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Ireland in the New Electricity Age

Dr. Werner Kruckow, CEO Siemens Limited
Dr. Andrew Kelly, MD AP EnvEcon

May 14th 2010

Agenda

Innovation and Sustainability @ Siemens

Setting the scene: Ireland in context

The Impact of High Oil and Gas Prices : Dr. Andrew Kelly

Ireland in New Electricity Age: Building a Sustainable Energy Future

Key Actions Required

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This is Siemens....

Industry

Divisions

- Drive Technologies
- Industry Automation
- Building Technologies
- Mobility
- Lighting (OSRAM)
- Industry Solutions



Energy

Divisions

- Fossil Power Generation
- Renewable Energy
- Oil & Gas
- Energy Service
- Power Transmission
- Power Distribution



Healthcare

Divisions

- Imaging & IT
- Workflow & Solutions
- Diagnostics

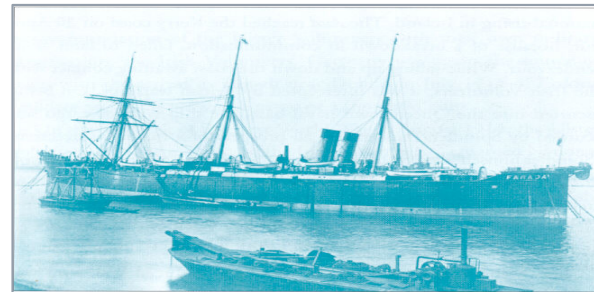


For 130 years, Siemens has been answering Ireland's toughest questions

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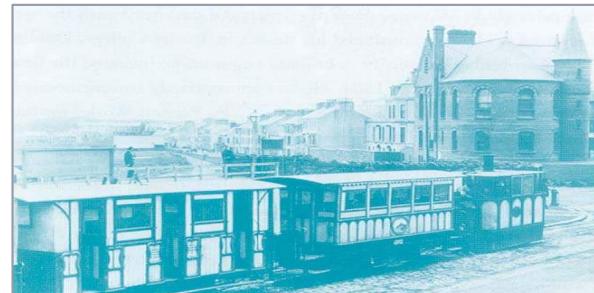
A history of innovation: developing answers for the issues of our time

How can we communicate over long distances?



1874 Transatlantic cable, Co. Kerry

How can we improve travel times?



1883 Bushmills Tramway, Portrush

How can we generate electricity with limited resources?



1925 Shannon hydro-electric scheme, Ardnacrusha

“Innovation is our lifeblood” - Werner von Siemens



Major R&D Investments:

- €3.8 billion in fiscal 2008, or 4.9% of revenue
- 32,300 R&D employees worldwide
- 17,000 software engineers
- 150 R&D locations in over 30 countries around the world

75% of our Products are less than 5 years old =>

we need to plan today where 75% of our revenues in 5 year's time are coming from!

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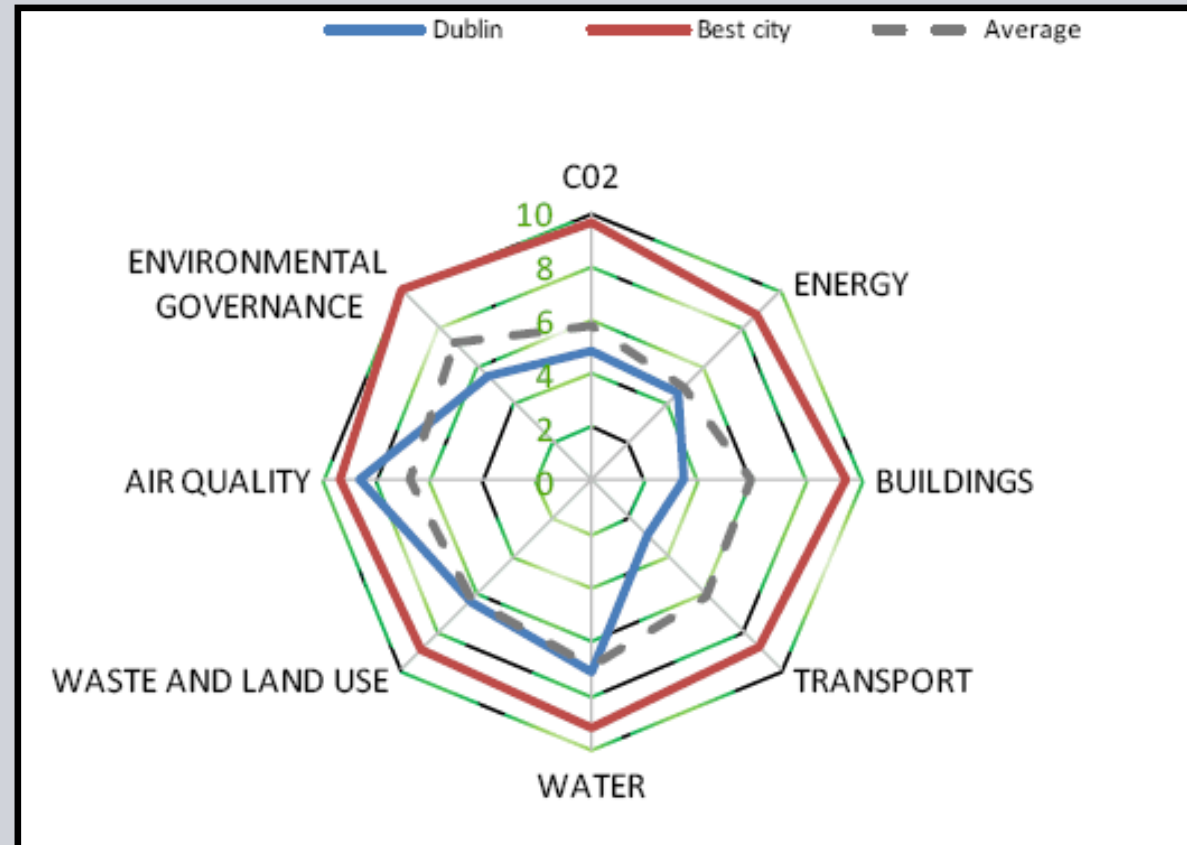
Ireland in New Electricity Age: Building a Sustainable Energy Future

Key Actions Required

Dublin is significantly behind the European average and Copenhagen as the “Best City” of the European Green City Index

