

# Next strategic Grid integration challenges Towards next Digital Grids 4.0

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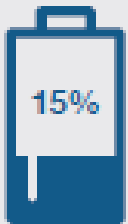
42 TSOs in  
35 countries



312 693 km of  
transmission lines

7 times the Earth's circumference

3278 TWh electricity  
consumption



15%  
of the global  
electricity  
consumption



over 500 million  
customers served

# Beyond just the EU

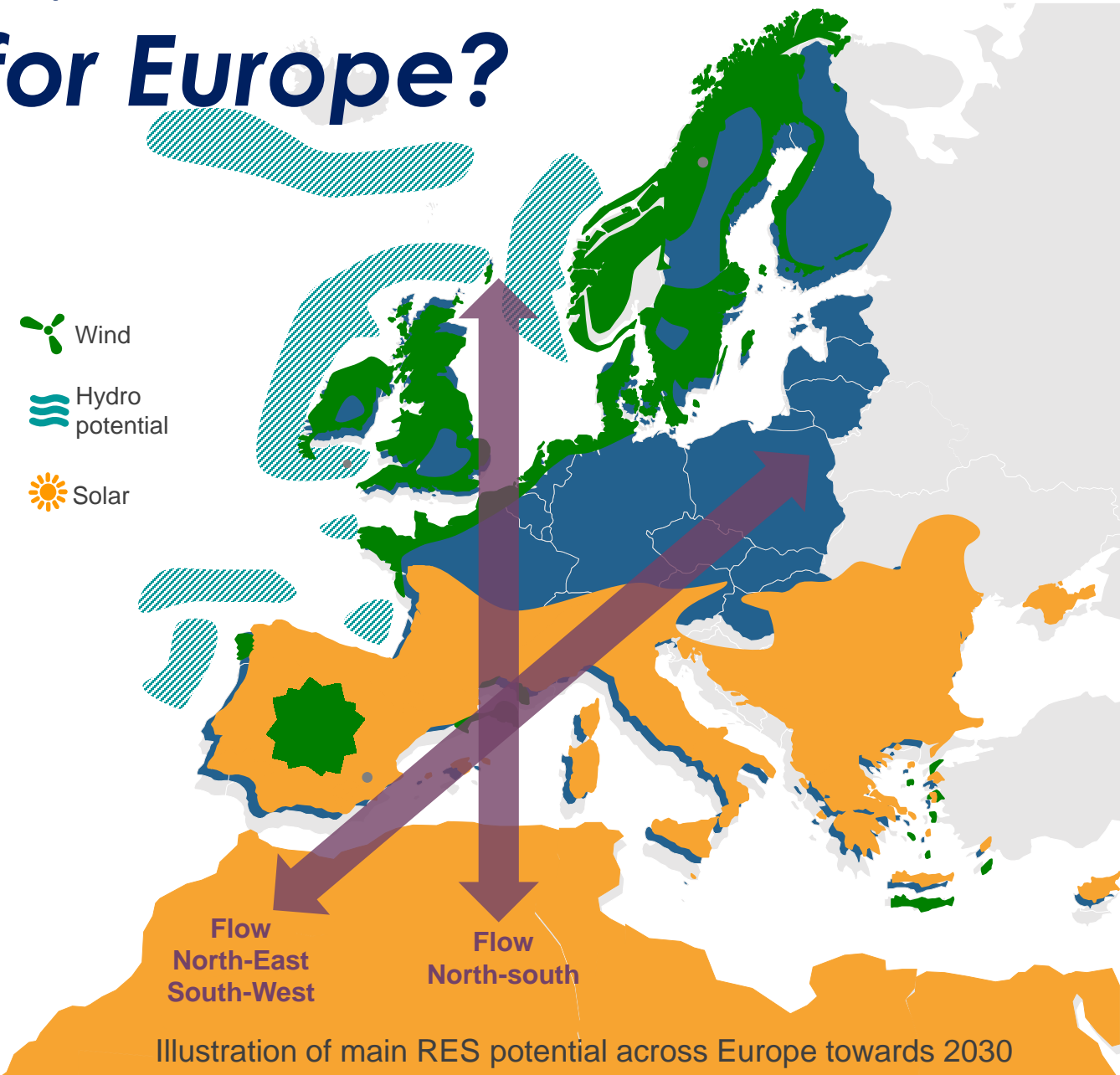


# The Energy Transition: *What does it mean for Europe?*

27% renewables by 2030 =  
+/- 45% for the power system

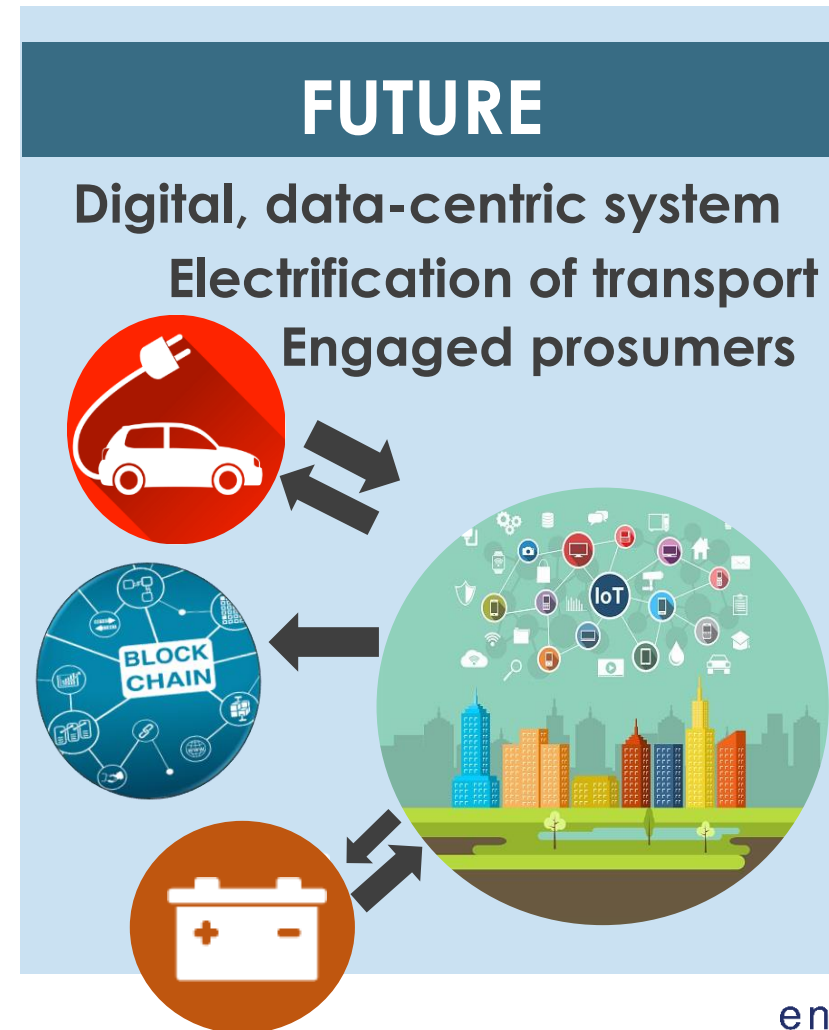
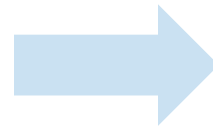
