UKERC
UK Energy Research Centre
Researching pathways to a low carbon future

Perspectives on the Future

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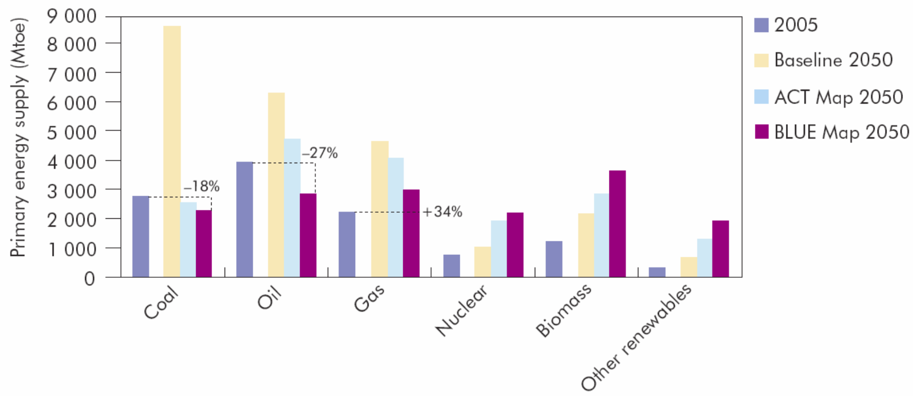
Executive Director, UKERC

FST Meeting
Energy policy: selecting the right mix for future electricity supply
7 November 2012

IEA Scenarios 2008

Figure 2.38 ▶ World fuel supply for Baseline, ACT Map and BLUE Map, 2050



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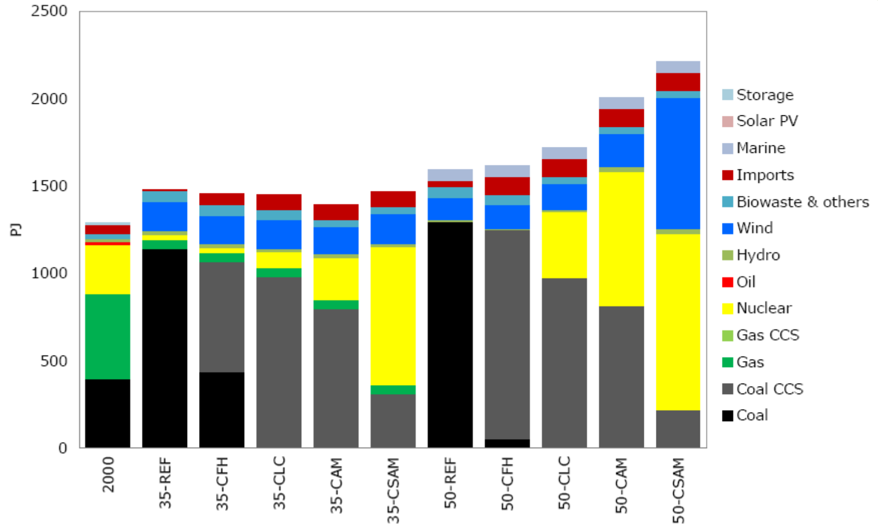
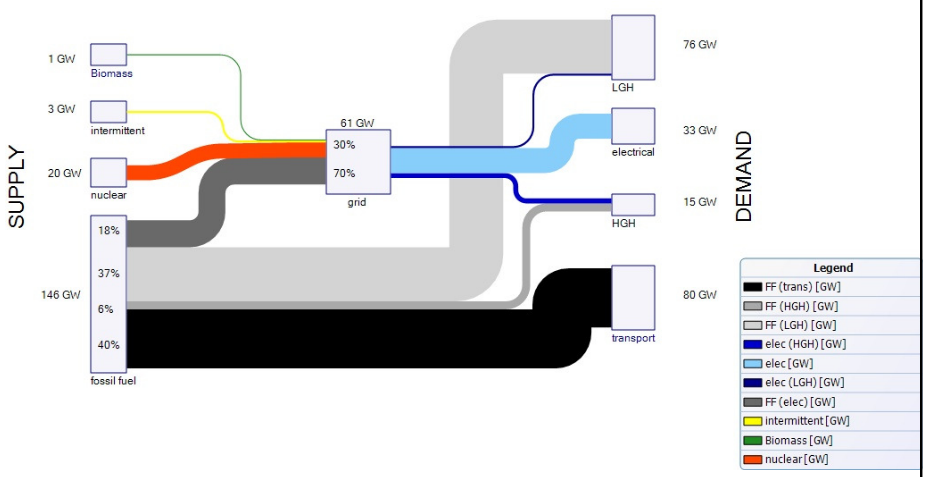
UK Electricity generation mix 2035 & 2050