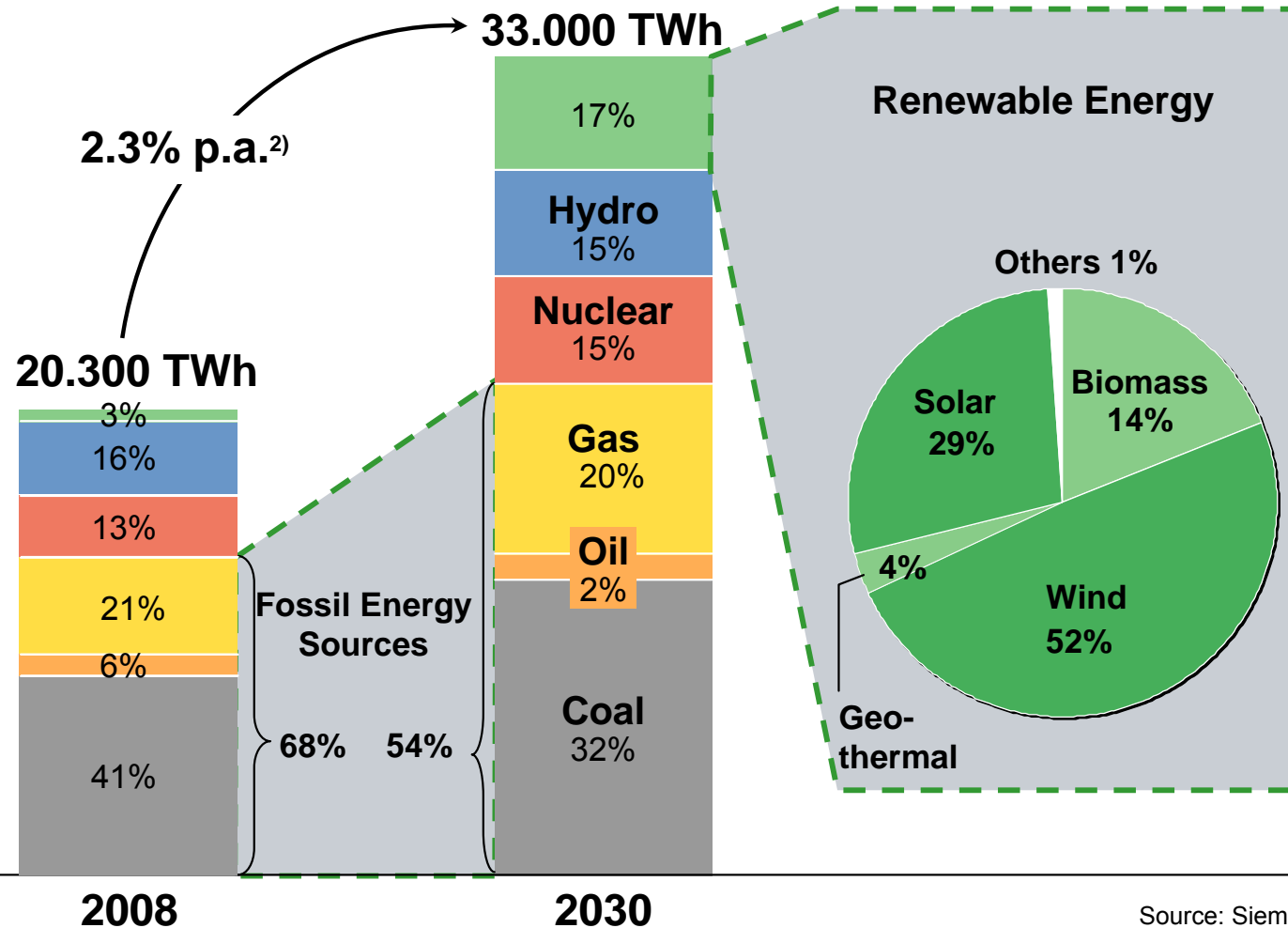


<i>Dublin</i>	<i>Rank</i>
Overall	21
CO ₂ Emissions and Reduction Strategy	19
Energy Consumption, Renewables	18
Transport	30
Environmental Governance	21



Globally by 2030 Renewables will grow from 3% to 17%
Fossil Fuels will grow significantly in absolute terms

Power Generation (in TWh¹)

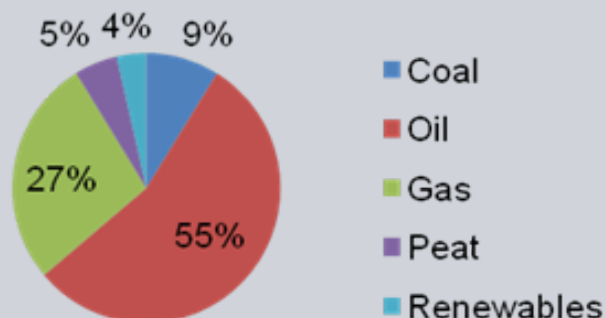


Source: Siemens Energy Sector, MC 1

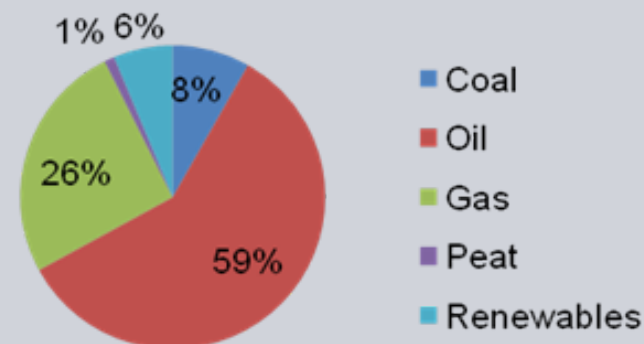
1) Terawatt hours 2) Primary energy demand increases 1.6% p.a.)

Ireland's energy pie shows a 96% reliance on mainly imported fossil fuels

2008 – Primary Energy Demand in Ireland



2025 – ESRI Baseline of Primary Energy Demand



1. Transport utilises most of the oil whereas power generating sector uses most of the gas.
2. Ireland has no proven oil resources and limited proven gas beyond 2020.
3. Ireland imports gas from the UK and by 2015 the UK will import 80% of its gas.
4. The current storage capacity in UK is 14 days and in Ireland 11 days.
5. Europe imports more than 50% of its energy needs and controls approximately 1% of global oil and 3% of global gas reserves.
6. Russia, Iran and Qatar hold the majority of the world's gas resources.
7. In Ireland oil and gas constitute 82% of national total energy requirements in 2008 growing to 85% in 2025 based on the ESRI Baseline scenario.

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AP EnvEcon and ESRI Study Context



Concept: Scenario modelling to inform policy debate

Context: How will the fossil fuel market evolve?

Policy decisions should be guided by broader perspectives of risks

This is the value of considering 'alternative' outcomes

'Unprecedented' events remind us of our vulnerability and uncertainty

Methodology in brief

Define 3 alternative price pathways for oil and gas within the boundaries of recent international outlooks.

Coupling assumption – arguably gas will be more stable in the medium term requiring staggered policies. Ultimately both oil and gas present similar challenges.

Describe the baseline scenario conditions as the benchmark for Ireland's path.

