



2.Smart Grids - Prospects and Challenges

Yerevan International Energy Charter Forum

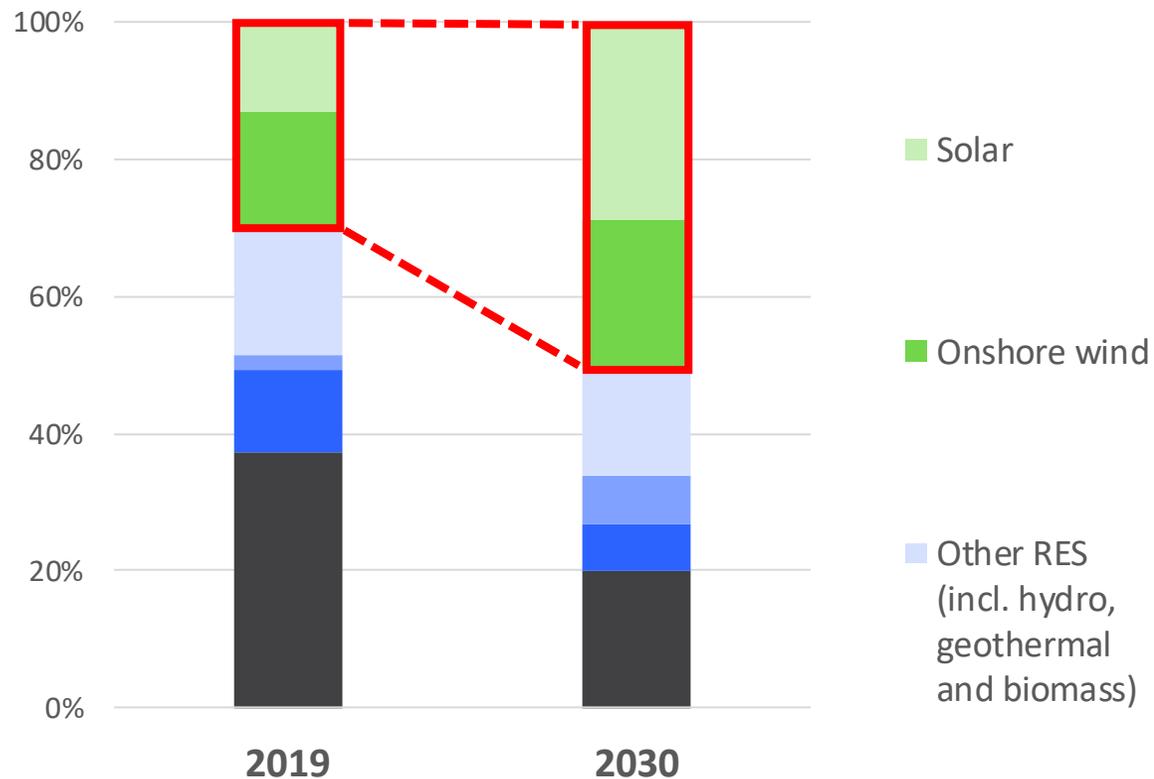
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Setting at scene - Distribution grid outlook

Installed power generation capacities in Europe



By 2030, we expect to see an additional 510 GW of renewables to be traded across European networks **-70% of which will be connected at distribution level.**

According to our landmark study, Connecting the Dots, it would cost between **375-425 billion euros** to update our distribution grid system accordingly.

Prospects for smart meters – decarbonising the grid and the power sector through digitalisation



- Smart meters are one of the main pillars to decarbonise the distribution grid, as they enable:
 - The integration of RES and energy storage
 - Bidirectional communication between DSOs/power utilities and market participants
 - Effective network management at low-voltage levels
 - The development of new services (e.g. flexibility, DRS..)
 - The shift from infrastructure-driven energy supply towards a more service-driven