Source: UKERC Energy 2050 Report, May 2009

UK Simplified Sankey Diagram 2007



Source: Royal Academy of Engineering

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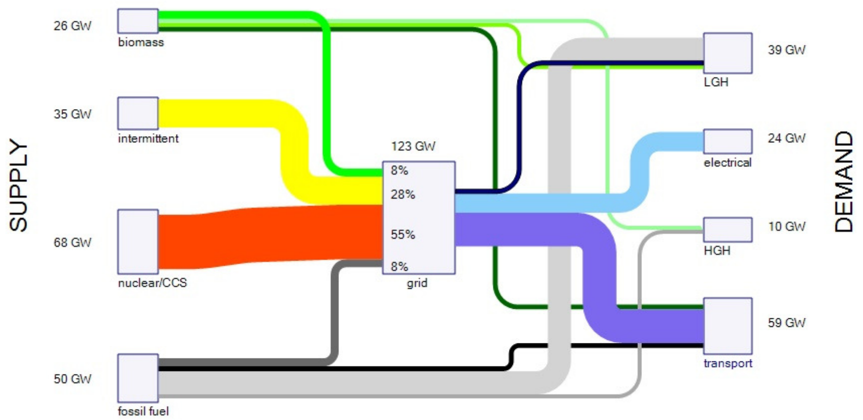
UK Simplified Sankey Diagram 2050



Source: Royal Academy of Engineering

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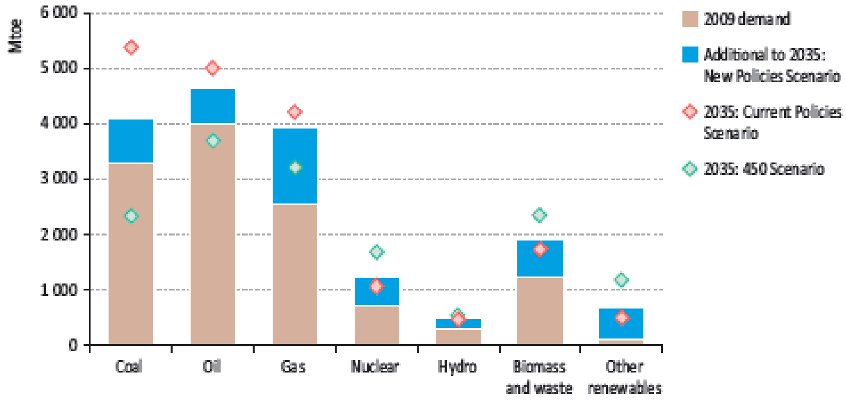
Current IEA thinking

Figure 2.2 • World primary energy demand by fuel and scenario, 2009 and 2035 (Mtoe)



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UKERC 2050 Scenarios

- REF: What we are doing already (more or less)
- ADD: Some extra things we might realistically anticipate
- LC: How to meet the 80% carbon reduction target
- GAP: from 2015 achievement is 70% of ambition

