



Generating the Future: UK energy systems fit for 2050

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Royal Commission on Environmental Pollution, 2000



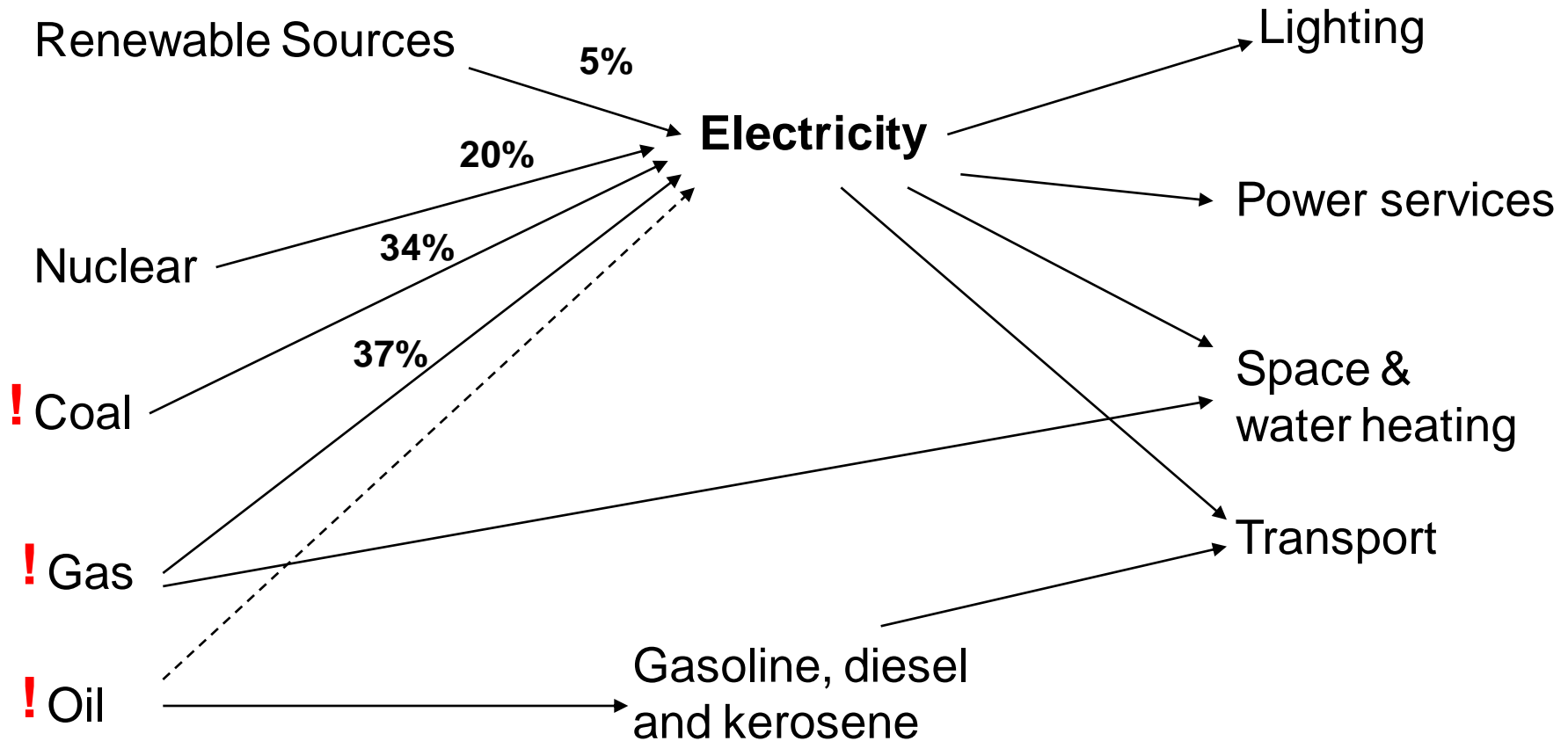
A group doing research on the original RCEP report

