Renewable Energy

The need for innovation

Philip Wolfe

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Taking a different path

- The targets – why and what
- Existing policies
- Emerging policies
- Some innovation opportunities

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Key drivers for energy policy

- Energy security
- Environment – climate change
- Economics – energy prices

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Economics

Stern report for HM Treasury

- Stabilisation is essential and affordable
- Global emissions need to be >25% below current levels in 2050 for <550ppm CO_2eq
- This will cost 1% of GDP p.a.
- 75% less emissions per unit GDP in 2050
- Doing nothing could be equivalent to a 20% reduction in consumption

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Say that again

- ***Doing nothing costs 5 to 20%***
- ***Solving the problem costs 1%***

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The EU commitments for 2020

- Emissions reductions — Binding
  - 20% unilateral, or
  - 30% if multilateral
- Energy conservation — Non-binding
  - 20% below current projections
- Renewables — Binding
  - 20% of total energy — UK share: **15%**
  - 10% of transport fuels

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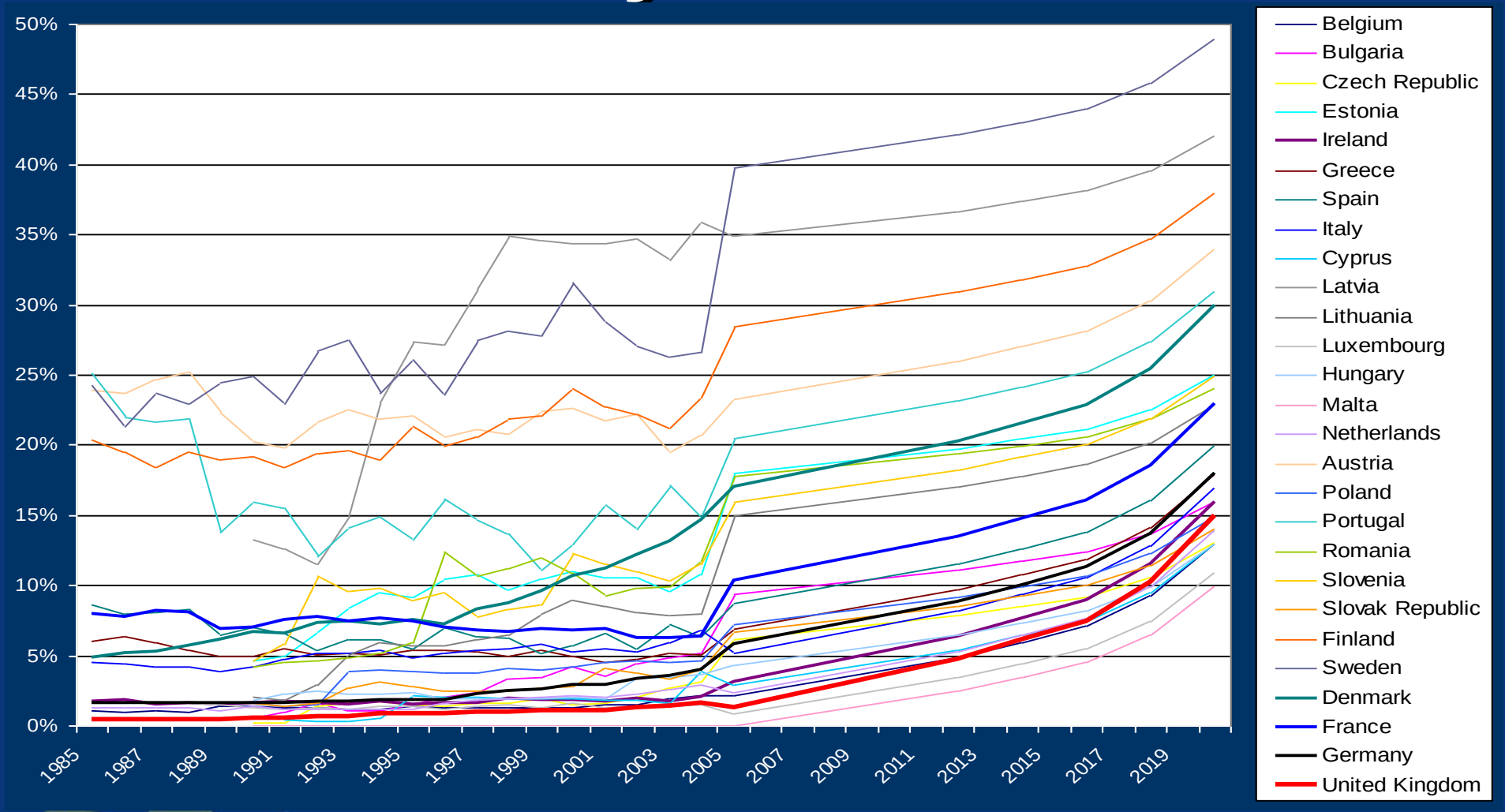
Eleven years to 2020



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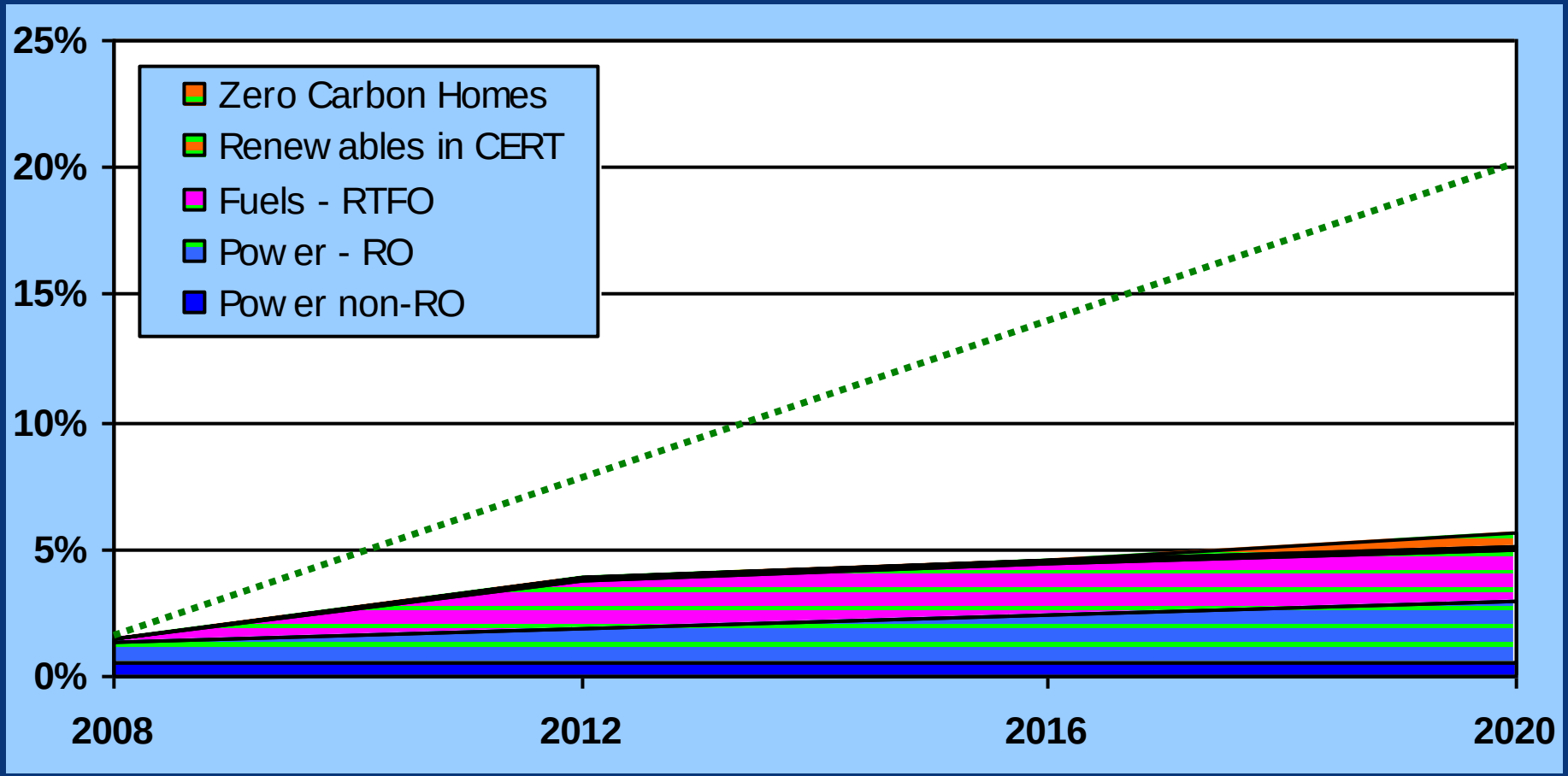
Existing UK policies



