



Nuclear Free Solutions to Climate Change:

Meeting future challenges without nuclear energy

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December 2006

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The Prime Minister argues that if Australians take global warming seriously, then nuclear power must be part of the solution.

Europe is the world leader on taking climate change seriously. It is on track to meet its Kyoto Protocol target, it has implemented the world's first multi-national emissions trading scheme, and European leaders have recently endorsed a 15 to 30 per cent emissions reduction target by 2020.

On the other hand, the US, with 103 nuclear power reactors, has the world's largest domestic nuclear power industry. Yet, it has steadily rising greenhouse gas emissions, due to the absence of an effective national policy framework to tackle climate change.

The paper looks at a number of European Union (EU) Member States that are dealing effectively with their Kyoto Protocol target *and* have rejected nuclear power.

1. Europe: Taking climate change seriously

EU Member States

Kyoto Target¹ for EU-15: reduction of 8 per cent

The EU Member States are expected to exactly meet their collective reduction target of 8 per cent by 2010, as some states will more than meet their target, whilst others have the capacity to overshoot their target. Meeting the 8 per cent reduction will require additional policies and measures and the use of the Kyoto Protocol 'Flexible Mechanisms' (referred to as Kyoto Mechanisms hereafter) and carbon sinks.

Long Term Reduction Target:

On 23 March 2006, EU Heads of State agreed to a 15 to 30 per cent greenhouse gas reduction target by 2020.

Germany

Kyoto Target: reduction of 21.0 per cent

Projections for 2010, with additional policies and measures and Kyoto Mechanisms (KMs)²: reduction of 21.0 per cent

¹ The Kyoto Target is: the amount of greenhouse gas reduction legally required of a country that has ratified the Kyoto Protocol. The target must be met by 2012. The target is based on emissions in 1990. The data in section 1 is sourced from: http://reports.eea.europa.eu/eea_report_2006_9/en/eea_report_9_2006.pdf

² 'KMs' refers to the Kyoto Protocol Flexible Mechanisms: the Clean Development Mechanism (CDM) and Joint Implementation (JI). Nuclear power is not recognized under the CDM, despite intense lobbying by the nuclear industry and some governments, including Australia. For more info on CDM: <http://cdm.unfccc.int/> and

Germany is on track to meet its Kyoto Target³.

National Long Term Reduction Target:

Germany has offered to reduce its greenhouse gas emissions by 40 per cent by 2020 if the EU agrees to a 30 per cent reduction by 2020.

Sweden

Kyoto Target: reduction of 4 per cent

Projections for 2010, with additional policies and measures, KMs and carbon sinks: reduction of 3.9 per cent

Sweden is on track to significantly improve on its Kyoto Target.

National Long Term Reduction Target:

Sweden has committed to a reduction in CO₂ emissions of 60 per cent by 2050.

Italy

Kyoto Target: reduction of 6.5 per cent

Projections for 2010, with additional policies and measures, KMs and carbon sinks: reduction of 5.8 per cent

Italy is on track to almost meet its Kyoto Target (distance away from target: 0.7 per cent)

Austria

Kyoto Target: reduction of 13 per cent

Projections for 2010, with additional policies and measures, KMs and carbon sinks: reduction of 6.5 per cent

Austria will not meet its Kyoto target, but is on track to reduce emissions by 6.5 per cent (distance away from target: 6.5 per cent)

Belgium

Kyoto Target: reduction of 7.5 per cent

Projections for 2010, with additional policies and measures and KMs: reduction of 6.6 per cent

Belgium is on track to nearly meet its Kyoto Target (distance away from target: 0.9 per cent)

<http://www.cdmwatch.org/>. For more info on JI:

http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php.

³ See footnote 9 on p.4.

2. Europe: Rejecting nuclear power

No Western European country has built a nuclear power plant since 1991. Finland is the only Western European country currently constructing one (with the completion date expected to be 2010)⁴. Before looking again at the countries in the previous section, let's first take a look at Finland.

