Nuclear Power:
An Expensive Waste of Time

The nuclear industry is using the issue of climate change and energy security as a means to win political and financial support for its dirty and dying industry. Even a massive, four-fold expansion of nuclear power by 2050 would provide only marginal reductions (4%) in greenhouse gas emissions, when we need global emissions to peak at 2015, cuts of 40% by 2020 and to drop by at least 80% by 2050.

Nuclear energy's 'contribution' to fighting climate change would come too late (long after 2020), with huge costs (USD10 trillion), and would create a myriad of other serious hazards related to accidents, waste management and proliferation. These large costs and negative impacts make nuclear energy an obstacle to the necessary development of effective, clean and affordable energy solutions.

During the last decade the nuclear debate has been based on rhetoric rather than implementation. G8 documents praise nuclear energy, but in reality the G8 countries are implementing a de facto nuclear phase-out. Since the late 1980s G8 countries have almost stopped building nuclear reactors. During the last three years no nuclear reactors have come online in any G8 country. While during the 1970s and 1980s these countries started an average of 14 reactors each year, the nuclear construction rate in G8 countries collapsed in the 1990s and has subsequently almost come to a complete halt.

Two G8 countries, Germany and Italy, have even had a nuclear phase-out policy.[1] According to International Atomic Energy Agency (IAEA) data only four reactors are under construction in G8 countries with a scheduled operational start[2]: two reactors in Japan, one in France and one in United States.

The low level of new construction confirms the downward trend of the nuclear industry in G8 countries. The reason? Nuclear energy is too expensive, too dangerous and it has no place in our energy future.

Nuclear energy in trouble on all sides

Even today, running at one-tenth of the hypothetically required construction speed, the nuclear industry is struggling with serious problems and has hit many obstacles:

- **Massive technical problems and ever-rising costs** have affected attempts to build new reactor units, for example both the French EPR units in Finland and France have already experienced years of delays and billions in cost overruns. Finland's Olkiluoto 3 project heralded as the nuclear industry poster child is already three years behind schedule and 50% over-budget[3].
- **Capacity to produce** reactor components is limited to a few pieces a year by half a dozen corporations in only a handful of countries[4].
- **Shortages in uranium supplies** to fuel the existing fleet of reactors, where the annual consumption reached 69,000 tonnes uranium in 2007, compared to production of just 41,300 tonnes in the same year[5]. The world's proven and reasonably assured uranium resources would only be able to cover current consumption levels for a few decades.

1 This decision is currently under revision in Italy by the current government.
2 The Russian government has announced the construction of eight reactors but no indication of a time scale.
3 Nucleonics Week, Platts, 4 September 2008
4 Platts Nucleonics Week publications; Nuclear Engineering International; http://www.areva.com
5 See World Nuclear Association, online: http://www.world-nuclear.org/info/inf23.html

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- **Raw material crunch** would occur because of the industry's huge demand for steel and concrete.

- **Negative health effects of ionising radiation.** Recently published peer reviewed research found statistically high incidences of childhood leukaemia in close vicinity of nuclear power plants in Germany[6] and the US[7].

- **Dangerous impacts of uranium mining and milling** threatens the lands, communities and health of Indigenous Peoples, many of whom (in Canada, the US, Africa, India and Australia, *inter alia*) continue to protest the extraction of uranium on or near their homelands and territories.

- **Lack of qualified engineers, inspectors and personnel** to safely manage and oversee operations at the current scale of construction.

- **Long lead-times for projects**. It takes 10 to 15 years, even in countries with related developed infrastructure, to plan, approve, build and start a new reactor. It would take even longer in countries that are just starting their nuclear programmes.

- **No safe disposal method for radioactive waste** that reactors have already produced, despite decades of research and money spent. In the past five years, the estimated costs of radioactive waste disposal grew by USD 40 billion in US[8] and by GBP 27 billion in the UK[9] with no guarantees to deliver safe storage at the end.

