

Renewable Energy

Opportunities for scientists and engineers



Philip Wolfe

EU's '20-20-20' targets for 2020

 Emissions reductions Binding

- > 20% unilateral, or
- > 30% if multilateral

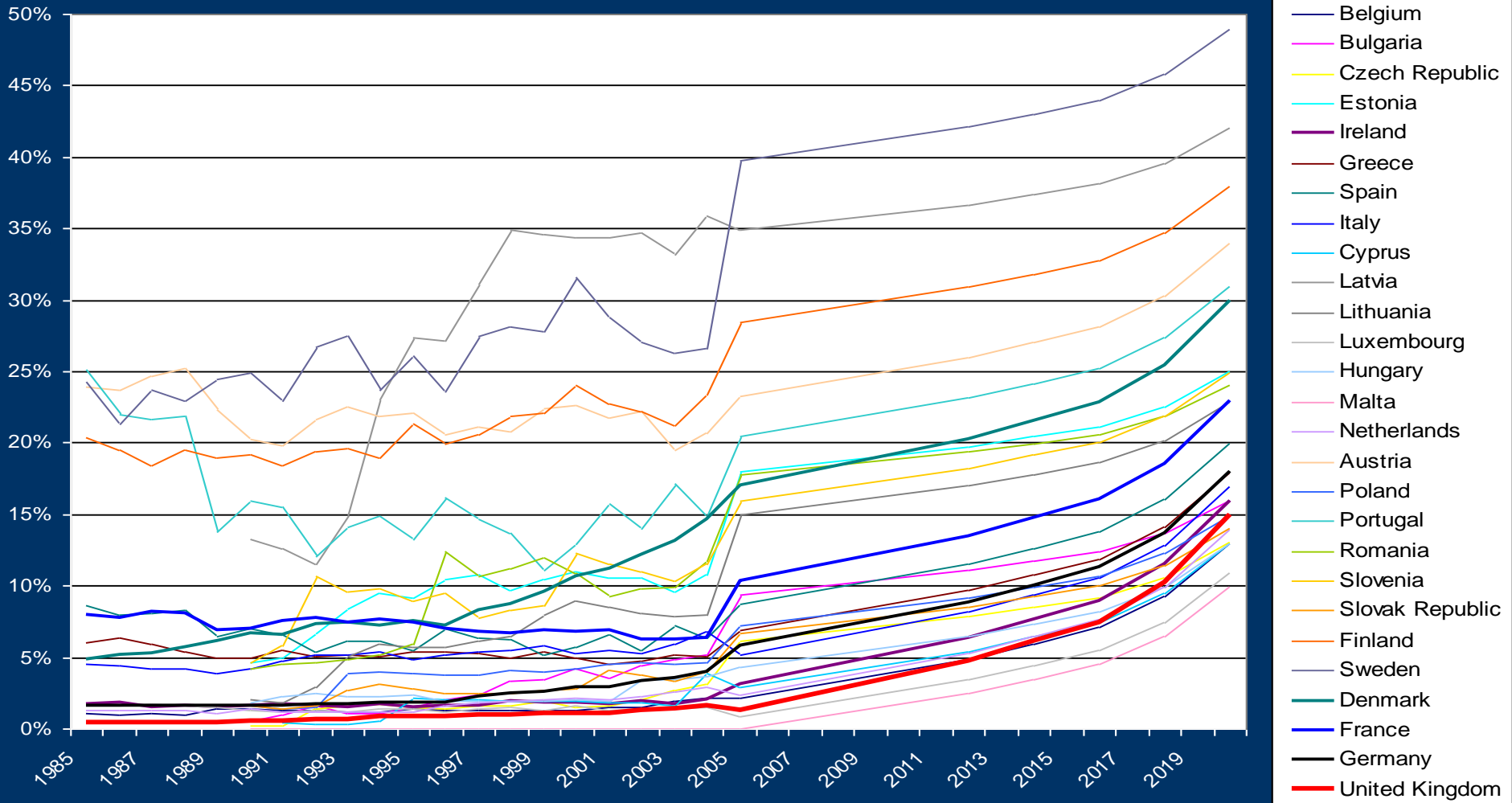