European regulatory framework for smart meters

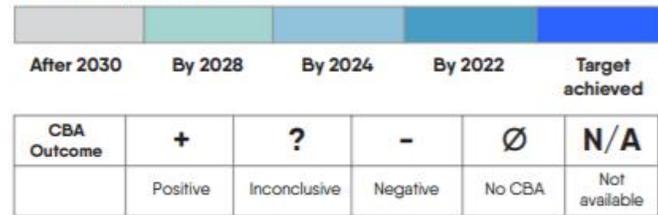
- The 2009 Electricity Directive called for Member States to **conduct a cost-benefit analysis**. Subject to a positive outcome, Member States were required to define implementation timetables for at least 80% of consumers to be equipped with smart meters by 2020. ¹
- The 2019 Electricity Directive updated and strengthened the provisions to assist the active participation of customers in the electricity market.
 - Article 20 and Annex II establish minimum functional and technical requirements for smart metering systems
 - Article 19 summons Member States with negative cost-benefit analysis to ensure recurrent assessments (every four years, or more frequently) in response to significant changes in the underlying assumptions, technological and market developments.
 - Article 21 entitles customers to request the installation of smart metering systems in countries with negative cost-benefit analyses (with any associated costs to be borne by the final customer).
 - Article 11 entitles customers with smart meters to request dynamic electricity price contracts with at least one supplier (with more than 200 thousand final customers)

