

The Irish Energy Tetralemma

Framework for Long Term Fuel Choices
and Policy Requirements

August 2010

Summary

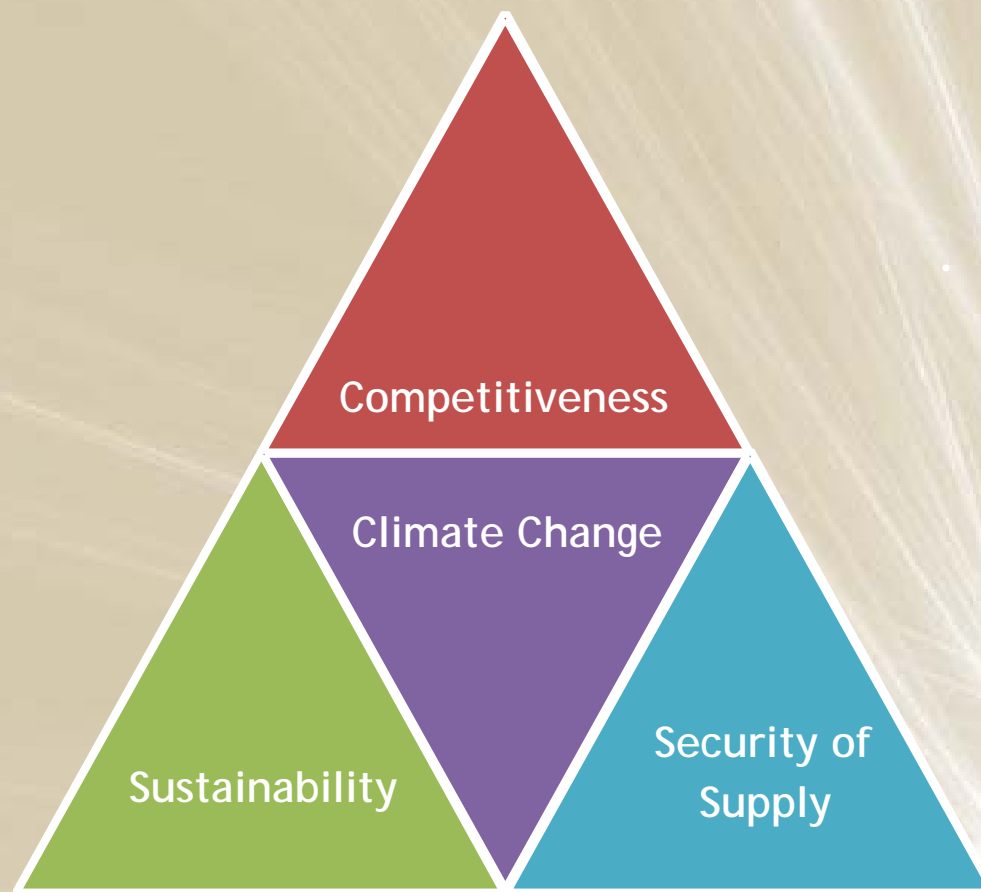
- ▶ Forfás has constructed a system for analysing the implications of different fuel choices for Ireland in the long-term.
- ▶ It allows for different policy priorities and different scenarios of how the world energy markets and energy technology will develop until 2030.
- ▶ It includes analysis of the enterprise opportunities arising from the fuel choices made.
- ▶ A first analysis of policy priorities and the way that different fuels perform is also included.

Report Overview

The Irish Energy Tetralemma is a suite of 13 reports comprising:

- ▶ *A Framework for Fuel Choices in Ireland*: an overview report that presents the first results of the analysis of long term energy options for Ireland and an assessment of the trade off positions of particular fuel choices.
- ▶ *Opportunities by Primary Fuel*: a report looking at the enterprise opportunities related to each fuel option.
- ▶ 11 fuel reports covering coal, oil, gas, peat, biomass, wind, solar, marine, geothermal, hydro and nuclear energy.