 Energy conservation Non-binding

- > 20% below current projections

 Renewables Binding

- > 20% of total energy UK: 15%
- > 10% of transport fuels

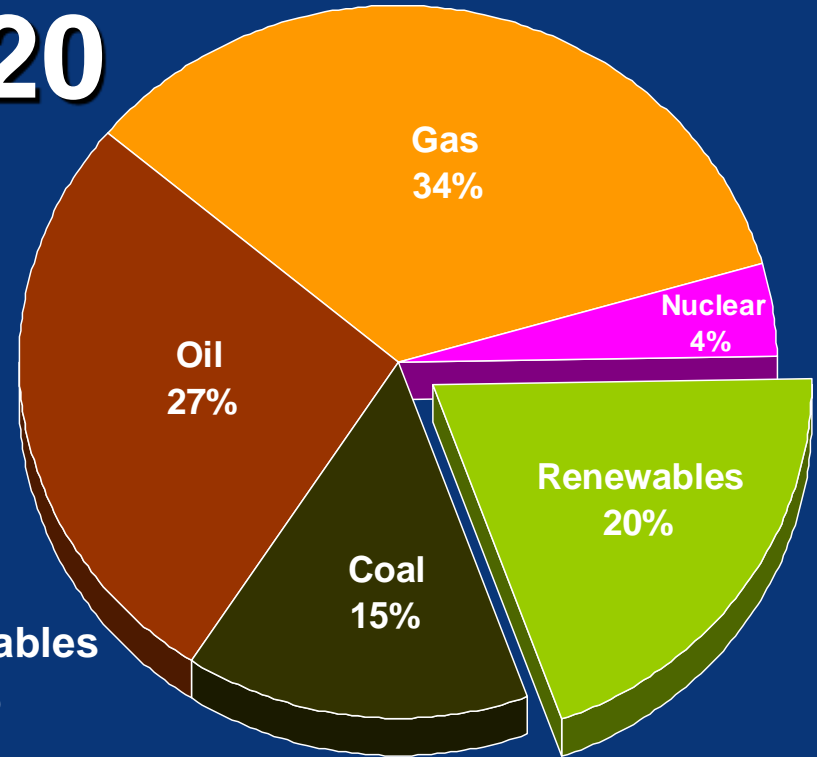
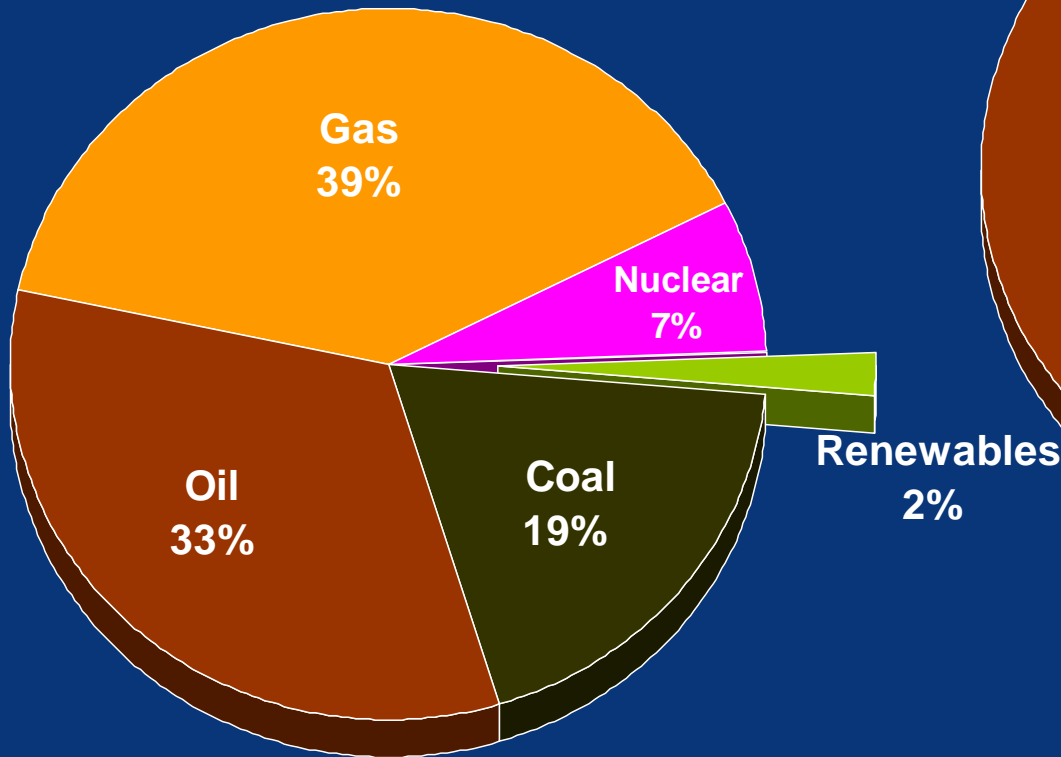
Ten years to 2020



