

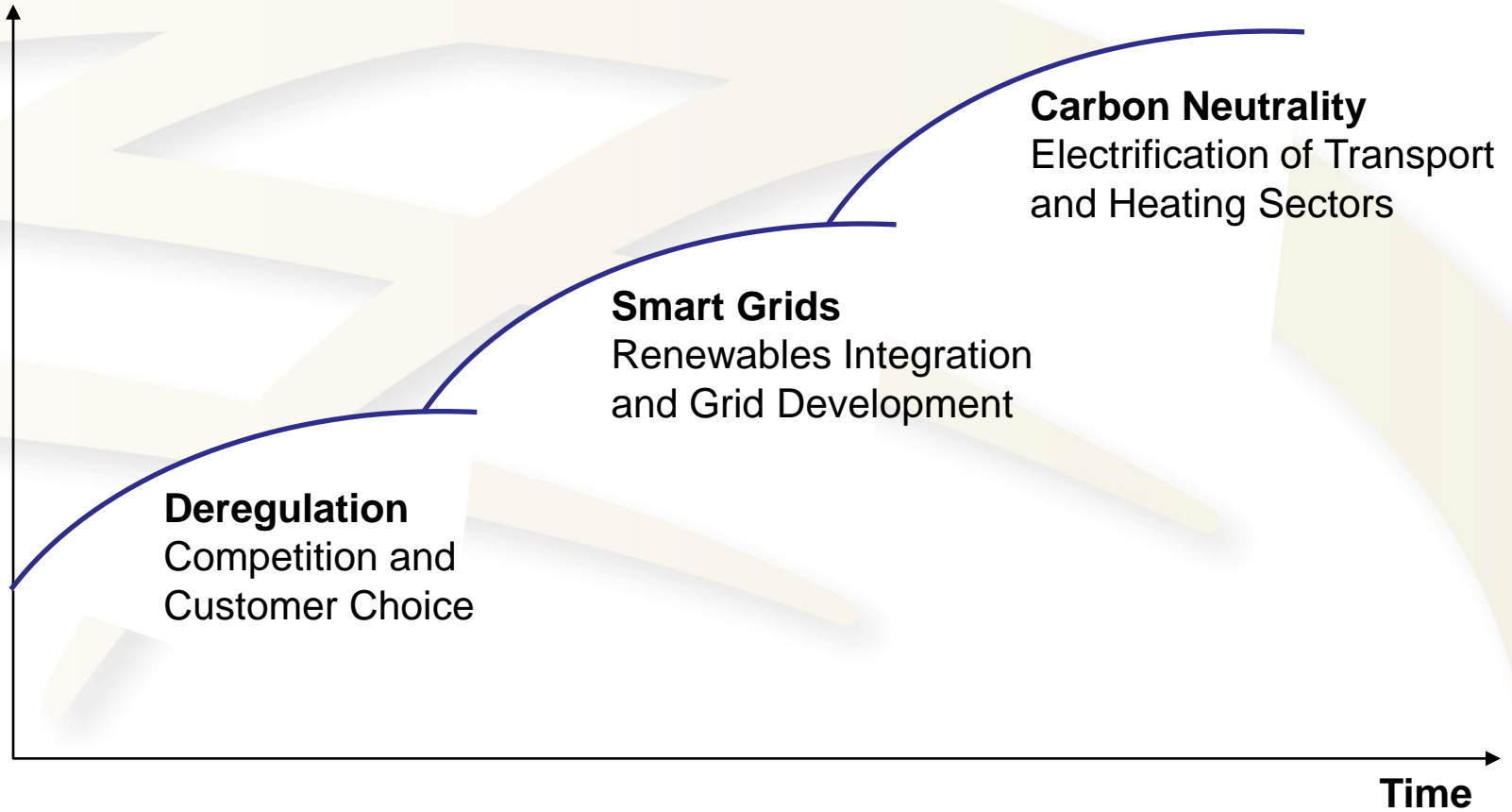
# *Transforming Ireland's Electric Power System*



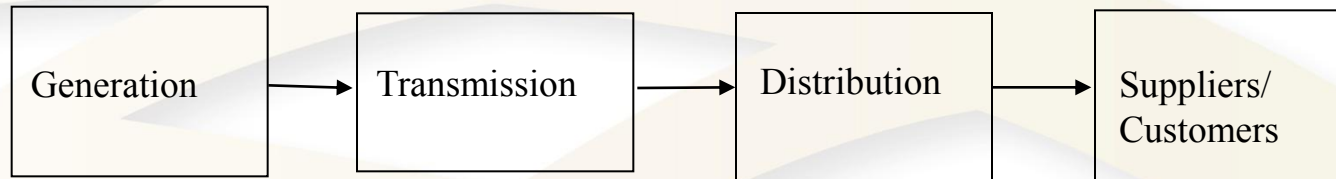
Dermot Byrne, Chief Executive, EirGrid plc

**ESI Seminar 18<sup>th</sup> June 2010**

# Transforming the Power System



# Industry Value Chain



## Evolution of Value Chain:

1. Competition in generation and supply
2. Introduction of Independent Regulatory Authority
3. Network Businesses remain as 'natural monopolies', but regulated
4. Independence of Transmission System Operators
5. Evolution of Wholesale Power Markets
6. Strategic push towards regional markets (EU)

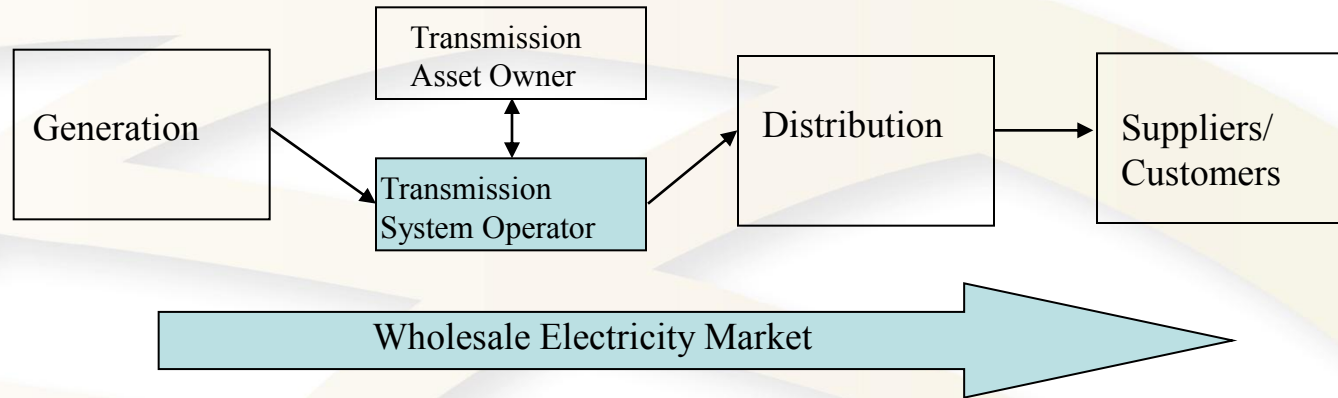
# EirGrid

- Ireland's Independent Transmission System Operator and Operator of the Wholesale Power Market
- Commercial State owned Company
- Separate from all parties in the electricity market
- Established by statute as TSO and licensed by Commission for Energy Regulation
- Annual turnover of approximately €300m

## EirGrid's Role

- To develop, maintain and operate a safe, secure, reliable, economical and efficient transmission system for the benefit of our customers
- To deliver quality transmission and market services
- To advise the Regulator (CER) in relation to security of supply

# EirGrid's Role in the Value Chain (Now)

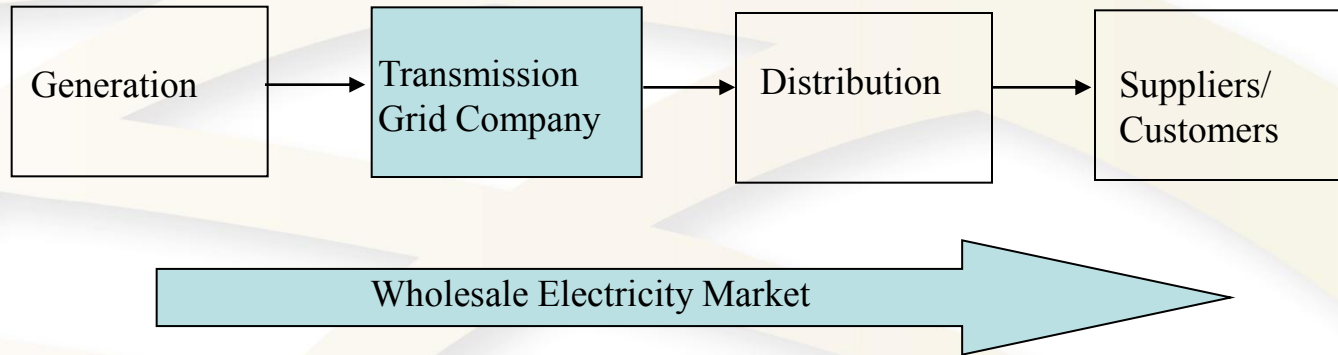


## Key Elements of Role:

1. Grid Development
2. Power System Operation
3. Transmission Access
4. Power Market Settlement

**EirGrid's independence from all market participants is critical**

# EirGrid's Role in the Value Chain (Future)



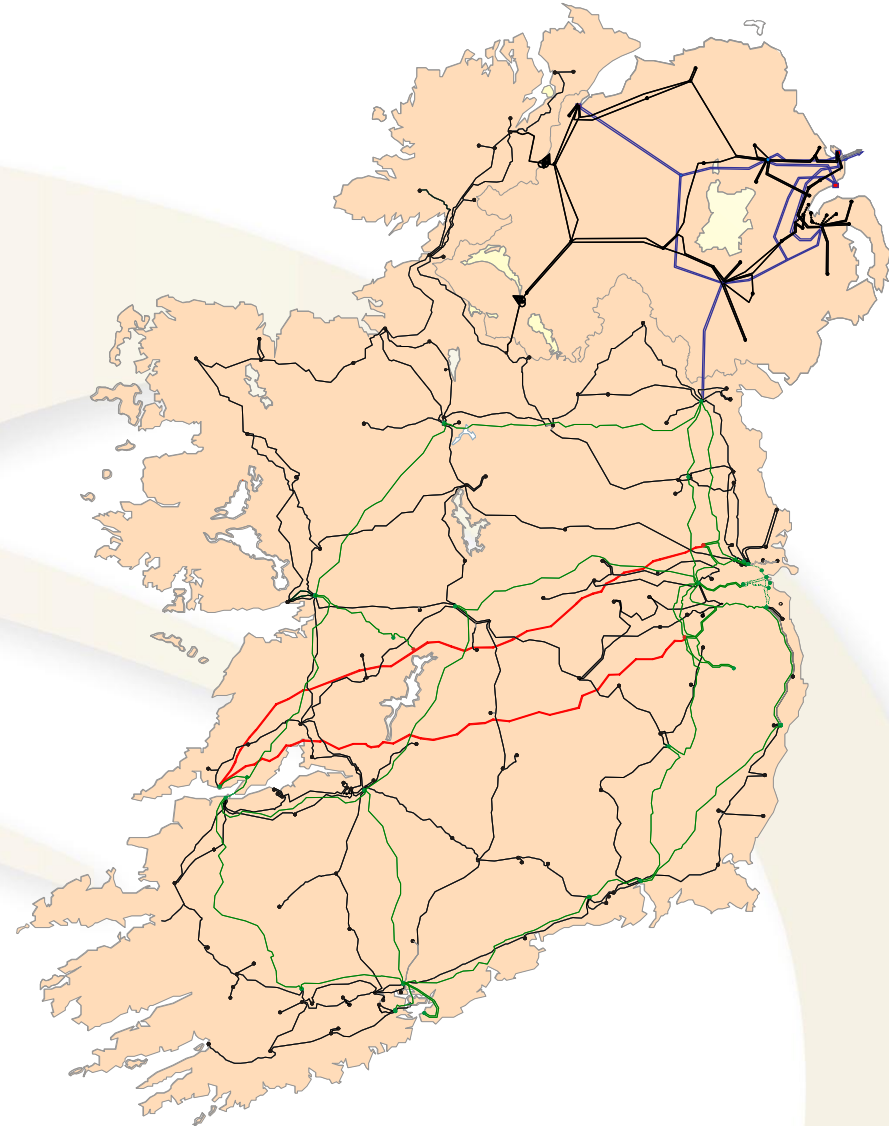
## Key Elements of Role:

1. Grid Development
2. Power System Operation
3. Transmission Access
4. Power Market Settlement

**EirGrid's independence from all market participants is critical**

# Transmission Grid

- High capacity, efficient, reliable link between
  - Generation
  - Demand centres
  - Interconnections to other systems
- Equivalent to “broadband” power or motorways

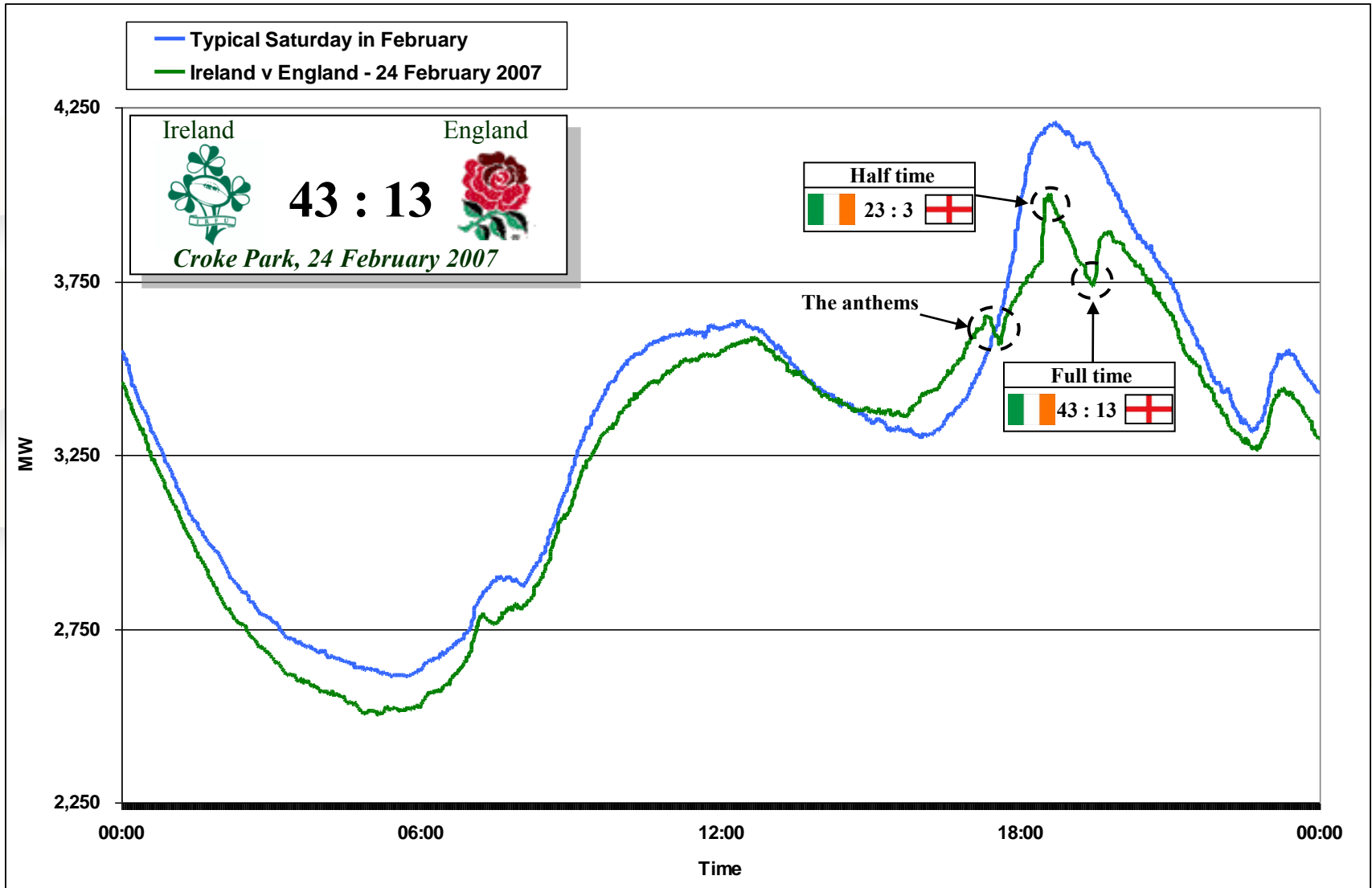


400 kV 440 km    220 kV 1830 km    110 kV 4000 km

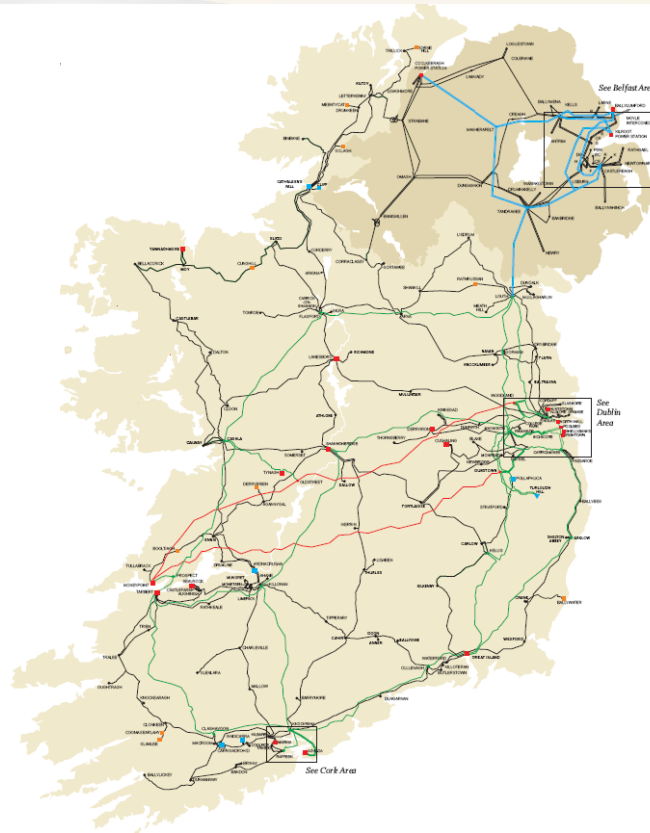




# THE IRELAND V ENGLAND RUGBY MATCH ALTERED THE USAGE OF ELECTRICITY ACROSS THE WHOLE COUNTRY



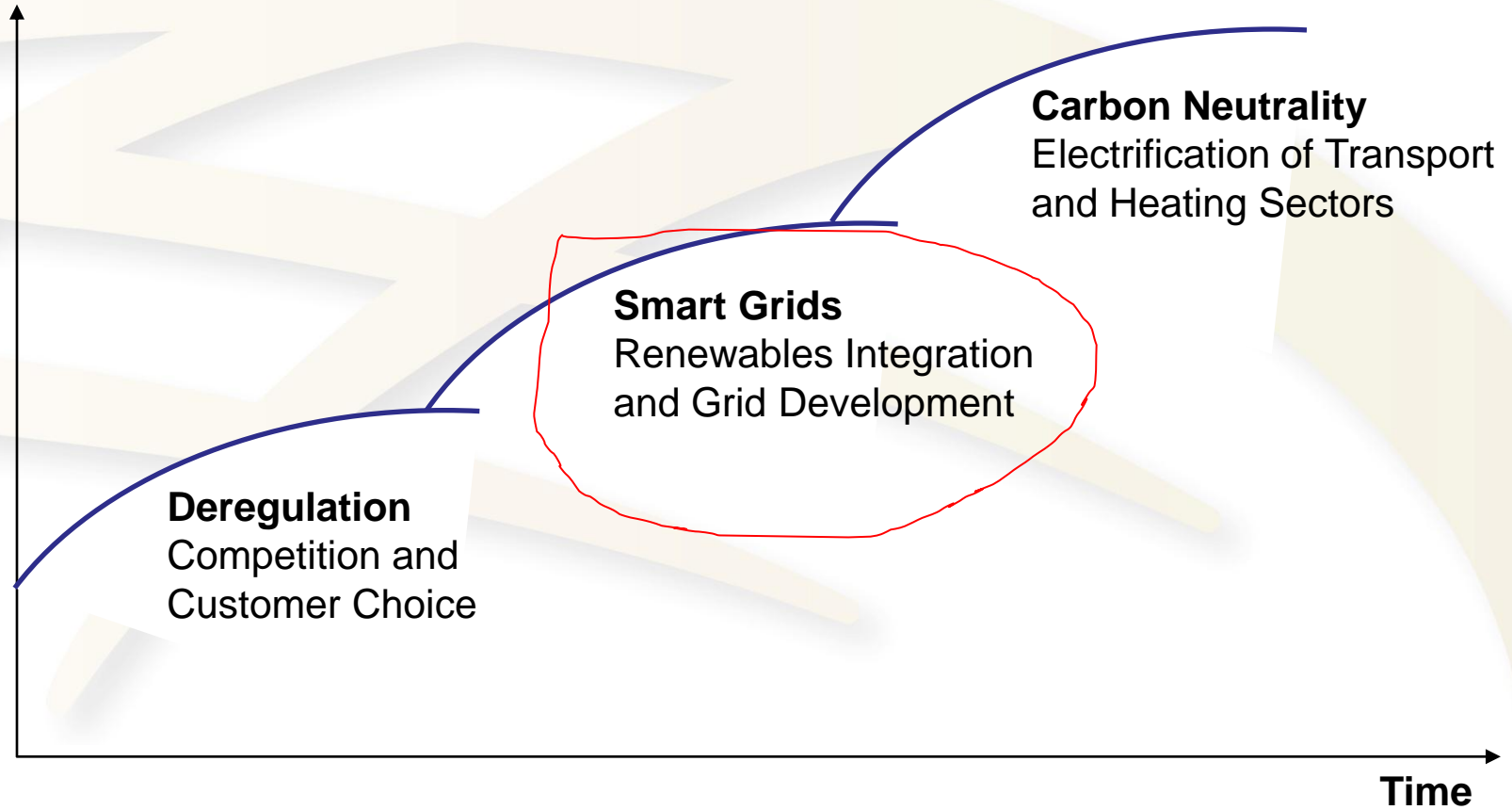
# EirGrid – An All-Island Energy Company