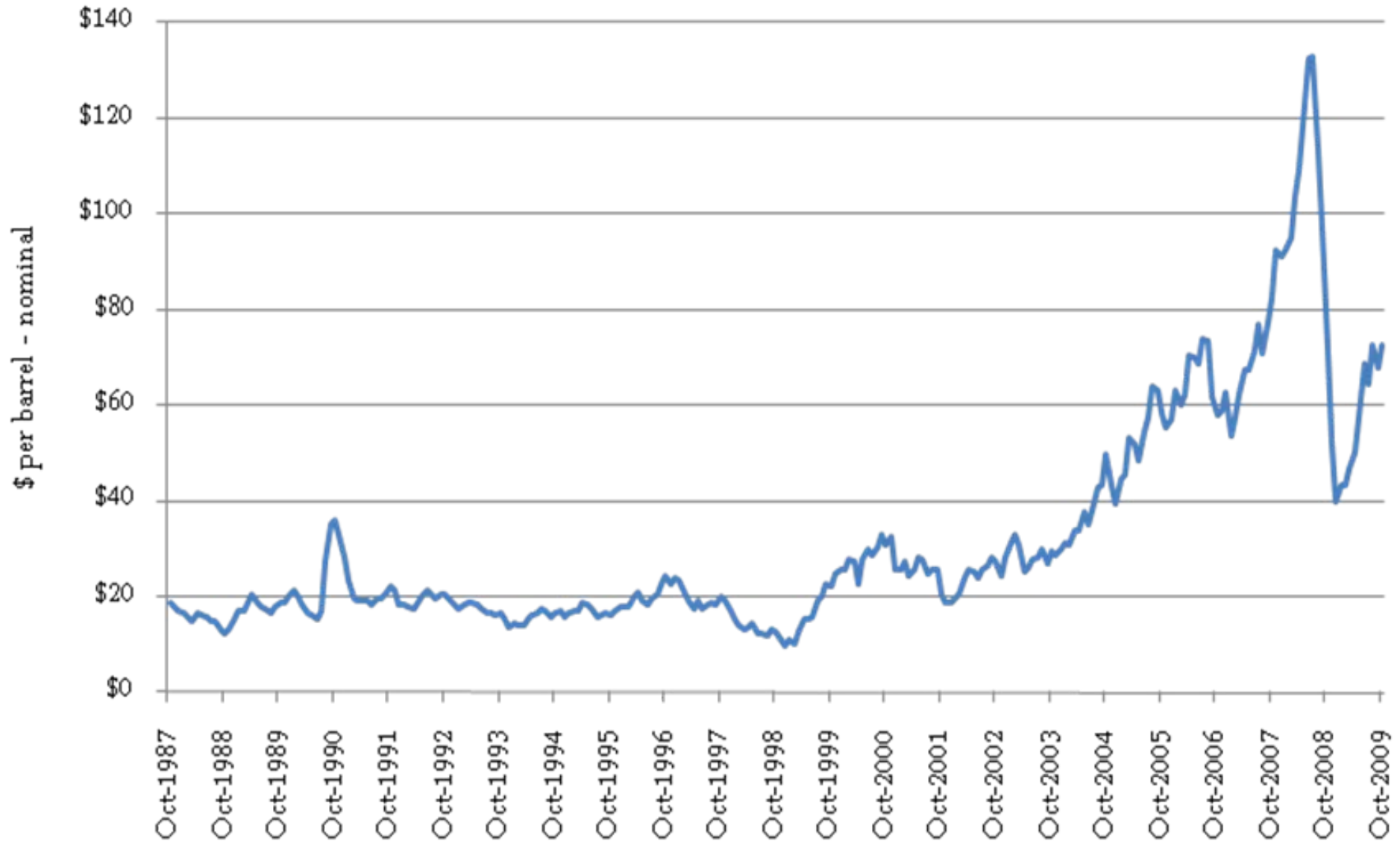
Model the international impacts of HOG prices using NiGEM.

Model the corresponding national impacts using HERMES and global outcomes.

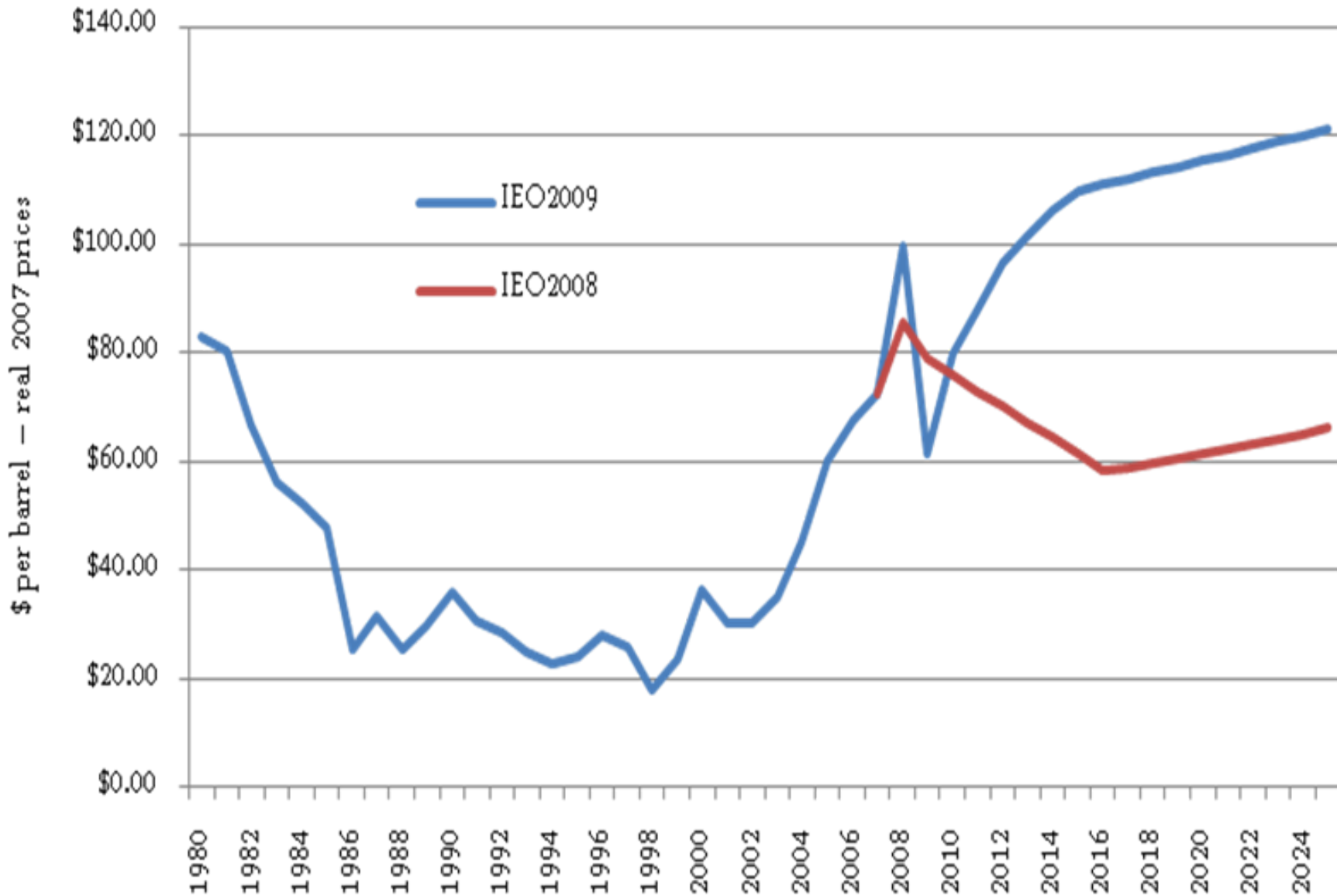
Examine broader social and economic impacts not directly captured in the modelling framework.