¹ Electricity Directive (2009/72/EC): Annex I

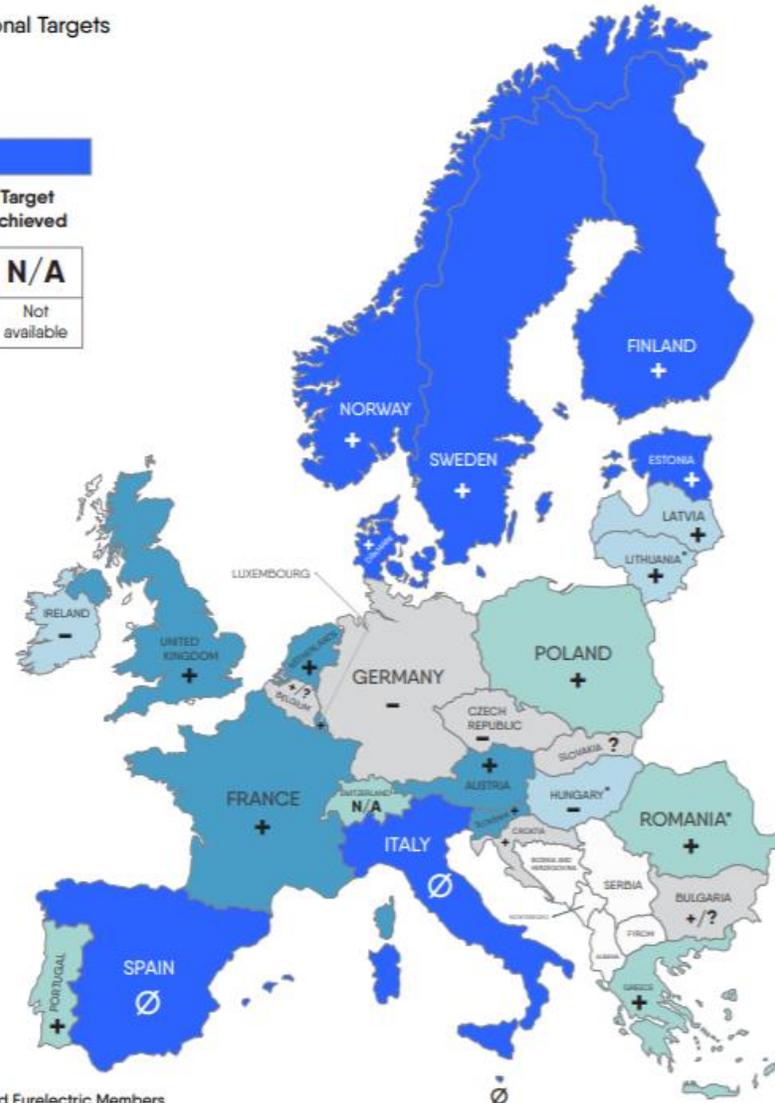
Outcome of CBAs for smart metering

Figure 2.1 Outcomes of Cost-Benefit Analysis and National Targets

Smart meter penetration rate



* Planned partial roll-out



6 market drivers in favour of smart meter's deployment cited in CBAs

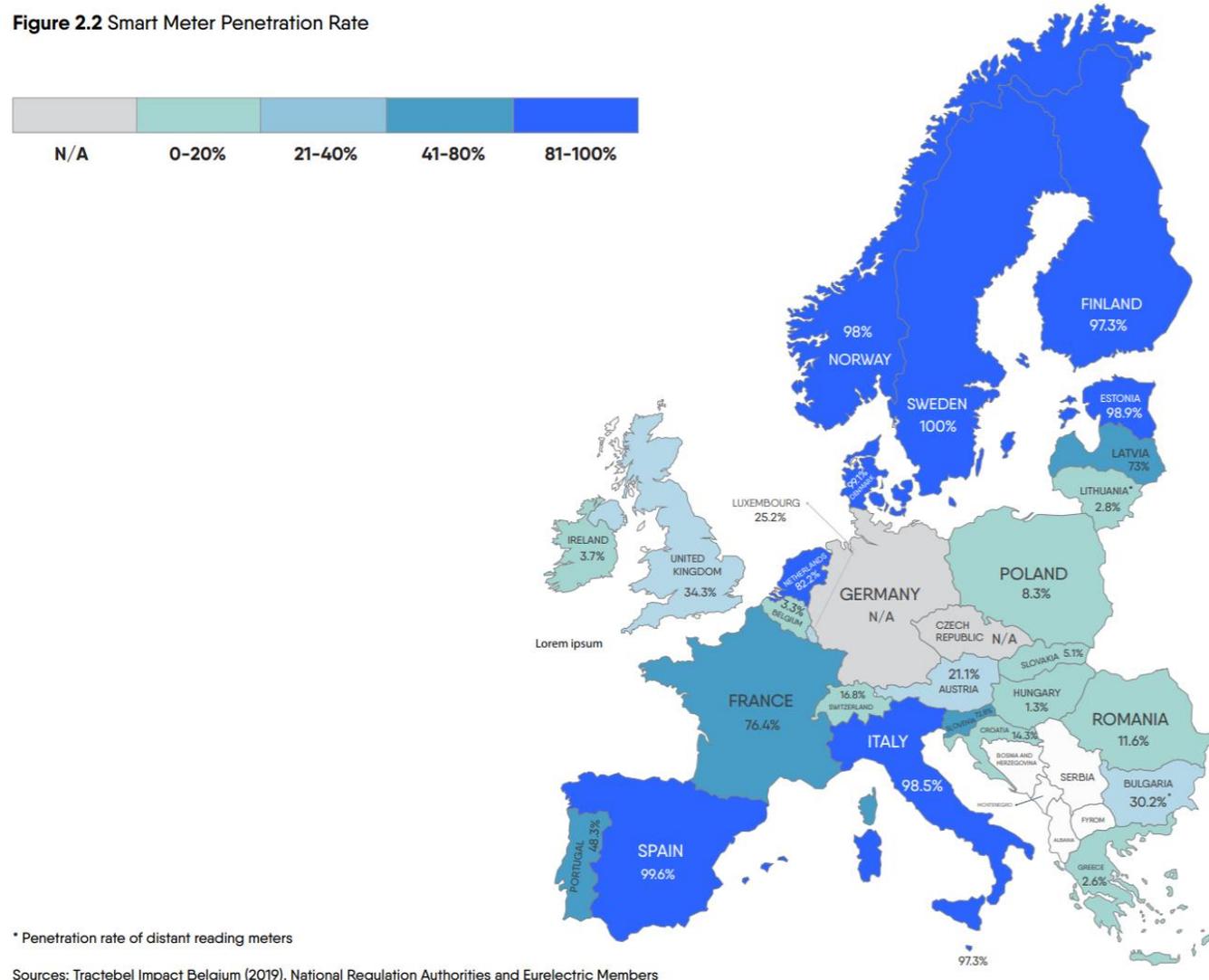
- ① 1. Enabling **dynamic tariffs** for households and SMEs
- ② 2. **Digitalisation** of the distribution grid and **optimisation of the network operations**
- ③ 3. Digitalisation of the retail market to foster innovation and **new services** by private actors
- ④ 4. **Integrating decentralised energy resources** with flexible access, such as load shedding or infeed curtailment
- ⑤ 5. Supporting actions **tackling fuel poverty**
- ⑥ 6. Supporting **energy efficiency**