# Transmission Projects in Progress

	<b>400 kV / 220 kV/ 110 kV</b>
<b>No. of New Stations</b>	<b>16</b>
<b>Overhead Line</b>	<b>610 km</b>
<b>Underground Cable</b>	<b>33.1 km</b>
<b>No. of New Transformers</b>	<b>17</b>
<b>No. of New Capacitor Banks</b>	<b>12</b>
<b>Upgrades</b>	<b>582 km</b>
<b>Refurbishments</b>	<b>83 km</b>

# Transforming the Power System



# Power System Transformation – Two Dimensions

1

## Investment Dimension

- The major Infrastructural Building Blocks
- The '**Hardware**'



2

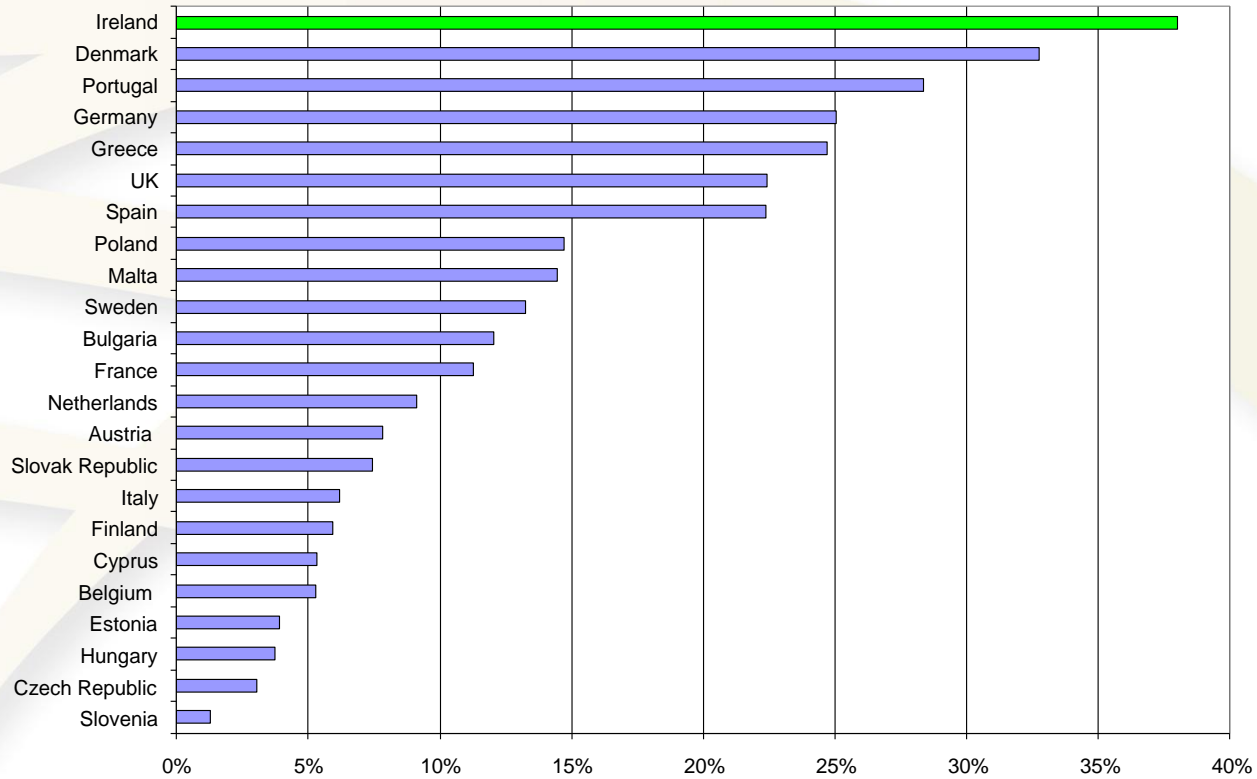
## Operational Dimension

- Policies, procedures, controls etc
- The '**Software**'



# Ireland's Renewable Policy Target

Wind as a Percentage of Total Electricity (2020 Target) - Select EU Countries



# 1 Investment Dimension – the ‘Hardware’







# eastwest interconnector



# ON TARGET FOR 2012



# Developing the Grid - Grid25



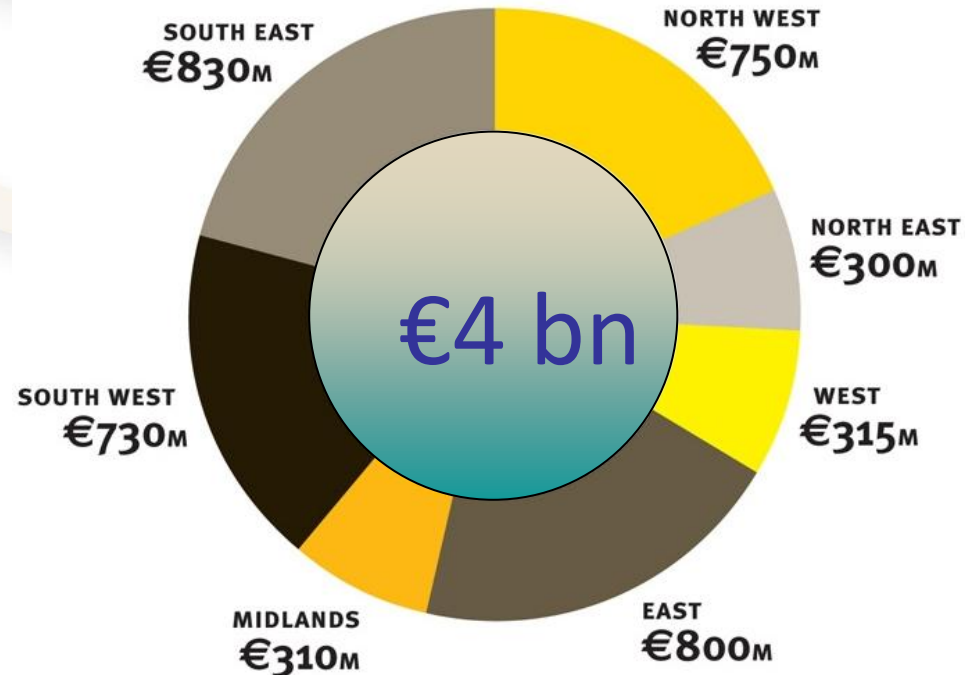
**GRID25**

A Strategy for the  
Development of Ireland's  
Electricity Grid for  
a Sustainable and  
Competitive Future

2,200 km Upgrades

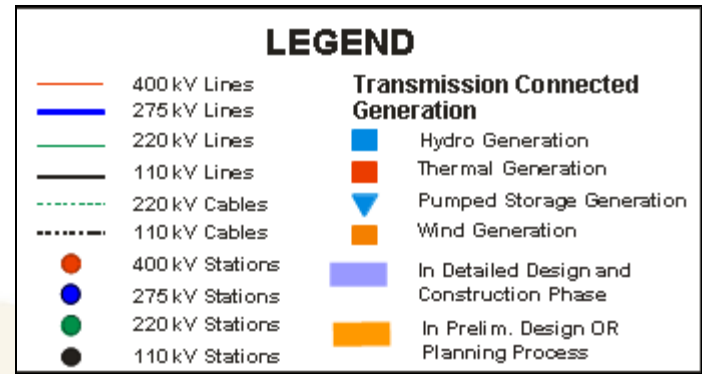
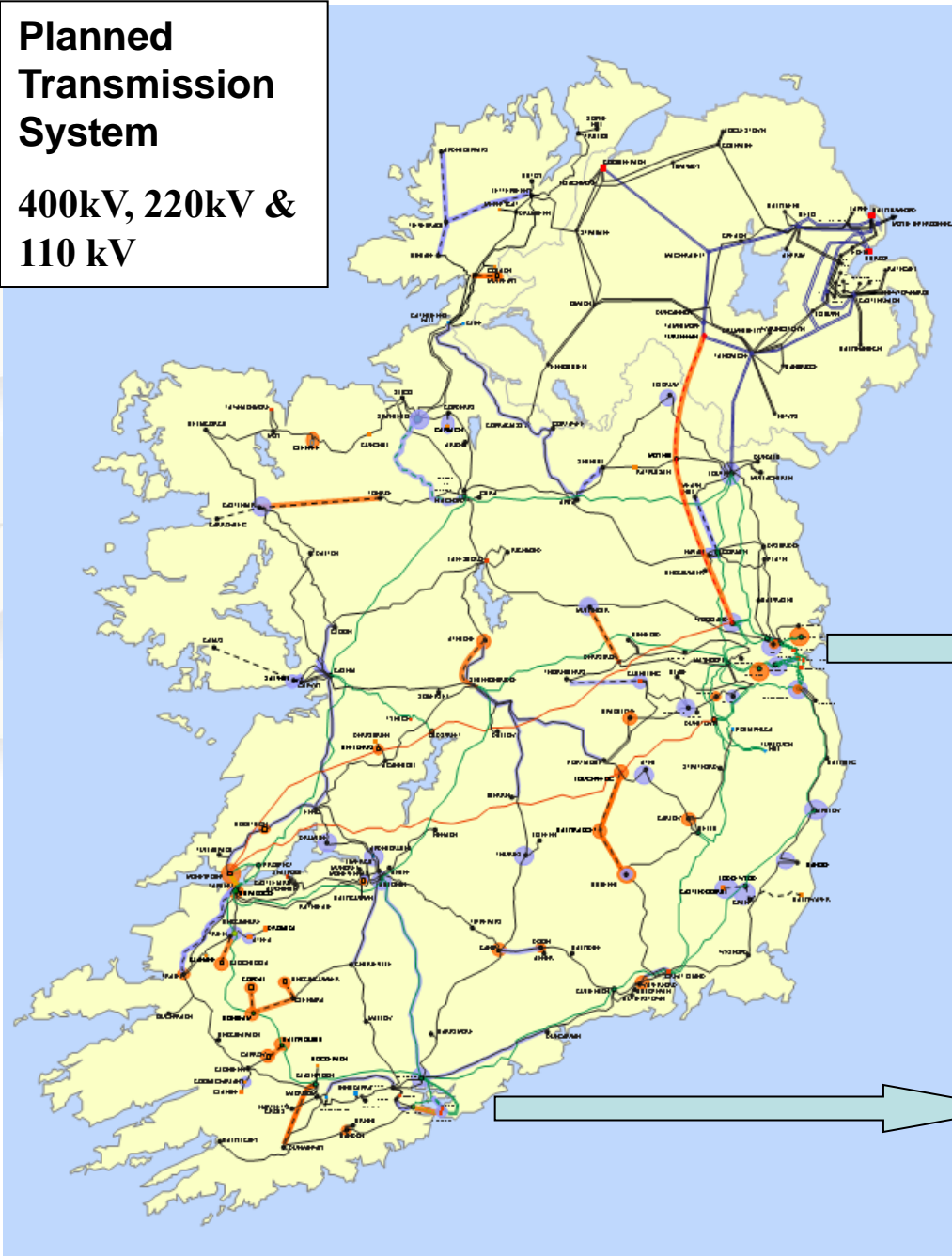
1,150 km New Build