Oil price is driven by a complex set of factors and are subject to shocks

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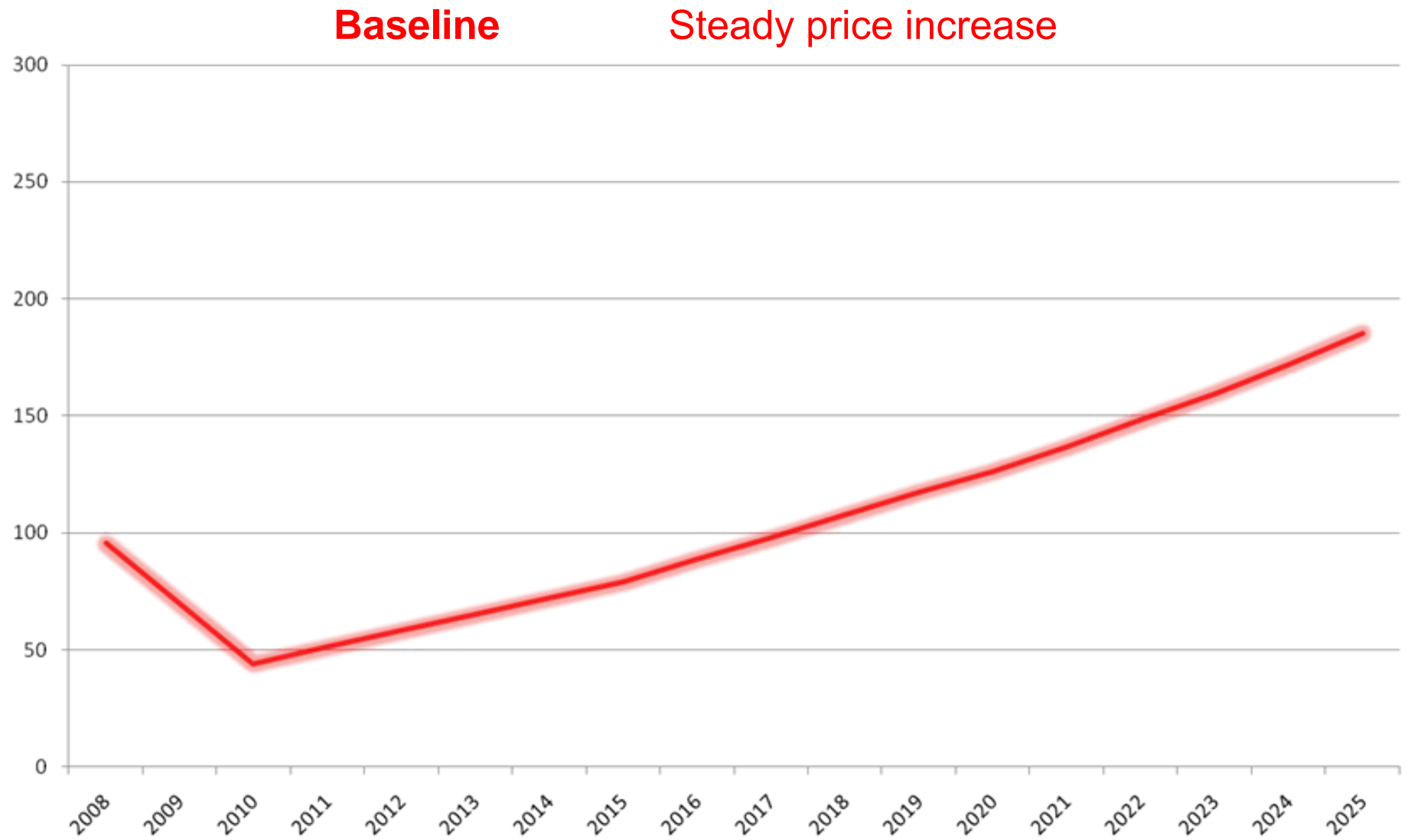
Price and outlooks of price can and have changed dramatically