THE UK ENERGY SYSTEM 2010

Primary Energy

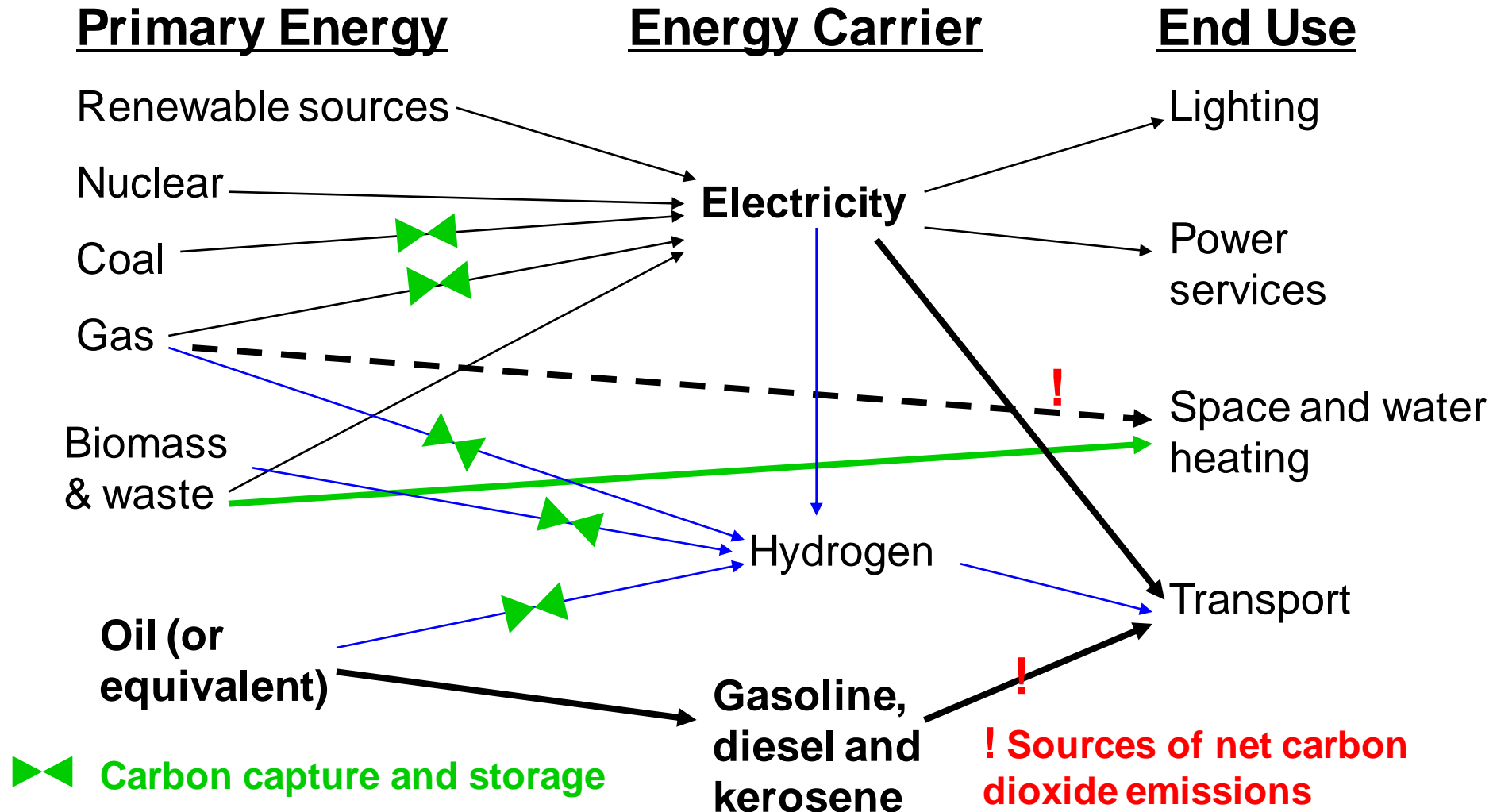
Energy Carrier

End Use



! Sources of net carbon dioxide emissions

A LOW-CARBON ENERGY SYSTEM 2050



Defining the scenarios

Scenario 1 Level demand

Fossil fuel prioritised for transport

Scenario 2 Medium demand reduction

Fossil fuel prioritised for low grade heat

Scenario 3 Medium demand reduction

Fossil fuel prioritised for transport

Scenario 4 High demand reduction

Fossil fuel prioritised for transport

The basic procedure

The procedure for generating each of the scenarios follows four basic steps:

1. Set the demand level of each category of energy demand relative to the current level.
2. Choose the primary sources of energy supply.
3. Balance supply and demand by adjusting the levels of supply.
4. Calculate the carbon emissions.
5. Repeat steps 2 and 3 until carbon emissions have reduced by 80%.

Relative energy demand in the four scenarios

(percentage reduction)	Level demand	Medium demand reduction	High demand reduction
	Scenario 1	Scenarios 2 & 3	Scenario 4
low grade heat	0	40%	67%
electricity	0	20%	33%
high grade heat	0	20%	33%
transport	0	20%	33%

Final average power demand

GW (av)	Scenario 1	Scenario 2	Scenario 3	Scenario 4
low grade heat	80.8	48.5	48.5	26.7
electrical appliances	32.3	25.8	25.8	21.6
high grade heat	14.4	11.5	11.5	9.6
transport	78.1	62.5	62.5	52.3
Total final average power demand	205.6	148.3	148.3	110.3
Total percentage reduction	0	27.9%	27.9%	46.4%

Renewable power supply (excluding biomass)

	Average delivered power GW(av)	Total installed capacity (GW)	Equivalent assets
Onshore wind	6.5	24	9,600 2.5 MW turbines
Offshore wind	11.4	38	38 London Arrays
Solar photovoltaics	7.2	72	25 million 3.2 kW solar panels

Renewable power supply (excluding biomass)

	Average delivered power GW(av)	Total installed capacity (GW)	Equivalent assets
Wave	3.8	9.4	1,000 miles of Pelamis machines
Tidal stream	1.4	2.8	2,300 SeaGen turbines
Tidal barrage	2	8.5	1 Severn barrage
hydro	0.9	2.3	1,000 hydro schemes
Total	33.2	157	