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Some assumptions

	Reference (firm and funded) (REF)	Additional measures (beyond Reference) (ADD)	Policy Gap (GAP)	Low Carbon (LC)
Carbon targets	• None	• None	• First two carbon budgets met. For 3rd and 4th budgets and 2050 target 70% of target reductions starting from 2015 baseline are achieved.	• First four carbon budgets met; 2050 reduction target of 80 % (compared to 1990); equal annual percentage trajectory 2025-2050.
Renewable energy directive/targets	• Renewable obligation (15 % of electricity renewable by 2015 and until 2050), with a buy out price of 28 £(2000)/MWh included. Max. 12.5 % of the renewable production can be from co-firing.	• As reference	• 70% achievement of RED (matches current RO achievement). 21% by 2020 and 28% by 2030. • Min. targets for 2020 for onshore wind (20 % of renewables), offshore wind (30 %) and biomass (30 %). • The limit on co-firing is removed	• 100% achievement of RED. Target for renewable electricity is 30 % for 2020, 40% by 2030 (and after that) and the buy-out option is removed. • Min. targets for 2020 for onshore wind (20 % of renewables), offshore wind (30 %) and biomass (30 %). • The limit on co-firing is removed
Electricity Market Reform	• Carbon price floor for electricity emission. Trajectory (in £ 2009) £15.70/tCO2 (in 2013), £30/tCO2 (in 2020) and £70/tCO2 (2030 - 2050). Interpolated linearly between the years.	• Emissions Performance Standard – Building of unabated coal power plants prohibited (in addition to the carbon price floor)	• As additional measures	• As additional measures

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Some assumptions

	Reference (firm and funded) (REF)	Additional measures (beyond Reference) (ADD)	Policy Gap (GAP)	Low Carbon (LC)
CCS demonstration plants	• 1st demonstration plant (425 MW) forced in	• Three additional CCS demos (total 1.275 GW), at least one of which will be a gas fired CCS plant	• As additional measures	• As additional measures
Renewable Heat Incentive	• No policies included	• Some renewable heat generation is forced in.	• 70 % achievement of RED leading to a target of 8 % renewable heat by 2020	• RED target for renewable heat is set at 12 % by 2020
Small scale Feed in Tariffs	• Feed in tariffs (in £2009) for micro CHP (10 p/kWh), solar PV (res. and comm. sectors (36.1 p/kWh)), micro wind (34.5 p/kWh) and micro hydro power (11 p/kWh). Starts in 2010, linearly reduced to zero by 2030.	• As reference	• As reference	• As reference
Household energy efficiency	• CERT/CESP are assumed to be reflected in the reference case hurdle rates	• Green Deal, hurdle rates in the residential sector reduced from 15 to 5 % and annual deployment constraints relaxed by 20 %.	• As additional measures	• As additional measures

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Some assumptions

	Reference (firm and funded) (REF)	Additional measures (beyond Reference) (ADD)	Policy Gap (GAP)	Low Carbon (LC)
Industry	• Climate Change Levy included	• As reference	• As reference	• As reference v
Services	• Carbon Reduction Commitment at £12/tCO2 (in £ 2011), for 60 % of the emissions from the service and for 18 % of the emissions of the industry sector.	• As reference	• As reference	• As reference
Transport	• Renewable transport fuel obligation, 5 % renewables in road transport • Fuel duties are kept constant	• As reference	• The target for renewable transport is increased to 10 % in 2020	• The target for renewable transport is increased to 10 % in 2020

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Some tweaks

- P1: No Renewables Obligation
- P2: No Carbon Price Floor
- P3: No RO and no CPF
- P4: No RO, no CPF, and no Carbon Reduction Commitment

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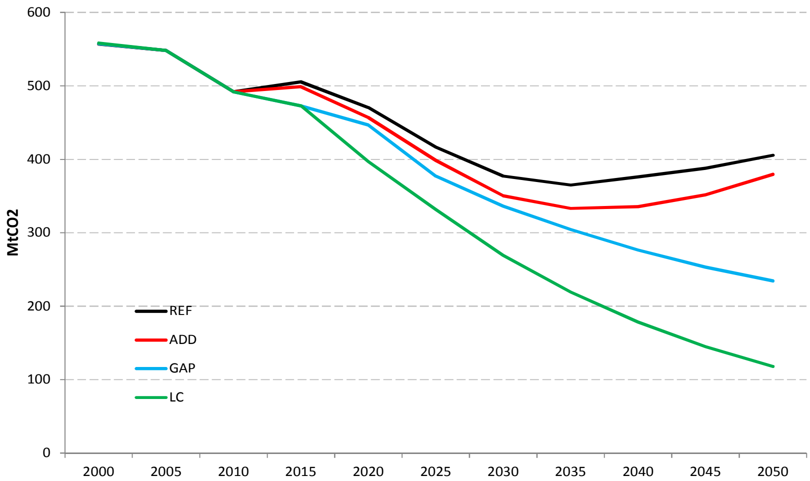
Carbon emissions