The Energy Tetralemma Framework - the four policy pillars



The Indicators in each Pillar

Competitiveness	Sustainability	Climate Change	Security of Supply
Fuel Cost (cost commodity price of the fuel as traded in different markets, before it is converted into energy)	Fuel longevity (reserves-to-production ratio)	Carbon content of fuel (not taking into account conversion efficiency)	Weighted Import Dependence
Delivered Energy Cost (price of a unit of delivered energy after the full conversion of the fuel at the stage of wholesale to businesses users)	Environmental impacts	Lifecycle carbon footprint (carbon emissions produced per unit of delivered energy)	Fuel Place of Origin
Policy and Regulation Framework		Supply and infrastructure vulnerability	Supply and Infrastructure Resilience (how complex and robust is the infrastructure associated with the fuel)
Market Context (Ireland)		Availability change (of the fuel resource)	Market Volatility
Enterprise Opportunities			Energy availability/ Intermittency (of supply)

The Fuels in the Tetralemma Index

Fuel Type- Main Category	Sub Category	Main Application
Fossils		
Coal	Brown Coal	Electricity
	Black coal	Electricity
Oil	Conventional Oil	Transport
	Unconventional Oil	Transport
Gas	Natural gas	Electricity
	LNG-Liquefied Natural Gas	Electricity
Peat	Peat	Electricity
Renewables		
Biomass	Woody Biomass	Electricity
	Non-woody Biomass	Transport
	Bio-residues	Electricity
	Bio-Gas	Electricity
Wind	Onshore wind	Electricity
	Offshore wind	Electricity
Solar	Solar thermal	Heat
	Solar Photovoltaic (PV)	Electricity
Marine	Wave	Electricity
	Tidal	Electricity
Geothermal	Geothermal	Heat
Hydro	Hydro	Electricity
Nuclear		
Nuclear	Nuclear fission	Electricity

Scenarios

High Scenario	Cheap, clean, secure and advanced energy system with low commodity prices, carbon capture and storage (CCS) deployment developed and a high carbon price.
Medium Scenario	Fossil fuel dominance in a moderately inexpensive, relatively clean, reasonably secure and conservatively advanced energy system with medium range commodity prices, CCS deployment underway and a medium carbon price.
Low Scenario	Expensive, dirty, insecure and less-advanced energy system with high commodity prices, no CCS deployment and a low carbon price.