## Sector Coupling:

- Power
- Gas
- Transport



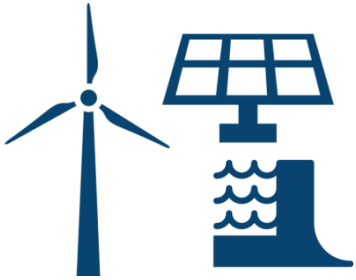
# Enabling the 4<sup>th</sup> Industrial Revolution with the Clean Energy Package 2025-2030

- Active customer
- Scarcity pricing
- Removal of price caps
- Easier supplier switching
- Risk preparedness framework
- European resource adequacy
- Ambitious Regional Cooperation



# New Prosumer integration strategy

Renewable  
energy units



Smart  
Consumption



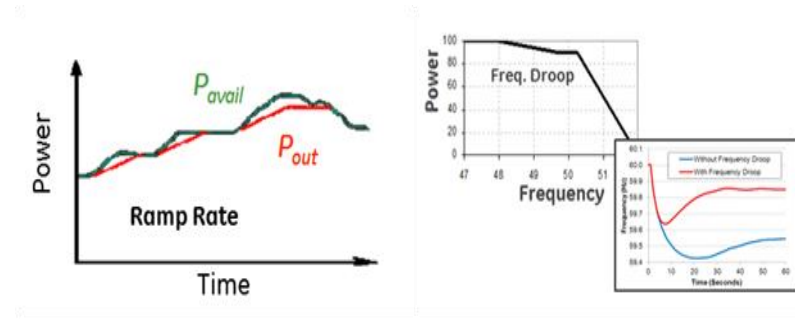
- Sensitivity to **price signals**
- Participation to the market in all time frames, including **balancing & ancillary services**
- New role for **aggregators**

