

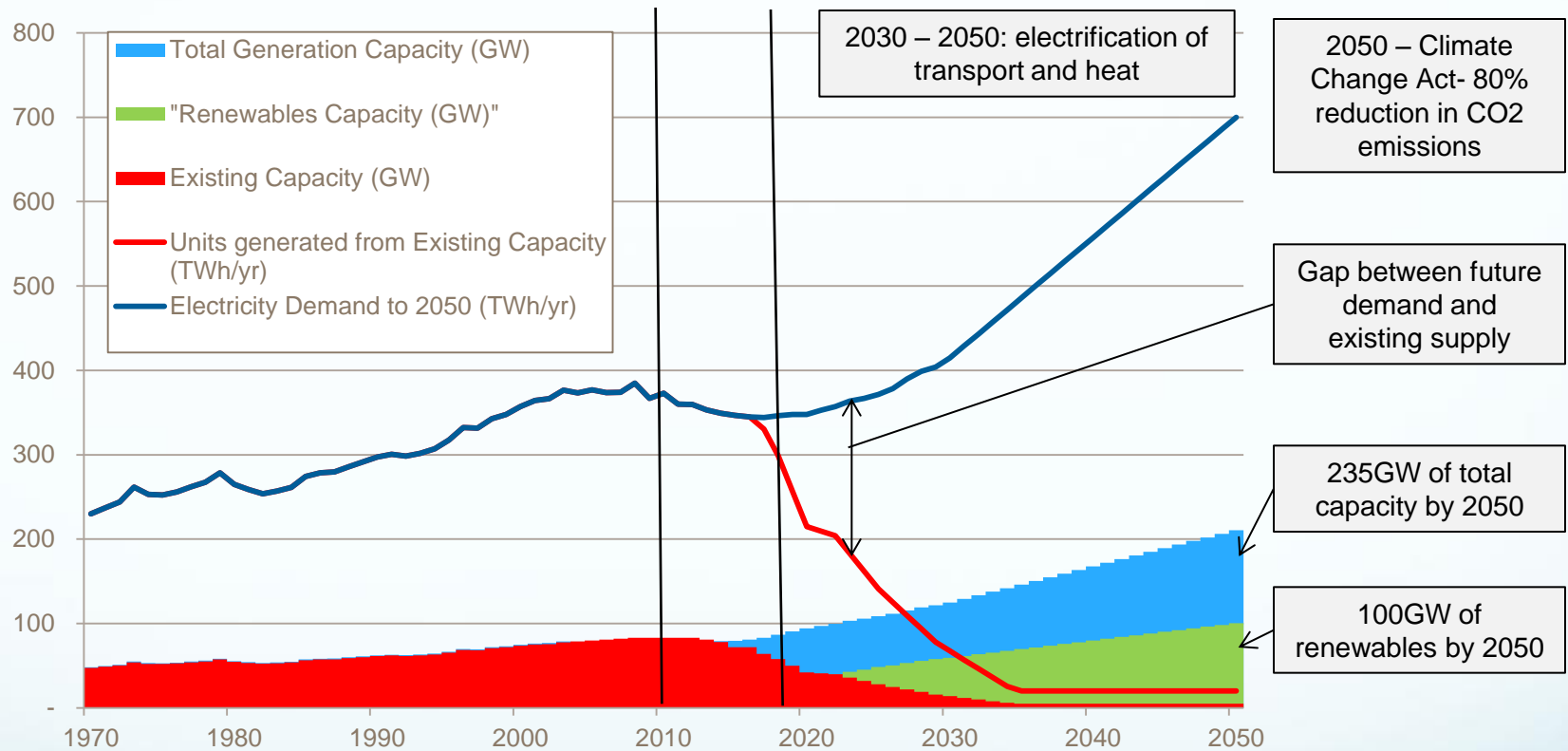
Overview – Regional Electricity Infrastructure, Demand Management and Energy Markets

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Background

- **The Climate Change Act**
 - 80% reduction in carbon emissions by 2050
 - Reduction of emissions from heat and transport (70% of total emissions)
 - Paris Agreement suggested that the rest of the world is moving in the same direction to reduce carbon emissions
- **Replacement and Augmentation of Electricity Generation**
 - End-of-life fossil fuel generation capacity
 - Security of Supply
 - Questions over cost and timetable for nuclear
 - Renewable Technologies – cost and location
 - Energy Storage – cost and technology
- **Affordability**
 - Cost to consumer – high on political agenda
 - Levy Control Framework – no capacity for new renewables until 2021
 - Demand Management – commercialisation lagging technology
- **BREXIT**
 - Changed fiscal environment
 - Concern over future environmental standards