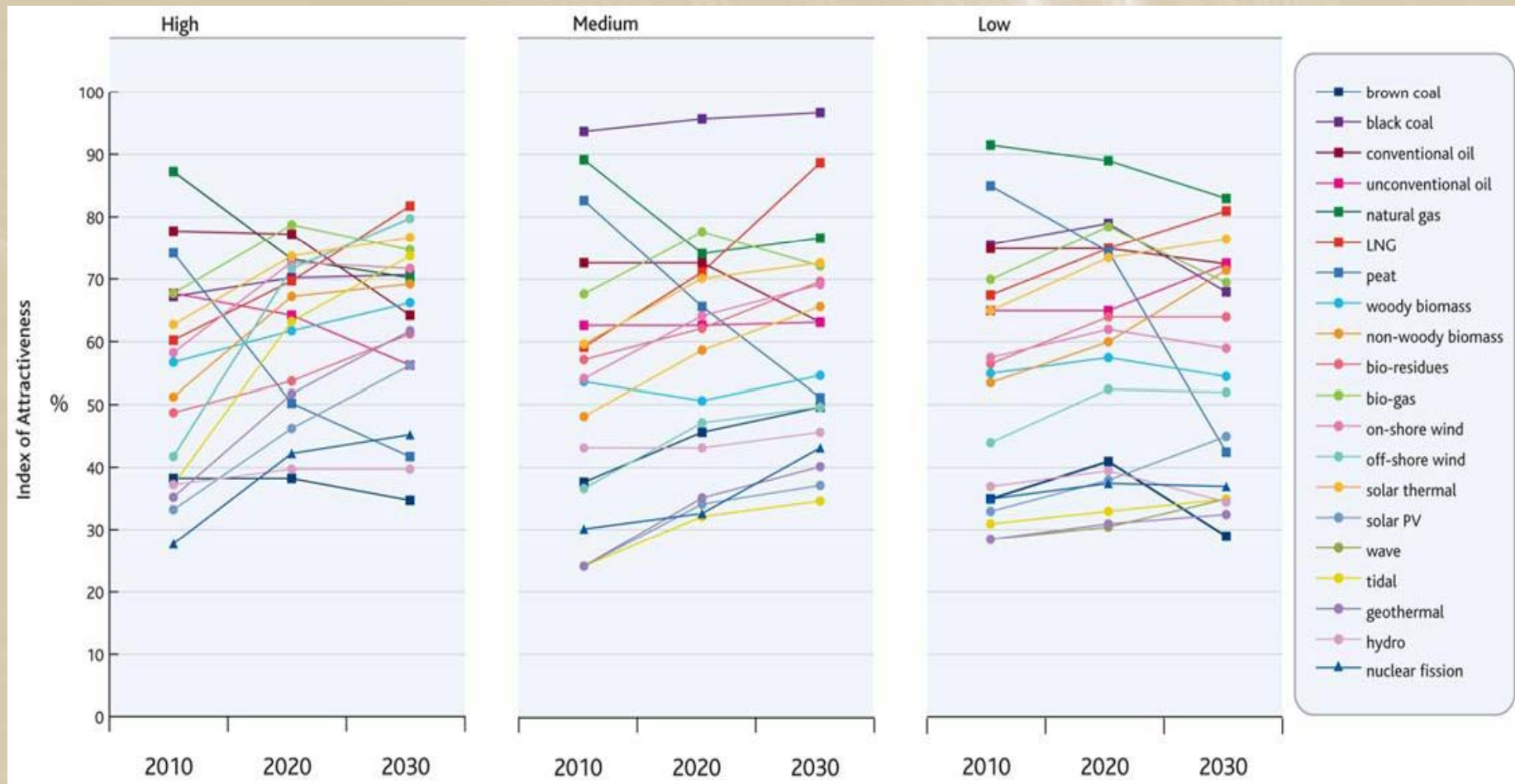
Overarching Policy Directions

- ▶ Significant expansion/reinforcement/renewal of the transmission grid will be required over the next decade to support the renewables targets and demand growth. Progression towards a smart energy grid should be a top priority for infrastructure spending.
- ▶ Enhanced electricity interconnection between Ireland and the UK is necessary to improve security of supply; additionally, a connection between Ireland and mainland Europe should be assessed.