Source: Ilkka Keppo, UKERC Energy Systems and UCL

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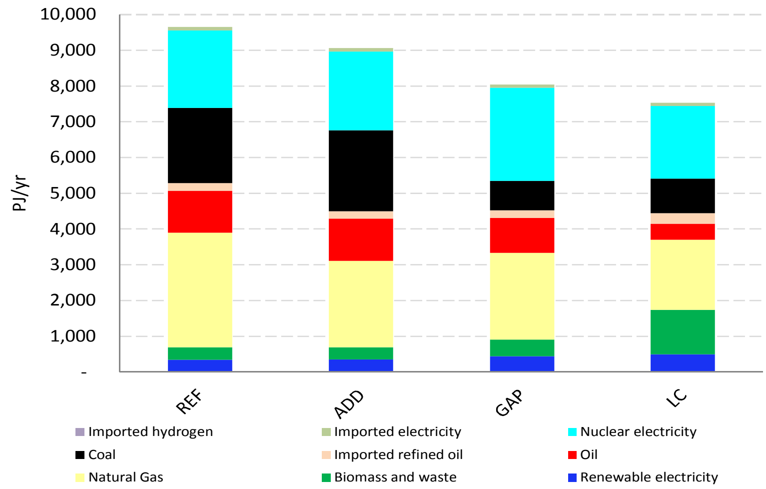
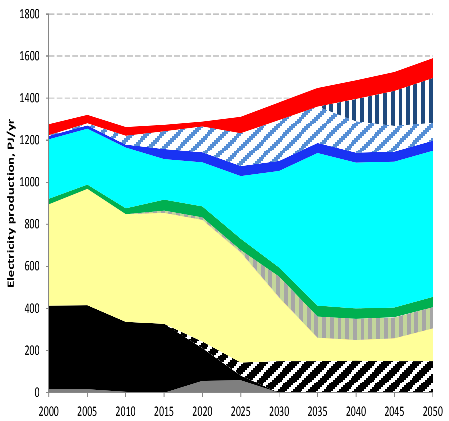
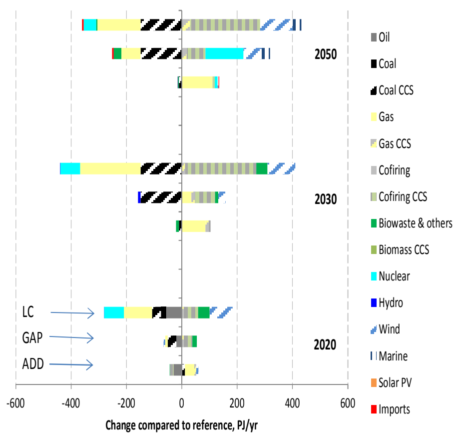
Primary energy (all sectors)



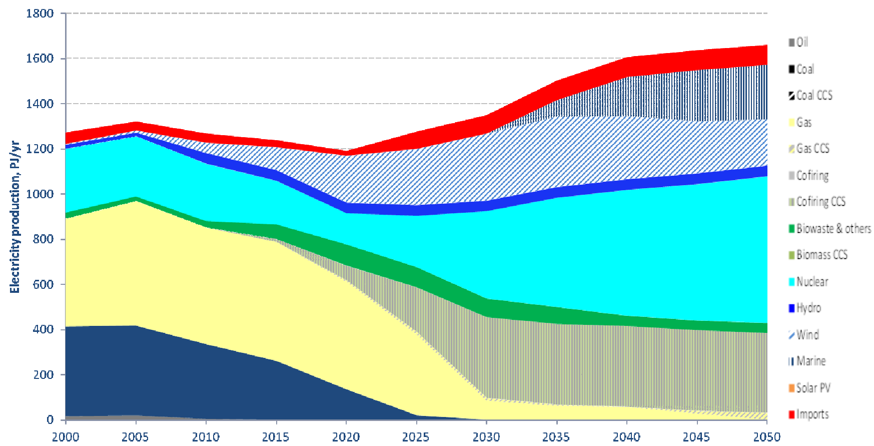
Source: Ilkka Keppo, UKERC Energy Systems and UCL

