



# 24/7 Carbon Free Energy by 2030 Workshop

Flexibility requirements to support 24/7

What exists already and what do we still need?

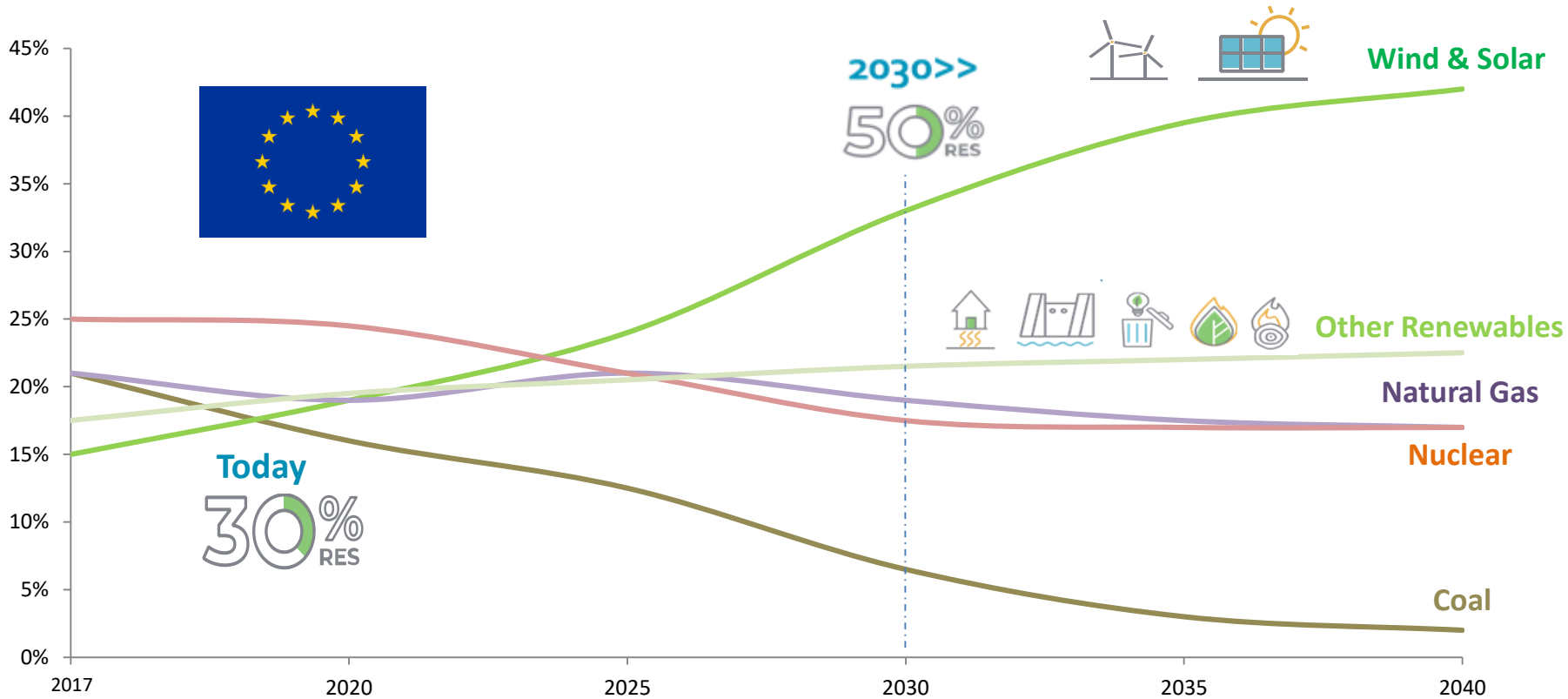
John Lowry



Renewables  
