"Nuclear New Build: Issues to be Addressed"

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Carbon profile of nuclear:
Note on greenhouse gas emissions from nuclear power

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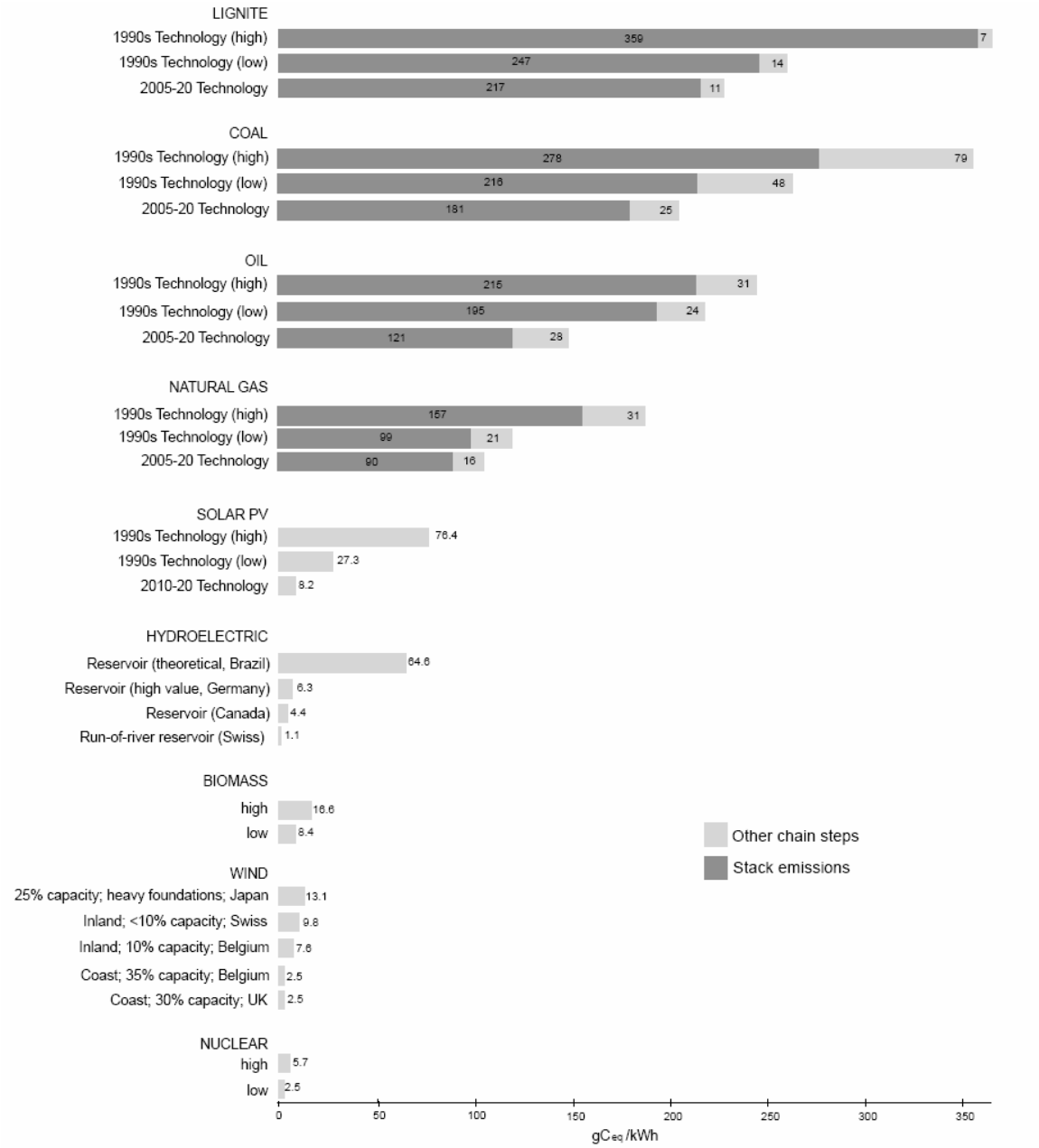
The complete nuclear life-cycle needs to be considered when assessing greenhouse gas emissions from nuclear power. Even though nuclear electricity generation produces virtually no greenhouse gas emissions at the point of generation (see Figure 1 below), greenhouse gases are released at all the stages of the fuel cycle, including fuel preparation and transportation, and during plant construction and decommissioning, (IAEA, 2000).

The main contributors to greenhouse gas emissions from nuclear power are fuel extraction, conversion, enrichment, plant construction and decommissioning and materials. Fuel enrichment by gas diffusion is an energy intensive process that can increase greenhouse gas releases by an order of magnitude when compared to enrichment by centrifuge. Fuel reprocessing accounts for 10-15% of the total greenhouse gas emissions from nuclear power. These emissions are highly country-specific as they depend on national fuel mixes, (IAEA, 2000).

According to the OECD Nuclear Energy Agency (NEA) and International Atomic Energy Authority (IAEA), and although this varies according to reactor characteristics and location, nuclear power emits between 2.5-5.7 tC_{eq}/GWh (see Figure 1). By contrast, coal emits around 245 tC_{eq}/GWh, gas emits around 100 tC_{eq}/GWh while emissions from electricity generation per unit of electricity supplied from fossil fuels are estimated to have been around 165 tC_{eq}/GWh in 2004 in the UK. The overall emissions from electricity generated from all sources (including nuclear and renewables) amounted to 125 tC_{eq}/GWh, (DTI, 2005). According to the IAEA in 2000, greenhouse gas emissions from nuclear power are in a similar range to onshore wind power and small-scale hydropower.

The large scale implementation of nuclear power has been questioned as an appropriate response to climate change, especially regarding the adequacy of nuclear fuel supplies. The argument put forward by critics like Mortimer, Storm van Leeuwen and Smith rests on the assumption that if the use of nuclear energy were to increase significantly then known uranium resources would be quickly consumed. This would lead to the use of lower grade uranium ores resulting in increased energy consumption and CO_2 emissions. However, the World Nuclear Association disputes the assumption that no further low cost reserves of uranium remain to be found, as new nuclear build and higher uranium demand would lead to increased exploration and the discovery of additional resources.

Figure 1: Range of total greenhouse gas emissions (in g C_{eq}/kWh) from electricity production chains, (IAEA, 2000).



GHG emissions at the point of electricity generation are shown in the dark bar segments. Shown in the light bar segments are emissions from all other stages of the electricity chain, i.e. fuel mining, preparation, and transport, plant construction and decommissioning and the manufacture of equipment.

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