Renewables in total energy

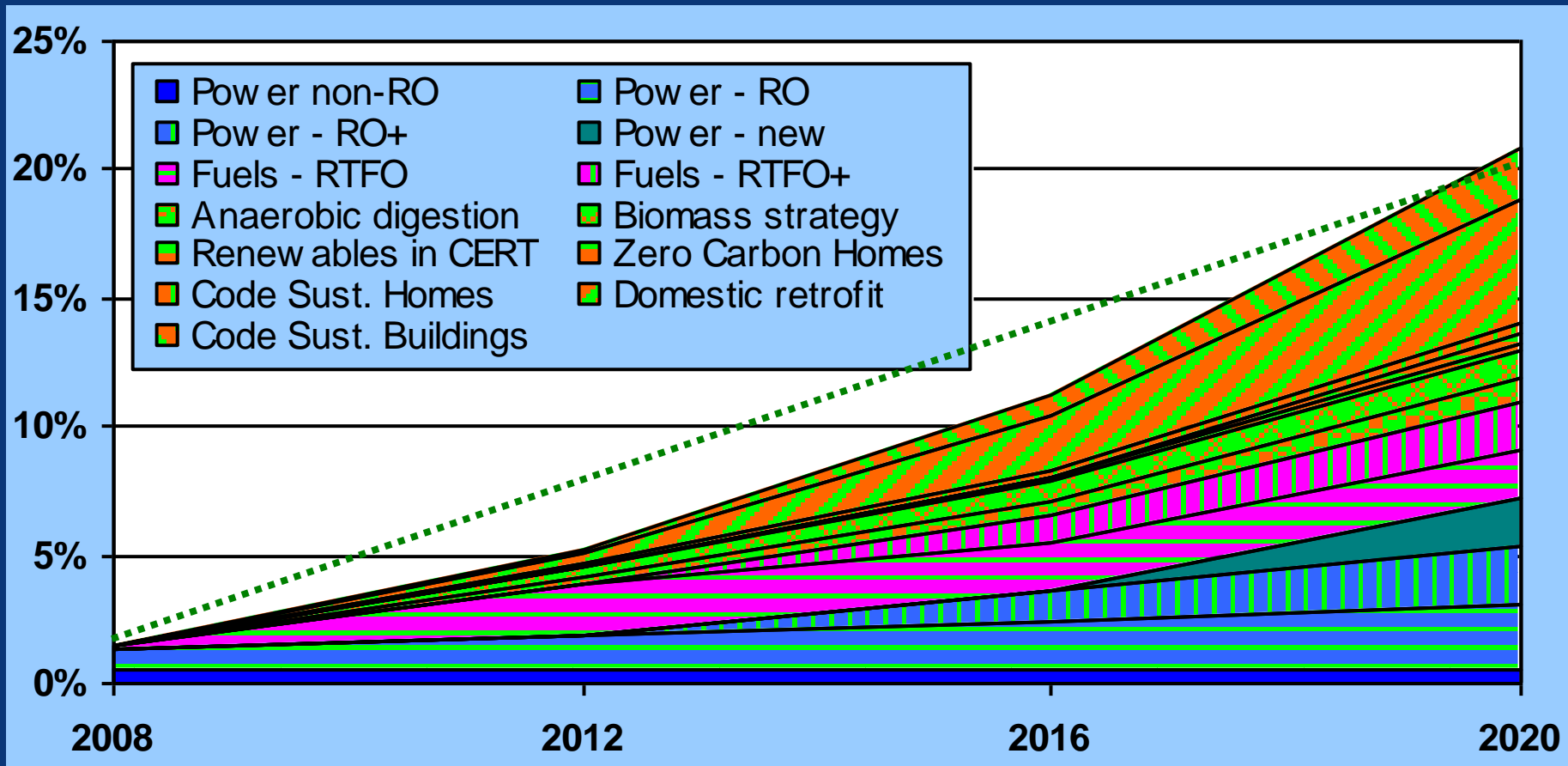
Today

2020



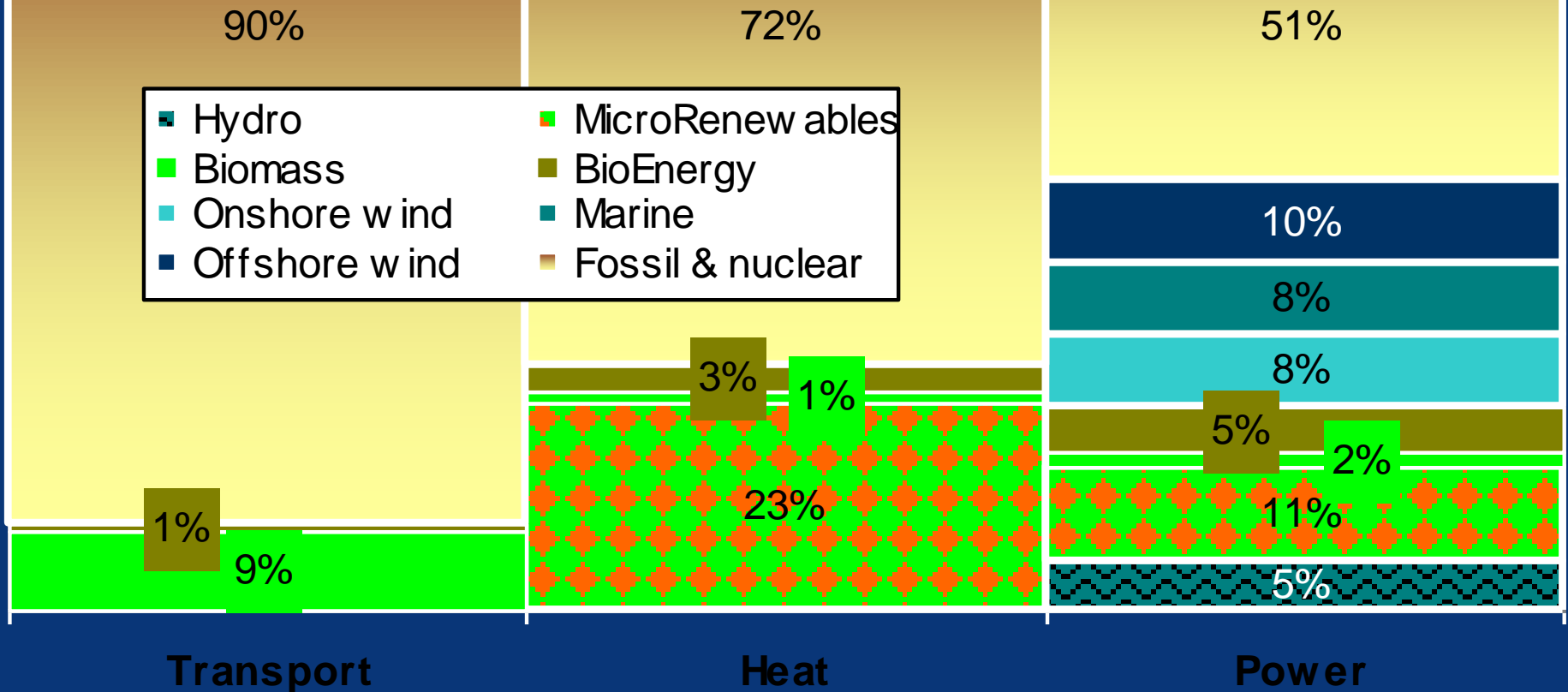
Routemap to 2020

Enhanced energy policy