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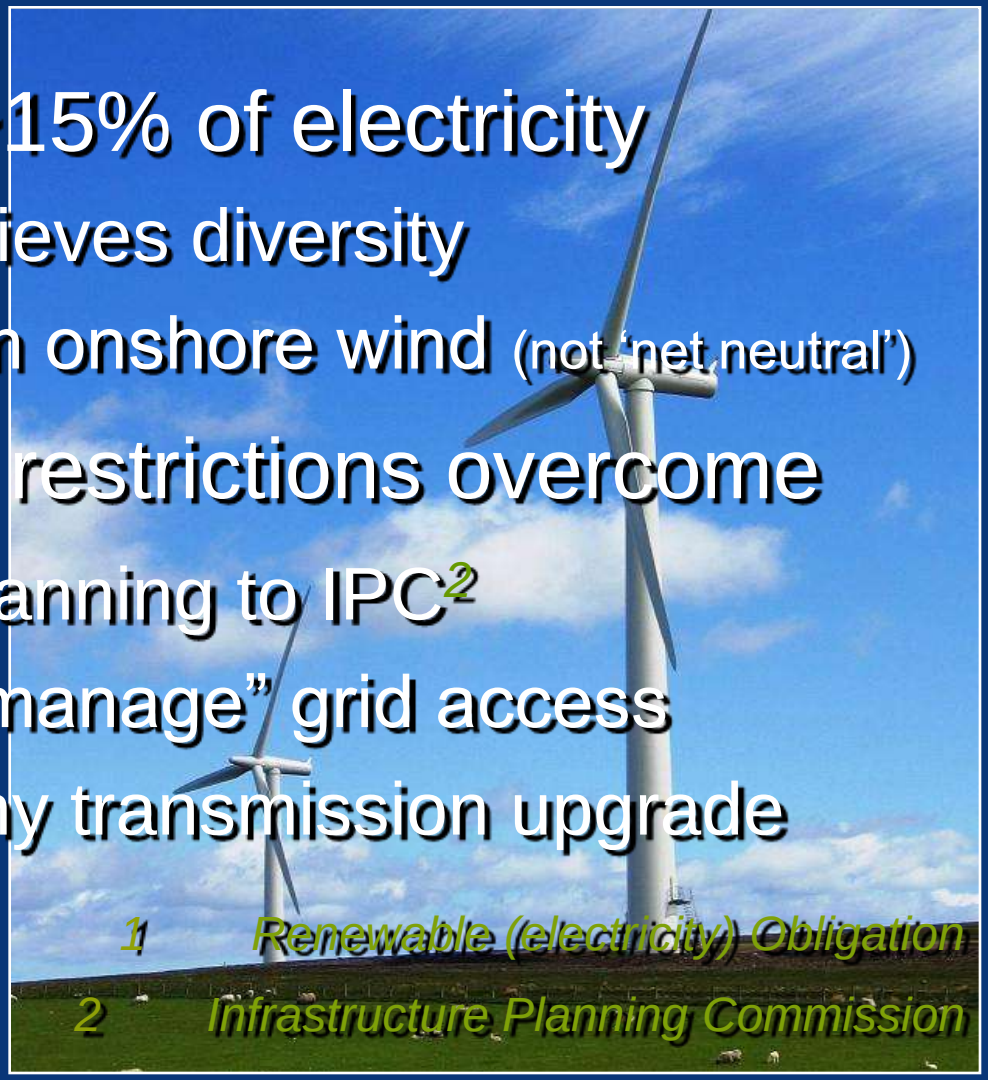
Existing policies, measures and assumptions
Merchant power

- RO[1] achieves ~15% of electricity
  - Banding achieves diversity
  - Doesn't harm onshore wind (not 'net neutral')
- Planning & grid restrictions overcome
  - All energy planning to IPC[2]
  - "Connect & manage" grid access
  - Beauly-Denny transmission upgrade



1 Renewable (electricity) Obligation

2 Infrastructure Planning Commission

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Existing policies, measures and assumptions

Transport fuels

- RTFO[3] introduced and effective
  - > Buy-out price that ensures quotas are met
  - > Sustainability reporting is appropriate
  - > UK market is as attractive as others
- Bio-fuel duty rebates remain in interim

3 *Renewable Transport Fuels Obligation*

Existing policies, measures and assumptions

Onsite energy

- Zero carbon new homes from 2016
  - Building regs: CSH[4] level 6 from 2016
- CERT[5] effective for 'micro-renewables'
  - Appropriate multipliers for renewables
- Positive planning
  - Extend 'Merton Rule'[6] nationwide
- Encourage renewables in existing houses
  - Energy certificates in home info packs