Finland

French company, Areva, is building the world's first Generation III nuclear power plant in Finland. On 27 September 2006, Areva released its financial results for the first half of 2006. The results show that Areva's operating income in its nuclear operations fell from EUR 373m in the first half of 2005 to EUR 73m in the first half of 2006. The results state that this fall is due to the Finnish reactor contract. It also states that the contract is "currently encountering difficulties and delays".⁵ The project is delayed for at least 12 months.

After receiving a complaint from the European Renewable Energies Federation, the European Commission decided to set up an investigation into possible illegal subsidies to the company.⁶ EREF asserts that the Finnish government provided unfair and uncompetitive advantage to the nuclear reactor project, which would otherwise not be competitive or economically viable. Examples include; a generous export credit guarantee, generous financial support and price dumping. The European Commission's investigation is a crucial test of whether nuclear power is a viable energy source in a liberalised, open and fair electricity market.

The following section looks at nuclear phase out dates and describes how a country is reducing its emissions without the use of nuclear power. The source of the information on country climate plans is: http://reports.eea.europa.eu/eea_report_2006_9/en/eea_report_9_2006.pdf.

Germany

As of 2000, nuclear power generated about 30 per cent of Germany's electricity. In that year, the Government of the SPD and the Greens came to a decision to phase out nuclear power. This decision was formalized in a voluntary phase-out agreement with nuclear power utilities. In 2005, the incoming CDU agreed with its SPD partners in government, to retain the nuclear phase out target. In May 2005,

Nuclear power phase out date:	2020
Number of operating nuclear power plants:	17
Share of nuclear electricity supply in national market, 1999:	31.21 per cent⁷

Decommissioning

By 2002, 16 nuclear power plants had been shut down or were under dismantling (see Appendix A), leaving 19 nuclear power plants at 14 sites in operation. In November 2003, the Stade PWR nuclear reactor was shut down, and in May 2005 the Obrigheim reactor was closed.

Decommissioning the currently operating reactors is expected to produce some 115,000 cubic metres of radioactive waste.⁸

⁴ France is expected to begin construction on a nuclear power plant soon, with completion planned for 2012.

⁵ http://www.areva.com/servlet/ContentServer?pagename=arevagroup_en/home

⁶ http://www.eref-europe.org/downloads/pdf/2004/EPR_Finland.pdf

⁷ <http://www.eu-decom.be/about/initabout.htm>

How will Germany meet its Kyoto Target without nuclear power?

Germany's plan to meet its Kyoto Target of a reduction of 21 per cent includes the following new policies and measures:

- Participation in the EU emissions trading scheme from 2008-2012⁹
- Use of mechanisms under the Kyoto Protocol
- Energy labeling of appliances
- Consumer information on cars

Germany's existing policies to reduce emissions include:

- Participation in the pilot EU emissions trading scheme from 2005-2007
- Promotion of electricity from renewable sources through Germany's power renewables feed-in legislation
- Taxation of energy products
- Promotion of co-generation of heat and power
- Energy performance of buildings
- Promotion of biofuels for transport

Germany is the world's third largest economy and the biggest in Europe. It has a heavy industrial base, but is still managing to reduce its emissions substantially, whilst phasing out nuclear power.

Sweden

Nuclear power provides half of Sweden's electricity. After the Three Mile Island nuclear accident, the Swedish Government held a referendum on nuclear power. The Swedish Parliament then voted in 1980 to ban the construction of any new nuclear plants and to adopt a phase out date of 2010. An electrical short circuit at the Forsmark nuclear plant in July 2006, leading to a near core meltdown and the temporary closure of three other plants as a result, would have created major public safety concerns and confirmed the need for a phase out in four years time.

Nuclear power phase out date: 2010
Number of operating nuclear power plants: 10
Share of nuclear electricity supply in national market, 1999: 46.8 per cent

Decommissioning

Until recently, Sweden had 11 operating nuclear power plants. However, one (Barseback-2) shut down at the end of May 2005.¹⁰ The other 10 will be closed over the next 4 years.

How will Sweden improve on its Kyoto Target without nuclear power?

