Electricity Market Reform (EMR) and new nuclear build in the UK

Atomexpo
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EDF Energy – A UK energy leader

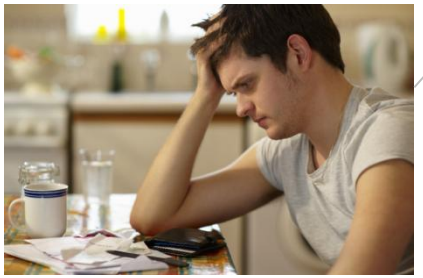
Generation

- The UK's **largest electricity generator**, generating ~1/5 of UK electricity
- Operates **8 of the UK's 9 nuclear power stations** (9GW)
- One of the largest **coal operators** (2 stations, 4GW)
- **A new CCGT** (West Burton, 1.3GW);
- **EDF Energy Renewables** currently operates >400MW of onshore wind farms in the UK and a >60MW offshore wind farm;
- Leader in Low Carbon Generation developing projects for **up to 4 new nuclear reactors,** and further **renewables project pipeline**

Customers

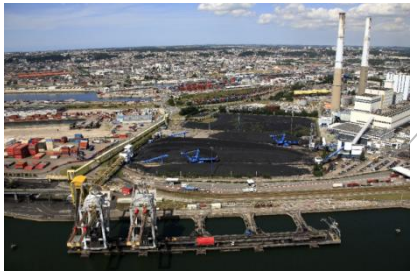
- **Largest electricity supplier to business customers** with ~20% market share
- Major residential supplier of electricity and gas with ~**5.5m customer accounts**, of which ~1.6m nuclear-backed **Blue product accounts**

A shared context between the UK and many other European countries



Economic & social concerns: affordability, competitiveness, employment and growth