4 Code for Sustainable Homes – Level 6 is 'zero carbon'

5 Carbon Emission Reduction Target (formerly EEC)

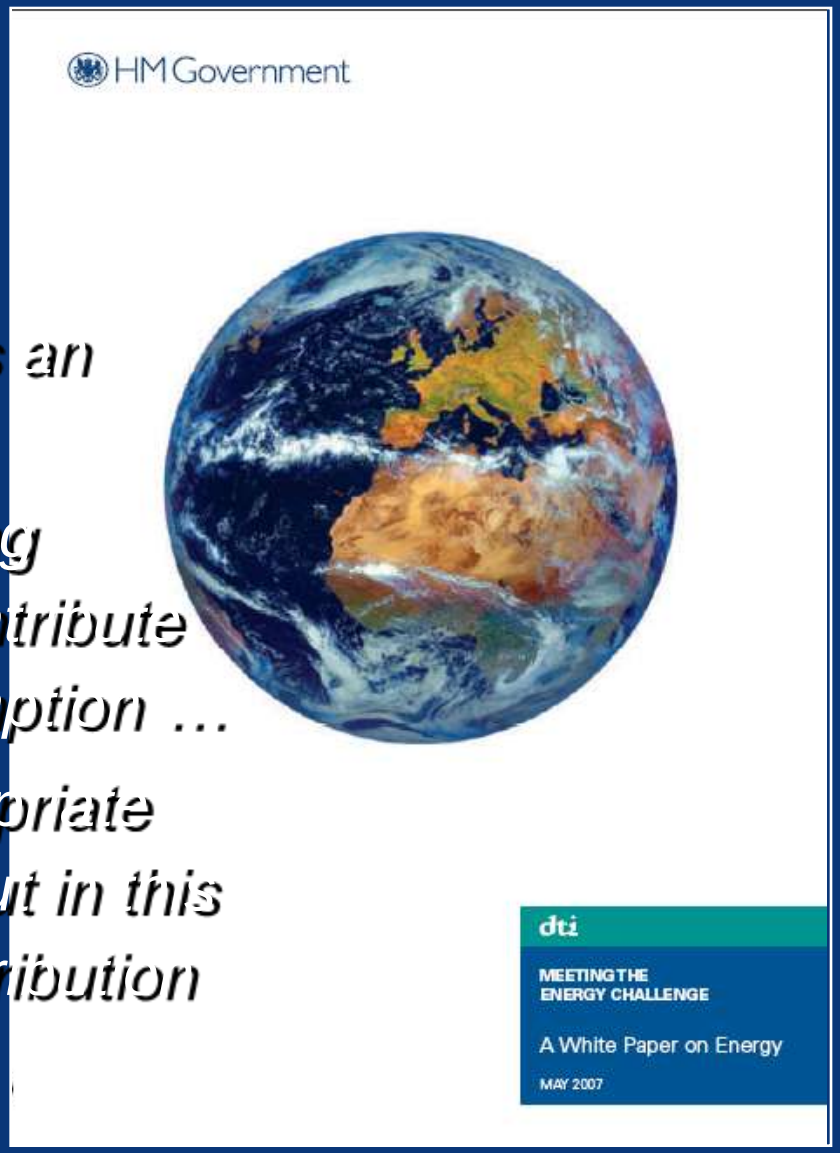
6 Larger developments require [10%] renewable energy

Energy White Paper

"The 20% renewables target is an ambitious goal …

by 2020, on the basis of existing policies, renewables would contribute around 5% of the UK's consumption …

we will bring forward the appropriate measures, beyond those set out in this White Paper, to make our contribution to meeting these targets."



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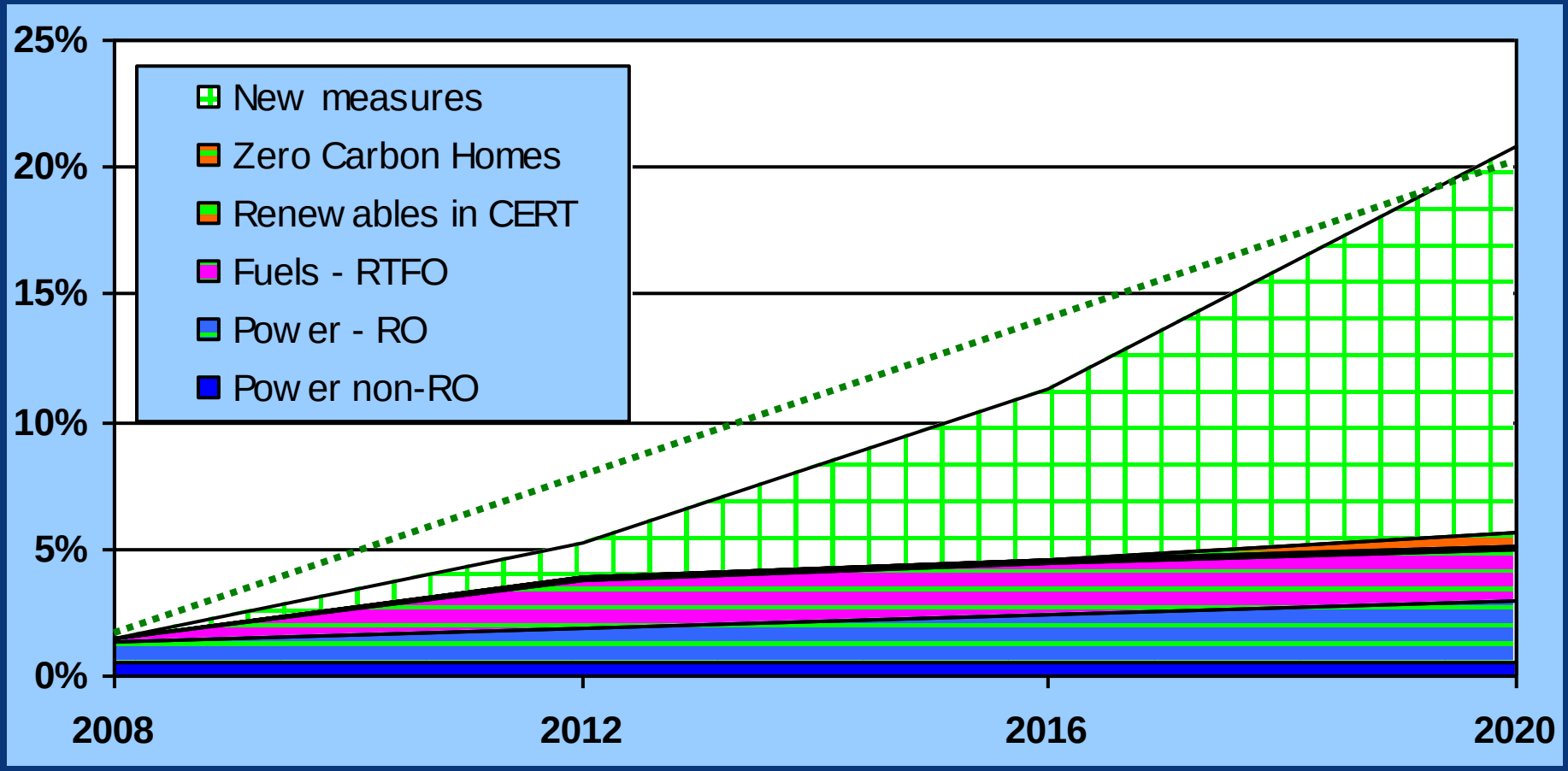
Routemap to 2020
New measures needed