Analysis Oil and Gas Price Scenarios –

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Nominal \$ barrel

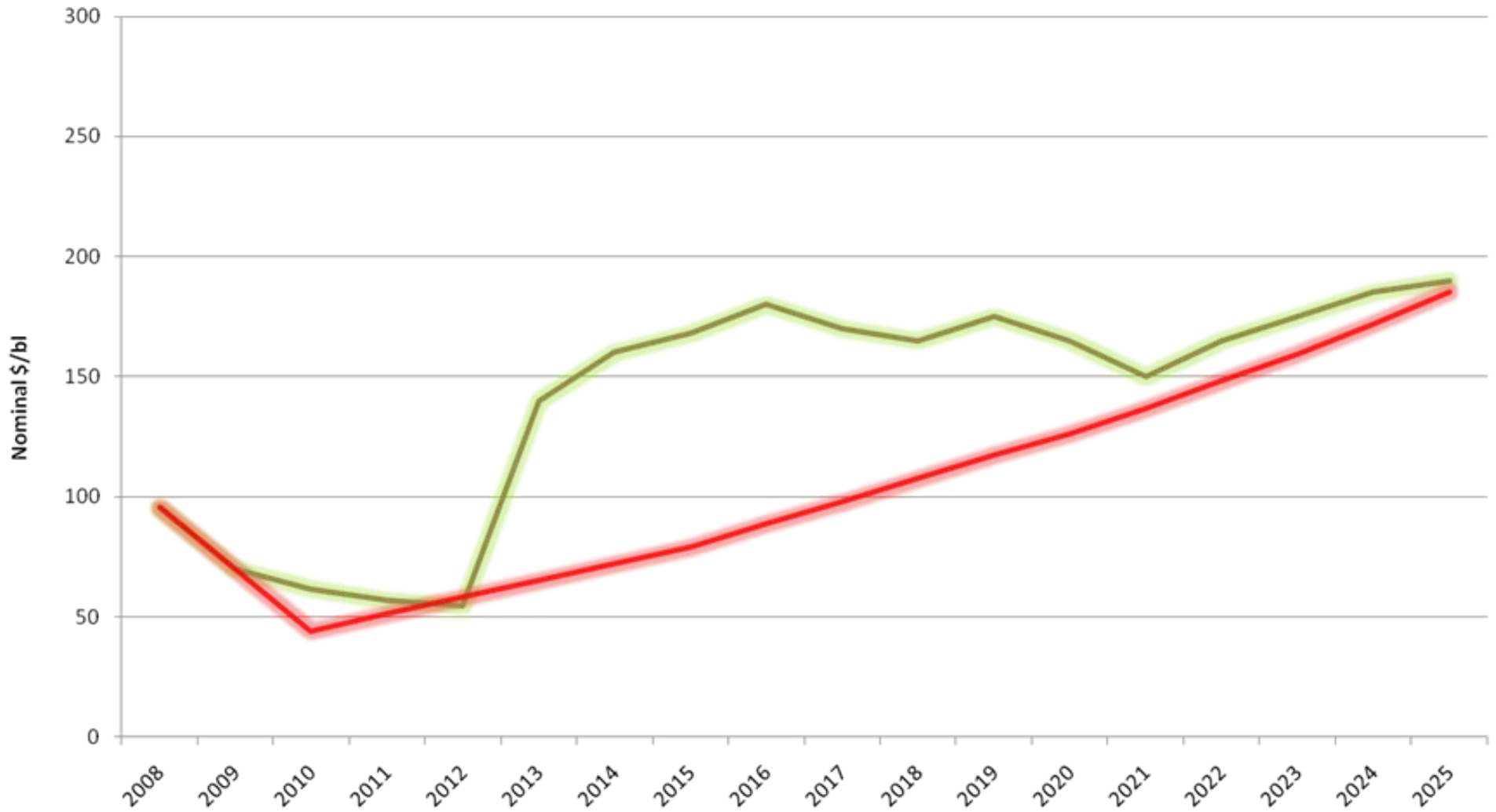


Analysis

Oil and Gas Price Scenarios



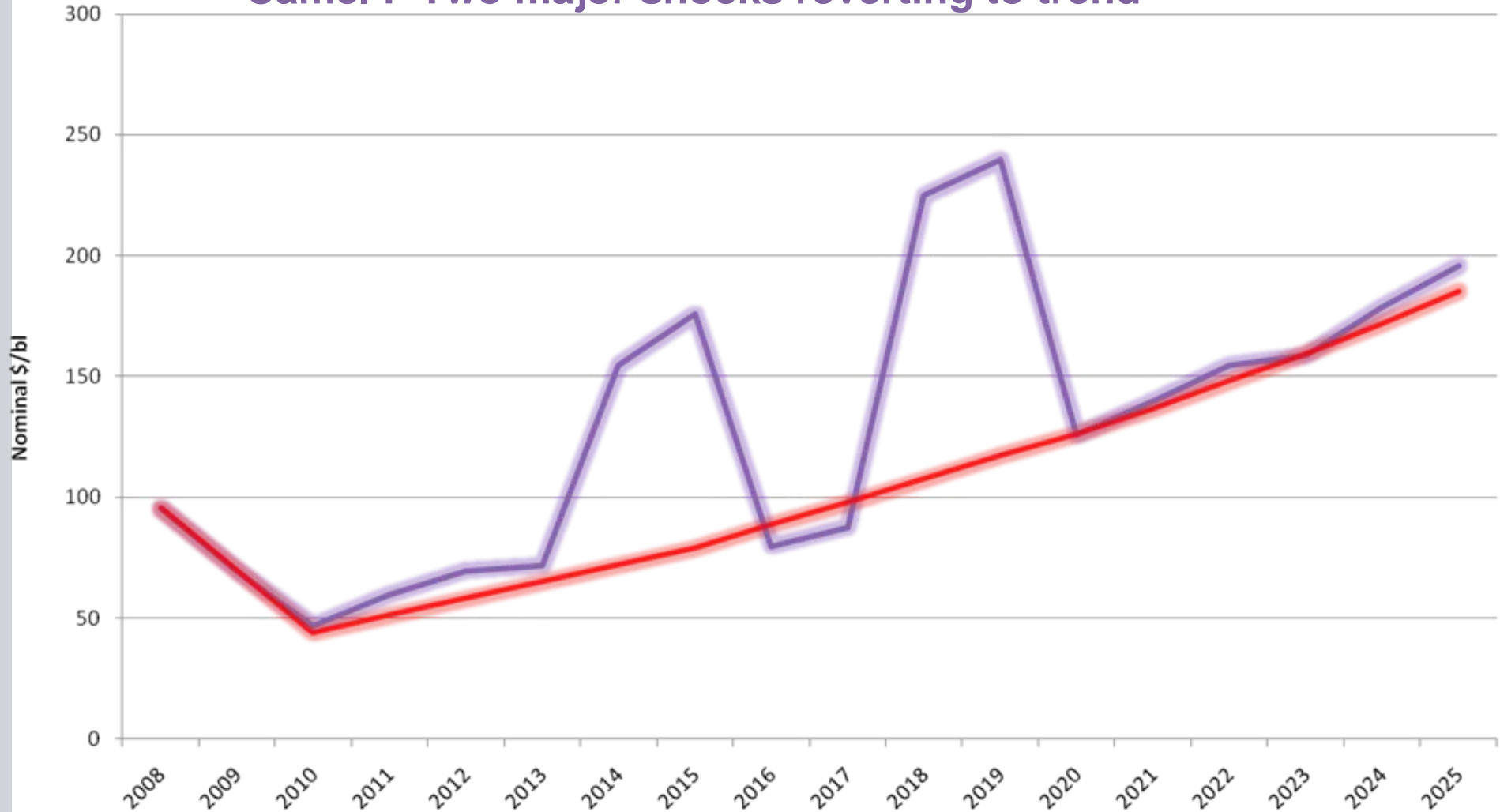
Root One major sustained shock



Analysis

Oil and Gas Price Scenarios

Camel : Two major shocks reverting to trend

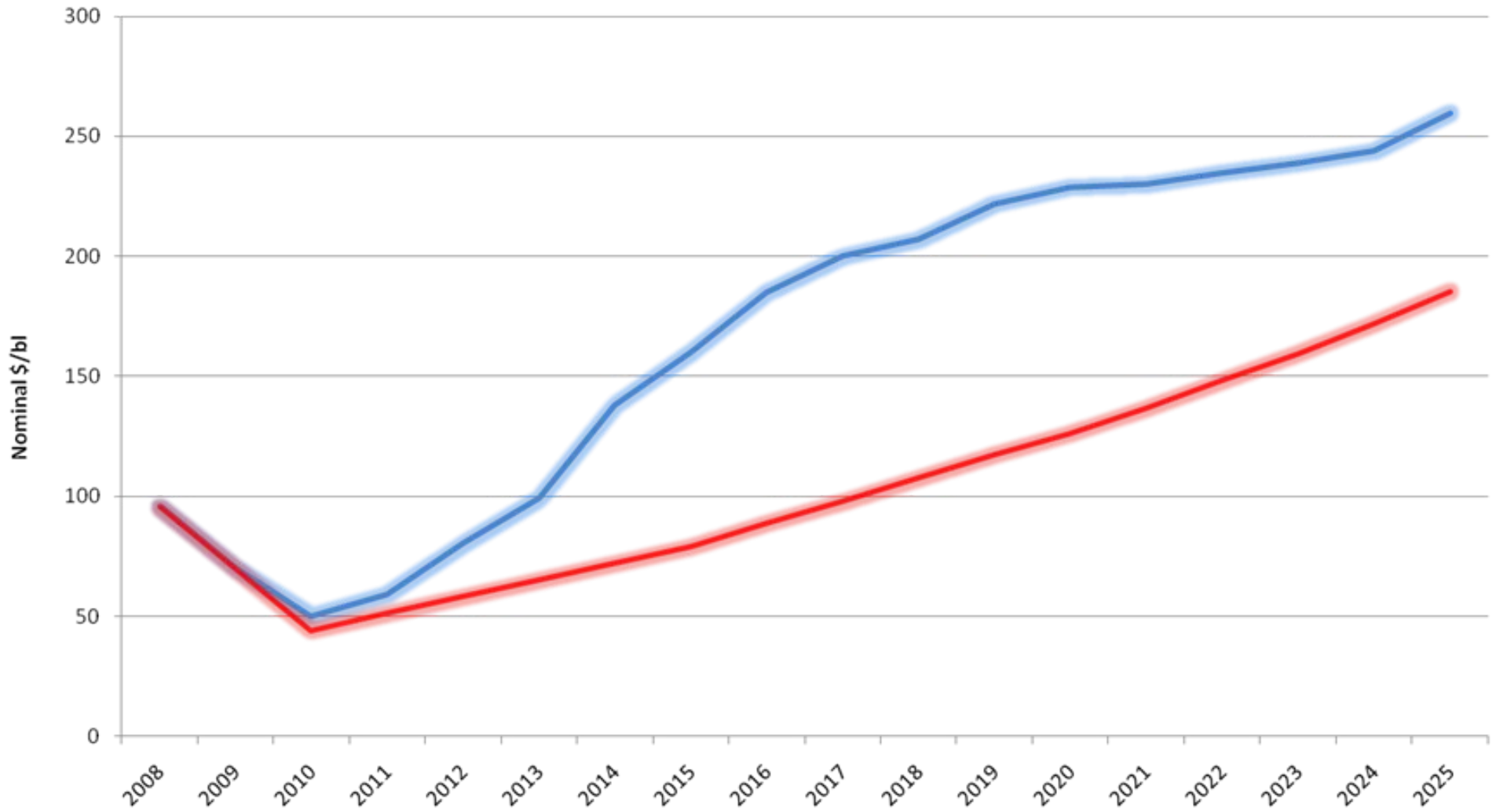


Analysis

Oil and Gas Price Scenarios



Accelerated Rapid but steady rise in price



Results

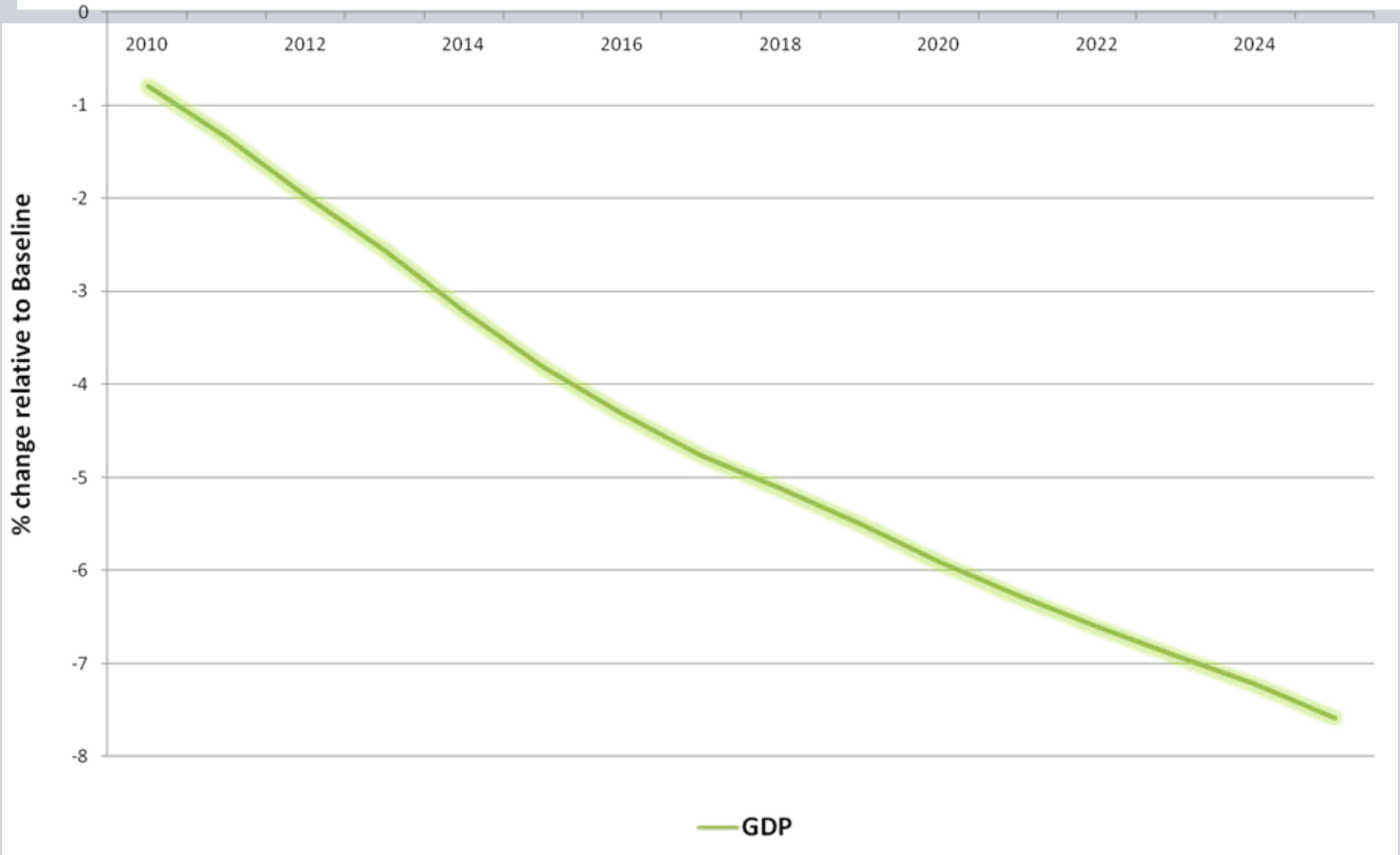