- **Growing proliferation problems**. As stockpiles of separated plutonium increase, nuclear technologies and materials spread to new countries. International safeguards are under-resourced and structurally weak. It is only a question of time before they become accessible to terrorist groups. One large reactor can produce 200 kgs of plutonium every year - enough for two dozen nuclear weapons.

Nuclear power can provide only expensive, late and marginal contributions in carbon mitigation

The International Energy Agency's (IEA) Blue Map scenario (taken from its *Energy Technology Perspectives 2008)* lays out an example of an energy mix that could achieve a 50% reduction in carbon emission by 2050. The agency assumes a four-fold increase of nuclear power generation, from today's 2,600 TWh/year to 9,900 TWh/year in 2050. But this would only reduce CO_2 emissions from the energy sector by 6% (a mere 4% of overall greenhouse gases).

Even getting to 6% would require unprecedented rates of growth sustained over 40 years. The nuclear industry would have to build an average of 32 large (1,000 MWe) nuclear reactors every year from now until 2050.

Compare this with the last decade's average where the nuclear industry added 3,000MW of new capacity a year and this is obviously unfeasible. Even in the 1980s, the decade of the industry's fastest growth, only an average of 17,000 MW was built a year – half the rate needed to realise the IEA's Blue Map scenario.[10] But the IEA believes we can build 32,000 MW capacity every year from now to 2050.

Then there's the cost. Moody's currently estimates the investment cost for new reactors at USD 7,500/kW.[11] Assuming this, the required 1,400 large new reactors would cost around USD 10,500 billion – and this is only the upfront investment.

While nuclear power presents itself as the largest carbon free energy source, its potential role in carbon mitigation is very limited and is simply not worth taking, given all its risks and costs.

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6 Spix C et al, Case-control study on childhood cancer in the vicinity of nuclear power plants 1980-2003, European Journal of Cancer (December 2007)

7 Joseph Mangano, Janette D. Sherman: Childhood Leukaemia Near Nuclear Installations, European Journal of Cancer Care No 4 Vol

8 Platts, Nuclear Fuel, 11 August 2008

9 Guardian, online: http://www.guardian.co.uk/environment/2008/jul/18/nuclearpower.energy

10 International Atomic Energy Agency's PRIS database, http://www.iaea.org/programmes/a2/index.html

11 New Nuclear Generating Capacity – Potential Credit Implications for U.S. Investor Owned Utilities, Moody's Corporate Finance, May 2008

Nuclear power is a hazardous obstacle to clean solutions

Expensive, dirty and hazardous, nuclear power stands in the way of clean and sustainable solutions. It would take USD10 trillion or more to build enough reactors to produce 9,900 TWh of nuclear electricity as projected under the IEA's 2008 Blue Map scenario. Building enough wind farms to produce the same amount of electricity, for example, would cost USD 6 trillion at current prices, with these costs decreasing over time.

Wind has no associated fuel costs and does not require expensive dismantling of the plant at the end of its life and long term disposal of radioactive waste. Other calculations show that, compared to nuclear, wind power at today's costs replaces twice as much carbon per invested dollar and energy efficiency measures three to six times more.[12]

Even the IEA's 2008 Blue Map scenario shows that, while massive nuclear expansion reduces carbon emissions from the energy sector by 6%, the potential of renewable energy sources is around four times bigger, and the potential of energy efficiency six times bigger. It is clear which technology needs to get priority.

Lastly is the issue of time. Energy efficiency measures can be implemented in months. A wind farm can be planned and built in one year. Nuclear reactors take one to two decades to prepare and build. Every dollar invested in nuclear power means a dollar less invested in energy efficiency and renewable energy sources that can replace several times more carbon for the same cost, at a much faster rate than nuclear power.

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[12] Amory Lovins and Imran Sheikh, The Nuclear Illusion: https://www.rmi.org/images/PDFs/Energy/E08-01_AmbioNuclIlusion.pdf