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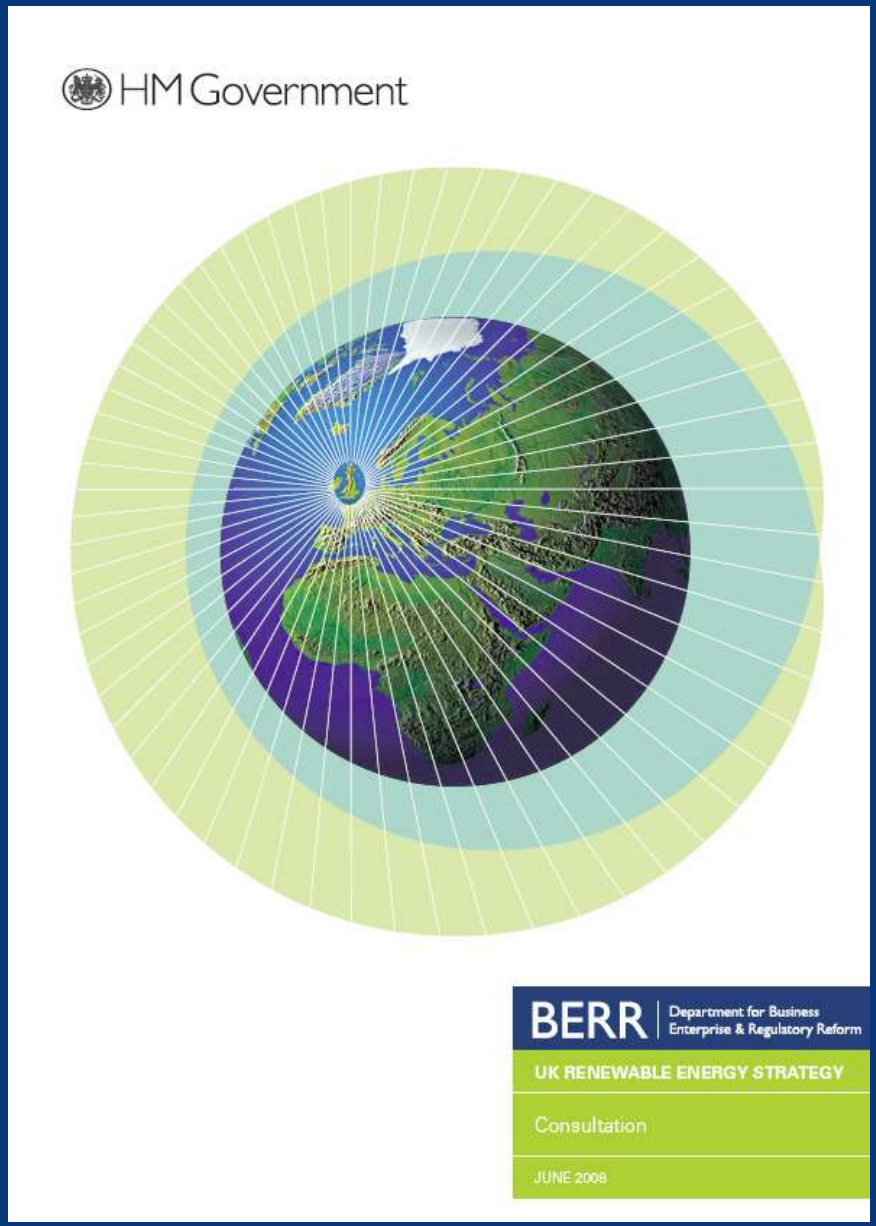
Renewable Energy Strategy (RES)



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Changing the paradigm – 2020 scenarios

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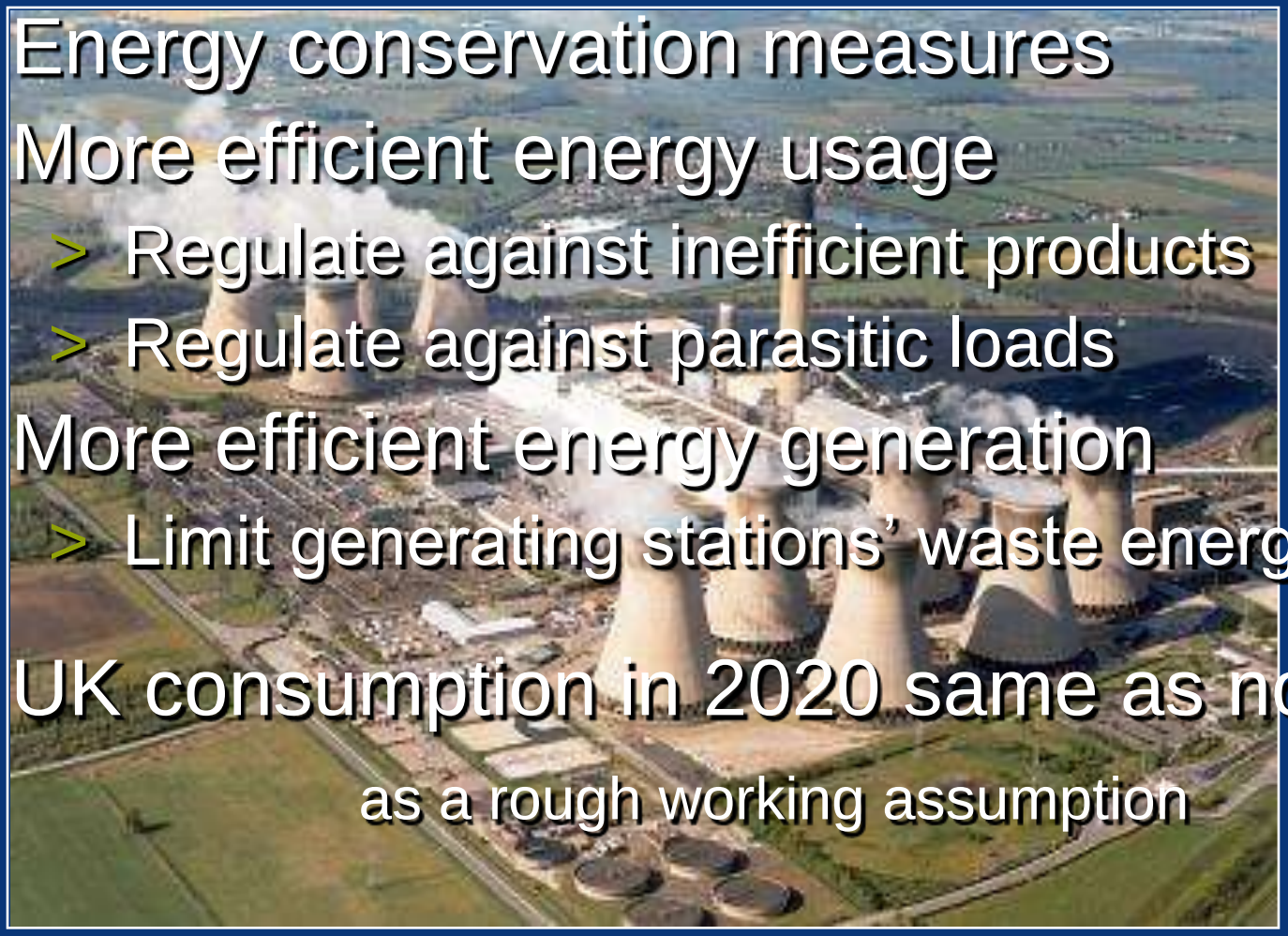
First: Cut energy consumption



- Energy conservation measures
- More efficient energy usage
  - Regulate against inefficient products
  - Regulate against parasitic loads
- More efficient energy generation
  - Limit generating stations' waste energy
- UK consumption in 2020 same as now

as a rough working assumption

Next: More renewables …

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New policies, measures and proposals
Merchant power

- Increased RO[1] objective
  - Set 25% quota and increase headroom
  - Offshore super-grid?
- Tidal lagoons, barrages and new large hydro?
- Incentives for large scale CHP[7]
  - Large thermal generators must use heat
  - Renewable Heat (or Gas?) Obligation
- Measures to deliver biomass strategy