- ▶ Identification and implementation of regulatory, legislative and planning process changes for competitive, long-term energy development is important as is the development of a new, integrated planning regime for energy projects.
- ▶ Energy-related research funding needs to be focused on demonstration and commercialisation.
- ▶ Increasing the uptake of solar thermal and geothermal for heating purposes by enhancing planning regulations or developing market incentives for heat supplies.

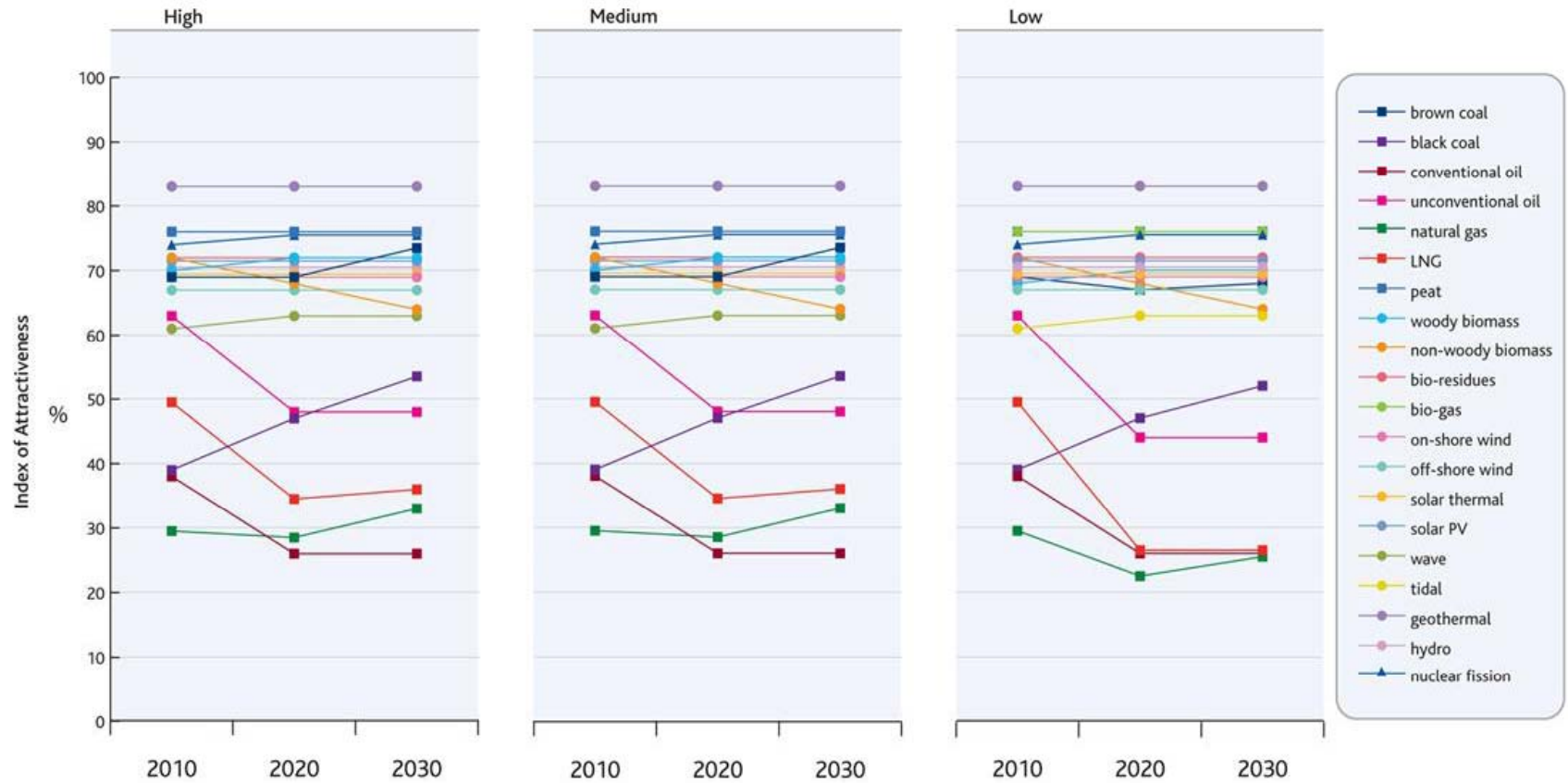
Overarching Policy Directions contd.