€4 billion



# Planned Transmission System

400kV, 220kV & 110 kV



## Dublin Area



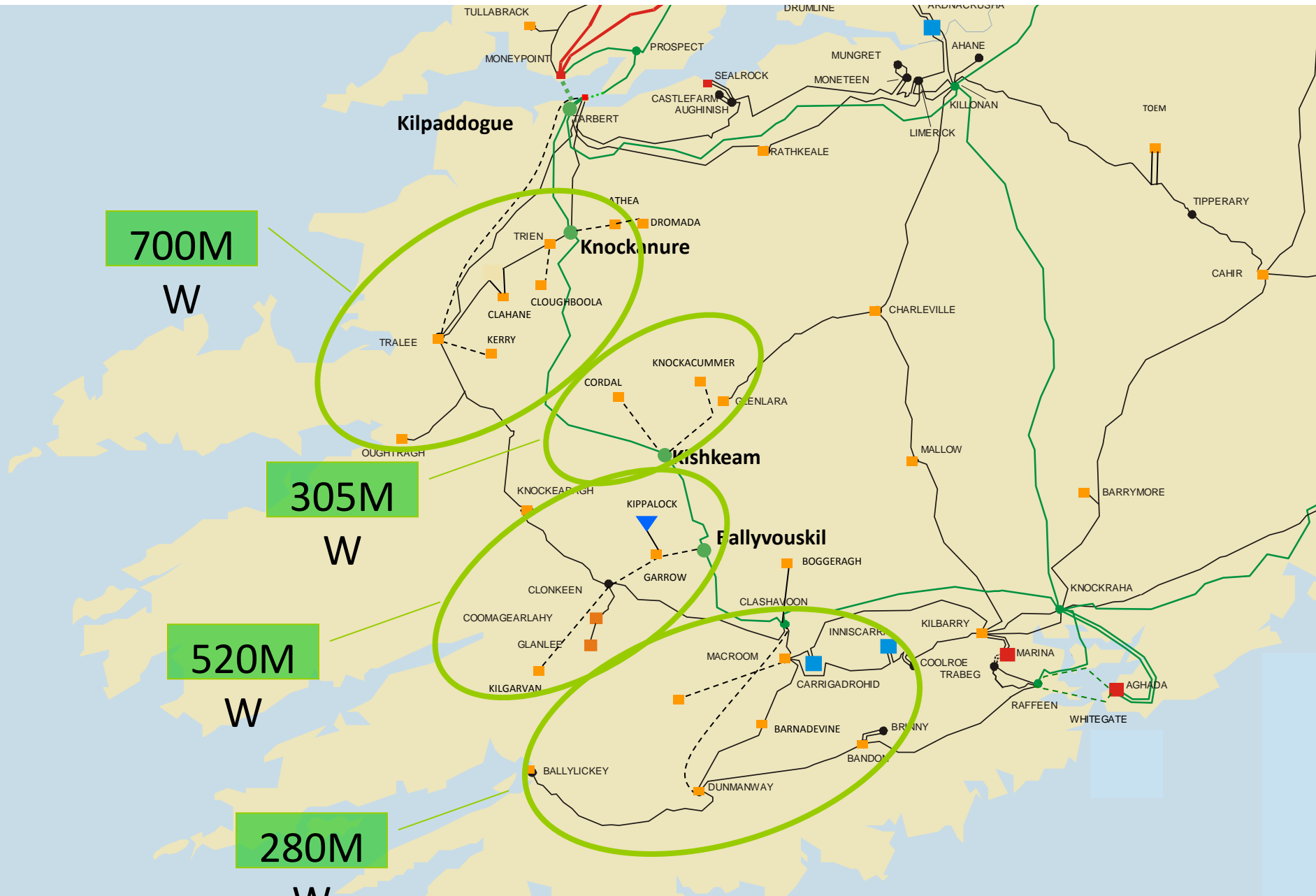
## Cork Area



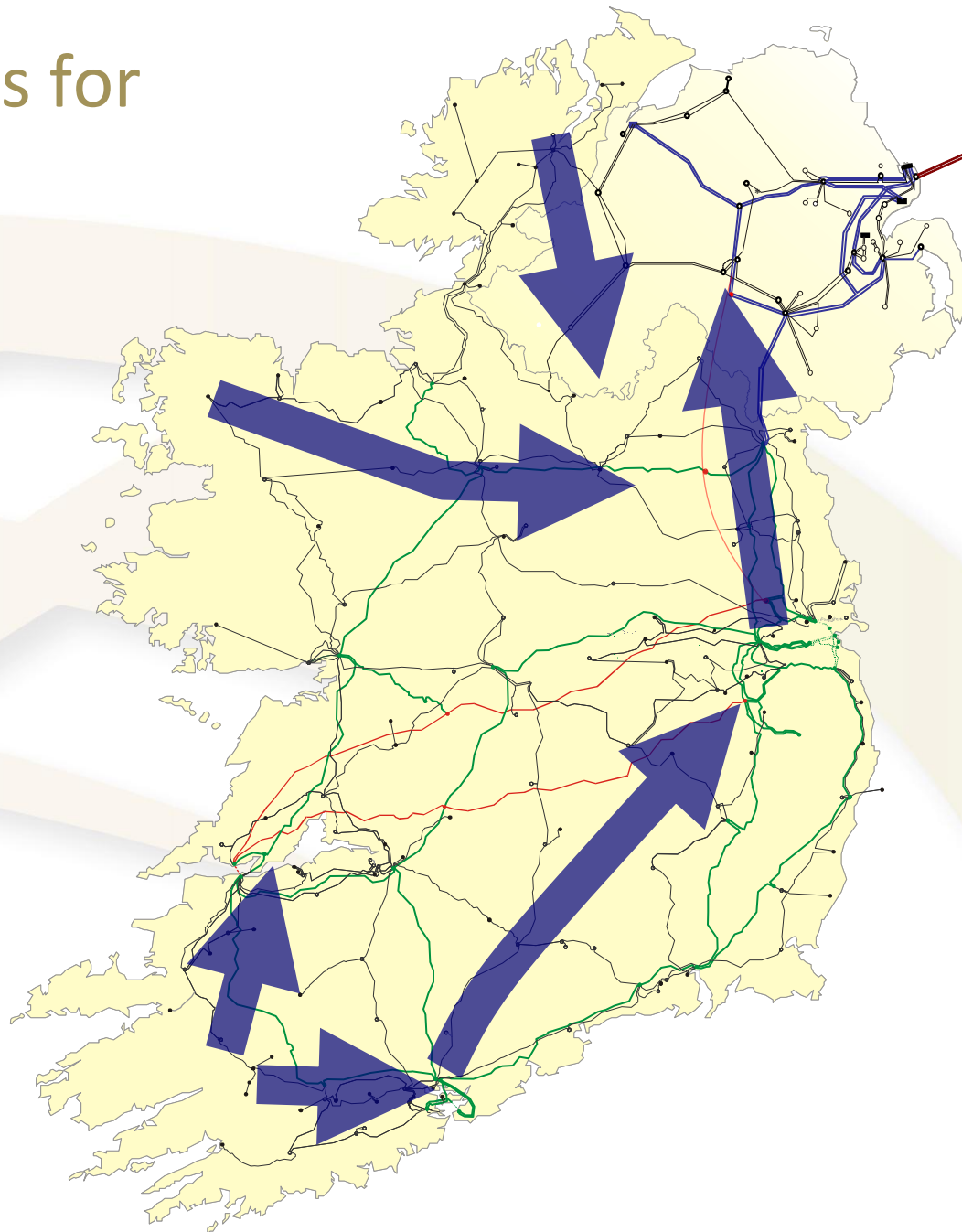
# Existing Transmission Network in South



# GRID25 Network Development South



# Primary Corridors for Reinforcement Investigation



# Construction Challenge

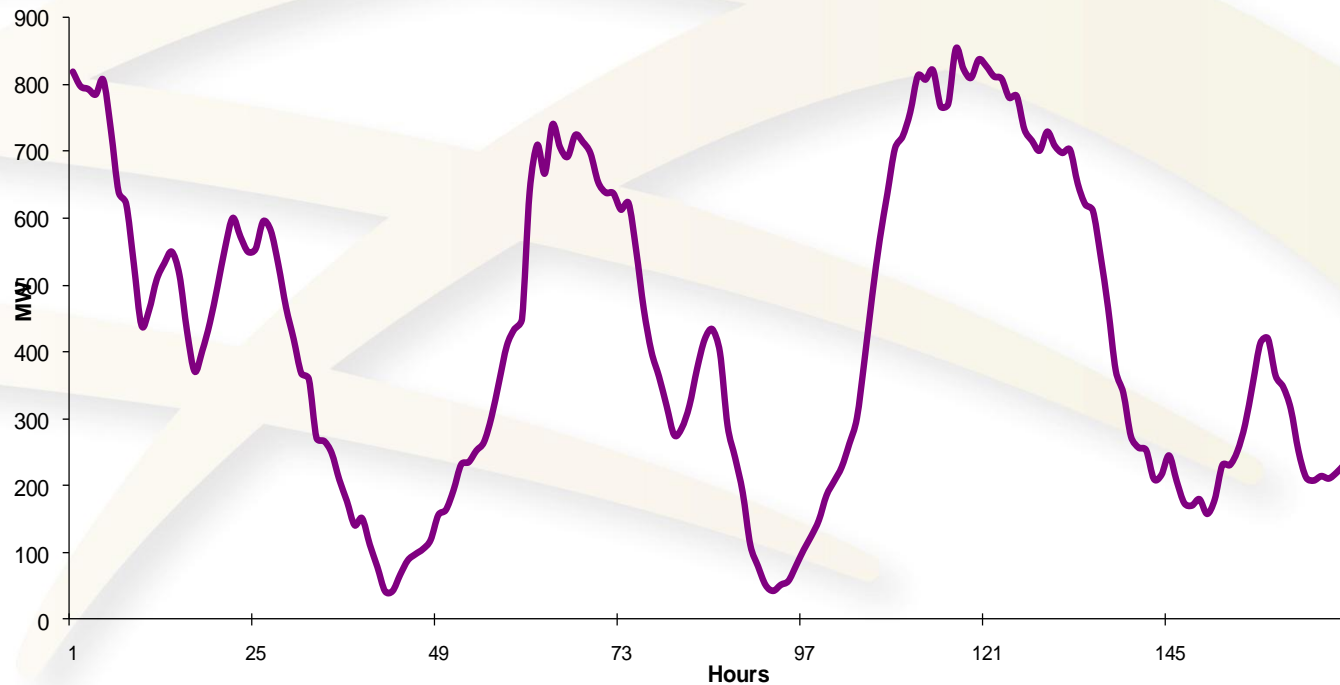


Getting the Balance Right:

- Reliability
- Cost
- Impact



# Hourly Average Wind (MW) over 1 week (week ending March 15th 2009)



## 2 Operational Dimension – the ‘Software’

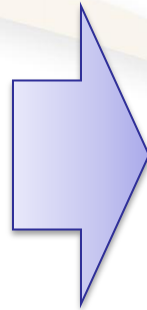
### Challenges

- Resource Intermittency
- System Stability
- Uncertainty
- Complexity
- Portfolio Performance