Grid Initiative 

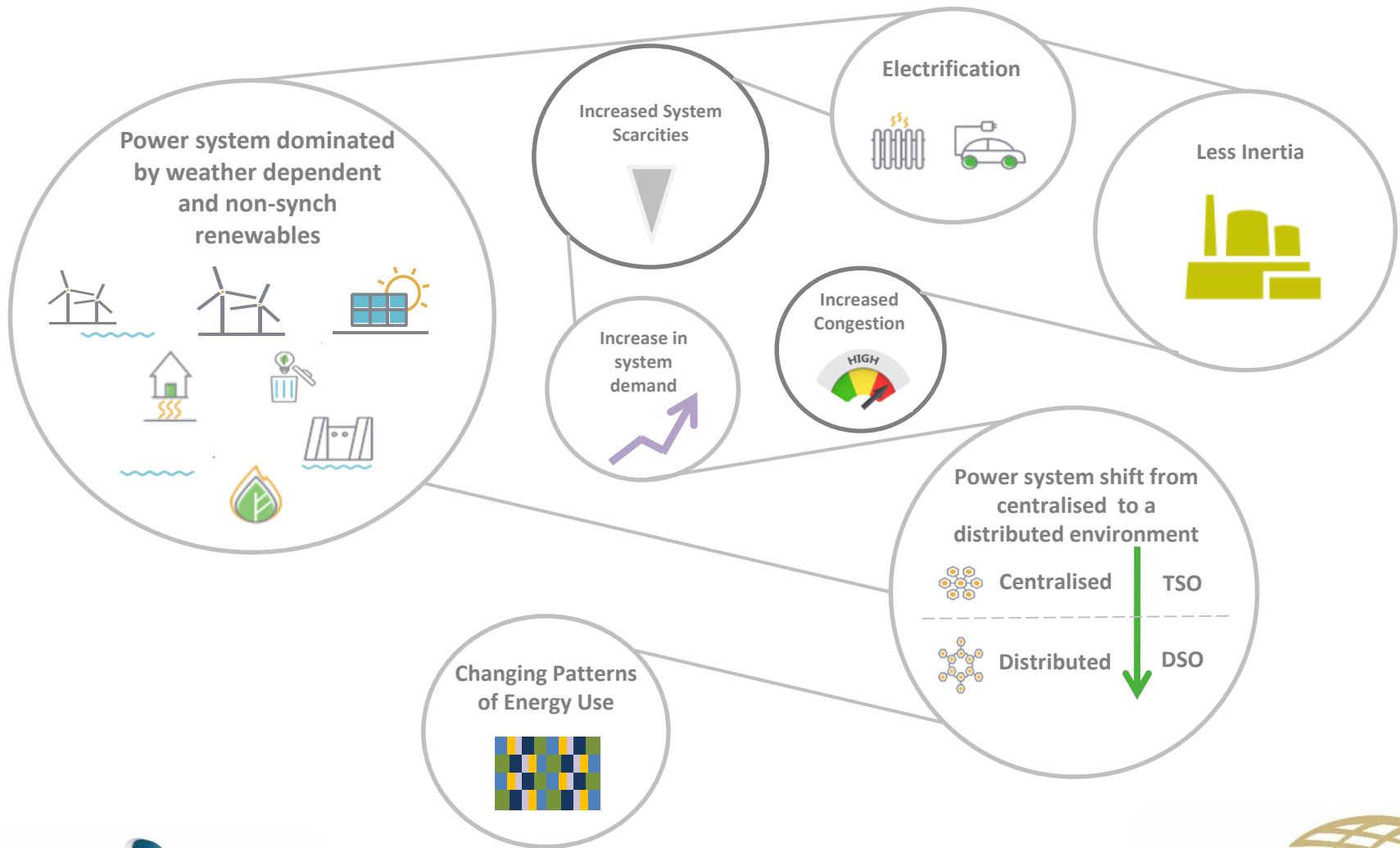


# The European Sources of Electricity Trajectory

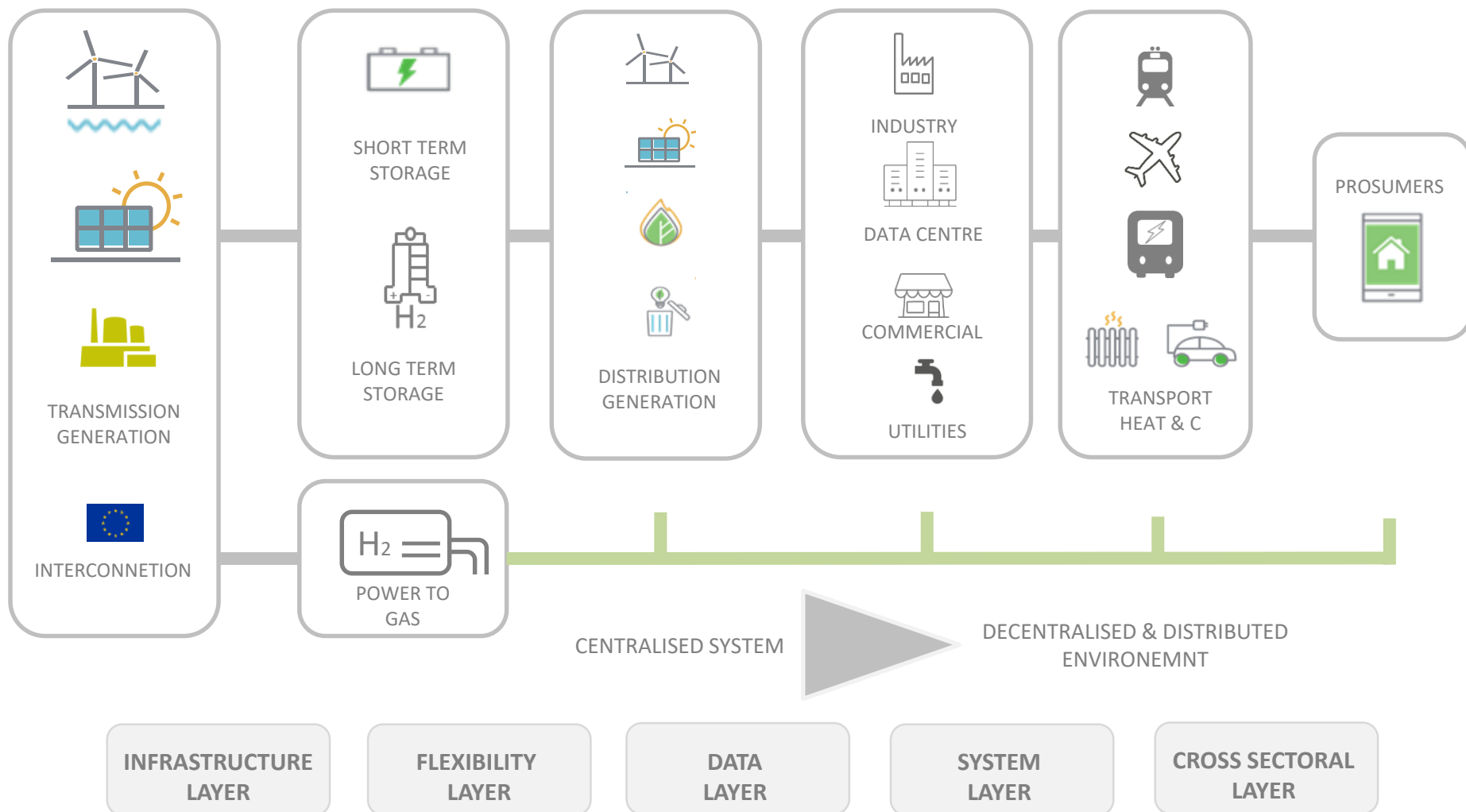


Share of electricity by source European Union 2017 -2040  
Source IEA 2018

# Increased System Complexity



# Changing Energy Landscape





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System operation and flexibility solutions to meet  
50% renewables in Europe by 2030