1. Renewable (electricity) Obligation
7 Combined heat and power

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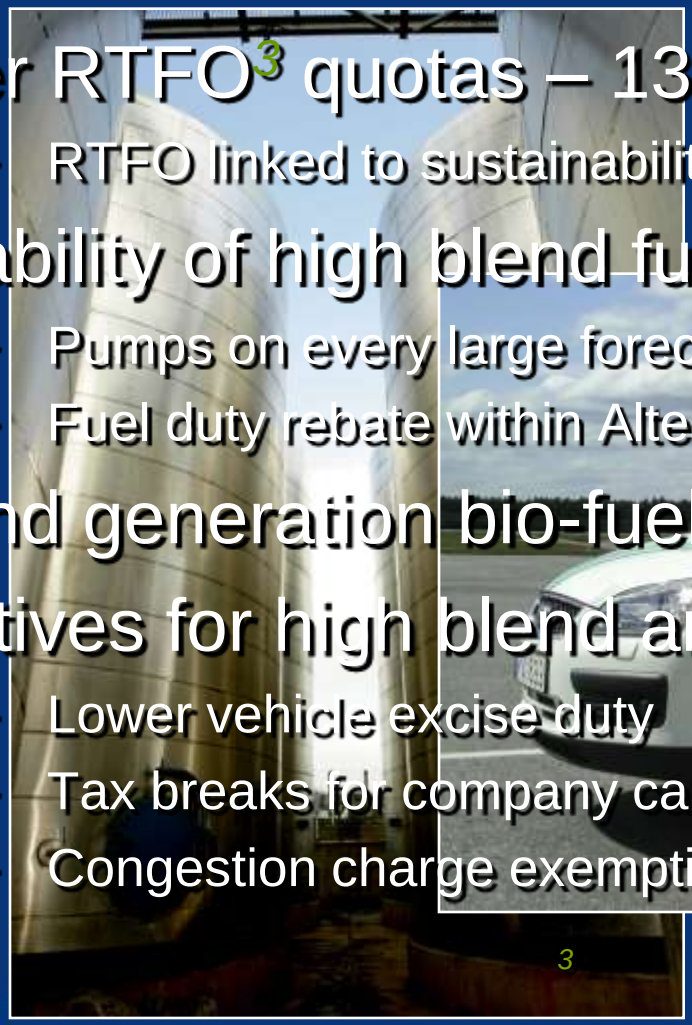
New policies, measures and proposals

Transport fuels

- Higher RTFO[3] quotas – 13% (by volume) in 2020
  - RTFO linked to sustainability measures
- Availability of high blend fuels
  - Pumps on every large forecourt
  - Fuel duty rebate within Alternative Fuels Framework
- Second generation bio-fuels
- Incentives for high blend and flex-fuel vehicles
  - Lower vehicle excise duty
  - Tax breaks for company cars
  - Congestion charge exemptions



3 *Renewable Transport Fuels Obligation*

New policies, measures and proposals

Onsite domestic

- Building regulations for new homes
  - CSH[4] level 4 from 2010, level 5 from 2013
- Smart metering roll-out programme
- Retrofit programme for existing houses
  - 100,000 rising to 1,000,000 per annum
  - Owner occupiers and private landlords:
    - Renewable energy tariffs for electricity and heat
    - Stamp duty breaks, council tax concessions
    - Financing measures, mortgages and loans
  - Social rented and fuel poor:
    - Through local authorities and housing associations

4 *Code for Sustainable Homes – Level 5 is 'low carbon'*

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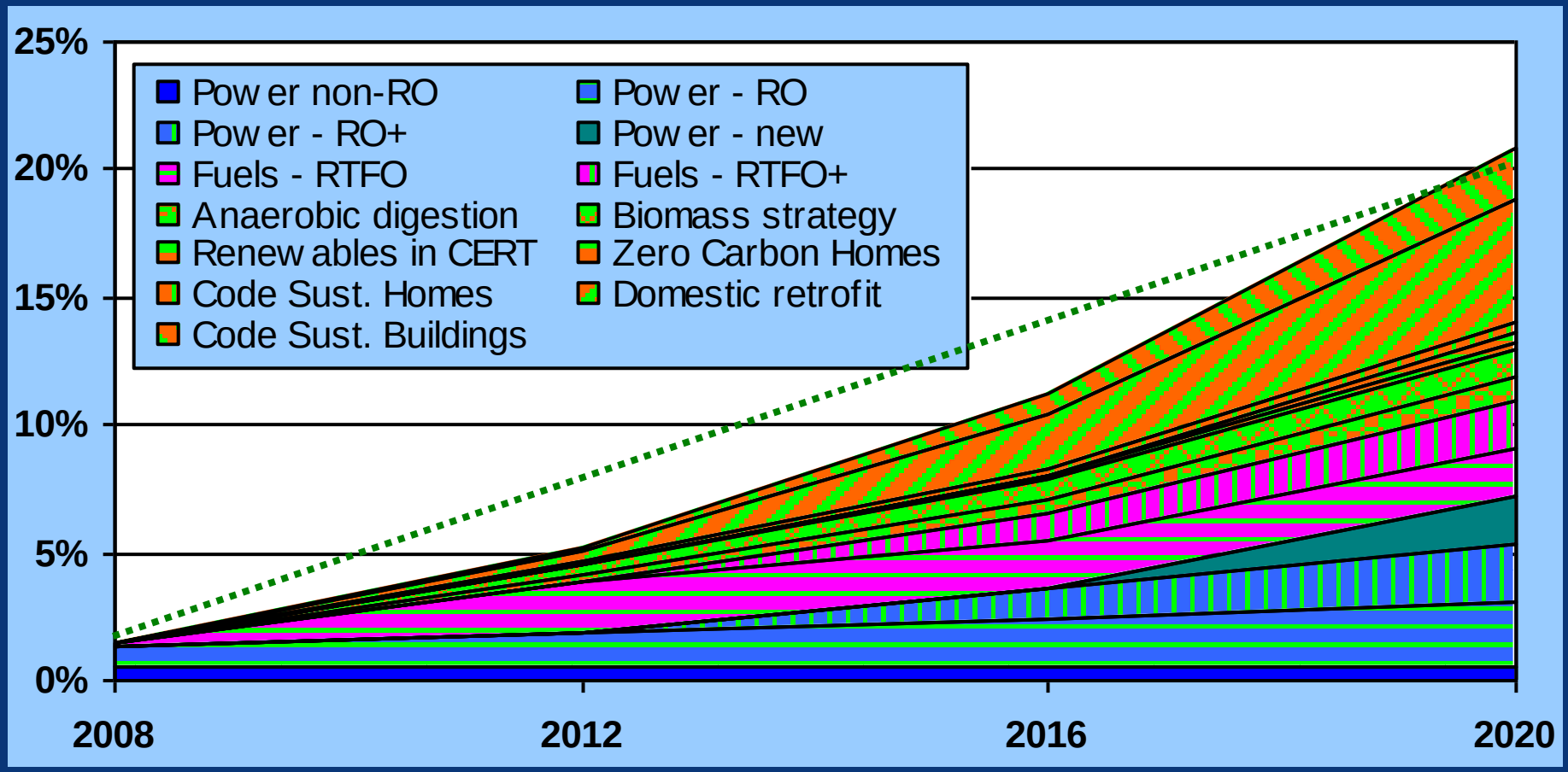
New policies, measures and proposals
Non-residential