Sources: Tractebel Impact Belgium (2019), National Regulation Authorities and Eurelectric Members

Smart meter rollout in Europe

Figure 2.2 Smart Meter Penetration Rate



- Today, around **120 million smart meters** have been **installed** in the EU-27, representing **48% of all metering points**
- Overall the EU-wide smart meter rollout keeps a steady progress forward, but within **very different operational environments and speeds** in each Member State.

* Penetration rate of distant reading meters

Sources: Tractebel Impact Belgium (2019), National Regulation Authorities and Eurelectric Members

Challenges



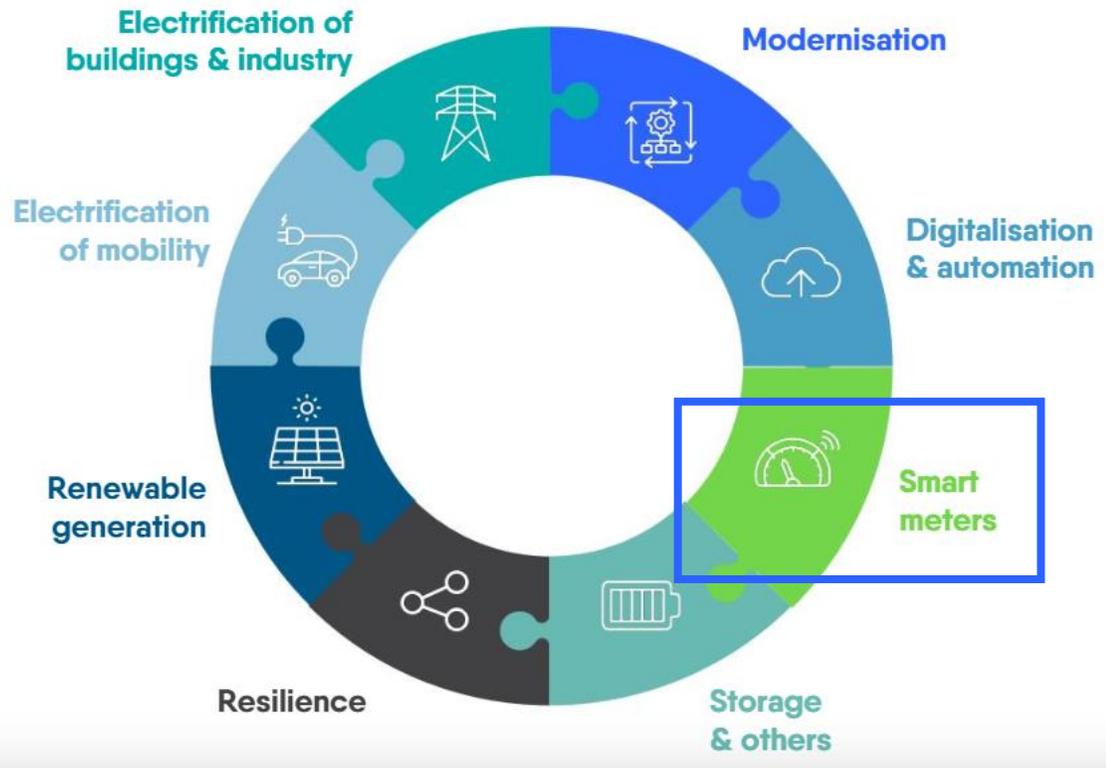
Challenges

- Lack of harmonised national regulations and incentives, leading to significant country-to-country differences
- Different ownership and legal unbundling models/requirements for DSOs across the EU
- Absence of significant customer demand/awareness* (*in certain regions/Member States)
- Rapid rollout plans hindered by the financial constraints of DSOs
- Interoperability standards/network communications (i.e. network codes)
- Development of new services (e.g. for energy communities, electric vehicle charging stations..)
- Data management (e.g. real-time communications, privacy, infrastructure..)