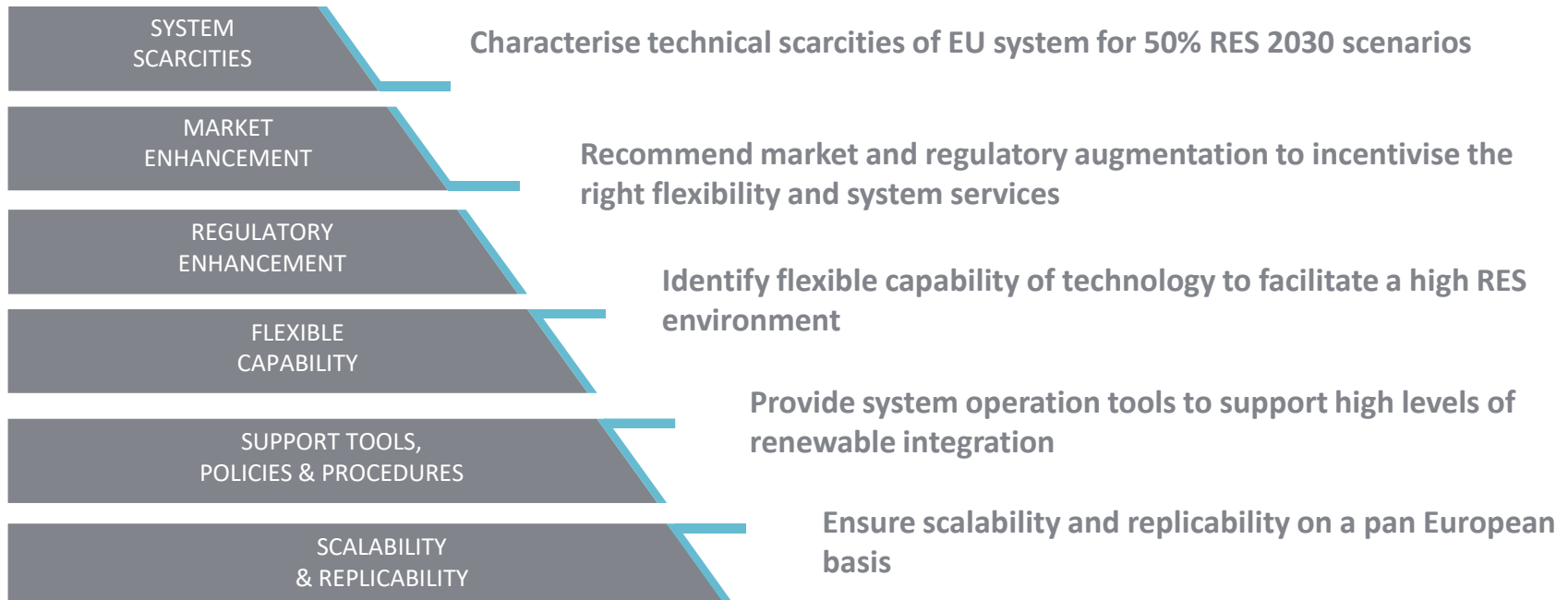
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# Project Dimensions



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# Key Findings - System Scarcities

	Continental Europe	Ireland & Northern Ireland	Nordic System
RoCoF (dimensioning incident)	Localised concern	Inertia scarcity	Evolving characteristic
RoCoF (system split)	Global concern	N/A	Not analysed
Frequency containment (dimensioning incident)	Evolving characteristic	Evolving characteristic	Evolving characteristic
Frequency containment (system split)	Global concern	N/A	Not analysed
Steady State Voltage Regulation	SS reactive power scarcity	SS reactive power scarcity	
Fault Level	No scarcity	Dynamic reactive injection scarcity	
Dynamic Voltage Regulation	No scarcity	Dynamic reactive injection scarcity	
Critical Clearing Times	Evolving characteristic	Evolving characteristic	
Rotor Angle Margin	Not analysed	Localised concern	
Oscillation Damping	Damping scarcity	Damping scarcity	
System Congestion	Global concern	Transmission capacity scarcity	
System Restoration	Not analysed	Evolving characteristic	