- ▶ A technical and economic feasibility study of the possibility of nuclear energy should be undertaken and incorporated into the policy debate.
- ▶ Carbon Capture and Storage (CCS) plans should be extended to all types of fuel generation plants in Ireland by 2020, and all plants should be CCS ready by 2030.
- ▶ A review of the adequacy of Ireland's current strategic storage requirements is required and consideration should be given to increasing oil reserves at gas-fired generation plants as an alternative to increasing gas storage.
- ▶ The Sustainable Travel and Transport Plan published by the Department of Transport should become a priority for cross-departmental implementation.

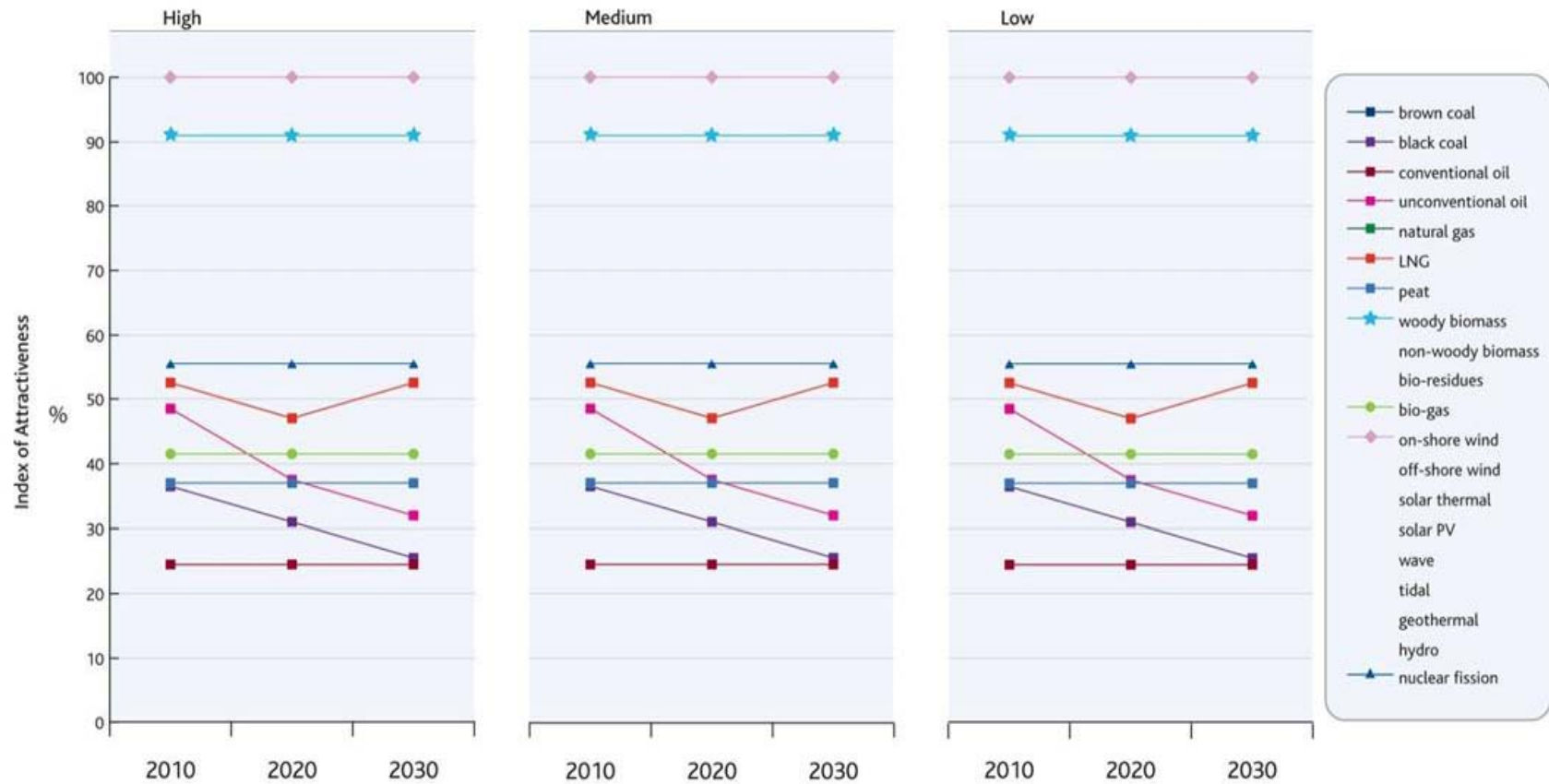
Competitiveness Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)



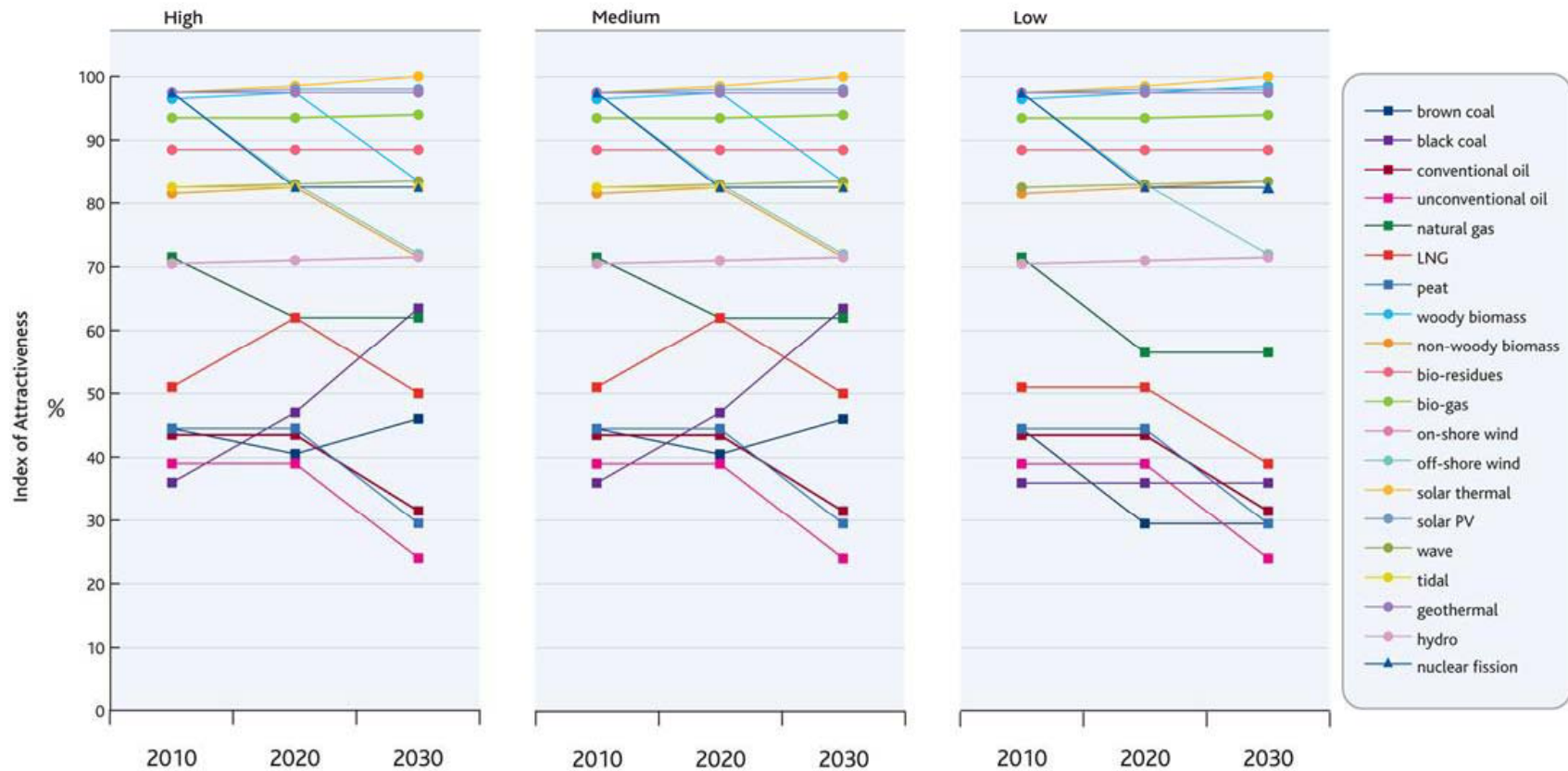
Security of Supply Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)