Economic Impacts of AG

Ireland's main exposure to the HOG price shocks comes through 3 channels:

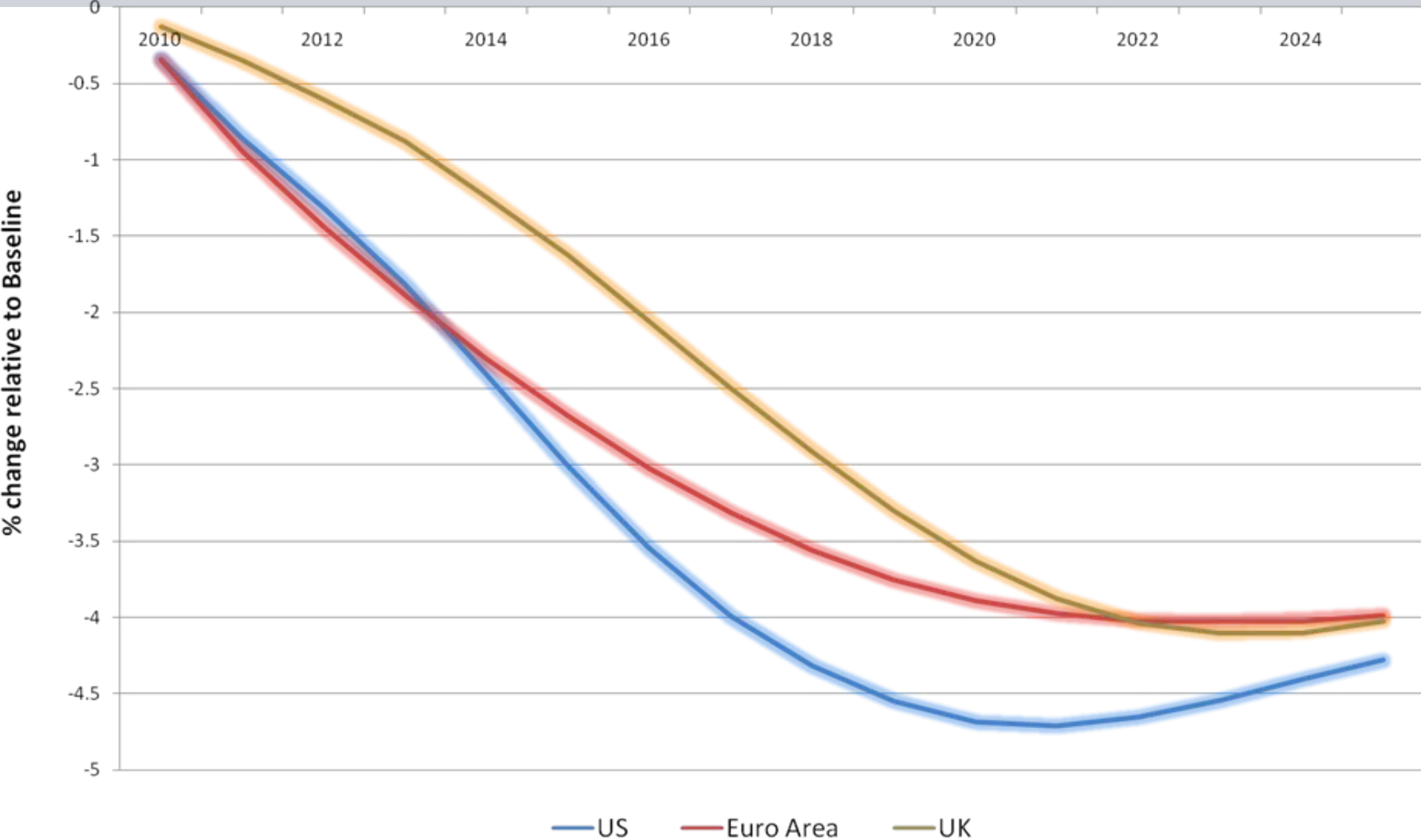
- ❖ Appreciation of the Euro reduces Irish competitiveness
- ❖ Inflation triggers interest rate increases from monetary authorities and reduces investment and national output
- ❖ Slowdown in the international economy reduces demand for Irish exports

Impacts on growth are generally more severe within Ireland. The AG scenario sees GDP 7.5% below the baseline in 2025.