- A new Code for Sustainable Buildings
  - Equivalent to CSH[4] – and in Building Regs
- Heat networks in new developments
  - Regulatory system for heat networks
- Positive planning
  - Progressively rising 'Merton Rule'[6] %s
- Renewables in agriculture
  - Anaerobic digestion on 000's of farms

4 Code for Sustainable Homes

6 Larger developments require [10%] renewable energy

Routemap to 2020
Enhanced energy policy



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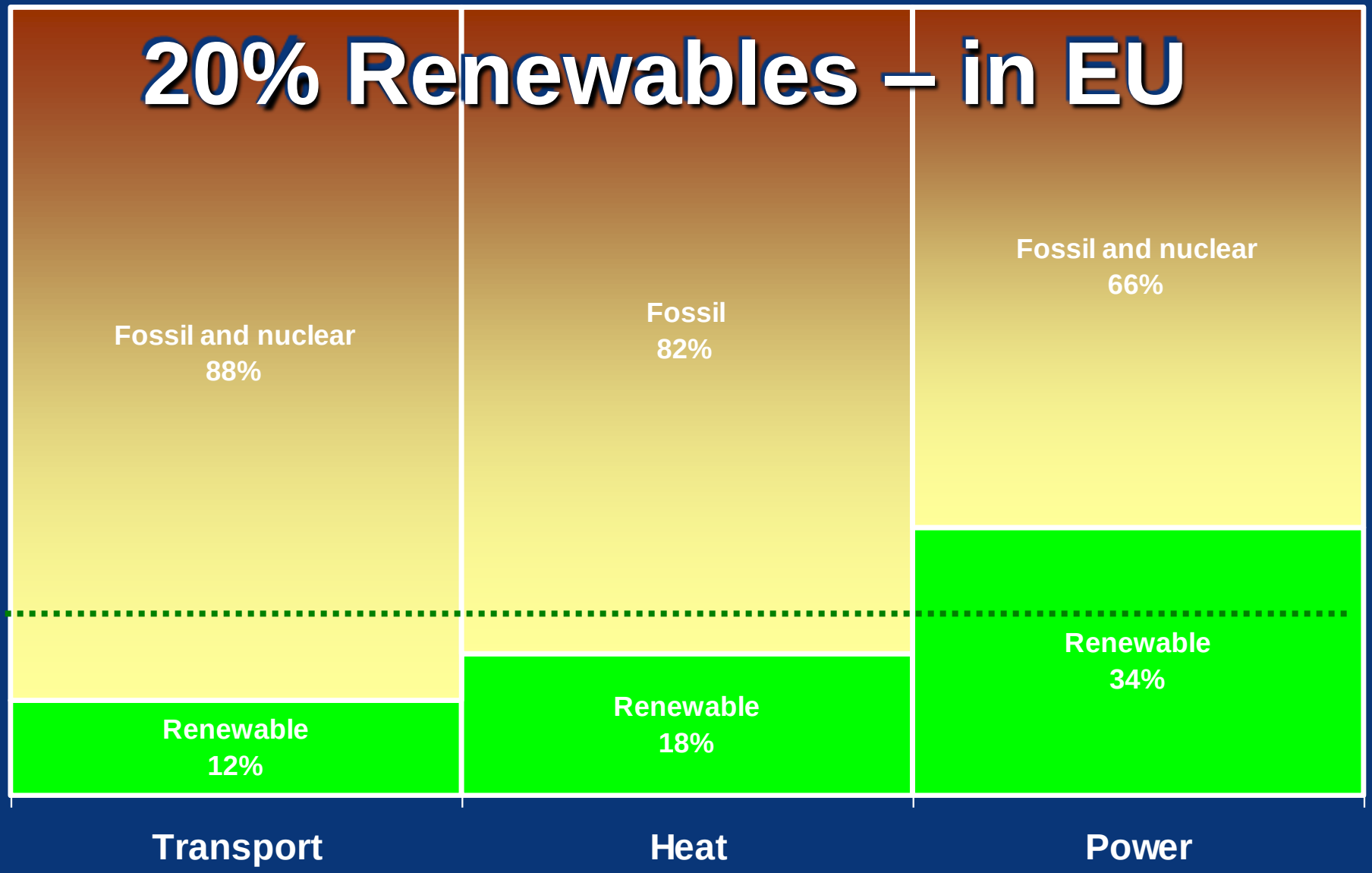
20% Renewables – in EU



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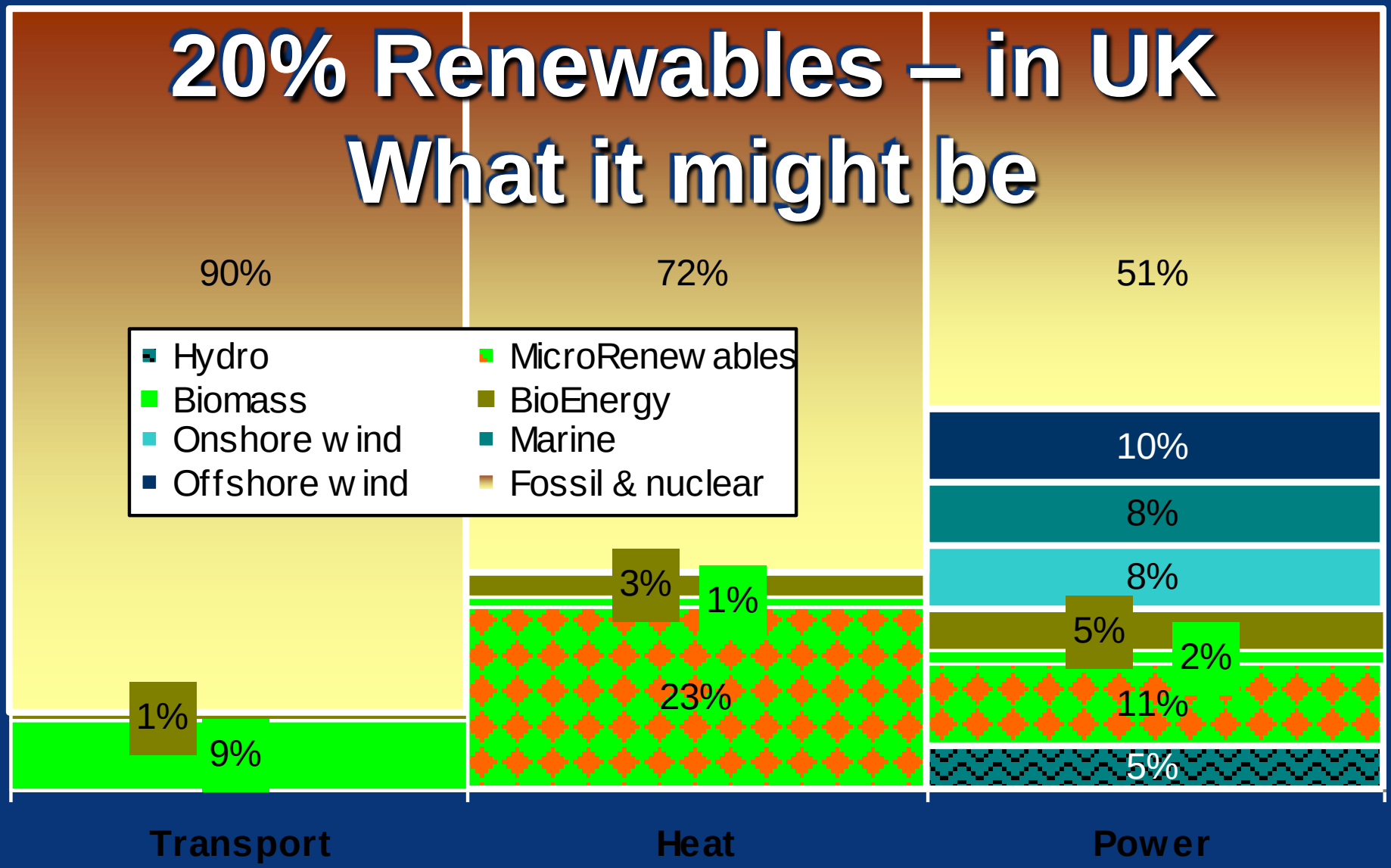
20% Renewables – in UK
What it might be



