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The Influence of Climate Change Policy on the Future of Nuclear Power

Jonathan Cobb

Nuclear energy plays an important part today in reducing greenhouse gas emissions. At present the use of nuclear energy avoids the emission of up to 2.3 billion tonnes of carbon dioxide. Without nuclear energy global greenhouse gas emissions would be up to 10% higher.¹ In contrast, the objective of the Kyoto Protocol is to reduce greenhouse gas emissions in industrialised nations by 5% by 2008–12 compared to a 1990 baseline.

In order for atmospheric greenhouse gas concentrations to be stabilised at a sustainable level it will be necessary to reduce emissions by around 60% from the 1990 level. Advocates of a policy of “convergence and contraction”, where developed and developing countries are to be allowed similar levels of emissions on a per capita basis, state that developed countries may have to reduce emissions by 80%.

Nuclear energy will make a significant contribution to meeting the world’s future electricity demand while helping reduce greenhouse gas emissions. However the scale of that contribution will be strongly influenced by the way in which this contribution is recognised in national and international policies designed to tackle climate change.

The debate over what effect the very large quantities of greenhouse gases being emitted by human activities will have on the Earth’s climate and what will be the resultant impact of that climate change on the Earth’s ecosystems still rages. However, the strength of evidence is such that the international community has committed itself to taking action to reduce emissions.

This paper will give an overview of the institutions and organisations involved in the international climate change negotiations. It will also describe the positions of different organisations on the issue of the role of nuclear power in mechanisms designed to reduce greenhouse gas emissions. The paper will also give an insight into the financial impact of assigning a value to carbon emissions and how that might change the relative economics of nuclear power in comparison to fossil fuel generation.

The Development of International Policies on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the World Meteorological Organisation and the UN Environment Programme (UNEP) to produce scientific information on climate change to assist policy makers in addressing the growing concerns about climate change. The IPCC published its First Assessment Report in 1990. The report confirmed that climate change was a threat and called for a global treaty to address the problem. The UN General Assembly established an Intergovernmental Negotiating Committee (INC) to negotiate such a treaty.

In 1992 the INC adopted the United Nations Framework Convention on Climate Change (UNFCCC). The Convention sets an ultimate objective of stabilising atmospheric greenhouse gas concentrations at a “safe level” within a timeframe that would allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. Around 180 governments and the European Union (EU) are Parties to the Convention. Parties meet at an annual Conference of the Parties (COP) to review the implementation of the Convention. Additional intergovernmental meetings of various subsidiary bodies are also held each year.

In the Convention countries are divided into Annex I and non-Annex I Parties. Annex I Parties are industrialised countries that were members of the OECD in 1992 and countries with “economies in transition” (EIT). The EIT countries include the Russian Federation, the other former Soviet Republics, and certain other Central and Eastern European countries. Non-Annex I Parties are the developing nations.

Annex I Parties were committed to adopting national policies that would stabilise greenhouse gas emissions at 1990 levels by 2000. However this was a non-legally binding aim and few countries have actually achieved this target.

The Annex I Parties that were members of the OECD in 1992 are also Annex II Parties. These Parties have an obligation to provide “new and additional financial resources” to developing countries to help them tackle climate change. Annex II Parties are also required to facilitate the transfer of technologies that can help tackle climate change to both non-Annex I Parties and the EIT countries.

At the first Conference of the Parties (COP 1), held in Berlin in 1995, Parties decided that the commitments taken on by Annex I Parties in the Convention were not sufficient, and they agreed to develop further commitments. The culmination of the negotiations that followed was the Kyoto Protocol, which was adopted at COP 3 in Kyoto at the end of 1997.

The Kyoto Protocol commits Annex I Parties to legally binding targets to limit greenhouse gas emissions. The overall effect of these limits would be to reduce these emissions by 5% by the period 2008–12, compared to 1990 levels. Individual countries have been set specific targets, ranging from an 8% cut to a 10% increase in emissions. The one exception to this allocation system is the EU, which has been given an overall target of an 8% reduction in emissions. EU member countries have reached an internal agreement on the allocation of individual country targets to achieve the overall EU target.

Over 80 countries have signed up to the Kyoto Protocol. However, few of the major emitters have ratified it. Therefore the Protocol has not entered into force and the emissions targets are not legally binding. For the Protocol to enter into force it must be ratified by 55 Parties to the Convention, including Annex I Parties accounting for at least 55% of 1990 carbon dioxide emissions.

Many countries are thought to be waiting for the operational details of the Protocol to be agreed before they ratify the Protocol. Considerable progress on the negotiations to develop these operational details is hoped to be achieved at

COP 6 in The Hague in November 2000 (further information is available at the UNFCCC website at www.unfccc.int).