Import dependency: costs of energy imports are increasing

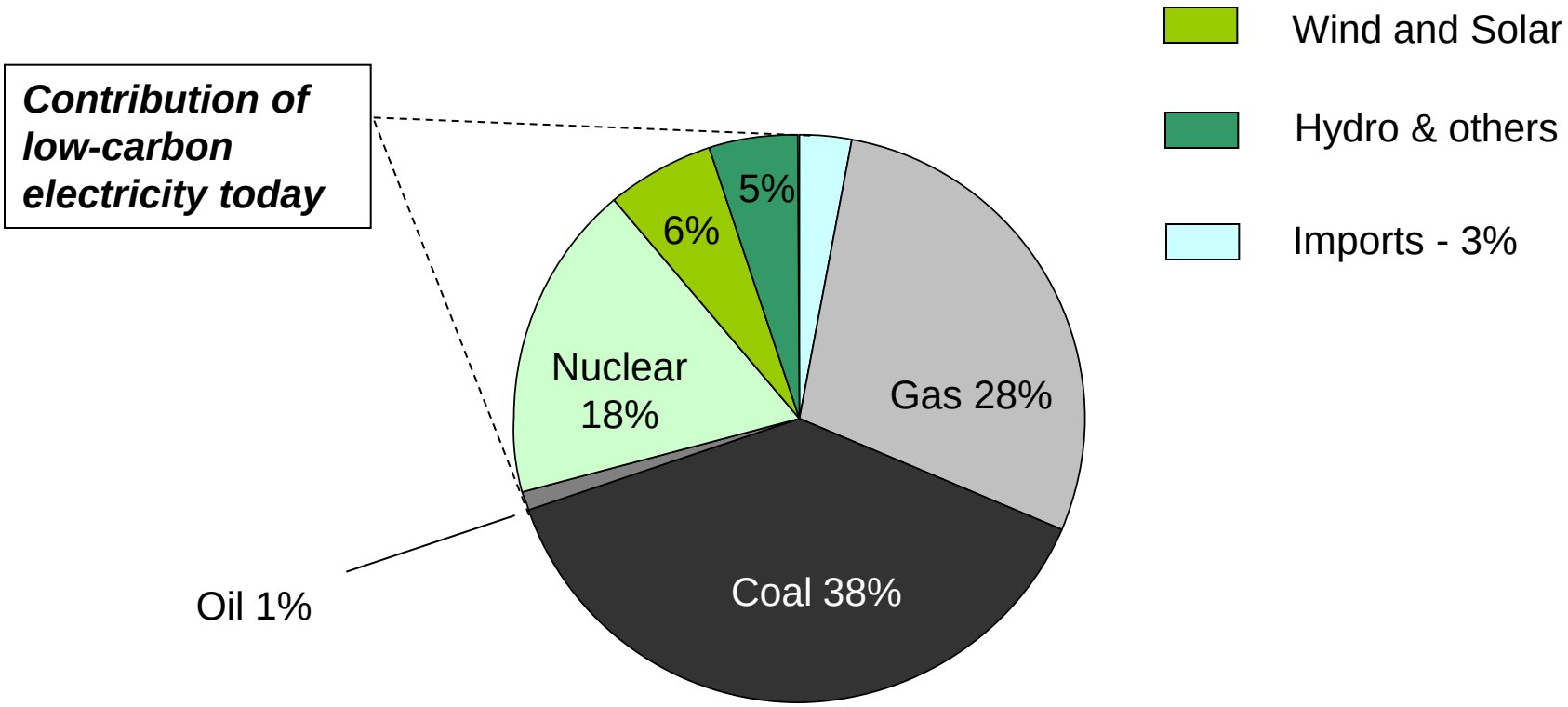


Ageing generation fleet: long-term concerns about generation adequacy

Investment hiatus: limited new investment currently forthcoming

Practical constraints for many / all low carbon solutions (Renewables, Nuclear, Energy Efficiency, Demand Side Response, Interconnections, CCS) - require a balanced energy mix

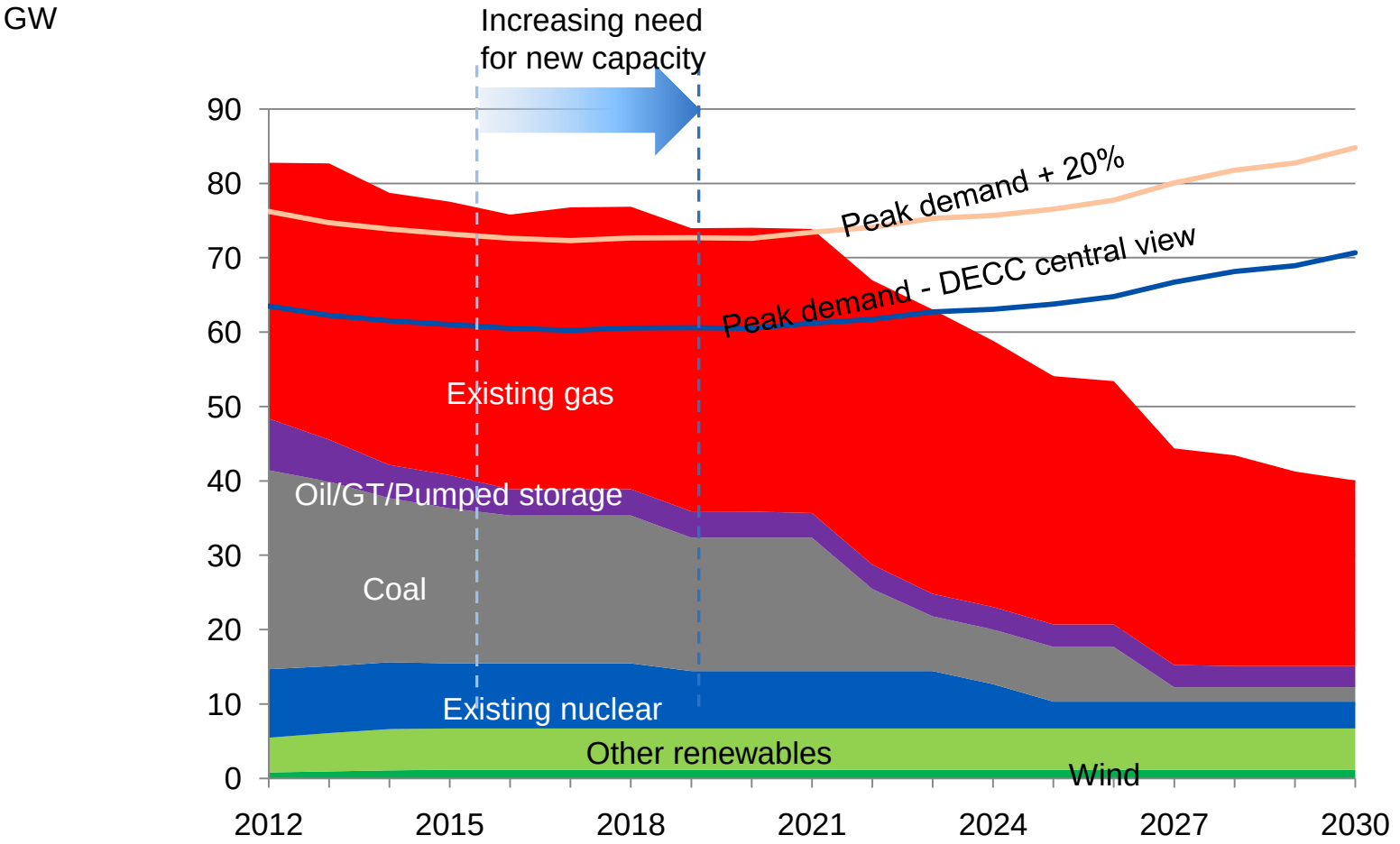
Need for Low Carbon Generation in UK
(figures for 2012)