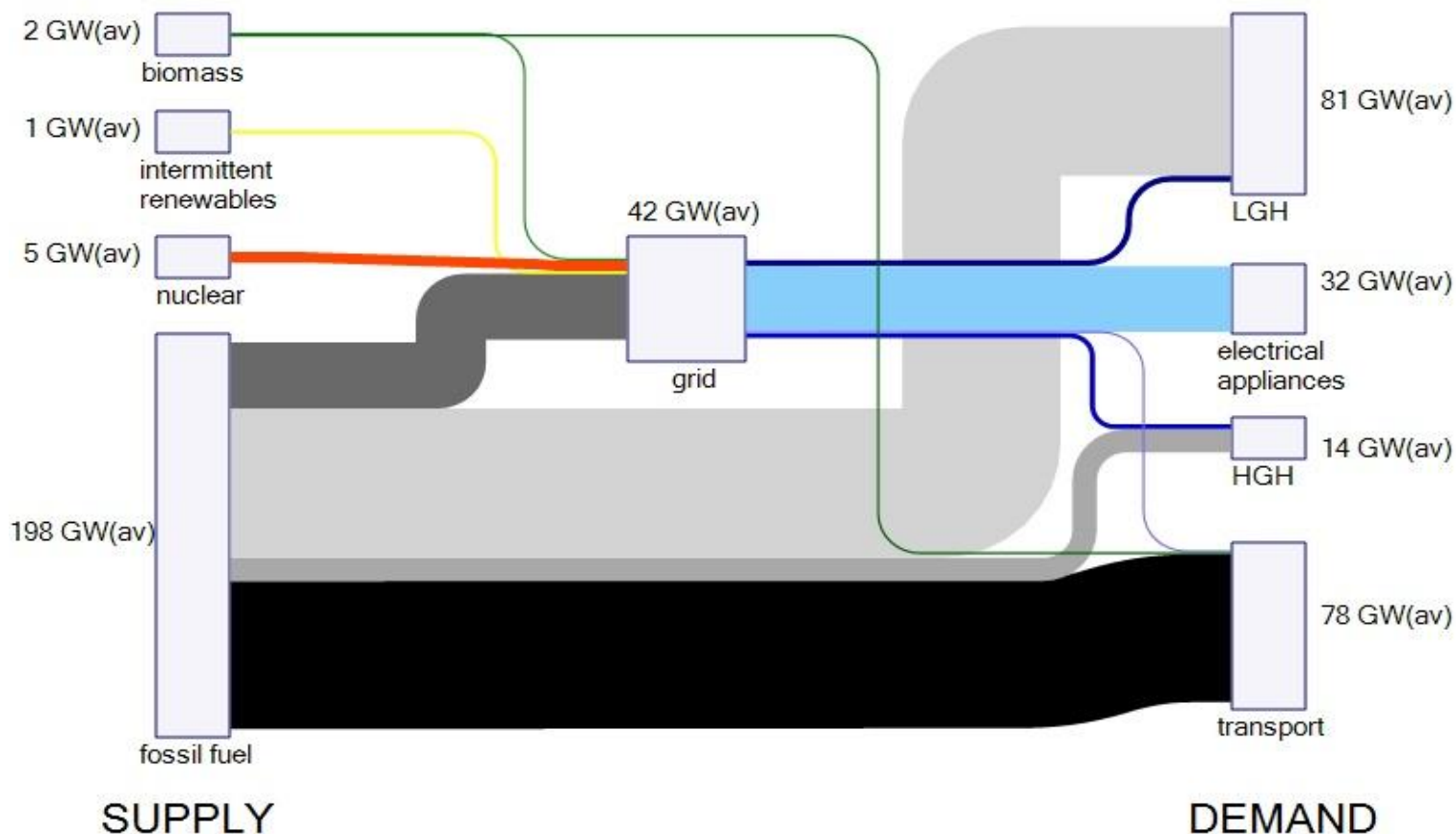
Total average power supplies from renewable sources

GW(av)	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Biomass (electricity)	9	6	6	4
Biomass (LGH)	21	14	14	11
Biomass (transport)	15	6	6	5
Renewables (ex. biomass)	33.2	33.2	33.2	33.2
Total renewables	78.2	59.2	59.2	53.2