Impact on Irish GDP – Accelerated Growth Scenario



Impact on International Output – Accelerated Growth Scenario



Important Socio-economic impacts:

- ❖ Distributional impacts – greater relative financial burden on those least able to afford
- ❖ Increases in fuel poverty levels – greater numbers pushed into positions of fuel and energy poverty
- ❖ Mobility reduction – high fuel costs would be expected to reduce mobility – particularly for leisure
- ❖ Price volatility and uncertainty – Problems for markets and business planning
- ❖ National cost competitiveness – Could reduce international cost competitiveness of our businesses
- ❖ Energy Import bill – Estimated €6bn per annum leaving the economy on imported fuels

Conclusion:

- Fossil fuels are finite and over the medium term Ireland has almost none.
- High dependency on imports creates an exposure.
- Different sectors face different risk - Gas/Power Oil/Transport
- Gas and Oil may evolve on different paths requiring staggered policy decisions.
- Ultimately both face similar issues – cost, constraints, carbon, cartels...
- Opportunity to exploit new market opportunities whilst reducing risk exposure.
- Debate should consider the **options** we have, the **balance** we need, and the necessary **speed of** and **supports for** action. => “The New Electricity Age”

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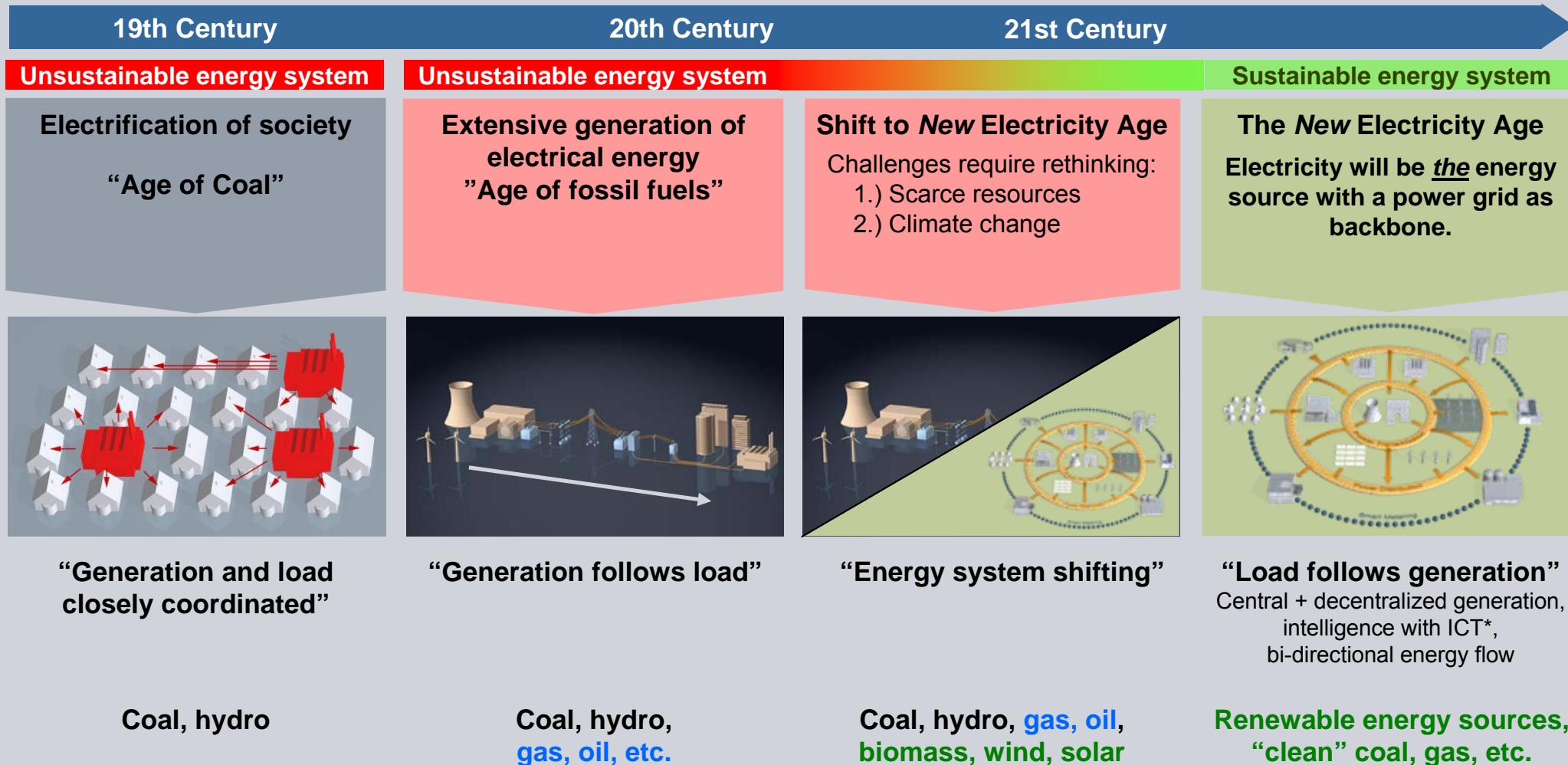
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Transformation of the Energy System leads to **New Electricity Age**