# New Renewable integration strategies



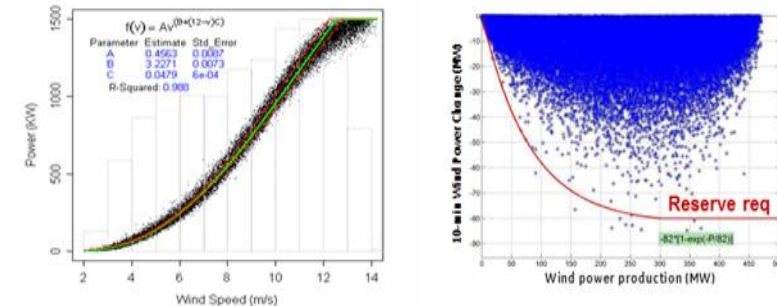
## Improved renewable controllability

- Grid Curtailment
- Integrated Renewable-Storage dispatch
- Volt/VAr dispatch through Smart Inverters
- Advanced Inertial response



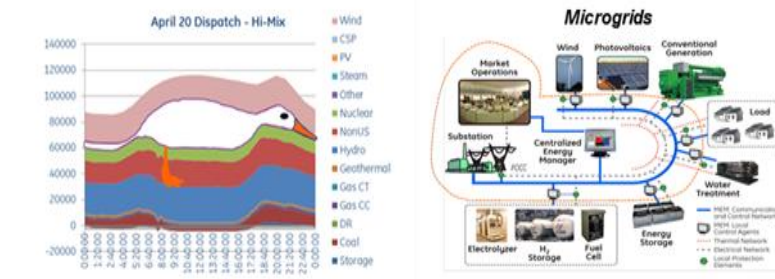
## New Generation dispatch strategy

- Compound real-time renewable forecasting
- Stochastic Economic Dispatch
- Storage & Demand Response controls
- Artificial Intelligence Based Load Forecasting