Sustainability Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)



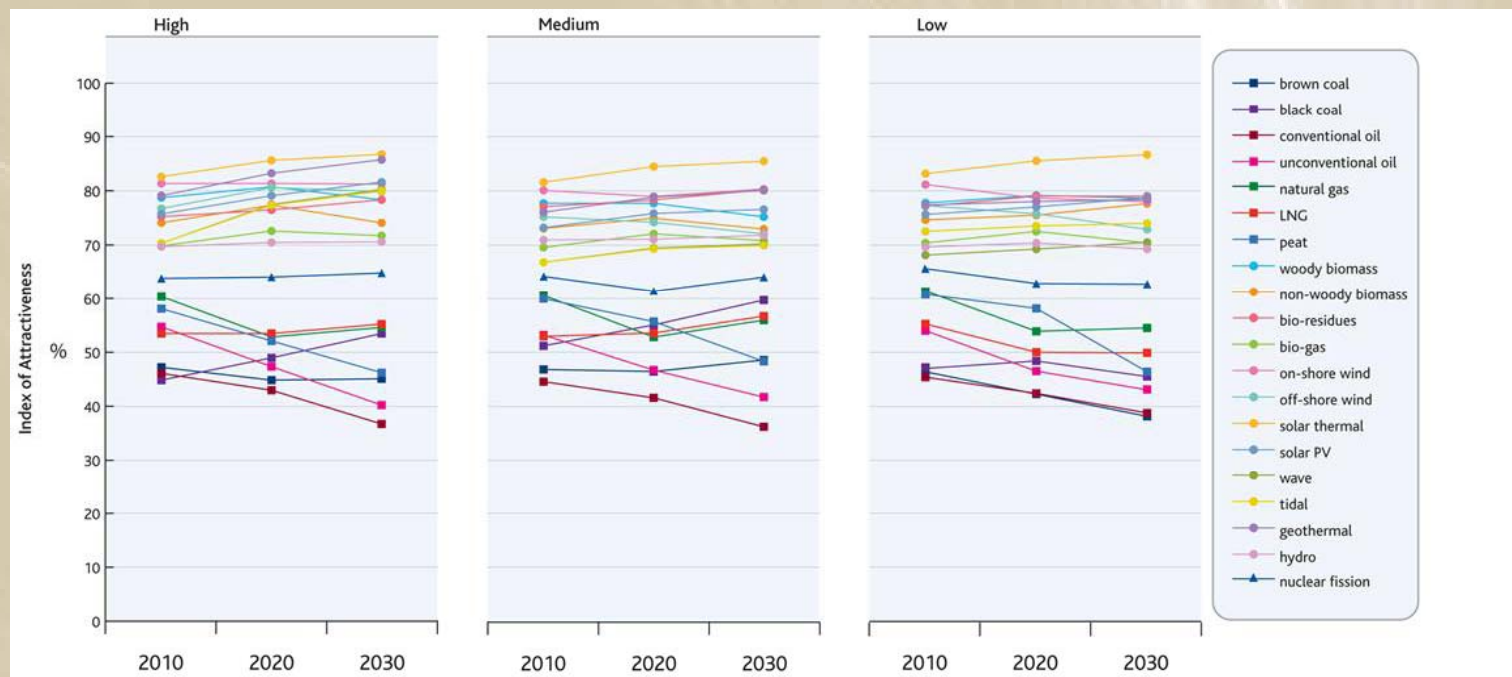
Climate Change Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)