20% Renewables – in UK

Prospective technology mix



Brave new world – renewable hotspots



Elemental conversion technologies

▲ New approaches in established technologies

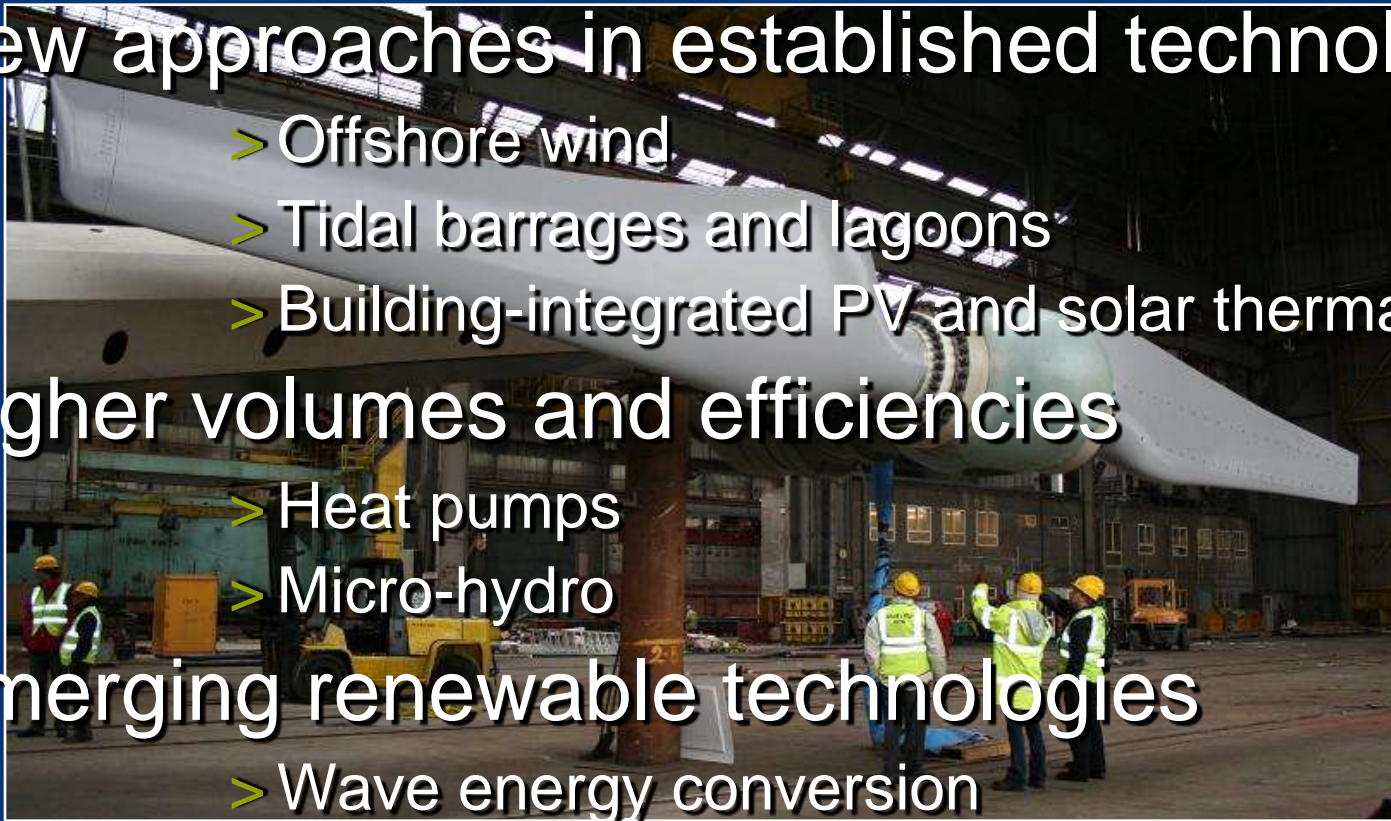
- > Offshore wind
- > Tidal barrages and lagoons
- > Building-integrated PV and solar thermal