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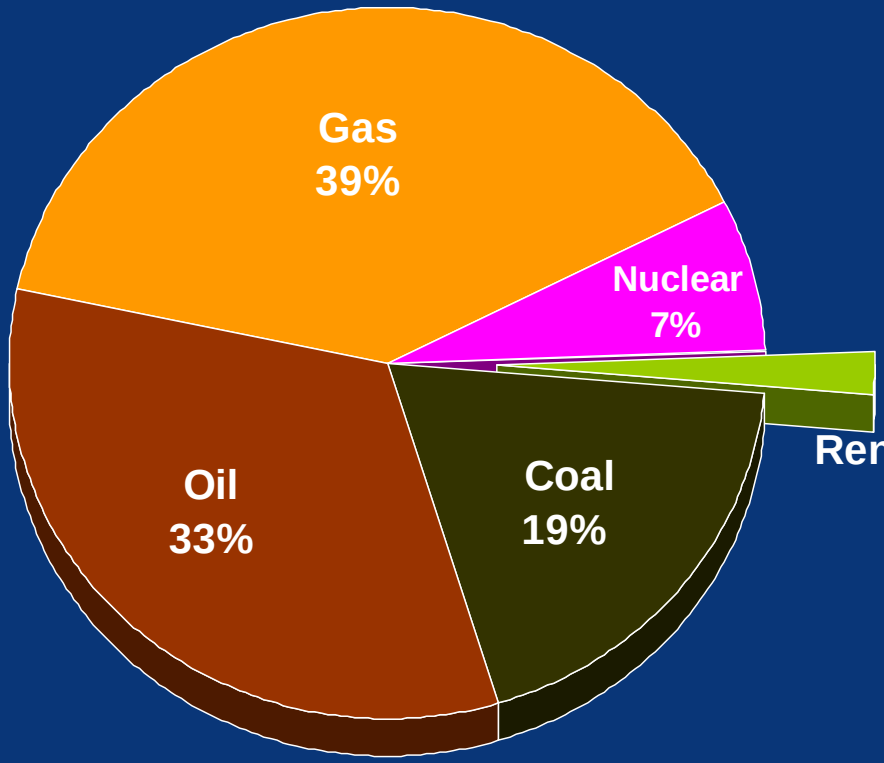
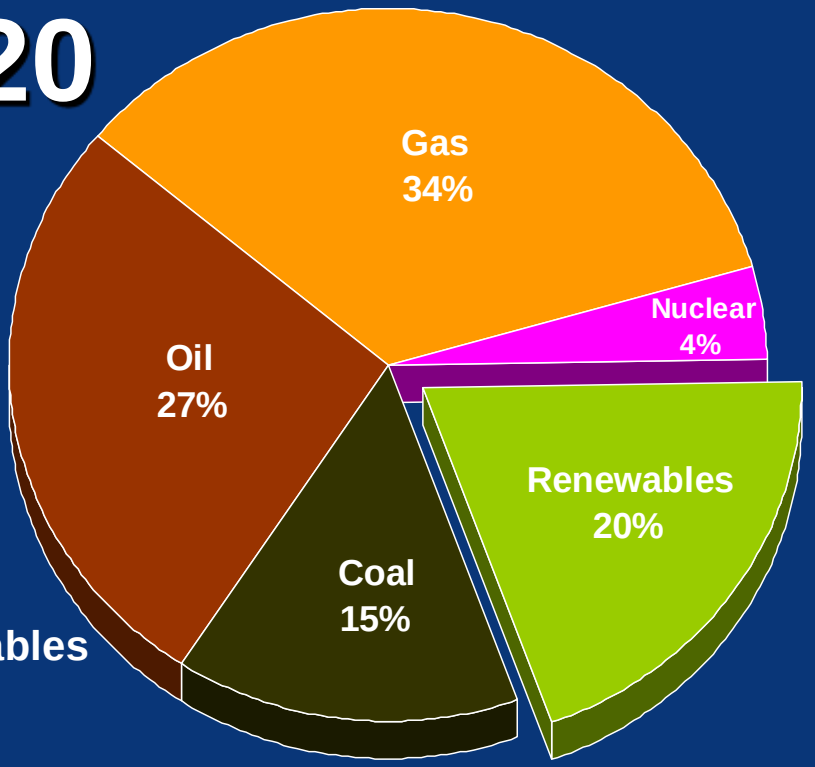
Renewables in total energy

Today



2020



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Brave new world – renewable hotspots