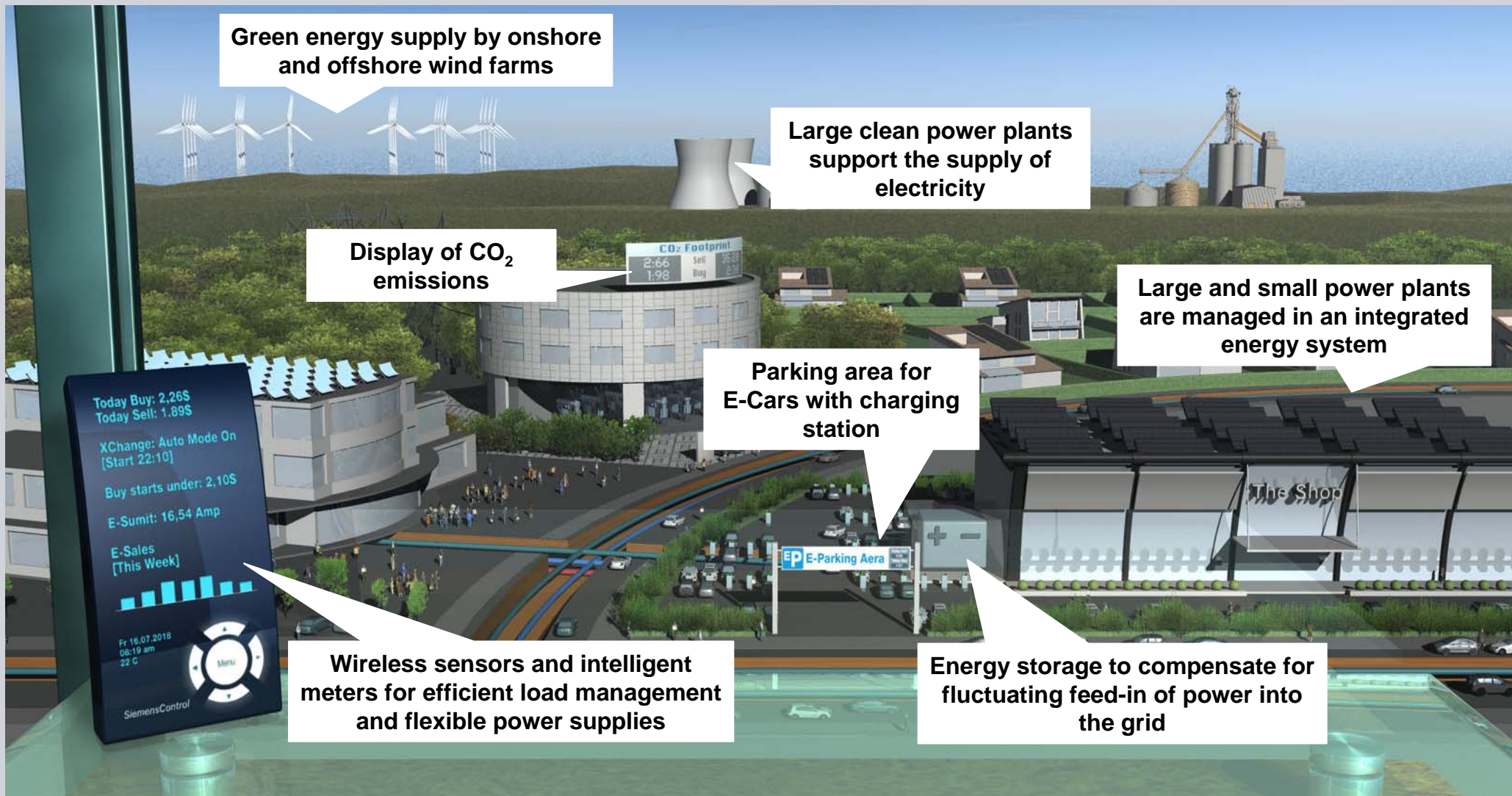
No environmental awareness



Environmental awareness

*) ICT = Information and Communication Technologies

Green Energy supply and intelligent homes



The four pillars for a sustainable integrated energy system in Ireland

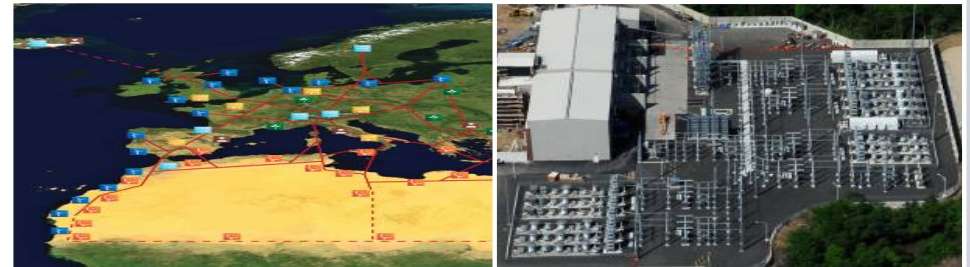
1

Maximising Electricity Generation from Renewables



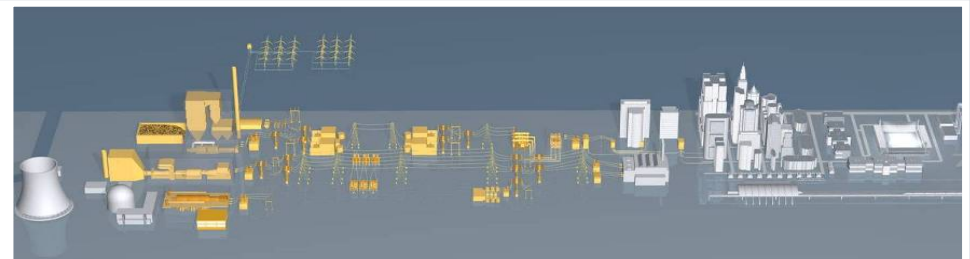
2

Grid Upgrade and Integration into European Grid



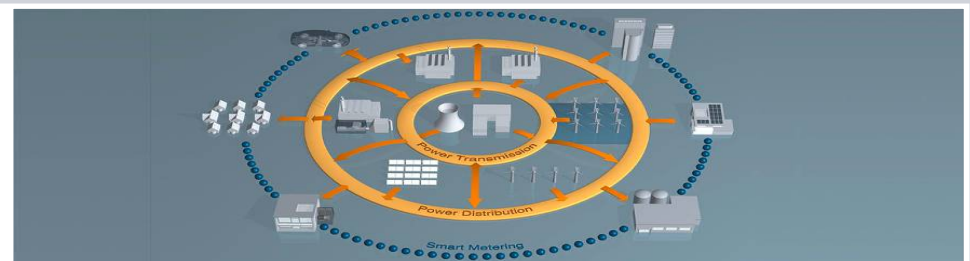
3

Energy Efficiency Increase



4

Maximising Electricity in end-use Applications



1 Maximising Electricity Generation from Renewables

Electricity Generation from Renewables

On-Shore Wind:

- Maximising efficiency and yield through applications
- Optimising Grid Developments to facilitate 2020 targets and beyond



Off-Shore Wind:

- Rapid Development of existing pipeline of off-shore projects
- Development and connection of larger (>5MW) devices
- Plan for East coast Supergrid



Maximising efficiency beyond 40% penetration

Storage:

- Deployment of Storage Technologies to capture off-peak Renewables
- Ireland to become a major exporter of energy



Ocean Energy:

- Development of Ocean Energy Technology beyond 1MW
- Development of Irish West coast as a major resource



National Grid Upgrade

Bigger, Faster, Smarter

- Development of national grid infrastructure including North-South Interconnector
- Extension of 400kV and 220kV Network to facilitate transmission from key renewable locations
- Implementation of Smart I&C Systems to manage Load to Generation matching



Integration into European Grid





Security & Efficiency:





- Ireland to become part of a trans-European Grid, facilitating:
 - Wind from the North
 - Wave from the West
 - Solar from the South
- Interconnected by one Supergrid with HVDC technology



The Super Grid for Renewables – A Vision of the future Energy System of Europe



Energy Efficiency in Buildings	By changing occupant behaviour and optimising equipment performance Efficiency improvement: up to 50%	
Component Efficiency	For Combined Cycle Power Plant installed in Irsching Efficiency up to 60%	
Pumping Stations	Efficiency increase by variable speed drives and automatic control systems Efficiency improvement: up to 60%	
LED Public Lighting	Efficiency improvements around 50%, good colour rendering for security, dimming and quick response allow intelligent public lighting Efficiency improvement: up to 60%	

eCar	Replacement of internal combustion engine by an electric motor will reduce CO₂ emissions significantly	
Ship-to-shore connection	Electronic coupler connects harbour power grid with ship. Result for container ship in Germany CO₂ reduction: 13 t CO₂ per day	
Hybrid Bus	Replacement of 7 litre engine by 2.5 litre diesel plus efficient electric drive and regenerating braking power will reduce fossil fuels and CO₂ by >35%	
Heating	Replace Fossil Fuel Burner by ambient or Geothermal heat pump will reduce primary energy consumption	

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Top Five Program for Policy Makers

**1**

Develop a high level 2050 strategy plan by 2010 with a measurable roadmap for the Energy System in Ireland – covering the 4 pillars for a Sustainable Energy Future in Ireland (Pump Storage, Interconnectors, Offshore Wind).

2

Develop a “Carrot and Stick” for business and public sector on Energy Savings and Green House Gas Emissions. Support investment with tax incentives and favourable financing models.

3

Deliver rail related projects in T21, run Hybrid buses in Dublin, speed up implementation of Electric Cars and related infrastructure.

4

Position Ireland as an attractive test-bed for sustainable pilot projects and encourage industry to participate and lead.

5

Modernize Public Procurement Process to take into account life cycle costs and support quick roll-out of pilot projects in the sustainability area.





UCD Earth Sciences Institute with TCD TrinityHaus *Transforming Ireland Seminar Series*

In conjunction with the TCD-UCD Innovation Alliance Public Lecture Series

With the support of Business in the Community Ireland and in collaboration with
Comhar Sustainable Development Council, Environmental Protection Agency, Geological
Survey of Ireland, Sustainable Energy Authority Ireland, Dublin City Council,
Met Éireann, Enterprise Ireland, Marine Institute and Teagasc



For Further details on the seminar series is available contact esi.admin@ucd.ie

A podcast of this seminar will be available on the ESI website soon, please join the online ESI mailing list for such notifications