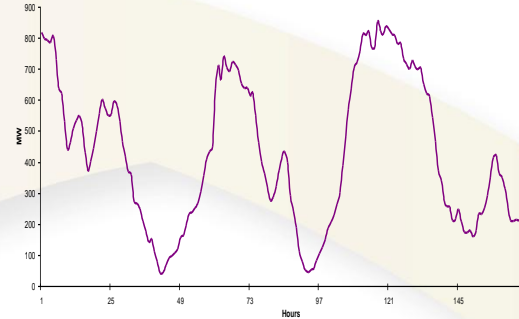


### Responses

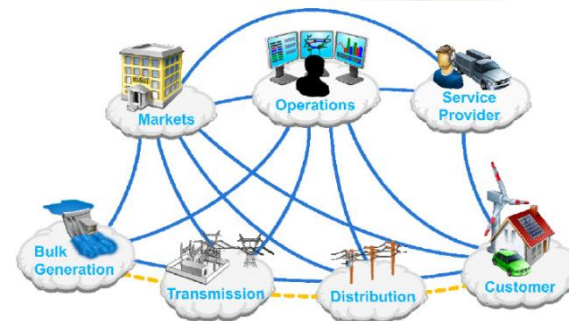
- ICT
- Customer responsiveness
- Decision support tools
- Codes / Protocols
- Smart Meters



Hourly Average Wind (MW) over 1 week (week ending March 15th 2009)



### Smart Grid



NIST Smart Grid Framework 1.0 Sept 2009

# TSO Renewable Facilitation Studies

## Objectives:

- Increase our understanding of the behaviour of the power system with large amounts of renewable generation
- Identify any potential technical issues
- Develop mitigation measures
- Wrap it all up in a comprehensive strategy for the operation of the power system with large amounts of renewables

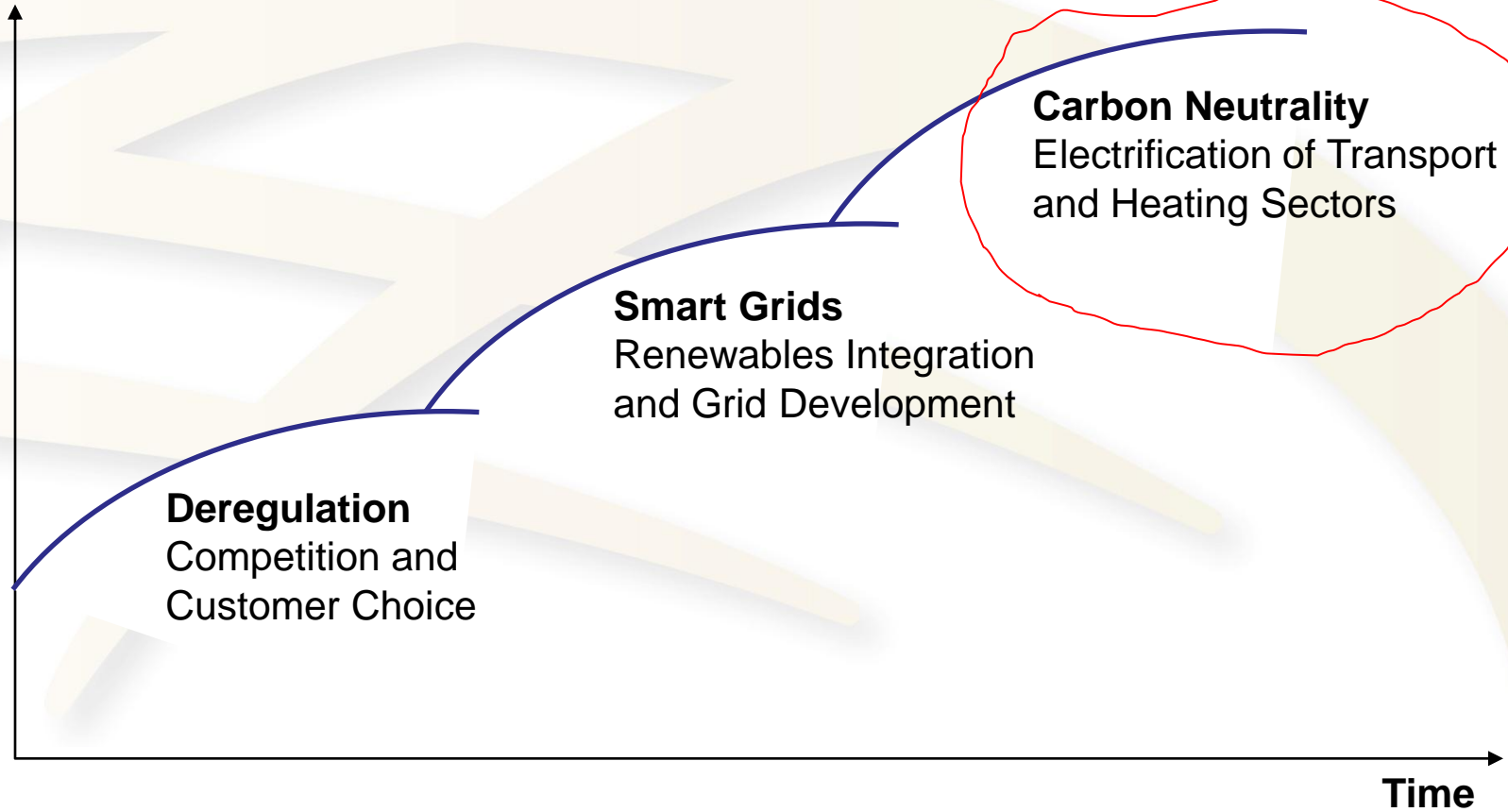
## Studies:

- 4000 Frequency response studies    5000 Transient Stability studies
- 1000 Short Circuit Level studies    Analysis of Wind patterns

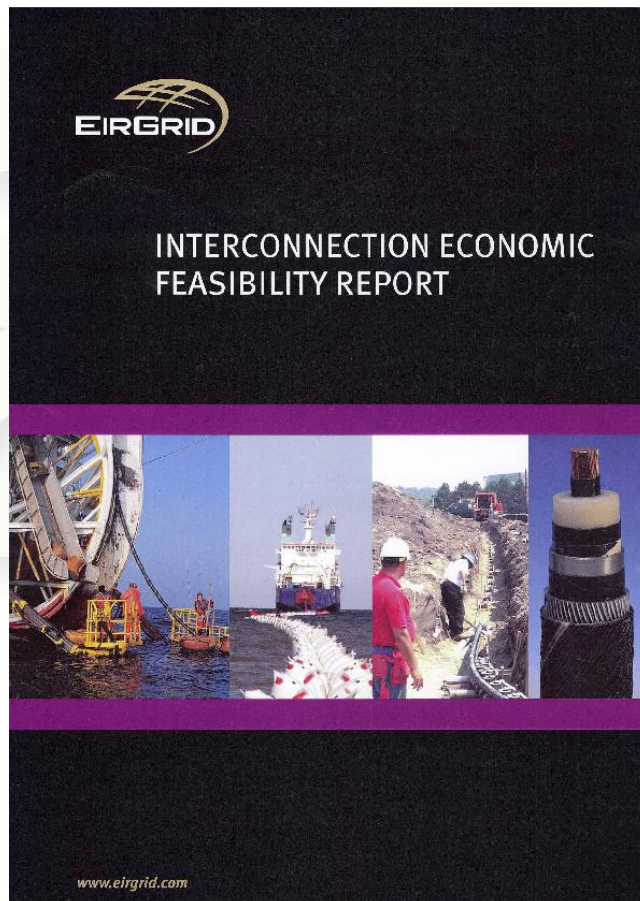


First comprehensive study of its kind in the World

# Transforming the Power System



# Case for further interconnection



- This confirms the very strong economic case for the East-West Interconnector.
- Further interconnection between AI and GB is economically attractive.
- Interconnection from Ireland to France also appears beneficial, but further detailed work is required to verify this and evaluate this against Ireland – Great Britain interconnectors.
- Interconnection assists in integration of more wind on the system, particularly for export.

# EirGrid Off-Shore Grid Study

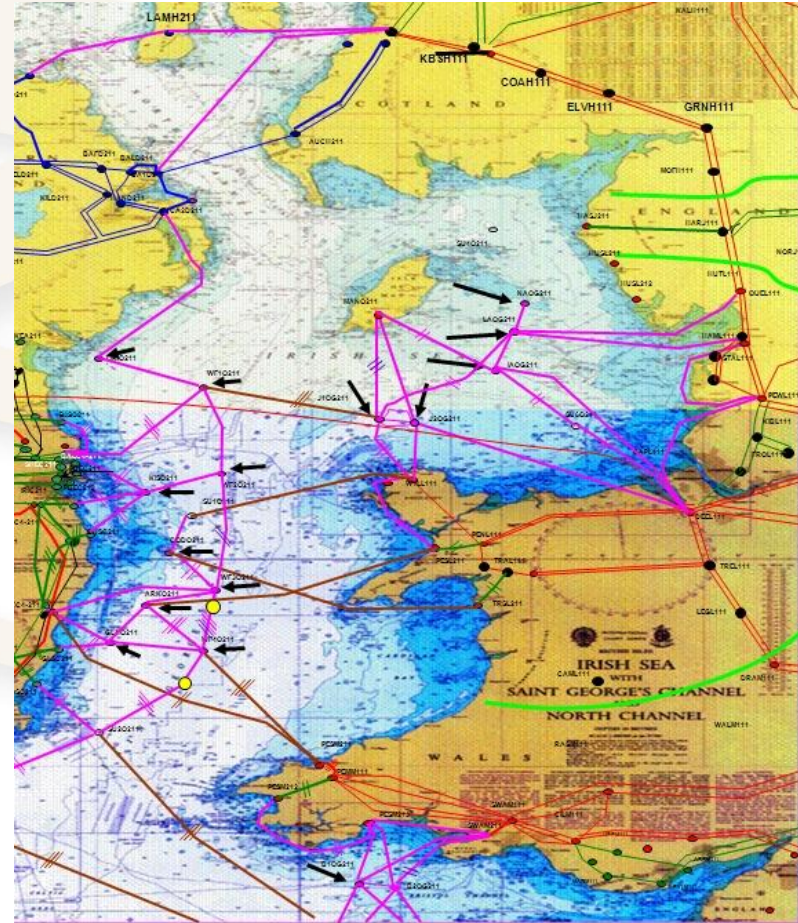
## Study Objectives:

- Develop optimised off-shore grid development strategies
- Utilise that strategy to inform the TSO offshore functional designs and policies

## Scenarios:

- 3/5/7GW off-shore.
- Study Period out to 2030
- Part A: off-shore Ireland only
- Part B: incorporating links to rest of Europe

Will feed into other broader-based studies (ENTSO-E, SEI etc.)