Source: UK Energy in Brief 2013

With 30GW of existing capacity expected to shut by 2025, substantial generation investments will be required

Existing and under construction UK generation plant



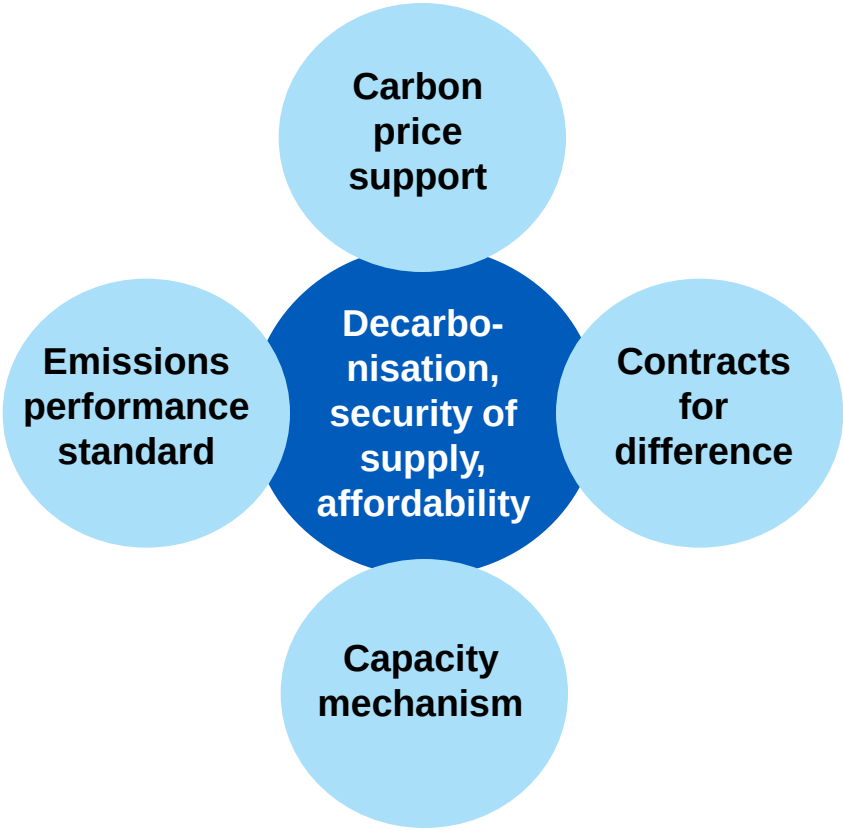
Notes: The date when new build large scale baseload generation is required depends on the rate of closure of existing plant. This chart shows a forecast of installed capacity of power plants in Great Britain by fuel-type, based on EDF Energy Best view as of Apr 2013. Chart excludes interconnection, currently 3.8GW, due to uncertain availability during peak times. Assumes 7-yr average lifetime extension for nuclear. Wind installed capacities have been de-rated at 10% to reflect wind's limited ability to provide capacity at peak times. Mothballed capacity assumed to remain closed. Peak demand based on DECC UEP, Oct 2012.