▲ Higher volumes and efficiencies

- > Heat pumps
- > Micro-hydro

▲ Emerging renewable technologies

- > Wave energy conversion
- > Tidal stream energy



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

More decentralised energy system

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



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



Green New Deal

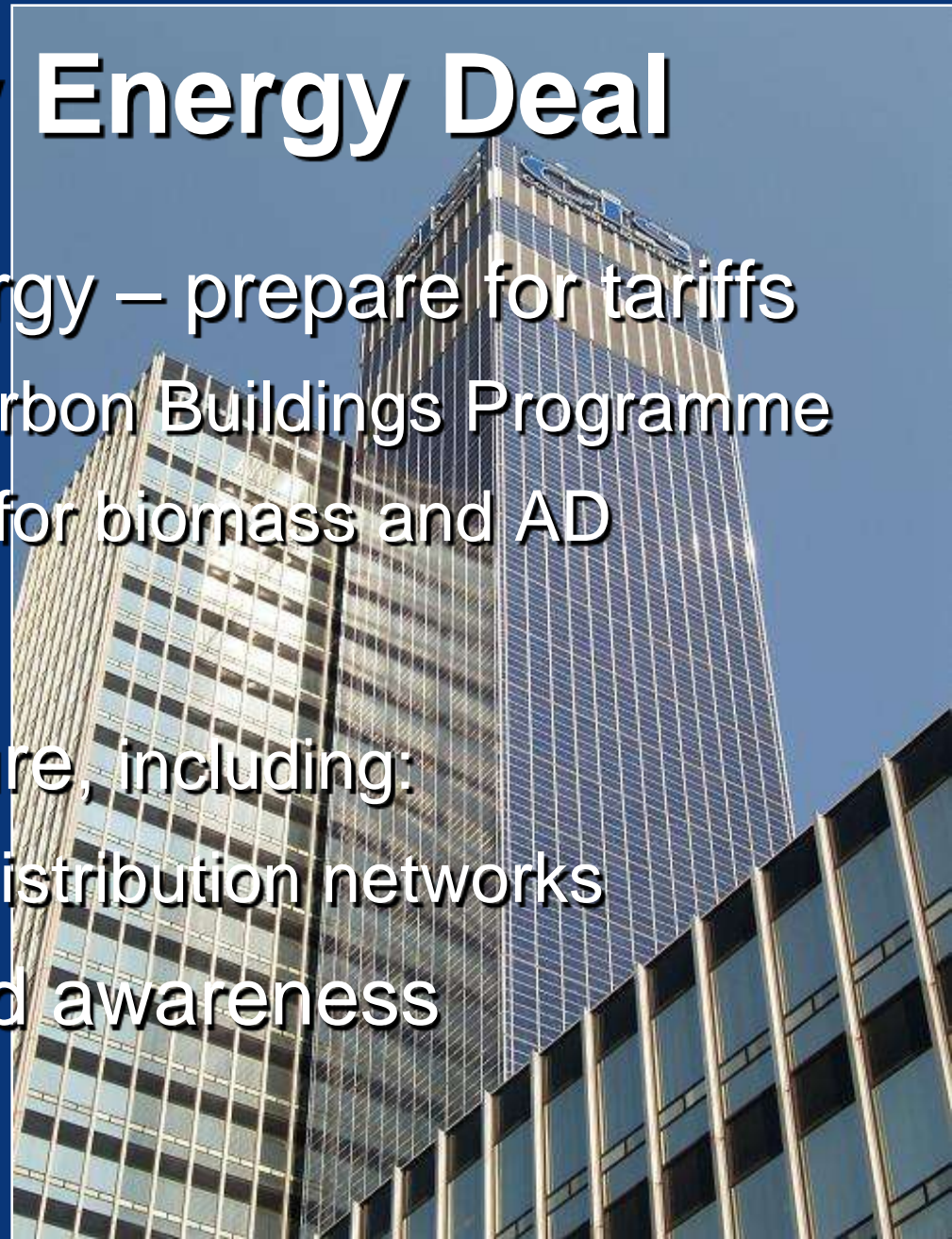
- ▲ Recession – recovery must be sustainable
- ▲ Stimulus packages – 20% should be ‘green’¹
 - > USA 12%; China 37%; Germany 13%²
 - > UK figure should be ~£10-20bn?
- ▲ Energy efficiency & renewables a major part
- ▲ What are the quick wins in renewables?

¹ *Professor Lord Stern*

² *HSBC*

Green New Energy Deal

- ▲ Decentralised Energy – prepare for tariffs
 - > Extended Low Carbon Buildings Programme
 - > Bioenergy grants for biomass and AD
- ▲ Bulk energy
- ▲ Energy infrastructure, including:
 - > Smart metering, distribution networks
- ▲ Skills, research and awareness



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