Policy impact on 2050 electricity generation





Source: Ilkka Keppo, UKERC Energy Systems and UCL



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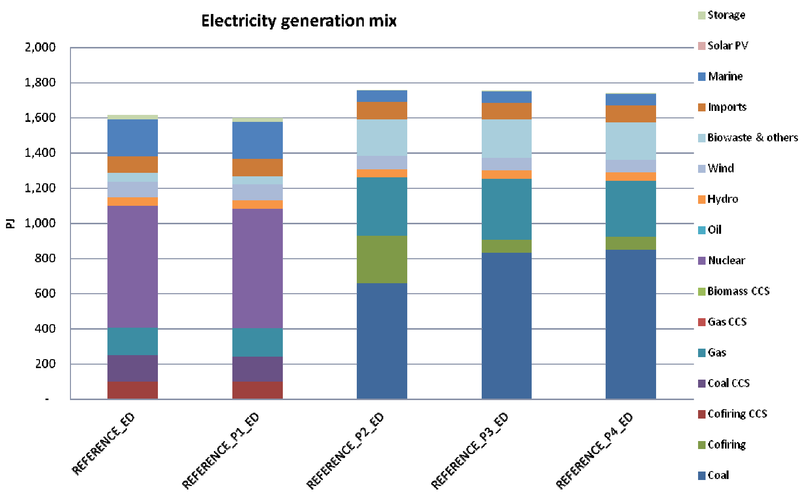
Impact of tweaks on generation



Source: Ilkka Keppo, UKERC Energy Systems and UCL

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More variations

- GAS: Price decoupled from oil, broadly constant real terms, and no supply constraints
- R(esilience): No fuel or technology has more than 40% share of portfolio, AND energy intensity of GDP reduces by 3.2% pa from 2010.

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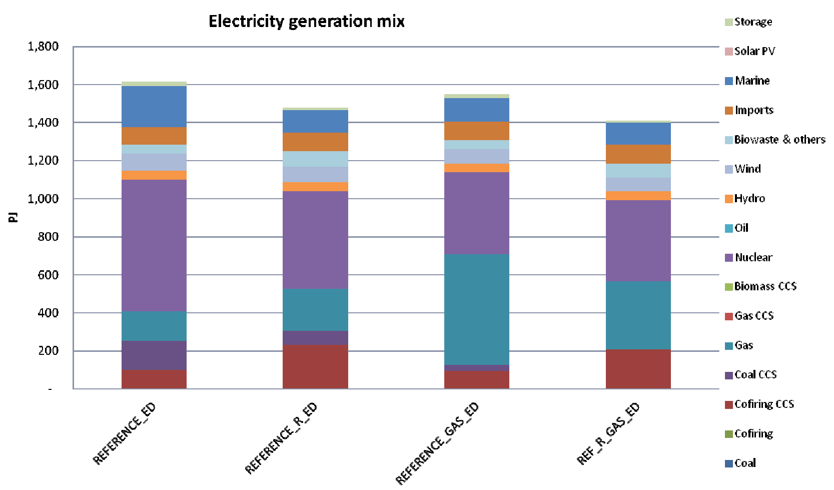
Impact of low gas price and resilience on generation



Source: Ilkka Keppo, UKERC Energy Systems and UCL

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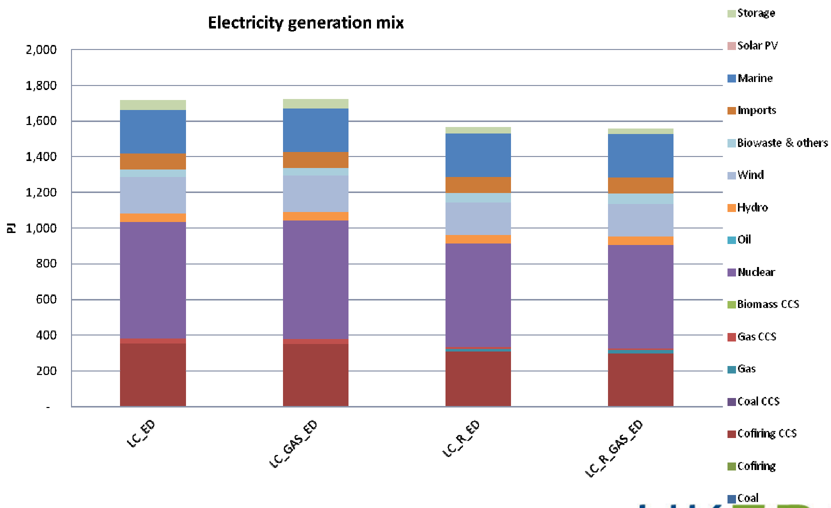
The low carbon picture