1) Source: DECC's Electricity Market Reform Technical update document, December 2011. Business as Usual scenario assumes 32GW of plant closures by the end of 2025.

UK Electricity Market Reform – a package to deliver the UK and Energy & Climate objectives

- **Carbon price support:** places a floor on the cost of CO_2 emissions. Announced trajectory for the floor price provides a stable long-term signal of the cost of emissions to promote low-carbon investment and switching away from high-carbon fuels
- **Contract for difference:** to give developers of low-carbon generation revenue security on projects with large initial investments and long pay-back periods, while protecting customers from paying too much
- **Capacity mechanism:** to be designed to promote investment in generation capacity to ensure security of supply, by paying providers of reliable capacity for being available if required (hence increasing their revenue certainty)
- **Emissions performance standard:** to cap the level of CO_2 emissions permitted from new generation capacity – prohibits new unabated coal (and possibly later other fossil fuel) plant

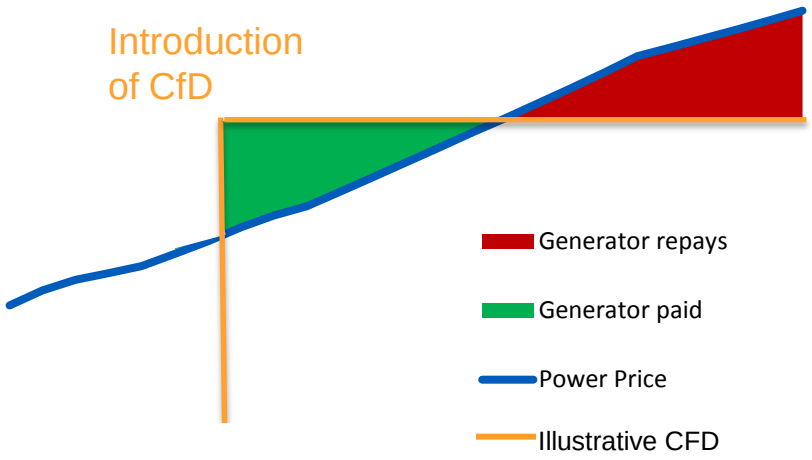
EMR objectives and measures



Contracts for difference (CFDs) allow customers to benefit from the price stability of low-carbon generation

Illustrative impact of CfDs on revenues for low-carbon generators, and on cost for customers