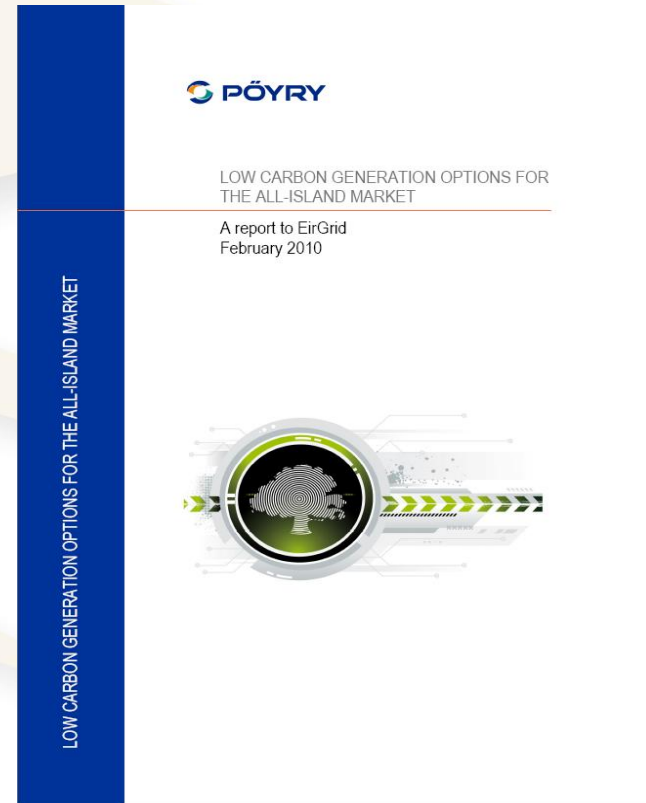
# Future Generation Portfolio Options

## Objectives:

- Dramatic reduction in Carbon Intensity
- Identify technology options
- Contribute to informed debate

## Study:

- Year 2035 selected
- Six Balanced Portfolios identified
- Detailed modelling performed
- Results presented

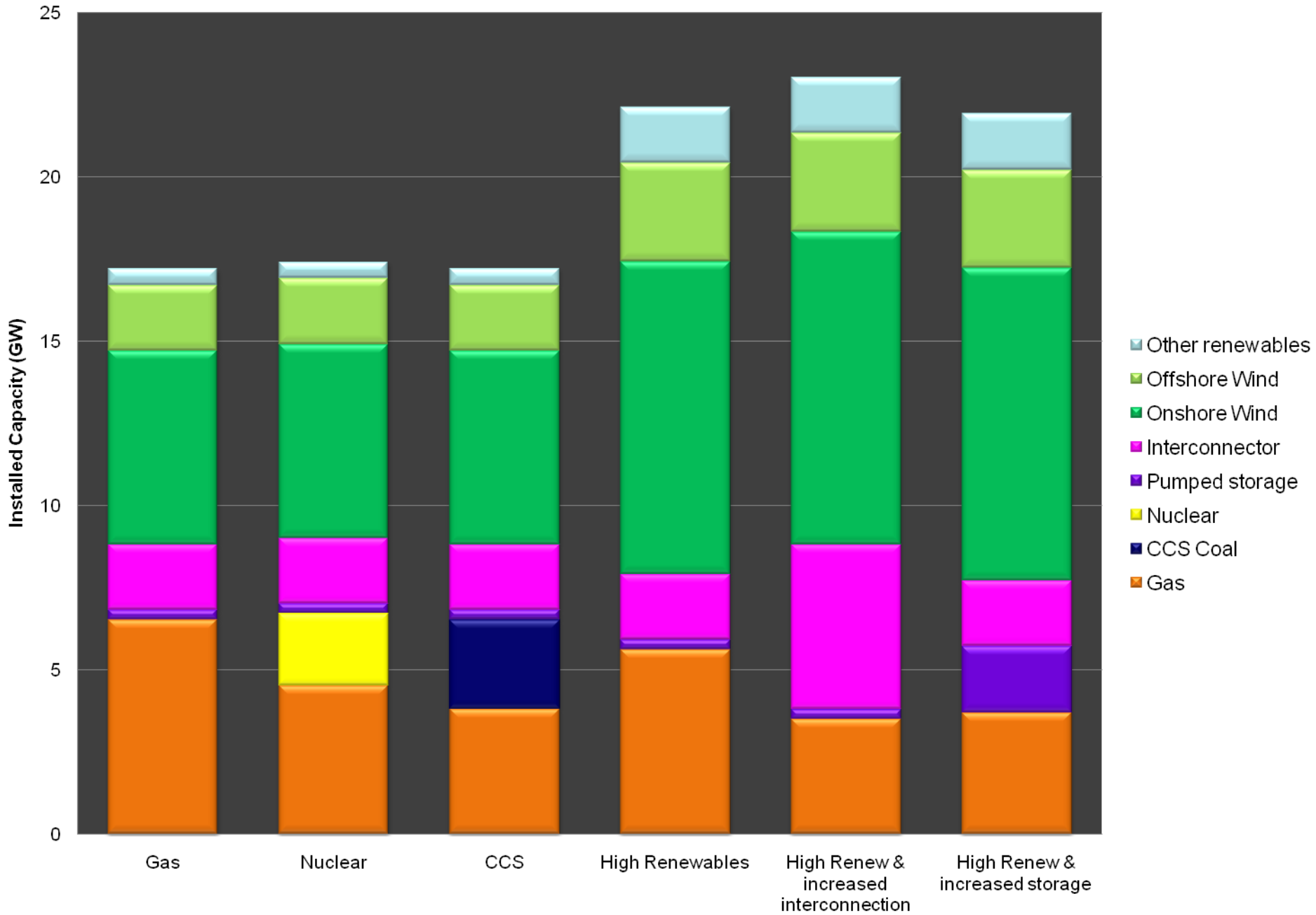


# Context

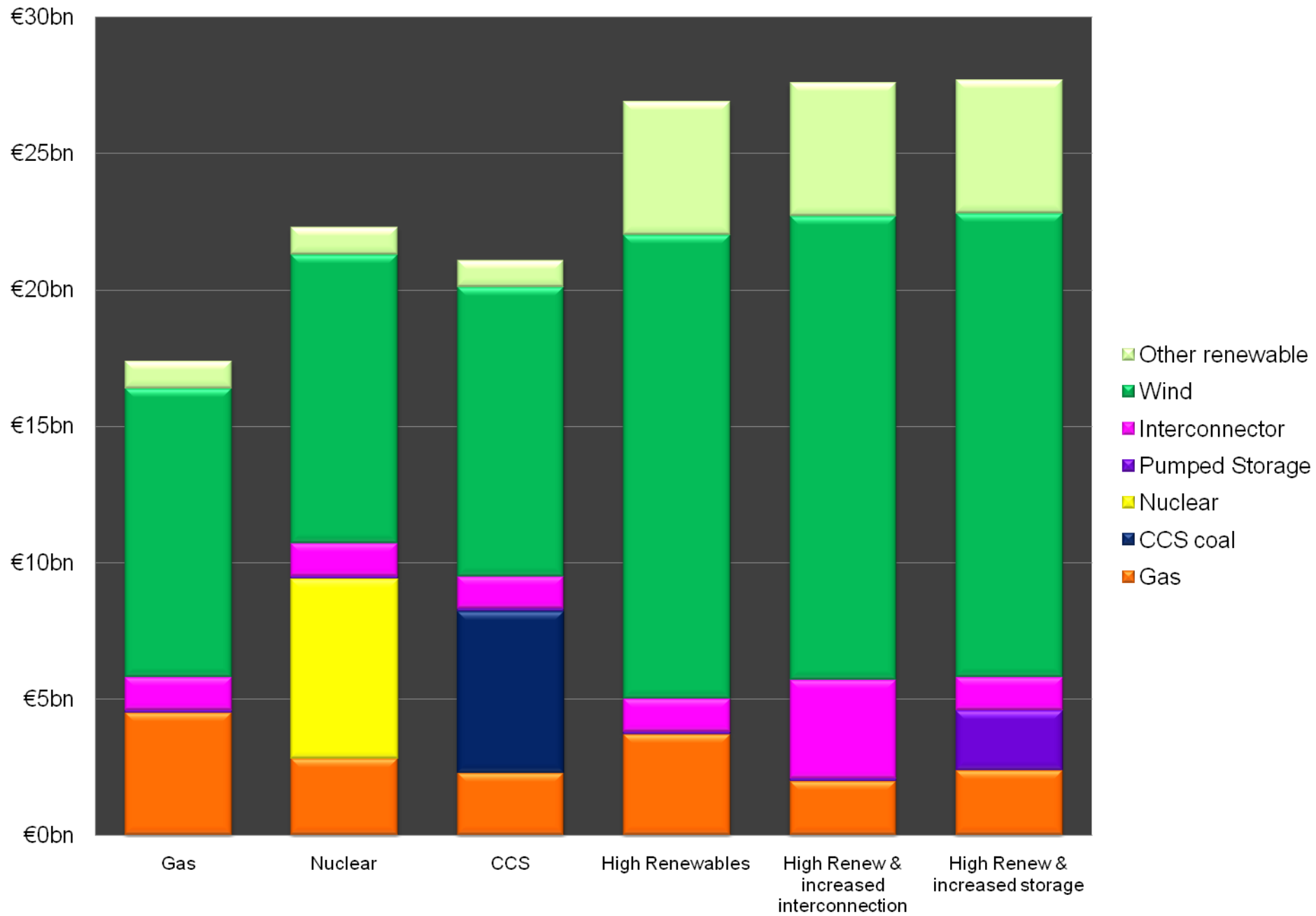
- Moneypoint, peat and oil plants set to close: fuel diversity issue.
- Debate should now progress to longer term policy
- Goal will be a transition to a low carbon electricity system.
- Wide range of options have development potential in this timeframe.