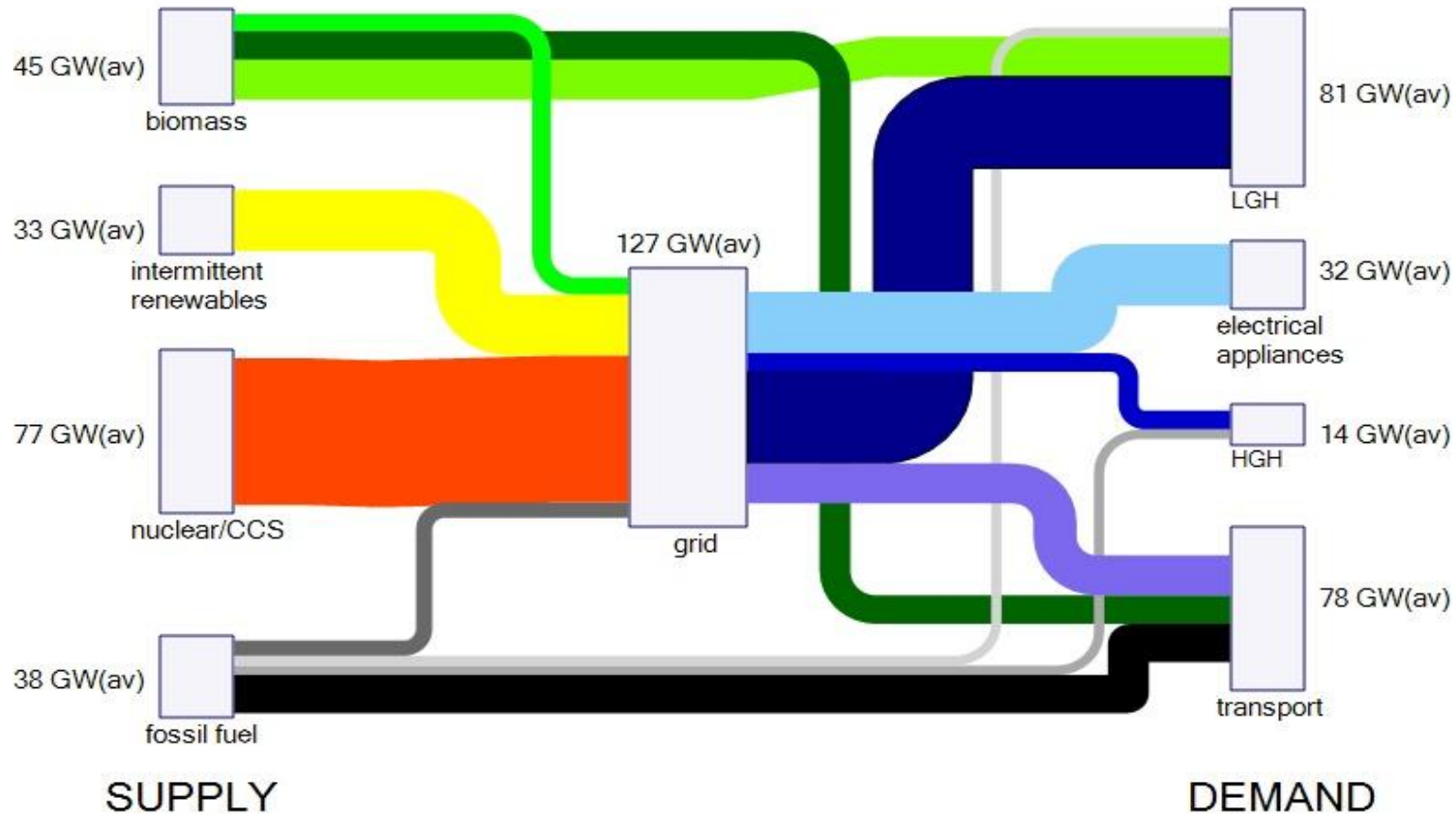
Summary of supply

GW (av)	Current	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total renewables	3.6	78.2	59.2	59.2	53.2
Nuclear/CCS	5.4	77	30	39	13
Fossil fuels	198.5	38	49	43	45
Total average power supply	207.5	193.2	138.2	141.2	111.2
Total electricity supply	42	127	80.1	78.1	56.1
Total CO2 reductions	0	79.0%	81.3%	79.6%	81.3%