Electricity price, £/MWh

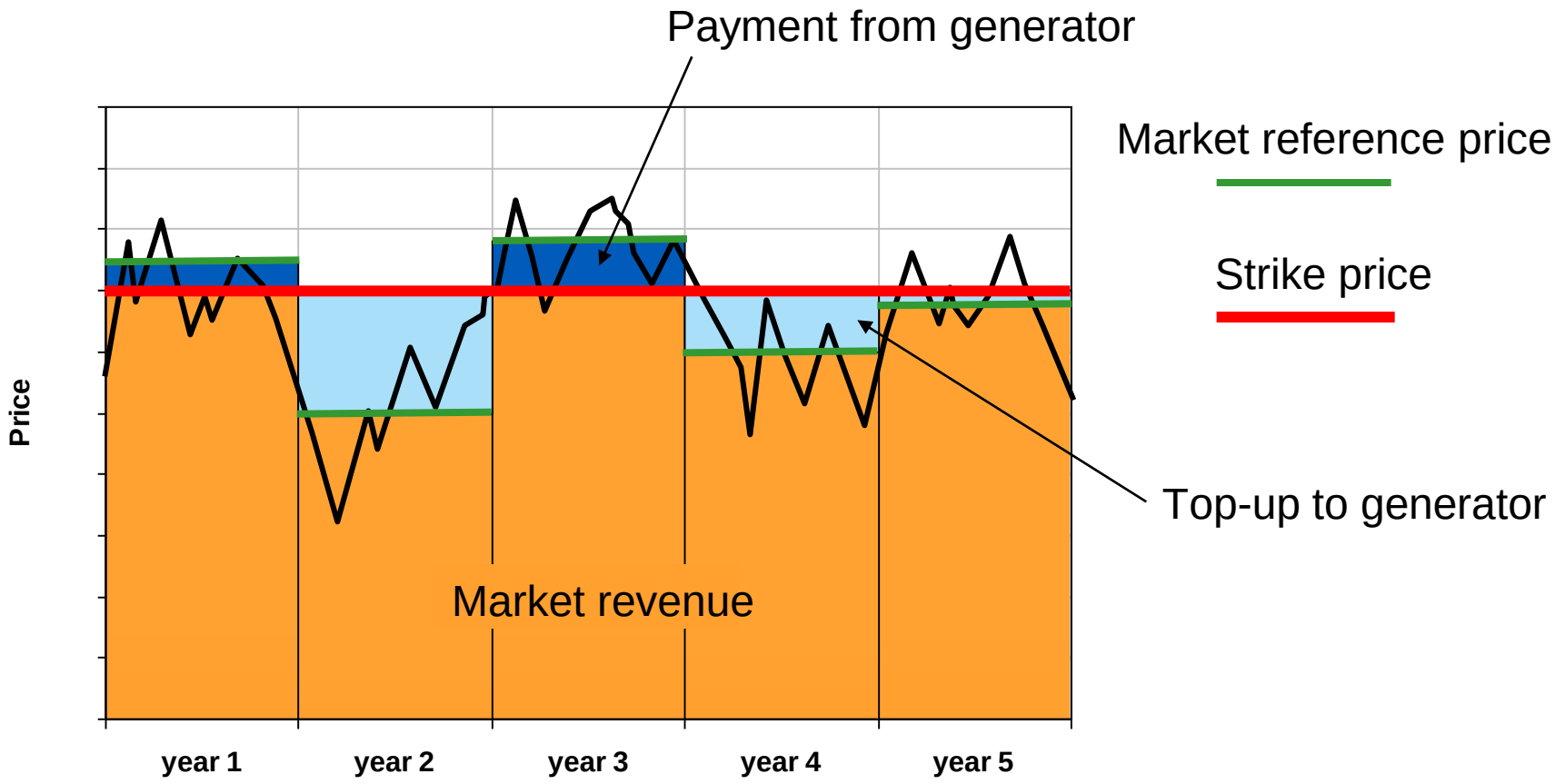


- A CfD effectively provides a fixed price for a plant's output, removing exposure to commodity price volatility
- Long-term price certainty reduces risk for investors, lowering cost of capital and price for customers
- CFDs provide protection against high commodity prices for customers
- Generator sells power, but receives a 'top-up' payment
- Top-up pays the difference between the 'Strike Price' and the market price:

  - Generator paid when market price below strike price

  - But, generator pays back when market price is high

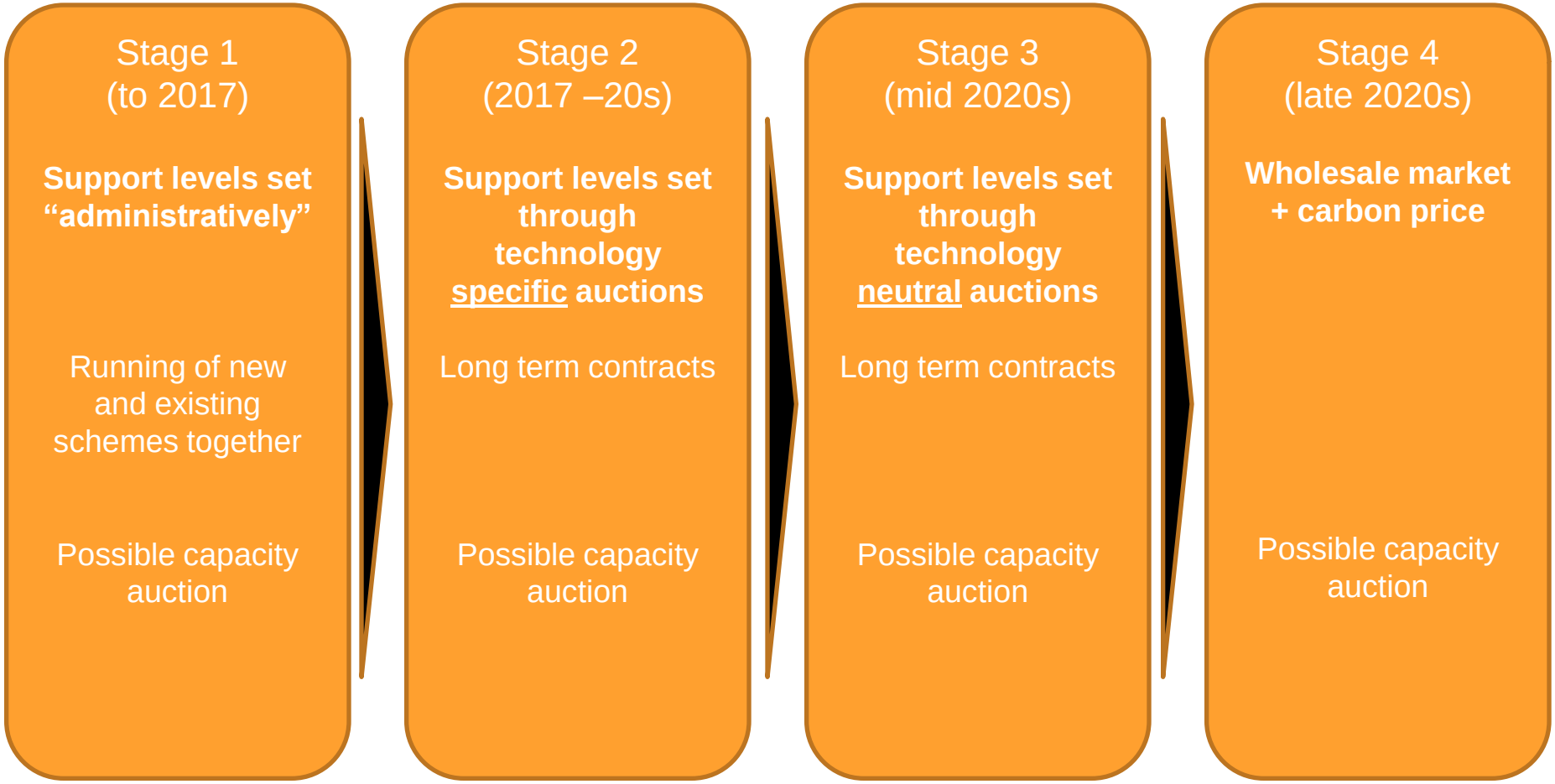
The UK's answer: the contract for difference (CFD)



The CFD: the best option for the UK ("a fair and balanced deal")

- **The CfD removes the market failures generated by the inability to share efficiently, or transfer, future price volatility risk for low carbon generation plants**
  - By providing some price certainty and mitigating against the risk of unhedged price volatility
  - By protecting against changes in policy and law (legally enforceable, long-term, private contract)
- **The CfD overall reduces the capital and financing costs and end user prices for consumers**
- **The CfD is a market-based instrument preserving market risks & incentives**
  - Operators still have to sell their power in the market and are still exposed to risks
- **The CfD ensures no over-compensation**
  - The payment works in both ways: generators receive top-up payments from, or make payments back to the CFD counterparty body
  - And the contract includes gain-share mechanisms, and cost re-openers

The long term transition (the UK Government view)



The existing market design does not address the main long term challenges of energy generation in Europe

- **There is a combination of market failures affecting electricity generation, low carbon generation more specifically, and new nuclear generation in particular.**