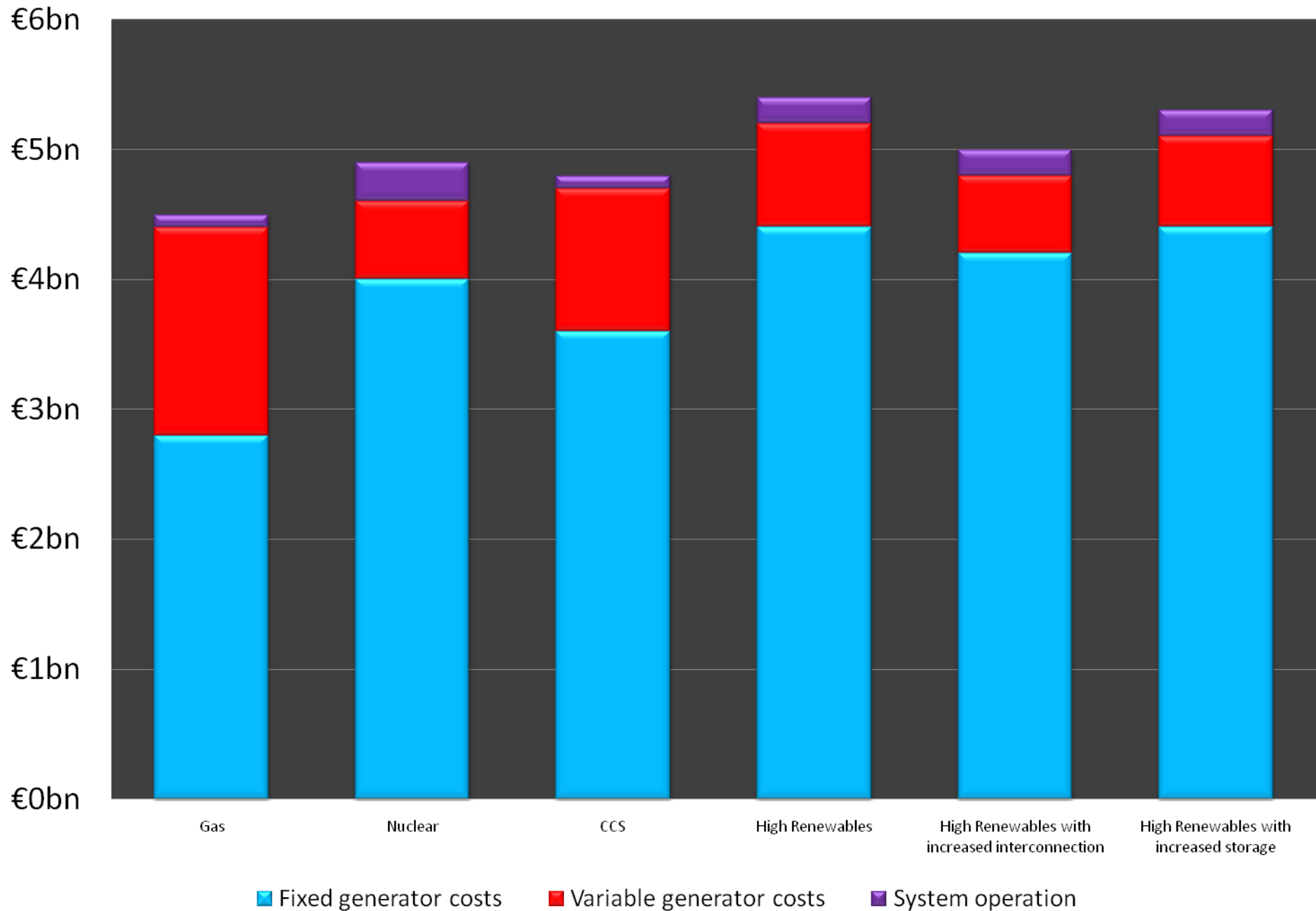
# Portfolio Options



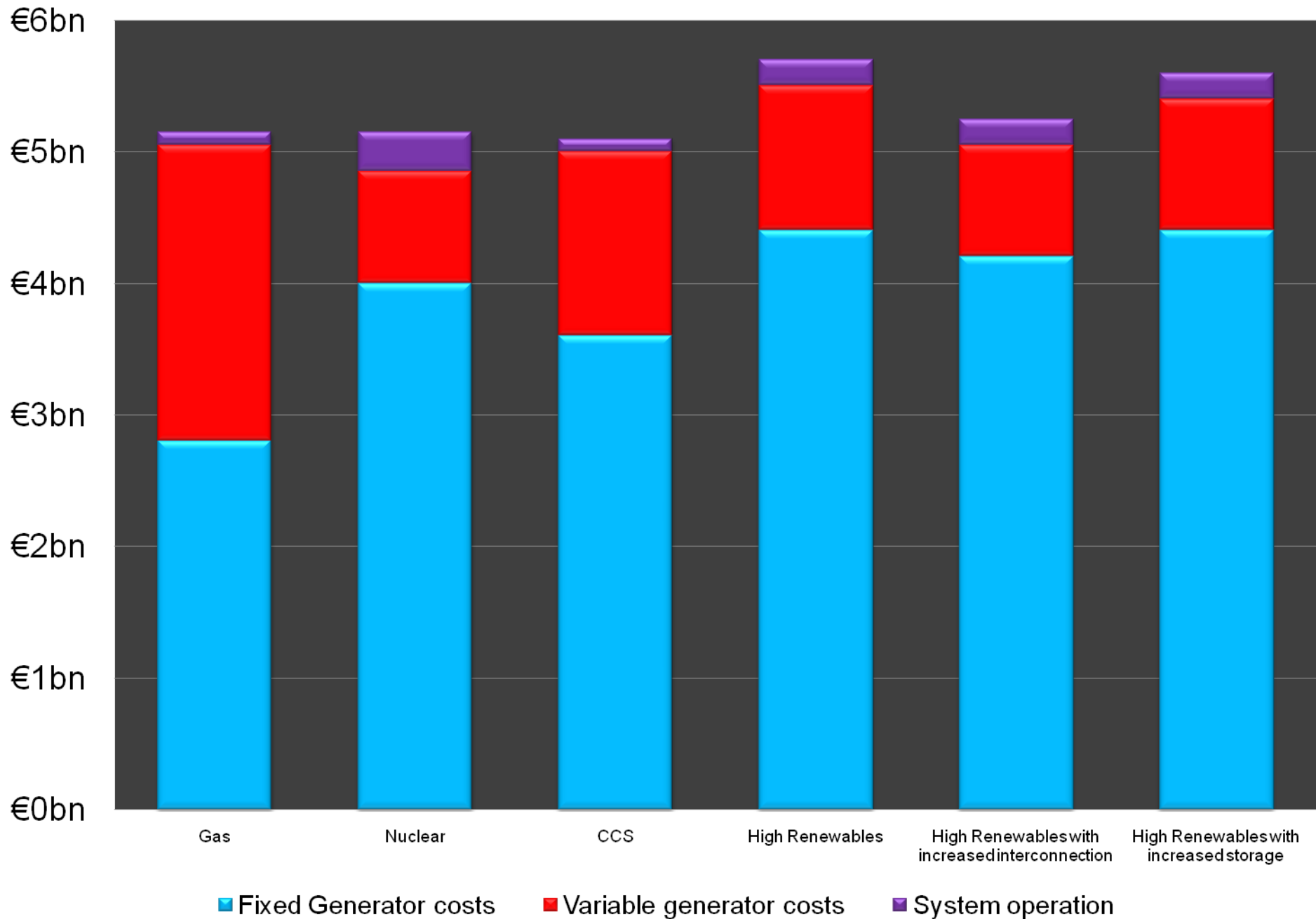
# Total capital investment in plant



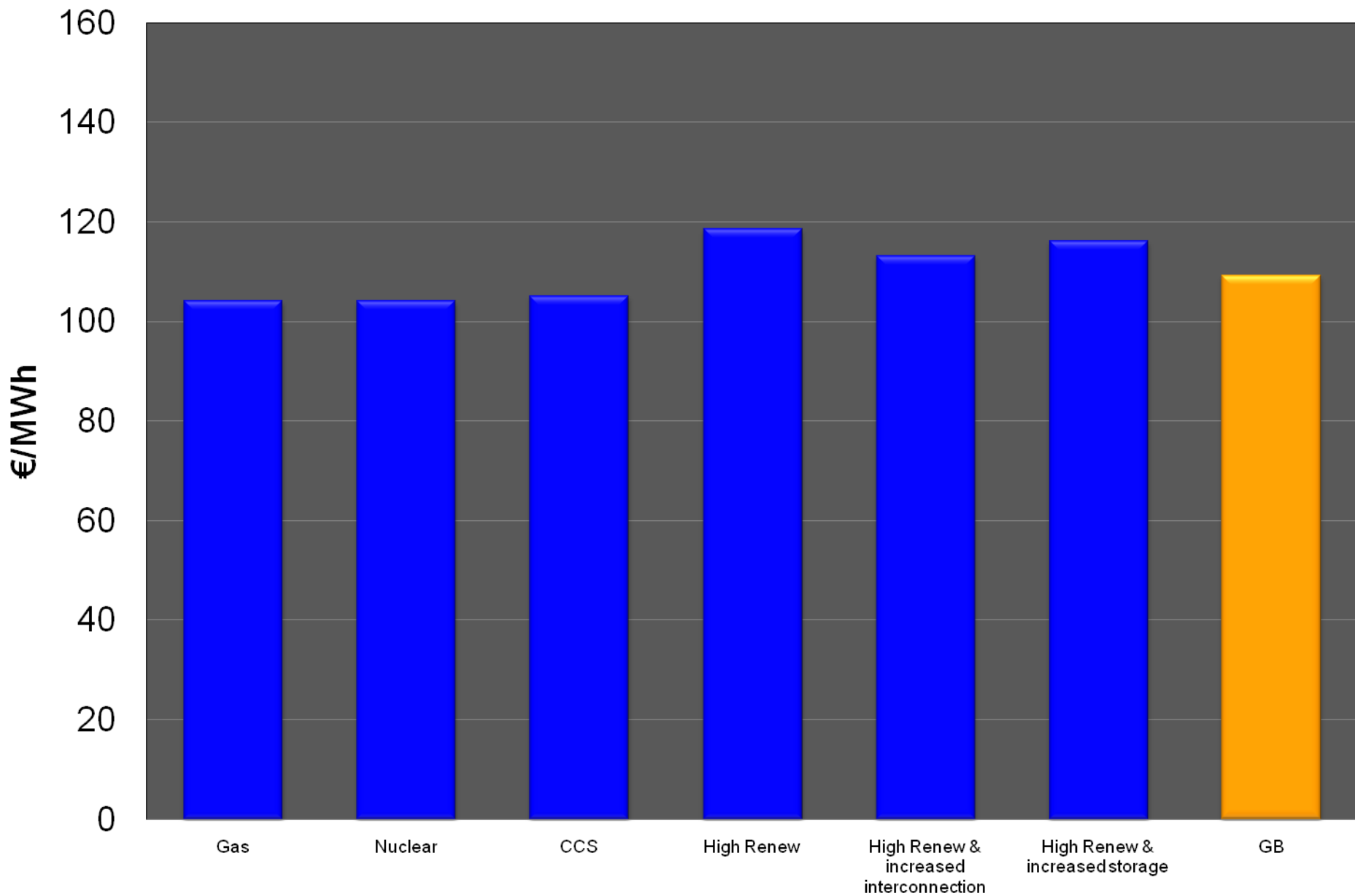
# Annualised costs – Central fuel price scenario