Sweden's plan to improve on its Kyoto Target of an increase of 4 per cent includes the following new policies and measures:

- Participation in the EU emissions trading scheme from 2008-2012
- Use of mechanisms under the Kyoto Protocol
- Investment in carbon sinks (forests)
- Energy labeling of appliances

⁸ <http://www.uic.com.au/nip46.htm>

⁹ This assumes acceptance by Germany of the European Commission recommendation (Nov 29, 2006) that Germany cut its CO₂ equivalent emissions cap by 29MT in the 2008-2012 second phase, compared to the 2005-2007 second phase. http://ec.europa.eu/environment/climat/2nd_phase_ep.htm

¹⁰ <http://www.uic.com.au/nip39.htm>

- Energy performance of buildings

Sweden's existing policies to reduce its emissions include:

- Participation in the pilot EU emissions trading scheme from 2005-2007
- Promotion of electricity from renewable sources
- Promotion of co-generation of heat and power
- Taxation of energy products
- Transport modal shift to rail
- Promotion of biofuels for transport

Italy

After the Chernobyl disaster, the Italian government held a referendum on nuclear power and the people said no. The last of Italy's four nuclear power plants closed in 1990 (see Appendix B). A moratorium on nuclear power still stands. The plants have not been decommissioned, but are lying idle and there are no plans or community support to restart them.

Nuclear power phased out: 1990

How will Italy try to meet its Kyoto Target without nuclear power?

Italy supplies some 87 per cent of its own electricity needs through gas (42 per cent), oil (22 per cent), coal (15 per cent) and hydro (13 per cent).¹¹ Italy imports about 13 per cent of its electricity, including nuclear power from France, due to the European-wide electricity grid.

Italy's plan to try to meet its Kyoto Target of a decrease of 6.5 per cent includes the following new policies and measures:

- Participation in the EU emissions trading scheme from 2008-2012
- Use of mechanisms under the Kyoto Protocol
- Investment in carbon sinks (forests)
- Promotion of electricity from renewable sources
- Promotion of co-generation of heat and power
- Energy performance of buildings
- Transport modal shift to rail
- Promotion of biofuels for transport
- Addressing landfill emissions

Italy's existing policies to reduce its emissions include:

- Participation in the pilot EU emissions trading scheme from 2005-2007
- Taxation of energy products
- Energy labeling of appliances

Austria

Austria has never had any operational nuclear power plants. One was built but never brought online due to public concern. In 1997, the Austrian Parliament voted against nuclear power.

Nuclear power ban: 1997

¹¹ <http://www.uic.com.au/nip101.htm>

How will Austria reduce its emissions by 6.5 per cent without nuclear power?

Austria's plan to reduce its emissions by 6.5% includes the following new policies and measures:

- Participation in the EU emissions trading scheme from 2008-2012
- Use of mechanisms under the Kyoto Protocol
- Investment in carbon sinks (forests)
- Taxation of energy products
- Promotion of electricity from renewable sources
- Energy labeling of appliances
- Energy performance of buildings
- Transport modal shift to rail
- Promotion of biofuels for transport

Austria's existing policies to reduce its emissions include:

- Participation in the pilot EU emissions trading scheme from 2005-2007
- Addressing landfill emissions

Belgium

In 1999, the Belgian government passed legislation to phase out nuclear power.

Nuclear power phase out date: 2025
Number of operating nuclear power plants: 7
Share of nuclear electricity supply in national market, 1999: 57.74 per cent

Decommissioning

Since the end of the 1980s, two decommissioning projects have been started: a nuclear power plant and a reprocessing plant (see Appendix C).

How will Belgium nearly meet its Kyoto Target of a reduction of 7.5 per cent without nuclear power?

Belgium's plan to nearly meet its Kyoto Target of a reduction of 7.5 per cent includes the following new policies and measures:

- Participation in the EU emissions trading scheme from 2008-2012
- Use of mechanisms under the Kyoto Protocol
- Taxation of energy products
- Promotion of electricity from renewable sources
- Energy labeling of appliances
- Energy performance of buildings
- Transport modal shift to rail
- Promotion of biofuels for transport

Belgium's existing policies to reduce its emissions include:

- Participation in the pilot EU emissions trading scheme from 2005-2007
- Addressing landfill emissions

Conclusion

Germany, Sweden, Italy, Austria and Belgium are modern industrialized nations that take climate change seriously and have rejected a domestic nuclear power industry. Their response to the climate change threat is a mix of intelligent, practical solutions.