The Energy Crisis in a nutshell

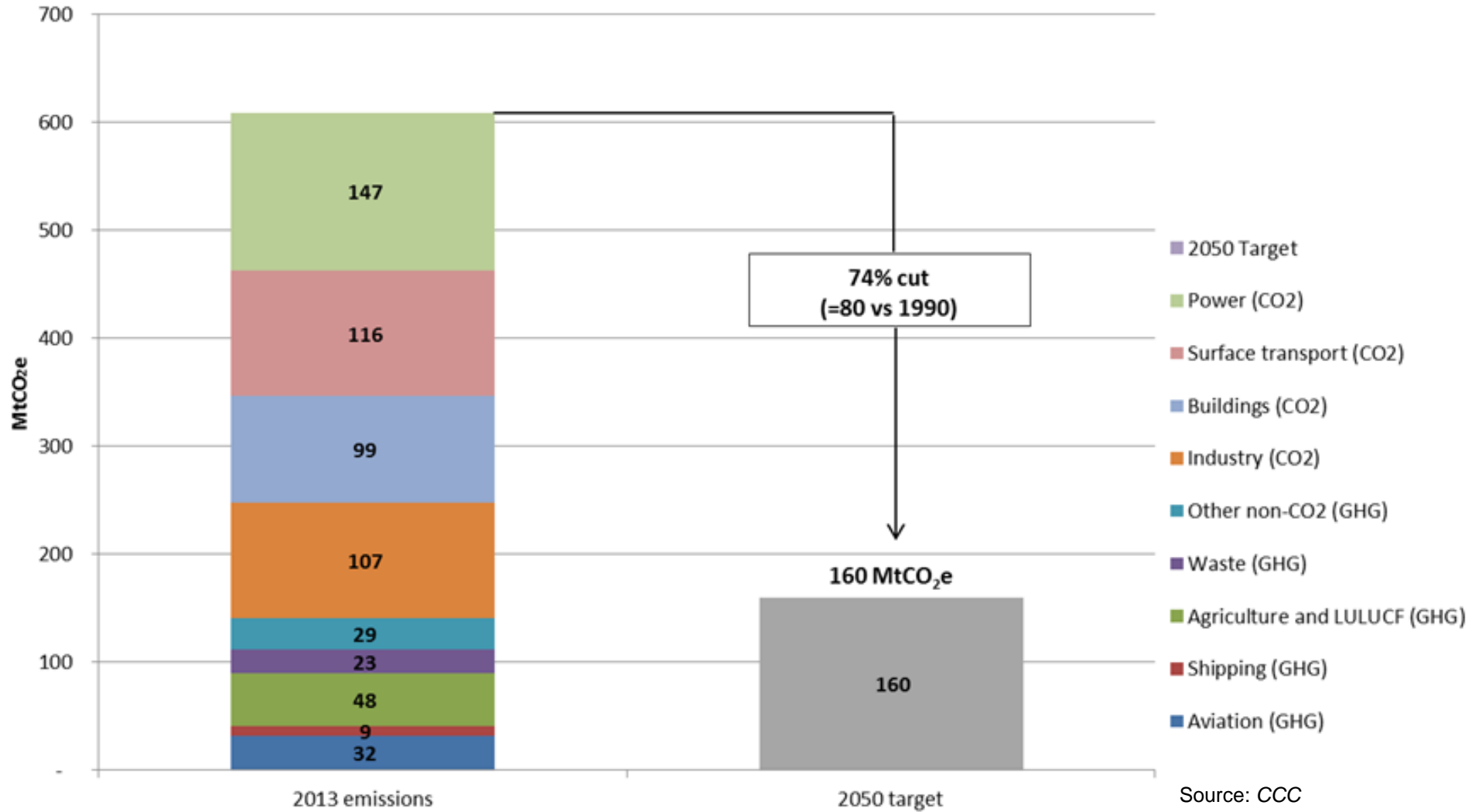


2012 to 2050:
Population increases
from
60m to 75m

Renewables Electricity:
Today – 15%
2020 – 30%

2027 – UK Gov't estimates
(12/11):
35-50GW of renewables,
10 - 15GW of nuclear

What is driving electricity demand?