Investment needs for smart meters

Key drivers for distribution grid investments in 2021-2030



Source: Eurelectric, E.DSO, Monitor Deloitte (2021): Connecting the dots

- Using a weighted **average cost of €153.3** per smart meter and assuming the installation of **266 million smart meters**, the European Commission identified **€41 BN** to achieve a smart meter **penetration rate of 92%** in the EU-27 by 2030.¹

¹ DG ENER & Tractebel Impact (2020): Benchmarking smart metering deployment in the EU-28

Annex

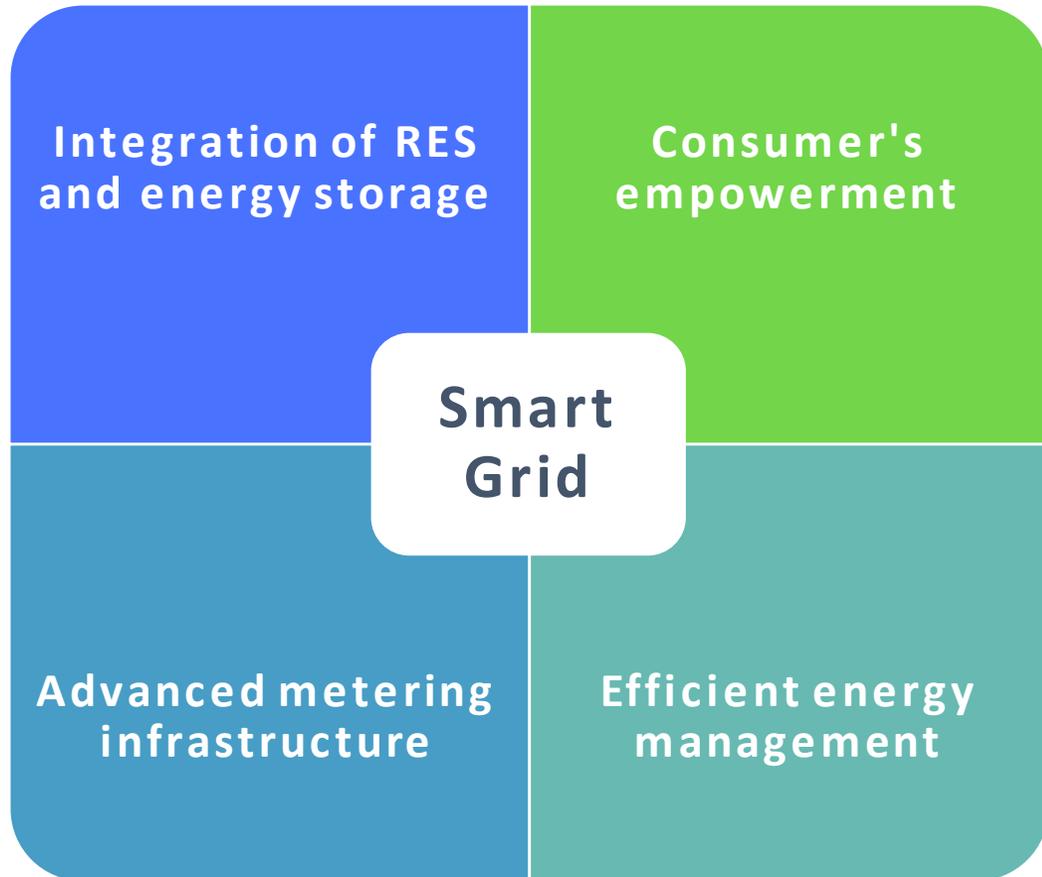
Figure 2.2: Smart Meter penetration rate

