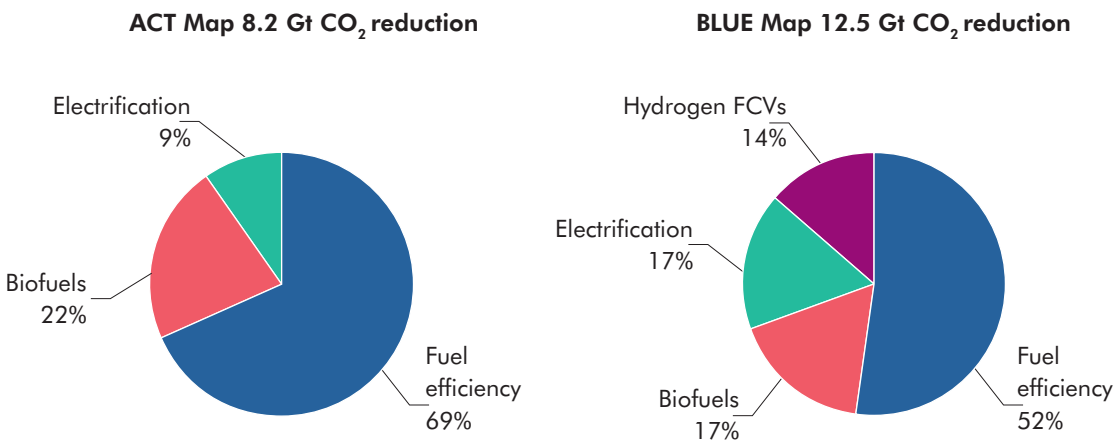
Figure 2.22 ▶ Emission reductions in transportation compared to Baseline for the ACT Map and BLUE Map scenarios, 2050



Key point

Fuel efficiency options dominate transport sector CO_2 reductions in the ACT Map scenario; alternative fuels play a larger role in BLUE Map.

In the BLUE scenario variants, fuel use in 2050 is up to 47% lower than in the Baseline. BLUE Map uses the most biofuels, about 700 Mtoe, representing 26% of total transport fuel demand. Biofuel demand in the other variants is between 500 Mtoe and 700 Mtoe. The use of conventional oil products is 35% below the 2005 level in the BLUE Map scenario. This constitutes a significant supply security benefit.

The contribution from hydrogen is near zero in the ACT Map scenario, where it remains a niche fuel. In the BLUE Map scenario, though, hydrogen plays a more important role. Fuel cell vehicle sales and the construction of a hydrogen infrastructure begin in earnest after 2020 and grow steadily over time. In "BLUE FC", fuel cell vehicles are assumed to reach a commercial scale by 2030 and to come to dominate vehicle sales in OECD countries by 2050. Electricity gains ground in all variants through plug-in hybrids, but reaches a much more prominent position in the EV variant – in which pure-electric vehicles are assumed to become fully commercial by 2030 and dominate vehicle sales by 2050.

On a life-cycle "well-to-wheels" basis, CO_2 emissions from transportation in the Baseline scenario, at 18 Gt in 2050, are 150% higher than in 2005 (Figure 2.24). Emissions increase faster on this basis than tailpipe emissions, due to the significant introduction of natural gas and coal-based synfuels in the Baseline scenario. The production of these fuels more than doubles emissions (relative to petroleum fuels) on a well-to-wheel basis. Tailpipe CO_2 emissions are about 13.8 Gt by 2050.

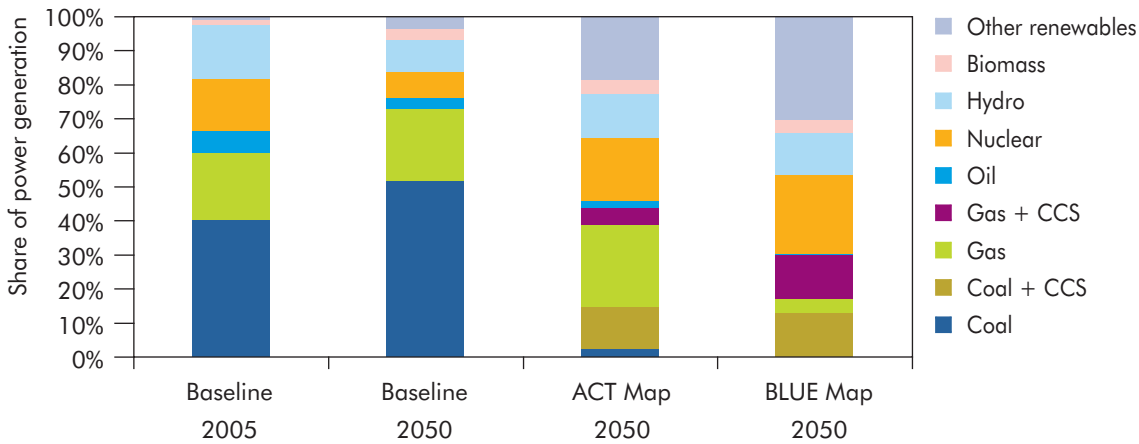
Overview

The current mix of natural gas and coal in electricity generation varies by country and region depending on resource availability and domestic fuel prices. Overall, 40% of the world's electricity production comes from coal and 20% from gas. In South Africa and Poland the share of coal in power generation is above 90%. In China and Australia it is close to 80%, as in India, where it is more than two-thirds. Coal accounts for around half of electricity generation in the United States and Germany, one-third in the United Kingdom, one-quarter in Japan and one-sixth in Russia. Russia produces almost half of its electricity from gas, the United Kingdom close to 40% and the United States and Japan around 20%.

Carbon-dioxide emissions from fossil fuel-fired plants can be reduced by improving conversion efficiency – by modernising and refurbishing existing plants and deploying the best available technologies in new plants; by co-firing coal with biomass, adding biogas to natural gas and employing CCS; and by switching from coal to natural gas.[1] The best combination of mitigation measures depends on the existing power generation stock, the price of competing fuels and the cost of alternative technologies.

In the Baseline scenario, without a CO_2 reduction price incentive, coal dominates the power sector, with nearly 50% of the total power generation in 2050 (Figure 7.1).

Figure 7.1 ▶ Share of power generation in the baseline, ACT Map and BLUE Map scenarios



Source: IEA Statistics, IEA 2006.

Key point

In the baseline scenario, coal's share in power generation increases from 40% in 2005 to more than 50% in 2050. In the ACT Map and BLUE Map scenarios, all coal-fired power generation will incorporate CCS in 2050.

1. Efficiency figures in this chapter are based on lower heating values (LHV). LHVs, unlike higher heating values (HHV), do not include the latent heat of the moisture originally present in the fuel or from combustion of the coal hydrogen. European and IEA statistics are reported on an LHV basis, while United States statistics are reported on an HHV basis. On these bases, HHV efficiencies are about 2% lower than LHVs for coal-fired power plants and 5% lower for gas-fired combined-cycle plants.