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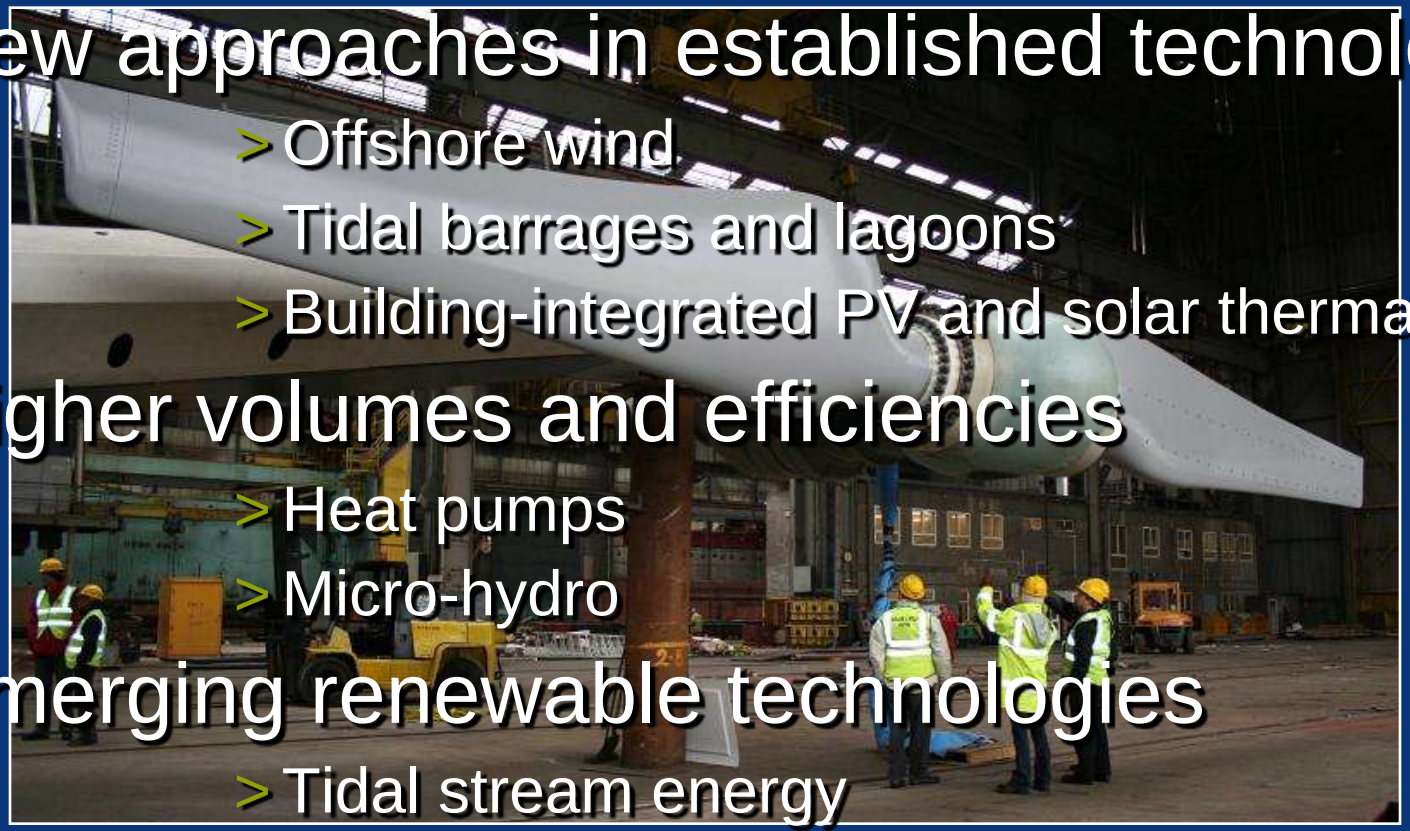
Elemental conversion technologies



- New approaches in established technologies
  - Offshore wind
  - Tidal barrages and lagoons
  - Building-integrated PV and solar thermal
- Higher volumes and efficiencies
  - Heat pumps
  - Micro-hydro
- Emerging renewable technologies
  - Tidal stream energy
  - Wave energy conversion

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Bio-energy conversion technologies

- New approaches in established technologies
  - Sustainable biofuels
  - Bio-methane for the gas grid
- Higher volumes and efficiencies
  - Biomass boilers and CHP
  - Anaerobic digestion
- Emerging renewable technologies
  - Second generation biofuels
  - Microbial energy

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More decentralised energy system

- Heat networks
- Intelligent distribution systems
- Smart metering
  - > Improved user interfaces
  - > Real-time pricing
- Active load management
  - > Non-traditional storage options

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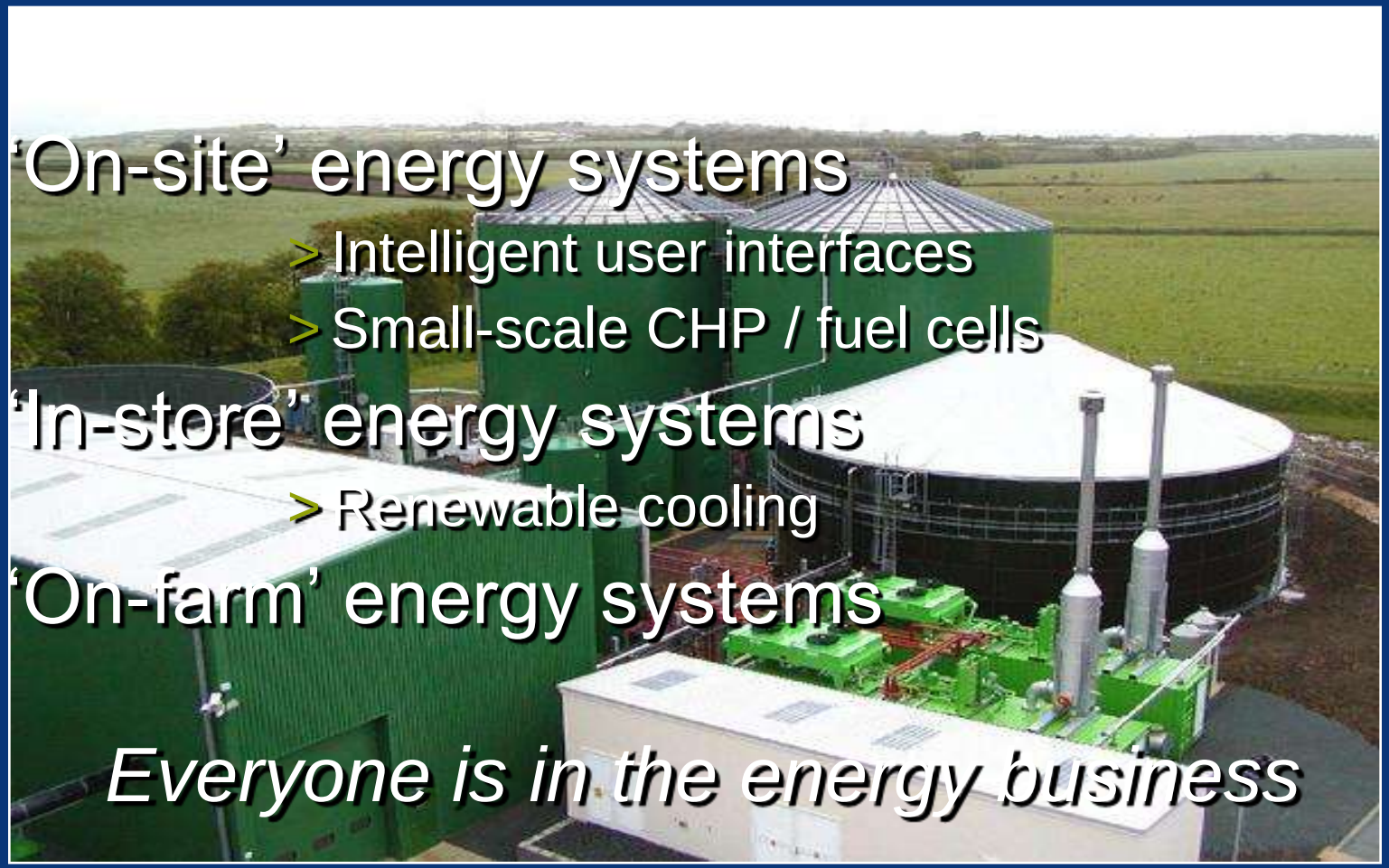
New energy integration options



- ‘On-site’ energy systems
  - > Intelligent user interfaces
  - > Small-scale CHP / fuel cells
- ‘In-store’ energy systems
  - > Renewable cooling
- ‘On-farm’ energy systems

Everyone is in the energy business

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