The country with the world's biggest nuclear power industry – the US, with 103 nuclear power reactors – has steadily rising greenhouse gas emissions, due to the absence of an effective national policy framework to tackle climate change.

Australia, too, has the skills, talent, and innovative spirit to pursue substantial greenhouse gas abatement strategies that avoid nuclear power. All that is required is the right national policy framework. The key elements to this are; ratification of the Kyoto Protocol, national emissions reduction targets of 30 per cent by 2020 and 80per cent by 2050, introduction of an emissions trading scheme, an ambitious renewable energy target, regulations and incentives for maximizing energy efficiency and an end to native forest logging and land clearing. These policies will set Australia on course to become a low carbon economy and will secure our prosperity and safety in a climate constrained world.

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Appendix A

The experience of decommissioning in Germany

European website on decommissioning of nuclear installations

<http://www.eu-decom.be/about/initabout.htm>

Table 1: Sixteen nuclear power plants under dismantling or already shut down

	Electrical power	Operating time	Actual status
Public owned facilities			
MZFR Karlsruhe	58 MW	1965 - 84	under dismantling
KKR Rheinsberg	70 MW	1966 - 90	under dismantling
AVR Jülich	15 MW	1966 - 88	deferred dismantling
HDR Karlstein	25 MW	1969 - 71	dismantling completed
KKN Niederaichbach	106 MW	1972 - 74	dismantling completed
KGR-1 Greifswald	440 MW	1973 - 90	under dismantling
KGR-2 Greifswald	440 MW	1974 - 90	under dismantling
KGR-3 Greifswald	440 MW	1977 - 90	under dismantling
KNK II Karlsruhe	20 MW	1977 - 91	under dismantling
KGR-4 Greifswald	440 MW	1979 - 90	under dismantling
THTR Hamm-Uentrop	308 MW	1984 - 88	deferred dismantling
KGR-5 Greifswald	440 MW	1989 - 90	under dismantling
NPP's of electric utilities			
VAK Kahl	16 MW	1960 - 85	under dismantling
KRB A Gundremmingen	250 MW	1966 - 77	under dismantling
KWL Lingen	254 MW	1968 - 77	deferred dismantling
KWW Würgassen	670 MW	1971 - 95	under dismantling

Table IV : List of shutdown nuclear plants in Germany, in order of operator and time of operation

Appendix B

The experience of closure in Italy

Uranium Information Centre: Nuclear Energy in Italy

<http://www.uic.com.au/nip101.htm>

Table 2: Four closed nuclear power reactors

Reactors	Model	Net MWe	Power
Latina	GCR	153	1963-87
Garigliano	BWR	150	1964-82
Trino Vercellese	PWR	260	1964-90
Caorso	BWR	860	1978-90
Montalto di Castro 1 & 2	BWR	982 each	-
Total operated (4)		1423 MWe	

Appendix C

The experience of decommissioning in Belgium

European website on Decommissioning of Nuclear Installations

<http://www.eu-decom.be/about/initabout.htm>

Table 3: One nuclear power plant and one reprocessing plant in decommissioning

Name - Location	Type of facility	Period of operation	Situation
BR3, Mol	Pilot Pressurized Water Reactor	1962-1987	In decommissioning
Doel 1, 2 ¹²	Commercial PWR	1975-	Operating
Tihange 1	Commercial PWR	1975-	Operating
Tihange 2	Commercial PWR	1982-	Operating
Doel 3	Commercial PWR	1982-	Operating
Doel 4	Commercial PWR	1985-	Operating
Tihange 3	Commercial PWR	1985-	Operating
Eurochemic (Dessel)	Reprocessing plant	1966-1974	In decommissioning

Table VIII : Summary of the main nuclear facilities situated in Belgium

¹² Doel 1 and 3 comprise two nuclear power plants