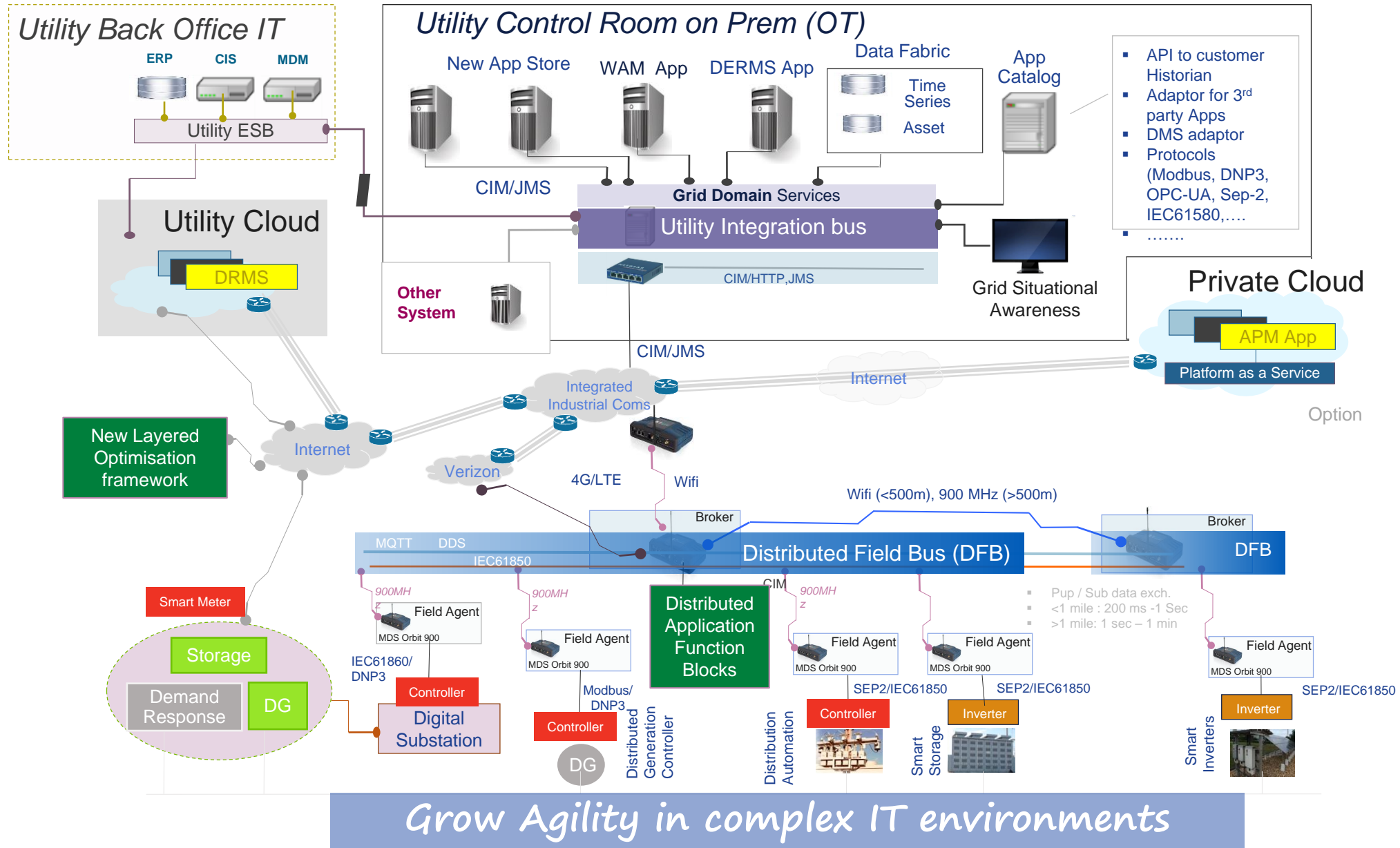


## New Distributed Energy Resources aggregation

- DER Virtual Power Plant participation into Markets & Grid ancillary services
- Optimal Gridded connectivity through Microgrids



# New Digital System of System Integration

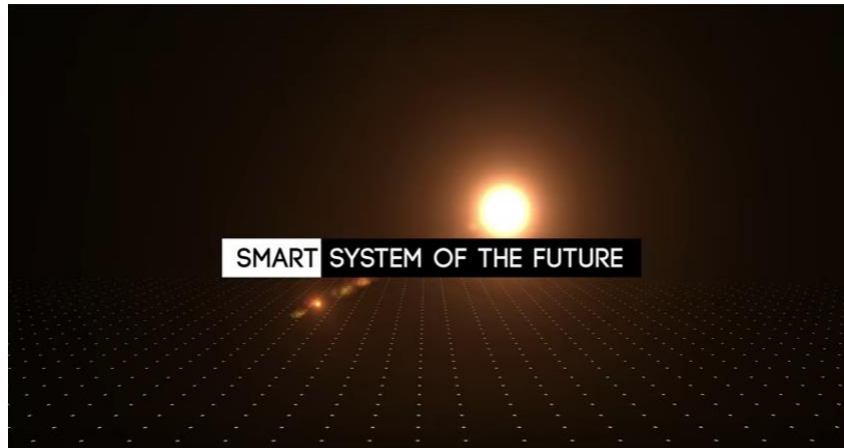




# New Strategic investments towards Digital



Energy Data Hubs & App Stores



New Generation Flow Based real-time markets

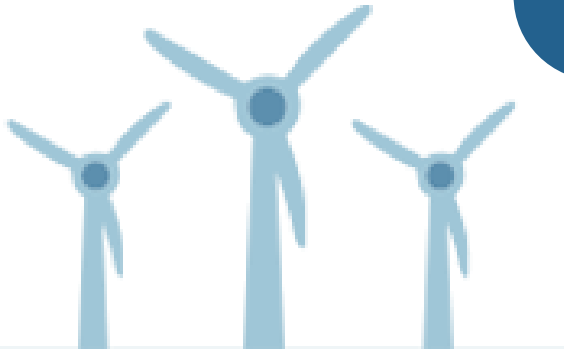


Reference Grid Architecture Model to support next Network Code deployments



# New Market Integration Strategy

- 1 Phase out of the priority dispatch for renewables
- 2 Expose 'mature' renewable energy sources to market
- 3 Renewable energy sources need to have **balancing responsibilities**
- 4 Renewables **support needs to be market-based**
- 5 Support needs to be **coordinated at regional and EU level**



# New sector coupling



- Power with Gas / Combined Heat & Power
- Mobility with Power & Gas & Emission Trading
- TSO-DSO
- Microgrid coupling at Gridedge through #Blockchain

# New network codes as strategic enablers



**Network Code implementation is a key priority!**



**CACM  
Guideline**

**Balancing  
Guideline**

**System Operations  
Guideline**



**Ensure market integration and integrity:**



**Optimal  
capacity  
calculation**

**Foster  
interconnection**

**Efficient  
provision  
of ancillary  
services**

**Wholesale/ retail  
integration**

# Next European transformation milestones



Intraday coupling go-live  
*Q1/2018*

RSCs implemented  
*12/2018 and*  
Synchronous Area  
Operational  
Agreement *03/2019*

All connection  
codes implemented  
*09/2019*

Common platform for  
balancing implemented  
*Q3/2019*

Day-ahead market  
coupling fully  
implemented  
*12/2020*



**And more  
to come...**

Integrate wholesale  
and retail markets

Realize demand  
side response

DSO-TSO  
cooperation

Cybersecurity .....

# THANK YOU FOR YOUR ATTENTION

For more information:  
[www.entsoe.eu](http://www.entsoe.eu)  
[www.entsog.eu](http://www.entsog.eu)

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