Source: Ilkka Keppo, UKERC Energy Systems and UCL

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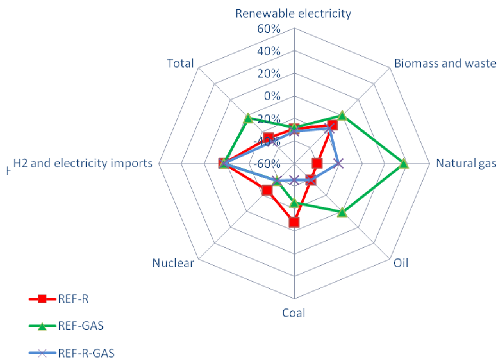
Energy – REF

Reference



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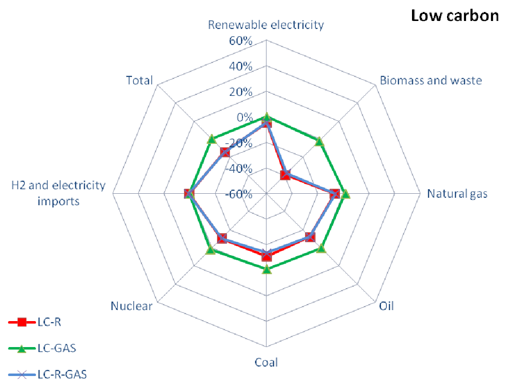
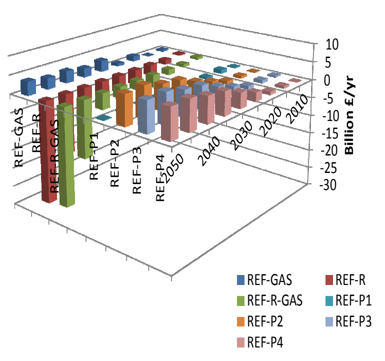
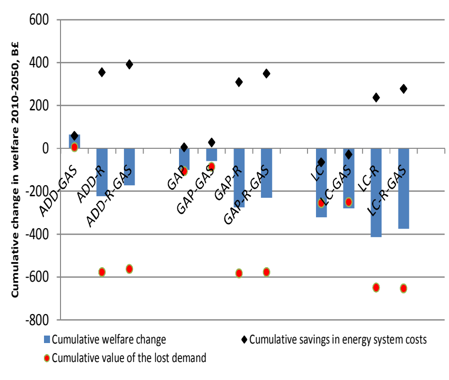
Energy – 80% achieved

Low carbon



Welfare costs

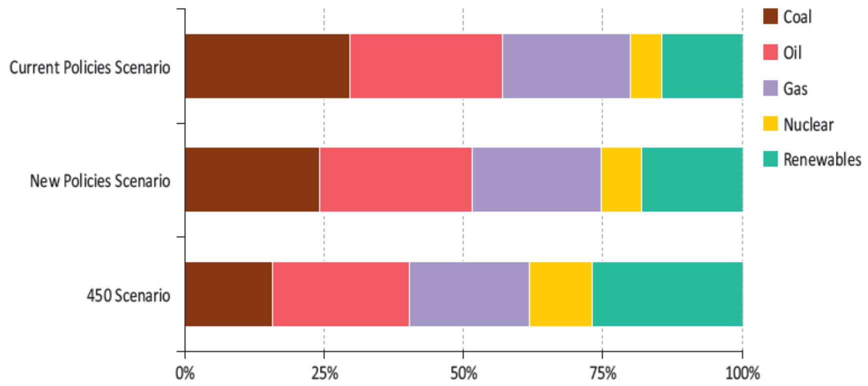




Source: Ilkka Keppo, UKERC Energy Systems and UCL

What will the world be using?

Figure 2.3 • Shares of energy sources in world primary demand by scenario, 2035



Source: IEA WEO 2011

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