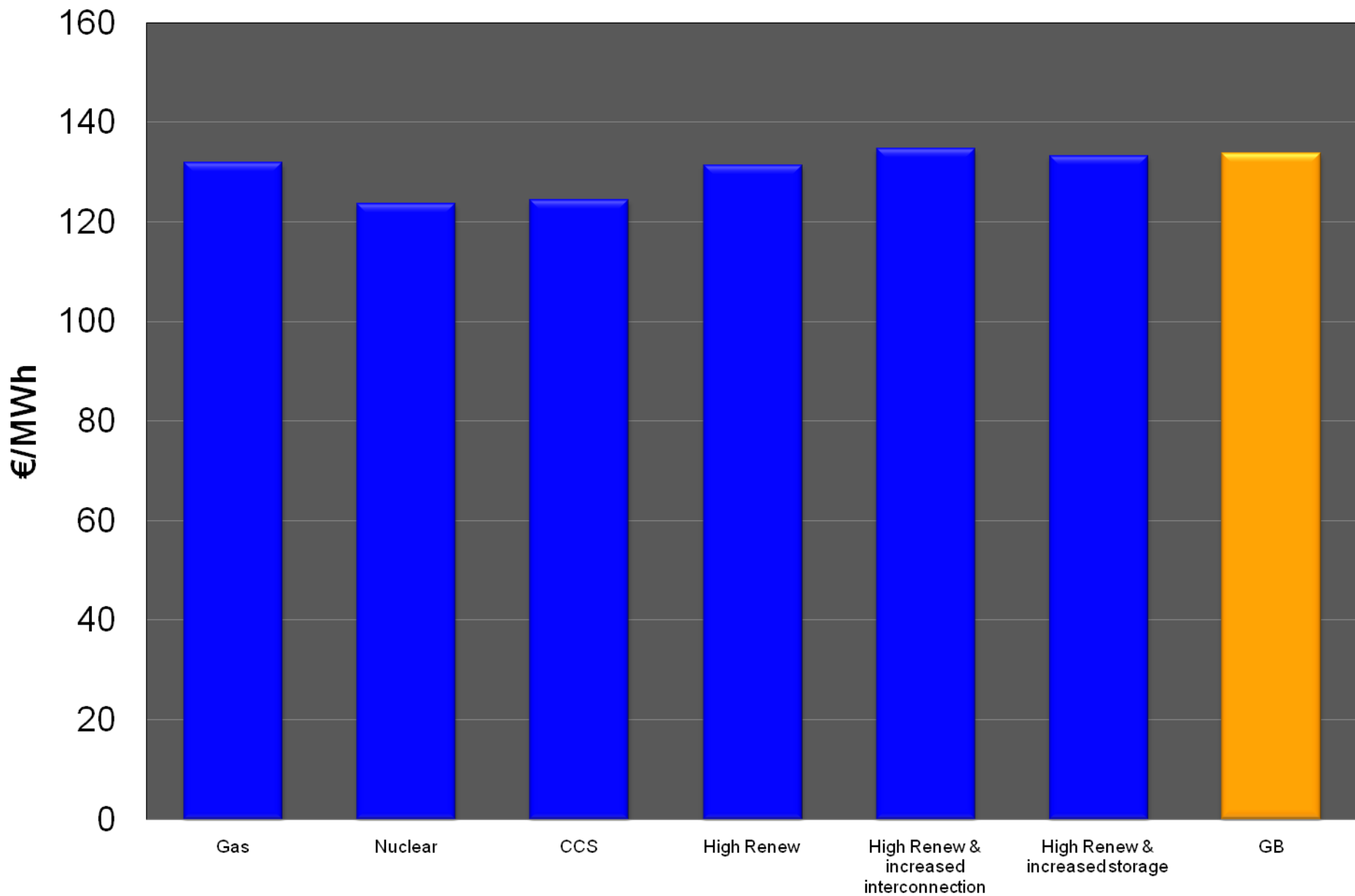
# Annualised costs – High fuel price scenario



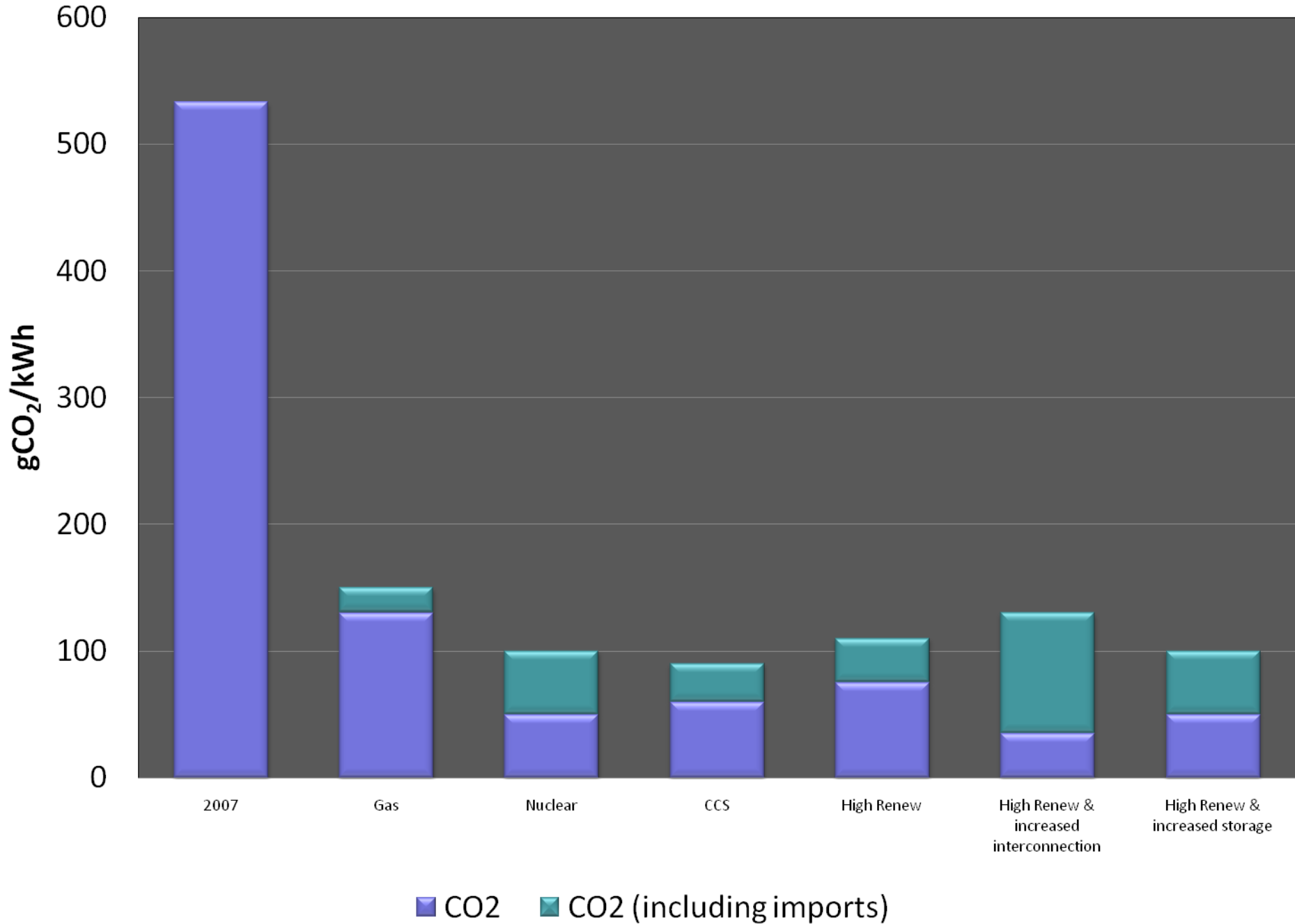
# Residential Retail prices – Generation component (Central fuel price)



# Residential Retail prices – Generation component (High fuel price)



# Carbon Intensities



# Summary

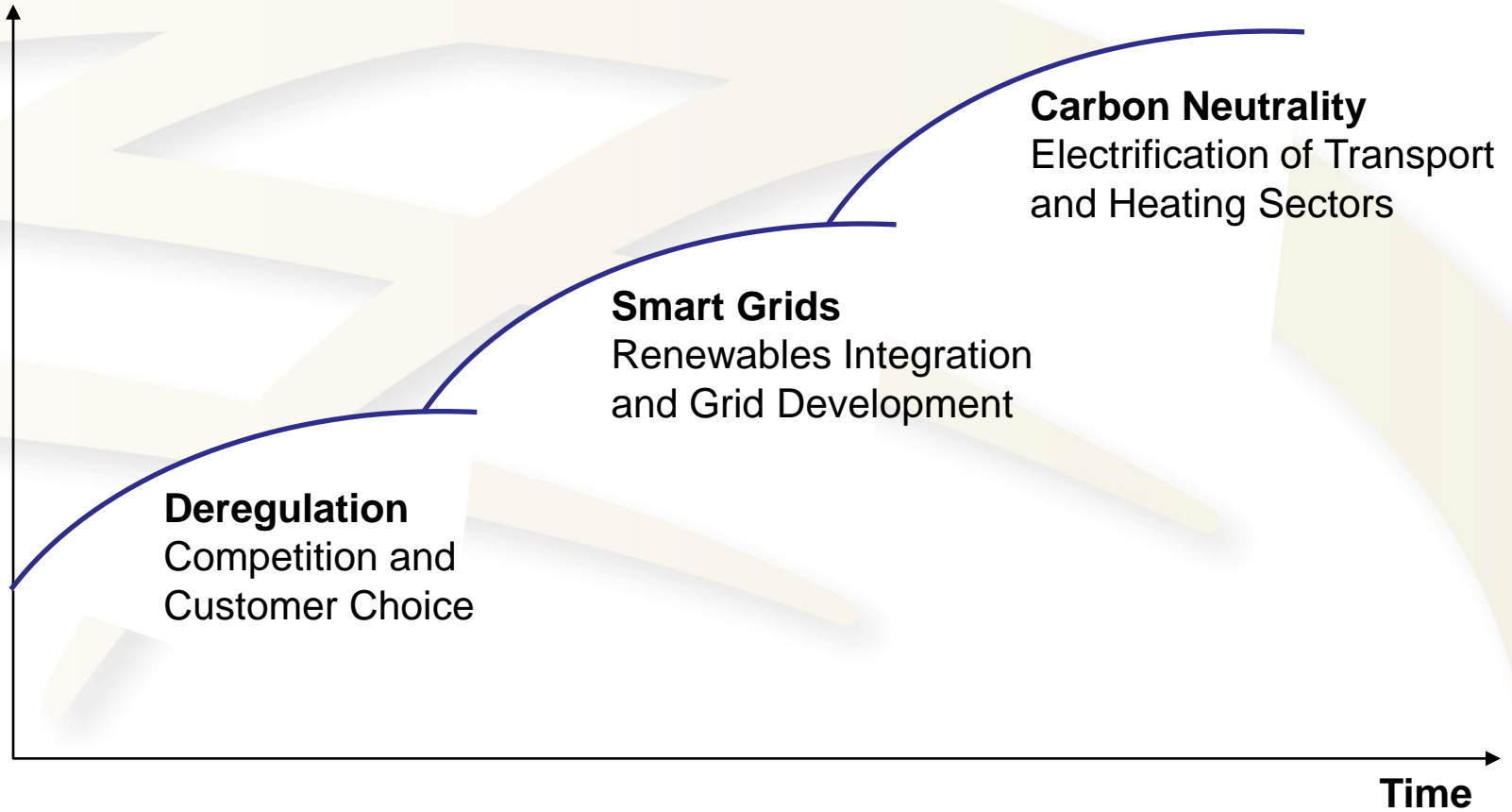
- Significant emissions reductions can be achieved in all portfolios
- All portfolios have higher capital costs and lower running costs relative to today.
- Under current policies the gas portfolio is the most likely outcome and could be viewed as a transitional step towards carbon neutrality by 2050.
- Coal CCS, nuclear, high renewables, storage and interconnection are all able to further reduce emission levels, however a number of technical, environmental and cost issues would need to be overcome



# Conclusion

- The purpose of this report is to contribute to a debate on energy policy.
- It builds on, and is complementary to, the Joint Committee's previous consultation and report on Electricity Needs post 2020.
- There are no simple or easy choices in this complex area.

# Transforming the Power System





Thank You