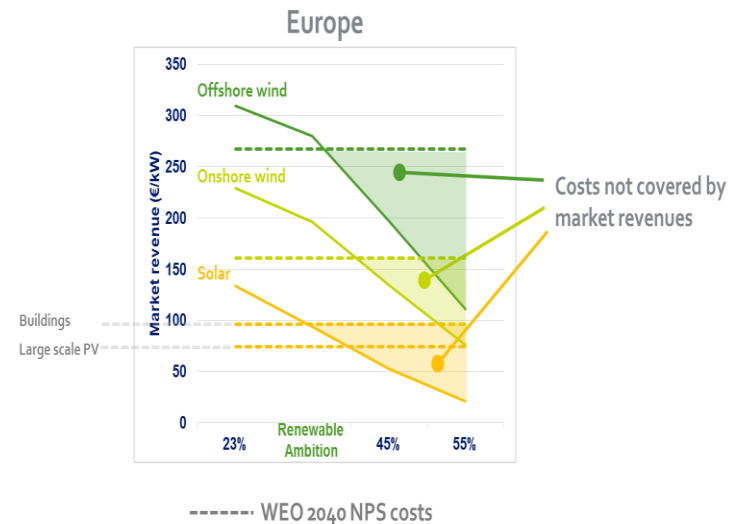
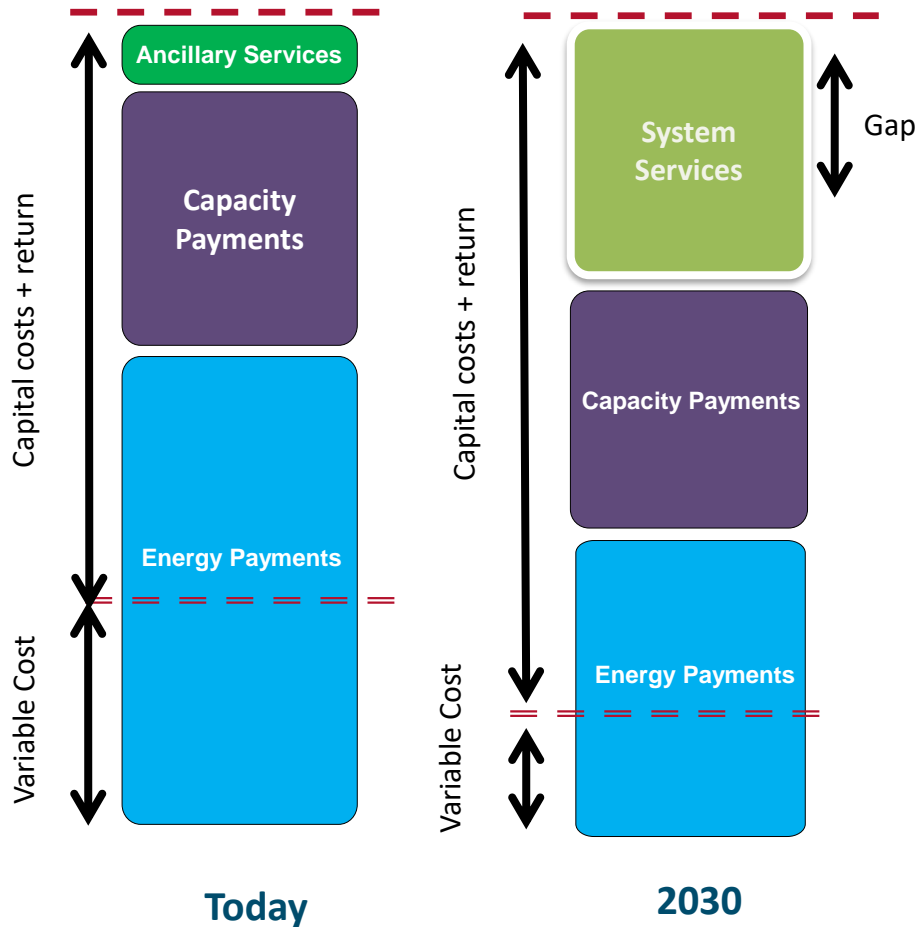
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# The Challenges are not just technical – Incentivising Investment to ensure we delivery 50% renewables

- Investment cost structure is changing
- Variables costs are decreasing
- Downward trajectory of energy market prices in future scenarios due to increase levels of VRES
- Energy revenues falling
- **Clear evidence that an additional revenue stream is needed to sustain a reasonable return**





# Webinar Series

 **#1: Technical Shortfalls for Pan European Power System with High Levels of Renewable Generation**

 **#2: Financial Implications of High Levels of Renewables on the European Power System**

 **#3: Conceptual market organisations for the provision of innovative system services: role models, associated market designs and regulatory frameworks**

 **#4: Impact analysis of market and regulatory options through advanced power system and market modelling studies**

 **#5: Big data considerations and solutions for flexible energy systems**



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# Achievements in Ireland

## Trialling 70% - System Non-Synchronous Penetration



75% SNSP



40% RES-E



95%+ SNSP



70% RES-E



# AMBITION & CHALLENGE

2030 70% SCENARIO – IRE & NI



INTERCONNECTION – 1.25GW



TRANSPORT – 300,000 EV  
HEAT & COOLING – 300,000  
HOMES



OFFSHORE WIND – 3GW



DEMAND SIDE RESPONSE – 1GW



ONSHORE – 2GW



SMALL SCALE  
MICRO GENERATION  
DISTRIBUTED ENERGY RESOURCE  
MANAGEMENT



SOLAR PV – 3.9GW

30% DEMAND INCREASE  
(DATA CENTRES REPRESENT 75%)



BATTERY STORAGE – 1.8GW



OTHER RENEWABLE TECH – 0.5GW