In electricity generation

- Diversity and security of supply are not sufficiently incentivised

In low-carbon generation

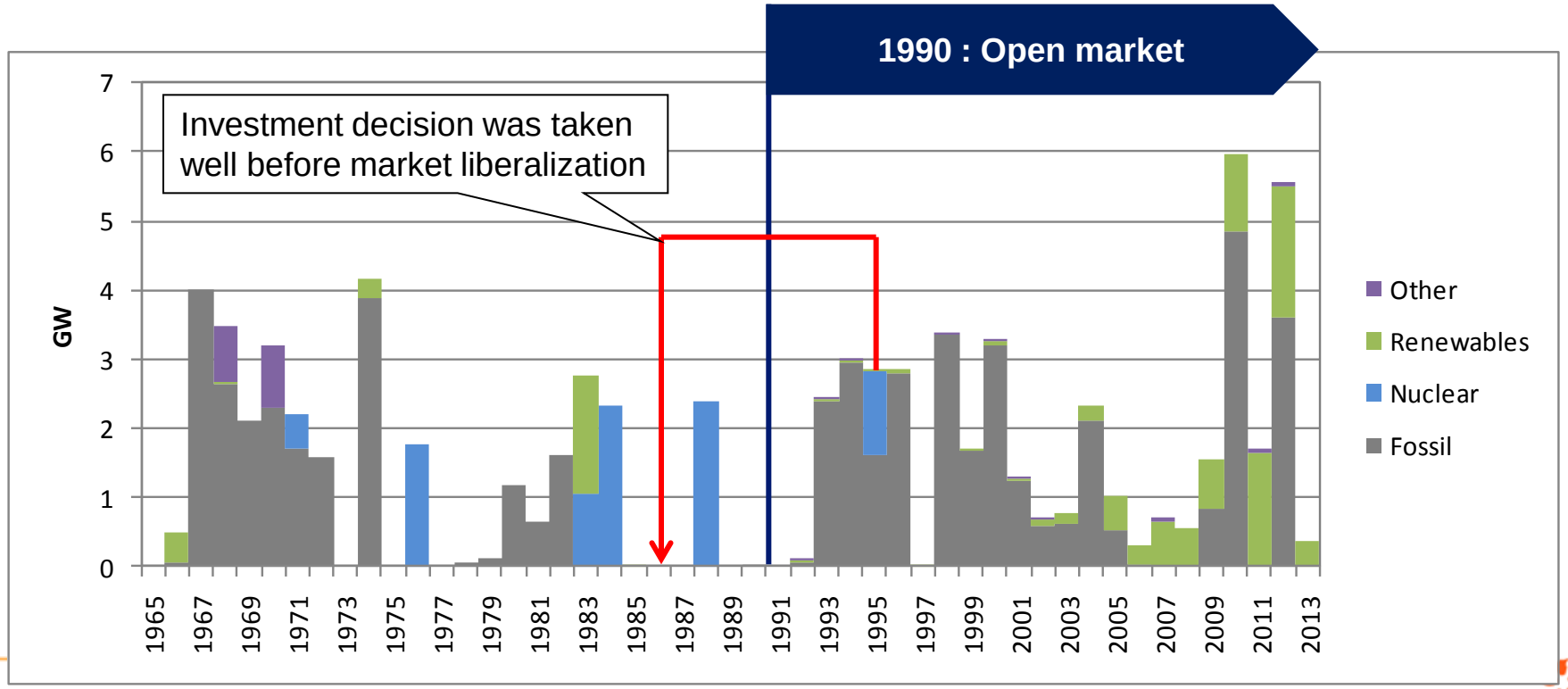
- The market does not provide sufficient visibility and certainty for low carbon investment which have high upfront costs

In nuclear generation

- The specific risks of nuclear (financial, operational and political) have to be addressed through targeted instruments

Limited new nuclear investment in EU since market liberalization (in spite of the fact it is competitive)

- In the UK, the electricity market was liberalized in 1990.
- The last nuclear plant Sizewell B was initiated before market liberalization (constuction took place between 1987 and 1995).
- Since then 32 GW of fossil fuel power plants have been built (mainly CCGTs), and 9GW of renewables (mainly wind, thanks to public support).



Nuclear is a valuable option

- Addresses each of the policy objectives on a long-term basis (and EU countries can exercise their right to choose their energy mix in accordance with the treati).

- Nuclear energy is a recognised source of low carbon generation.
  - Comparison with a CCGT option: The unabated gas generation required to produce as much electricity as an EPR would generate 9 MtCO2/y. A coal plant would generate 18 MtCO2/y.

