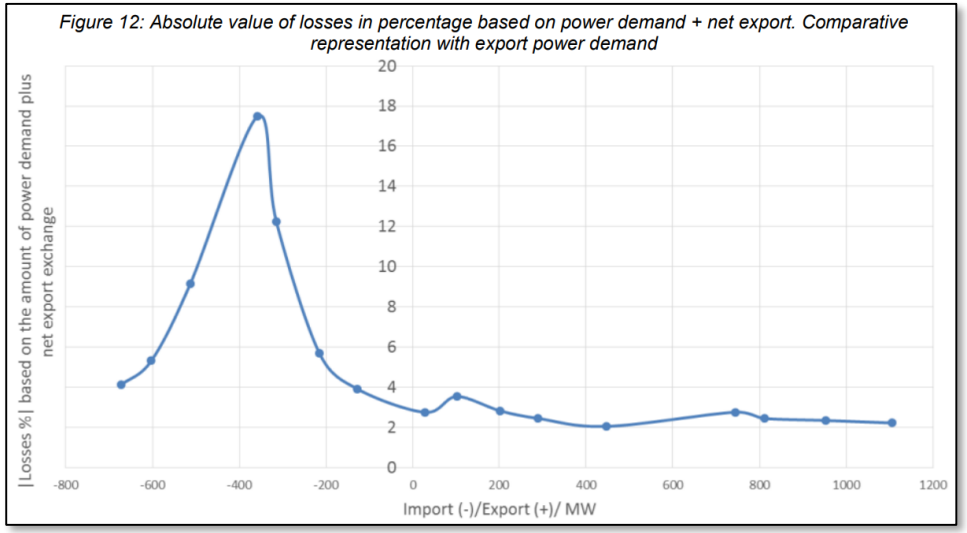

Figure 14: Viesgo´s proposal for a new formula for the incentive for losses reduction

1 Current Grid Losses Methodology

Losses = ∑ Borders - ∑ Demand

% Losses = Losses / ∑ Losses

ENERGY BALANCE EXAMPLE

GWh	IN	OUT	NET
DSO-TSO	115	400	-285
DSO-DSO	400	850	-450
GENERATION	500	0	500
WIND-DSO	2,255		2,255
TOTAL BORDERS	3,270	1,250	2,020
CUSTOMERS		1,850	-1,850
		LOSSES	170

2 New Methodology Proposal (Viesgo)

Losses = ∑ Borders - ∑ Demand

% Losses = Losses / (∑ Borders + ∑ Borders (OUT)

1. CURRENT METHODOLOGY

ENERGY NET (IN-OUT)	2,020
CUSTOMERS	1,850
Losses	170
% Losses	**8.42%**

2. NEW PROPOSAL (Viesgo)

ENERGY IN	3,270
CUSTOMERS + ENERGY OUT	3,100
Losses	170
% Losses	**5.20%**

https://www.ceer.eu/documents/104400/-/-/09ecee88-e877-3305-6767-e75404637087


Teşekkürler
Gracias
Merci
谢谢
Danke
ArigatoTak
Vďaka
Thanks
Mulţumesc
Благодаря
Obrigado
Köszönöm
DíkyGrazie