Trade-Off Positions

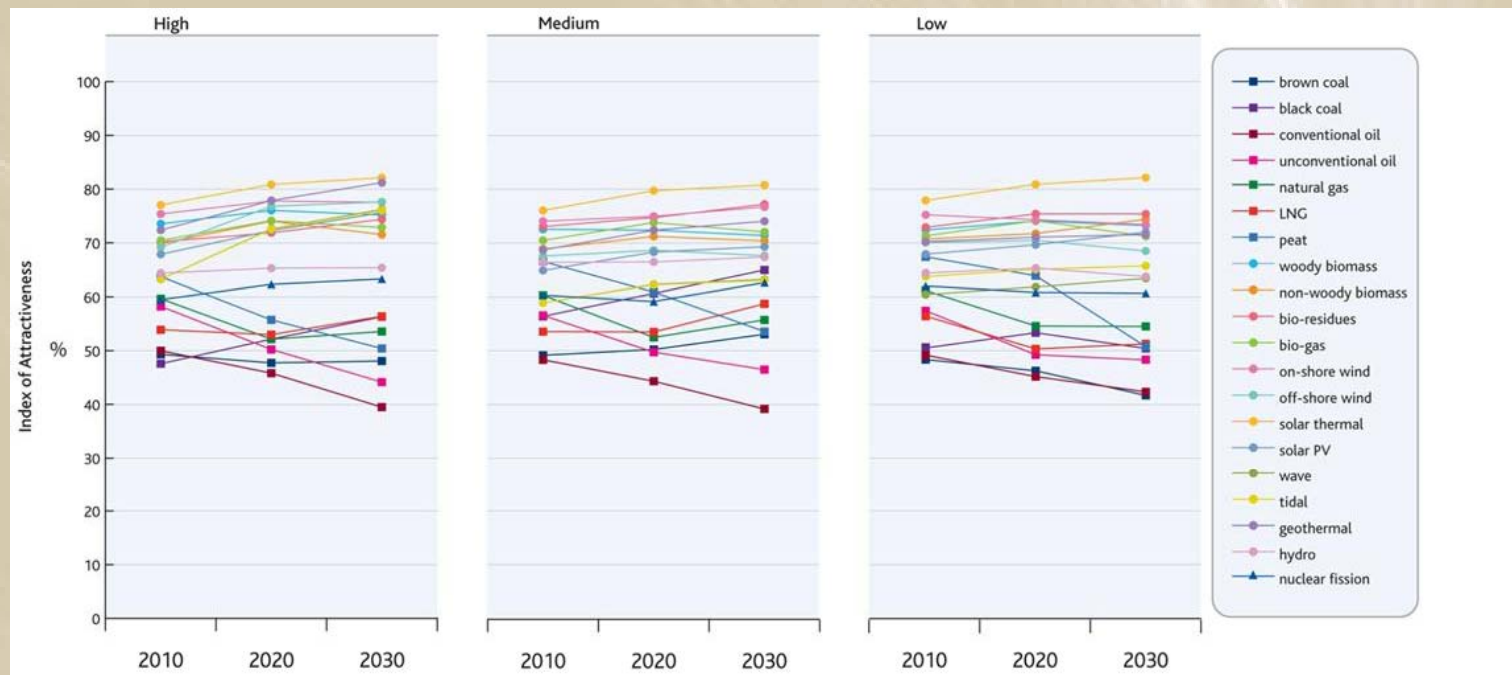
Equal Weighting Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)

25 per cent Competitiveness / 25 per cent Security of Supply/ 25 per cent Sustainability / 25 per cent Climate Change