- Nuclear provides significant benefits in terms of diversity of supply & security of supply :
  - the ability to reduce dependence on imports of fossil fuels
  - the ability to deliver energy at a cost known well in advance (no volatility).
  - the ability to provide reliable baseload (which most renewables cannot).

- There is evidence that nuclear is competitive with other forms of large scale generation, particularly other forms of low carbon generation

Nuclear New Build: a cornerstone of the future UK energy market

Broad support for NNB in the UK

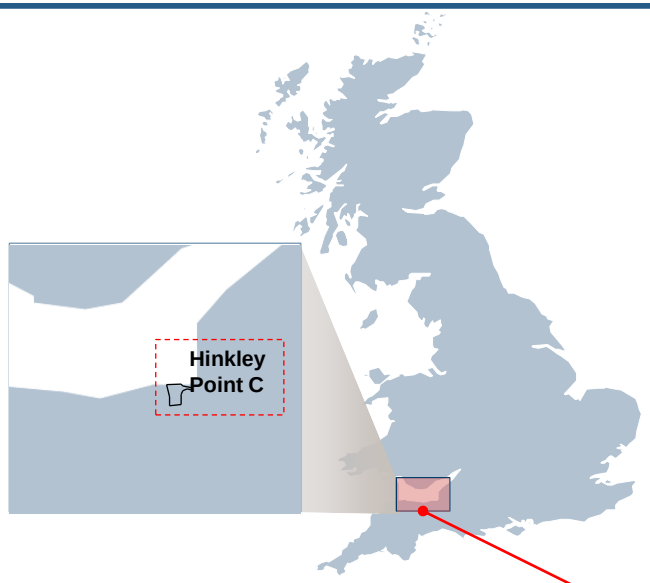
- Cross political party support
- Consistent support of UK public opinion
- Support of the local community
- Strong and independent UK regulator
- Supply chain and union support for efficient construction

Project Overview – Key features of HPC

Key features of the Hinkley Point C development

Licensee	■ NNB Generation Company
Location	■ Bridgwater, Somerset
Reactors	■ Two UK EPR reactors
Capacity	■ 3,260MWe (2 x 1,630MWe)
Design Life	■ 60 years
Main construction contracts	■ Nuclear Steam Supply System, Instrumentation & Control Systems: Areva ■ Turbines: Alstom ■ Main Civil Works: Bouygues TP/Laing O'Rourke ■ Marine works: Costain
Expected Costs	■ £16 billion project costs (2012 money)
CfD agreement	■ CfD strike price: £92.5/MWh(1) (2012 money)
Expected joint venture partners	■ EDF Energy, CGN, CNNC, Areva, other investors
Key dates	■ Pre-development works 2014 pending positive State Aid clearance decision and commercial operations due to start in 2023

Project location



Design and development well advanced, final investment decision anticipated in 2014 (subject to State aid clearance) and commercial operations due to start in 2023

Source: Company information, public information.
(1) Strike price of £89.5/MWh if Sizewell C goes ahead – Economics of HPC investors protected through licence payment from Sizewell C.

The HPC Investment Contract is the appropriate instrument

The HPC Investment Contract provides the minimum certainty required for us to make a final investment decision, given the market failures identified.

NNBG will sell its electricity on the market and will not be insulated from market risks. NNBG will continue to face substantial risks in relation to the project.

Ongoing negotiations with investors and with IUK suggest that the combination of strike price, return, duration and adjustment mechanisms are finely balanced at an appropriate level for the risks inherent in the project.

Rate of return	Project costs	Duration	Prevention of overcompensation
• Reflects risk associated with the project • Consistent with EDF Group's hurdle rates • Previous partner argued the rate was too low • Compares favourably against other benchmarks	•A product of competitive tendering, negotiation and challenge of suppliers. •Subject to verification by the UK Government and its advisors	•35 years ultimately the lowest acceptable level to both NNBG and Government considering FDP liabilities and strike price •Strike price set on basis of project's costs over 60 years – any lengthening of the contract would have no impact on price	•CfD is two-way •Construction gain-share mechanism •Equity gain-share mechanism •Other cost re-openers •Cap on total volume of support

Next steps