	Code	Smart Meters	Metering points	Source
	AT	1 310 783	6 199 303	Tractebel report (2019)
	BE	196 533	5 975 000	FEPEG (2020)
	BG	1 554 493*	5 137 377	EVN Bulgaria EAD (2020)
	HR	350 000	2 433 000	HEP (2020)
	CY	300	546 500	Tractebel report (2019)
	CZ	N.A.	5 712 550	Tractebel report (2019)
	DK	3 387 676	3 418 222	Dansk Energi (2020)
	EE	700 000	707 900	Tractebel report (2019)
	FI	3 650 000	3 656 580	Finnish Energy (2020)
	FR	28 243 000	36 951 446	Energie (2020)
	DE	N.A.	50 700 000	Tractebel report (2019)
	GR	195 000	7 577 996	HEDNO (2020)
	HU	95 000	7 500 000	Tractebel report (2019)
	IE	85 000	2 300 000	Tractebel report (2019)
	IT	36 237 165	36 789 000	Tractebel report (2019)
	LV	805 000	1 096 000	Sadales tīkls (2020)
	LT	50 255	1 782 637	ESO (2020)
	LU	75 847	300 499	Tractebel report (2019)
	MT	309 287	317 747	Tractebel report (2019)
	NL	6 900 000	8 400 000	Netbeheer Nederland (2020)
	PL	1 469 661	17 719 000	PGE S.A. (2020)
	PT	3 000 000	6 200 000	EDP (2020)
	RO	1 120 790	9 640 322	Romanian Association IRE
	SK	127 325	2 513 743	Tractebel report (2019)
	SI	699 000	959 817	Elektro Ljubljana d.d. (2020)
	ES	28 528 482	28 632 114	AELEC (2020)
	SE	5 300 000	5 300 000	Tractebel report (2019)
	NO	2 900 000	2 950 000	Energi Norge (2020)
	CH	944 220	5 620 358	Federal Office of Energy (2020)
	UK	5 935 202	29 807 531	ENA (2020)

Figure 2.1: Outcomes of Cost-Benefit Analysis

		Year of last CBA	Conducted by
	AT	2010	PwC Österreich
	BE	2017	Brugeo (BRC), Commission Wallonne pour l'Énergie (Wallonia)
	BG	2013	Energy and Water Regulatory Commission
	HR	2017	Croatian Energy Regulatory Agency (HERA)
	CY	2014	DNV GL
	CZ	2016	Ministry of Industry and Trade
	DK	2015	Competition and Consumer Authority
	EE	2011	N.A.
	FI	2008	N.A.
	FR	2011	Commission de Régulation de l'Énergie
	DE	2013	EY
	GR	2012	N.A.
	HU	2018	Energy and Public Utility Regulatory Agency
	IE	2017	Commission for Regulation of Utilities
	IT	No CBA	
	LV	2019	JSC Sadales tīkls
	LT	2017	Ernst & Young Baltic, UAB-EY and Energo skaitmės operacijos AB (ESO)
	LU	2011	Schwartz and Co.
	MT	No CBA	
	NL	2010	KEMA Nederland
	PL	2014	N.A.
	PT	2018	ERSE
	RO	N.A.	AT Kearney
	SK	N.A.	Regulatory Office for Network Industries
	SI	2014	DNV KEMA & Korona
	ES	No CBA	
	SE	2015	N.A.
	NO	2007	Norges vassdrag- og energidekkning (NVE)
	CH	2012	Bundesnetzagentur (BNE)
	UK	2019	Department for Business, Energy & Industrial Strategy

The cornerstones of smart grids



- Services enabled by smart grids
 - Flexibility services
 - Infrastructure provision for electric vehicles
 - Energy efficiency and services
 - Data handling
- These factors lead to:
 - Optimising asset utilisation
 - Improving reliability and efficiency
 - Reducing GHG emissions
 - Increasing energy security and quality of supply
 - Two-way power and data flow between utilities and consumers

Distribution grids in Europe



1

2 556 DSOs in EU-27 connecting more than **300 million** customers

2

192 DSOs have been unbundled from their vertically integrated undertakings.

3

Ownership and shareholding structures vary from one DSO to another

Distribution Grid in Europe :

-  Supply around **2800** TWh of electricity/year
-  **10** million km of power lines
-  **60%** of the network is composed by LV lines, **37%** by MV lines and **3%** by HV lines