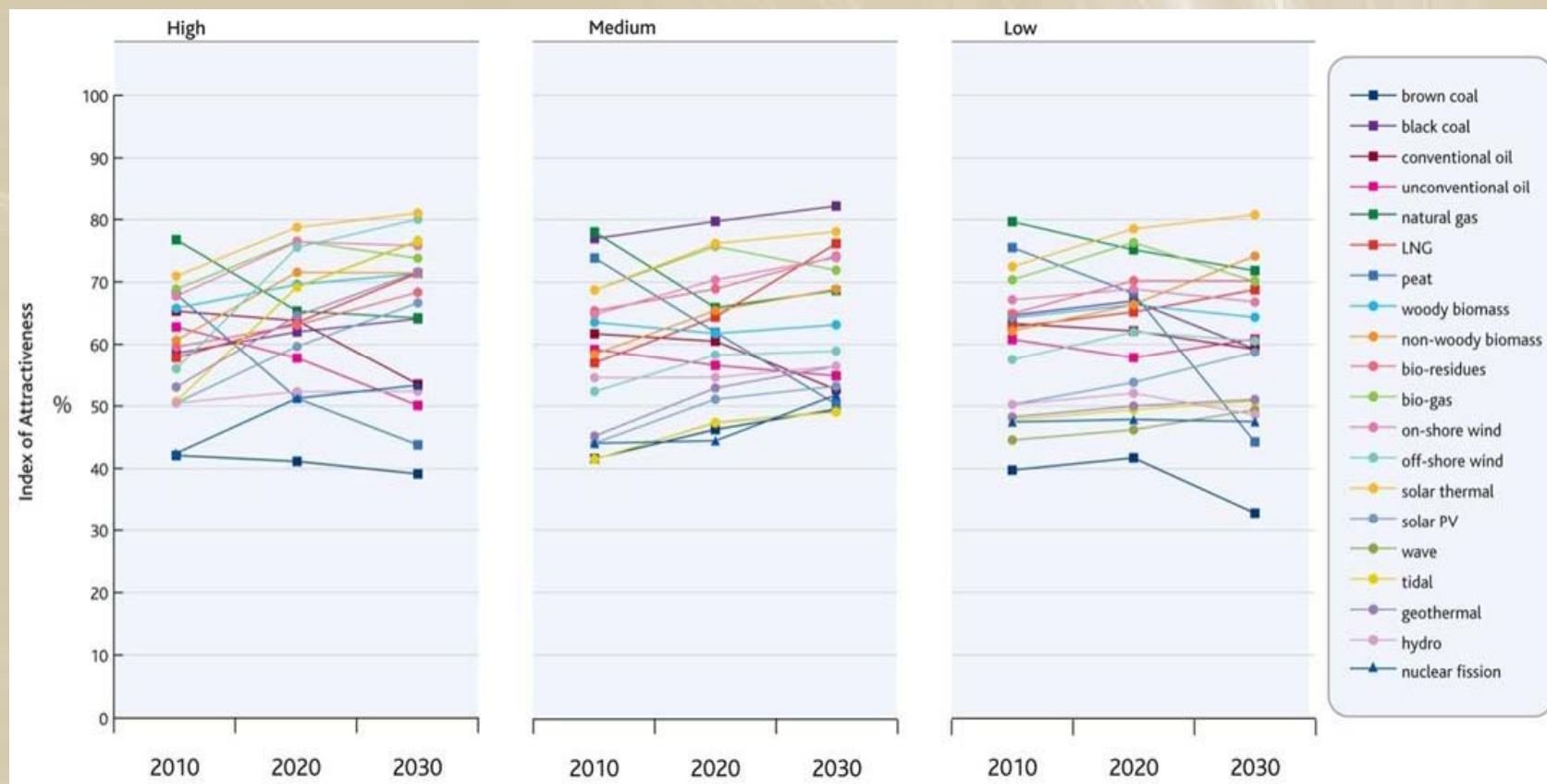
“Traditional” Three Pillar Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)

33.3 per cent Competitiveness / 33.3 per cent Security of Supply/ 16.65 per cent Sustainability / 16.65 per cent Climate Change



Competitiveness at 70 per cent Index Scores in 2010, 2020 and 2030 across the three scenarios (high, medium and low)

70 per cent Competitiveness / 10 per cent Security of Supply/ 10 per cent Sustainability / 10 per cent Climate Change



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