Challenges

- **INSTRUMENTS USED TO REGULATE ELECTRICITY INVESTMENT**
 - Contract for Difference (low carbon generation)
 - Capacity Market (storage, demand management back-up gas generation)
 - Levy Control Framework (cap on subsidies – feast and famine!)
- **POLICY SIGNALS TO MARKET AND INVESTORS**
 - Market driven – emphasis on short term investment and return
 - Policy emphasis changes with each change of Government
 - New policies needed to meet 5th Carbon Budget
- **PLANNING**
 - Best resource for renewables often in the most sensitive environmental areas
 - 10 years or more from project identification to energy generation
- **COSTS**
 - Development costs are high risk
 - Cost of energy – private return or public investment – 8% or 3.5% rate of return

Flexible Technologies

- **MEETING AND/OR SHIFTING DEMAND**

- 2016 represented the first year in which National Grid operated the system differently from the last 50 years
- Demand side response (DSR) of controllable industrial and commercial and consumer loads, through shifting and frequency response, including electric vehicles (EVs) and heat pumps;
- Energy storage technologies, from distributed batteries to large pumped hydro or compressed air systems;
- Interconnectors that can move electricity between countries to reduce demand or supply imbalances; and
- More flexible CCGTs that can operate more dynamically, starting faster, changing output levels faster and turning down further.

- **NEW FORMS OF GENERATION**

- Marine including lagoons, tidal stream and wave
- Mini nuclear
- Fuel Cells

BEIS Vision for UK Energy

Amber Rudd on the 29th June 2016:

- We made a clear commitment to acting on climate change. That will continue;
- We made tough decisions on support for renewable energy, reflecting our core belief that technologies should be able to stand on their own two feet;
- We remain committed to new nuclear power in the UK – to provide clean, secure energy;
- We must nurture new technologies and industries that will make our future energy system both cheap and clean, supporting entrepreneurs as they look to develop the innovations of the future – in storage, in energy efficiency, in renewables

BEIS Industrial Strategy on 23 January 2017

- Nuclear, Storage, Smart and Flexible Systems - low cost to consumers

ICE Vision for UK Energy

Electricity Storage: Realising the Potential (October 2015):

- Exempt storage operators from balancing charges
- Classify storage as a distinct activity within the electricity licencing regime
- Support small-scale storage through a premium Feed in Tariff

The first two recommendations look like they are being taken forward by Government and feature prominently in the recent BEIS/Ofgem Call for Evidence

National Needs Assessment (October 2016):

- sets out what needs to be done now and the decisions that need to be taken to deliver services for our infrastructure needs until 2050. A key element of this is the nexus between energy, transport and digital infrastructure sectors.

ICE Vision for UK Energy

Responses to Consultation

- **BEIS/Ofgem - A Smart, Flexible Energy System.** The main part of this 100 page consultation was on electricity storage. Outcome awaited.
- **Hendry Review – Independent Review of Tidal Lagoons.** The Review looked at whether, and in what circumstances, tidal lagoons could play a cost effective role as part of the UK energy mix. ICE submitted a joint response with RAEng and IMechE, suggesting the proposed facility at Swansea Bay go ahead as a test facility before other sites are developed. This was quoted in the report to back it's recommendation of the same.
- **National Infrastructure Commission – National Infrastructure Assessment Call for Evidence.** The newly established NIC will produce an NIA once in every Parliament, setting out the Commission's assessment of long-term infrastructure needs on a 30-year time horizon with recommendations to the government. The energy section of ICE's response focuses on the need to decarbonise heat. Consultation closes in February

ICE Vision for UK Energy

Parliamentary Inquiries

- Low Carbon Network Infrastructure
 - ICE gave evidence on intermittency in the electricity system. The Inquiry's conclusion was a central message to the Government that it must address the network system as a whole, learn lessons from policy lags and develop its readiness to change – as systems change and new technologies are introduced.
 - More and more electricity generation occurs at the regional distribution, rather than national transmission level, but Distribution Network Operators remain somewhat blind to their energy flows and passive in managing them. There must be a transition to fully-functional Distribution System Operators which balance and control their local grids.

The South West Challenges

- Population Increase and New Housing, conversion of transport and heat to low carbon – higher demand
- New or enhanced transmission and distribution networks in areas of natural beauty
- The Bristol Channel Conundrum – 2nd highest tide in the world but little agreement on how best to exploit
- Supply chain capacity – skilled engineering resources to design and build tomorrow's projects
 - Current UK annual electricity spend: £7.5bn
 - >£100bn capex required by 2020....(£15bn/yr)
- Reducing cost
- Managing adverse impacts – solar farms, wind, tidal.....
- Encouraging the new flexible agenda – storage, demand side response etc

Energy Investment Potential in the South West

- New nuclear power stations at Hinkley and Oldbury
- On and offshore Wind
- Solar – particularly on buildings
- Tidal Range in the Bristol Channel (eg lagoons)
- Tidal Stream and Wave
- Flexible transmission and distribution
- New wave of open cycle gas turbines
- Mix of local and central generation, increased use of storage
- >£75bn capital spend by 2030?