

## 10 Scenario Impacts on World Energy and Emissions<sup>41</sup>

This chapter describes the impact of the technological scenarios, which were presented in the previous chapter on the global power generation system. In order to facilitate the evaluation of the impacts of the changes in assumptions, the baseline power generation trends are presented first.

### 10.1 Baseline Electricity Trends

The technologies retained in this study include those considered in the central electricity production module of POLES, as well as some other included in the new and renewable module.

The baseline world electricity mix for 2030 is summarised in Table 10-1 to Table 10-4. At world level, Table 10-1 shows the remarkable success of the gas turbine in combined cycle technology: by the end of the period, this technology represents almost one fourth of total world electricity generation, one third of thermal production. Amongst the baseload technologies, supercritical coal seems to expand rapidly its market share, although IGCC also retains a significant degree of competitiveness due to its flexibility in using fuels of varied quality.

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Table 10-1: POLES world electricity projection 1992-2030.

	1992	2000	2010	2020	2030	1992/ 2000	2000/ 2010	2010/ 2020	2020/ 2030
Electricity Generation in TWh	12670	14998	22377	30764	40769	2.1%	4.1%	3.2%	2.9%
Thermal	7787	9495	15964	23113	31655	2.5%	5.3%	3.8%	3.2%
of which:									
Clean Coal	108	130	566	2007	3348	2.4%	15.8%	13.5%	5.3%
Gas Turbines	271	1040	3840	6410	8931	18.3%	13.9%	5.3%	3.4%
Biomass	138	174	227	283	348	2.9%	2.7%	2.2%	2.1%
Nuclear	2126	2304	2567	2978	3607	1.0%	1.1%	1.5%	1.9%
Hydro+Geoth	2219	2584	3238	4000	4796	1.9%	2.3%	2.1%	1.8%
Solar	0.95	1.75	6.30	20.33	35.81	7.9%	13.7%	12.4%	5.8%
Wind	4.66	9.76	14.86	29.18	60.37	9.7%	4.3%	7.0%	7.5%
Small Hydro	125.3	168.6	183.8	213.4	250.0	3.8%	0.9%	1.5%	1.6%
CHP	405.9	433.2	403.4	408.7	363.7	0.8%	-0.7%	0.1%	-1.2%

Table 10-2: Baseline world electricity mix (TWh) by 2030.

<b>Large Hydro</b>	4795	<b>Oil Powered Gas Turbine</b>	1455
<b>Nuclear 1000-1500 MW LWR</b>	2538	<b>Gas Turbine in Combined Cycle 200-350 MW</b>	8873
<b>New Nuclear Design</b>	1042	<b>Gas Turbine in Combined Cycle &amp; CHP</b>	364
<b>Supercritical Coal</b>	5940	<b>Small Hydro</b>	249
<b>Integrated Coal Gasification with Combined Cycle</b>	2978	<b>Wind on Shore</b>	60
<b>Advanced Coal Cycle</b>	2784	<b>Solar Power Plant</b>	31
<b>Lignite &amp; FGD</b>	2761	<b>Waste Incineration CHP</b>	81
<b>Hard Coal 200-500 MW</b>	5593	<b>Biomass Gasification</b>	268
<b>Oil Boiler Monovalent</b>	414	<b>Proton Exchange Membran Fuel Cell</b>	101
<b>Gas Powered Trad.Turbine</b>	556	<b>Solid Oxyde Fuel Cell</b>	7

In the OECD countries (see Table 10-3), the growth of total electricity consumption and generation remains very moderate. Gas turbines progress rapidly by the beginning of the projection period and at a slower pace by the end, when this technology represents one third of thermal production. Clean coal technologies also show high growth rates, which remain so until the end of the