Sankey Diagram for 2008



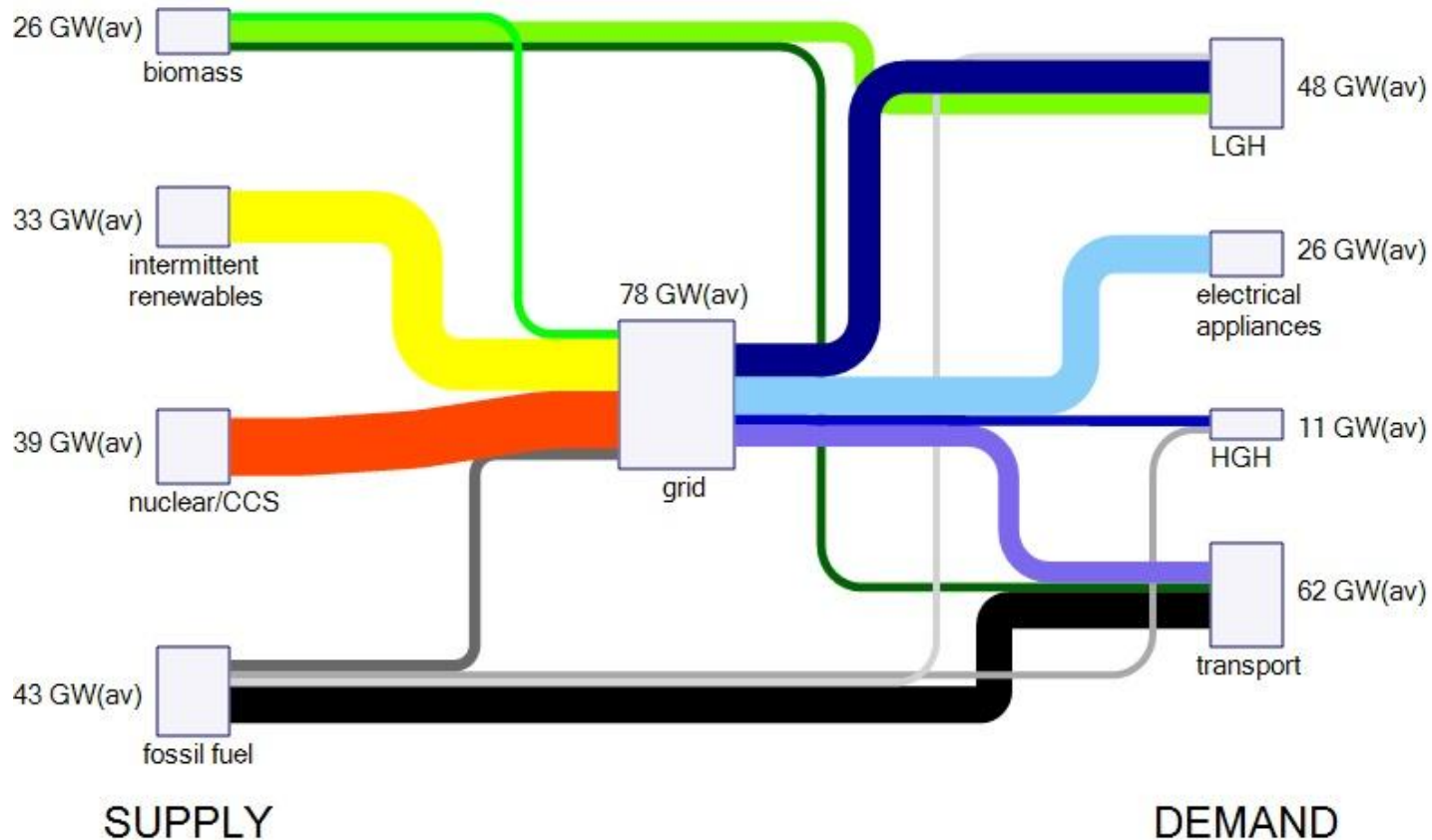
Scenario 1: level demand



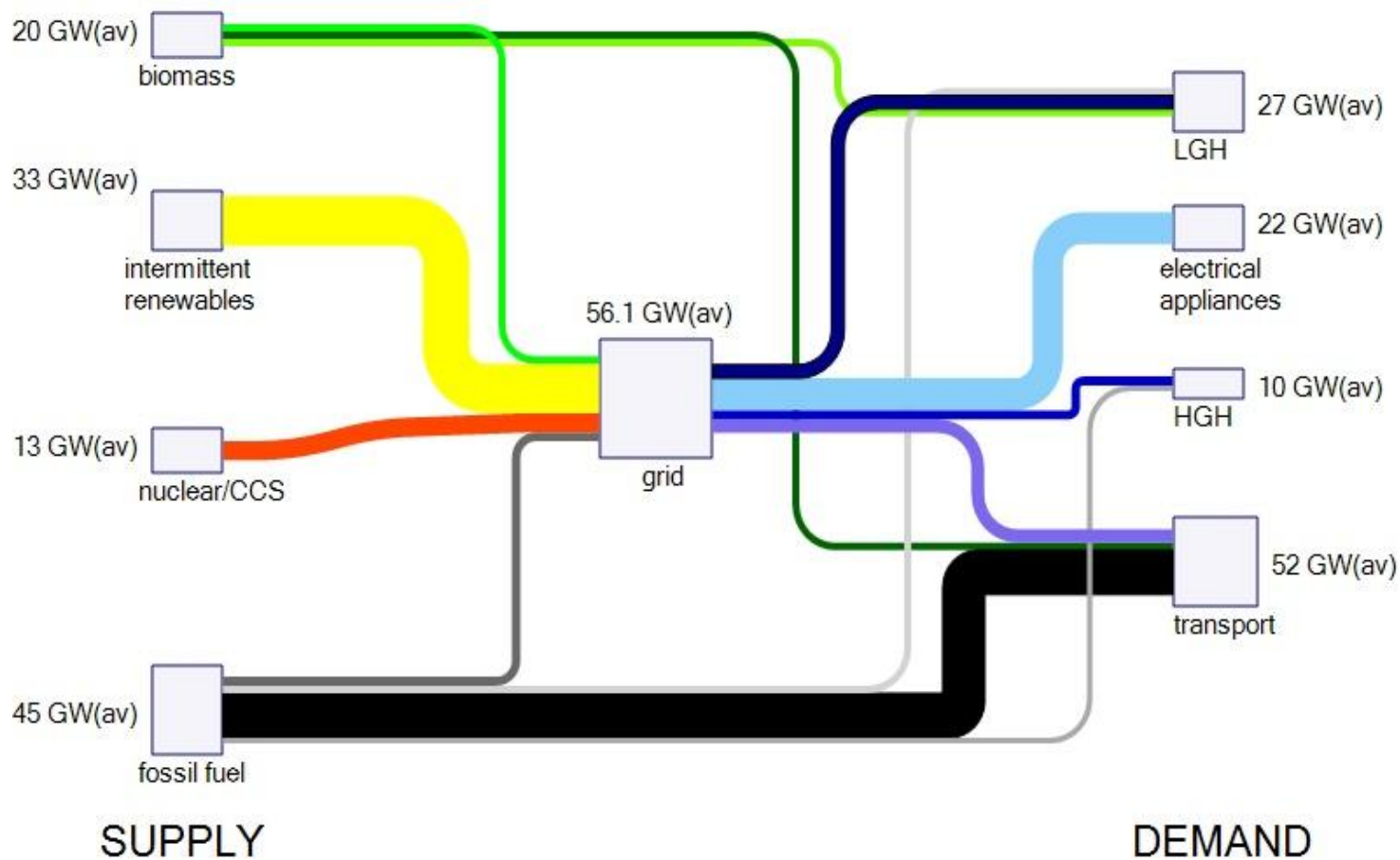
Scenario 2: medium demand reduction & electrification of transport



Scenario 3: medium demand reduction & electrification of low grade heat



Scenario 4: high demand reduction



Why 2050?

In 2000, the RCEP was the first body to call for sweeping cuts in carbon dioxide emissions: 60% by 2050. The figure of 60% followed from the limit of 550 ppm of CO₂ equivalent in the atmosphere as an estimate for the 'tipping point' beyond which the likelihood of catastrophic climate events becomes intolerable.

The change of target from 60% to 80%, as adopted in the UK's Climate Change Act, followed from stronger scientific evidence which lowered the limit from 550 to 450 parts per million (ppm). However, the planning horizon of 2050 was not merely an arbitrary mid-century date, even though the date has been accepted without comment or review in most of the discussions around climate change and energy policy. The RECP adopted the date of 2050 because realistic advocates of hydrogen fusion then estimated that fusion power (which remains speculative) would be commercially available by that time. Therefore 2050 was the most remote date by which mitigation had to be achieved using only known technologies; more recent prognoses push this date to 2060 but we have not extended the time horizon in these scenarios

Furthermore, even if the mitigation target for 2050 is met, that does not mean the problem is solved. The RCEP analysis shows that, for both the 550 ppm/60% and the 450 ppm/80% cases, a further halving in greenhouse gas emissions by 2100 will be needed to avoid serious climatic risk. Therefore, it must be remembered that 2050 is only one stage along a path that will subsequently need further, even more demanding measures.