The Kyoto Mechanisms

The Kyoto Protocol established three “mechanisms” to help Annex I Parties reduce emissions. The three mechanisms are known as emissions trading, joint implementation (JI), and the clean development mechanism (CDM).

Emissions trading would involve the purchase of a proportion of one Party’s quota of emissions by a second Party. The Protocol states that the COP will develop the rules and guidelines that will allow Parties to carry out emissions trading. At present the Protocol only deals with emissions trading between Parties. However, it is likely that systems will be put in place to allow legal entities (e.g. companies) to participate.

While an international emissions trading scheme operating under rules set out by the COP may be some years off, some national emissions trading schemes are currently being developed. Some of these schemes are being developed in co-operation with business and industry. It is important that companies in the nuclear sector participate, where possible, in the development of these national schemes to ensure that the nuclear industry is fairly treated.

The two remaining mechanisms, JI and CDM, share some similarities. They are concerned with the execution of “projects” that can reduce emissions. The JI mechanism applies to projects carried out in an Annex I country whereas the CDM is for projects carried out in a non-Annex I country.

The JI mechanism allows one Party to transfer emissions reduction units to another Party in return for projects carried out by the second Party in the first Party country. The projects must result in emissions reductions additional to any that would otherwise occur. The exact meaning of this “additionality” has yet to be defined.

Parties may authorise legal entities to carry out projects. An example of a JI could be if Company X carried out an upgrade to a nuclear reactor in Country A on behalf of Country B (where both Country A and B are Annex I Parties) which resulted in additional output, either through improved performance or extension to the operating lifetime. If it could be demonstrated that this additional output displaced electricity generation from greenhouse gas emitting sources then the project would be eligible for credit for the emissions avoided.

The CDM operates in a similar way to the JI mechanism in that credit would be given for projects carried out that resulted in lower greenhouse gas emissions than would have otherwise occurred. However, the CDM applies to projects carried out in countries that are non-Annex I Parties (i.e. developing countries). As these countries do not have an assigned emissions reduction target under the Kyoto Protocol they can not transfer emissions credits to an Annex I Party seeking to carry out a project. Instead it is expected that an official body will be set up to evaluate CDM projects and award Certified Emissions Reduction credits (CERs) based on the emissions avoided. These CERs may be used by an Annex I Party towards meeting its emissions target.

A sponsoring Party may authorise legal entities to carry out projects on its behalf.

The CDM mechanism has another objective, namely to assist developing countries in achieving sustainable development. It is this second objective that provoked considerable debate on the eligibility of nuclear power projects. Whether or not nuclear power projects will be eligible for the CDM is one of the issues that will be discussed at COP 6. Nuclear power projects are not the only type of project facing objections against inclusion in the CDM. The use of sinks (e.g. forestry projects and land use management) and cleaner fossil fuel technologies are also facing objections.

The Current Position on Nuclear Energy and the Kyoto Mechanisms

The latest text on the eligibility of nuclear energy for the Kyoto Mechanisms was drafted at a meeting of the subsidiary bodies in Bonn in June 2000. The draft consolidated text excludes the use of nuclear power explicitly and presents barriers to nuclear projects even if the explicit exclusion is removed. It states:

“CDM projects shall:

- (a) Assist the host Party in achieving sustainable development;
- (b) Provide reductions in emissions by sources, [or an enhancement of removals by sinks] that are additional to any that would occur in the absence of the proposed CDM project activity, and contribute to real, measurable, and long-term benefits related to the mitigation of climate change;
- (c) Be based on the best available long-term environmental option, taking into account local and national needs and priorities;
- (d) Lead to the transfer of state-of-the-art, environmentally sound technology in addition to that required under other provisions of the Convention and Protocol;
- (e) Give priority to renewable energy, energy efficiency technologies that are at the top end of efficiency practise anywhere, reducing emissions from the transportation sector and carbon sequestration for the combating of desertification;
- (f) Not support the use of nuclear power;
- (g) Not include activities enhancing anthropogenic or non-anthropogenic removals by sinks of greenhouse gases until the outcome of methodological work on Article 3, paragraphs 3 and 4, is reached and the COP/MOP decides on eligibility of such projects activities in the CDM; and
- (h) Not include types of project activities excluded by a decision of COP/MOP due to concern about, *inter alia*, their additionality, their overall environmental integrity, methodologies to estimate GHG levels for such projects or their potential to cause negative impacts in relation to the domains covered by other multilateral environmental agreements.”

The clauses set out above, with the exception of Clause (a), have also been included as an optional requirement for JI projects. Some developing nations want to place the CDM criteria on JI projects because of fears that the additional cost of the CDM criteria could lead Parties to invest in JI projects between developed countries instead of CDM projects with developing countries.

It is worth considering how some of these clauses could impact on a nuclear power project. The most obvious barrier to such a project is Clause (f), which explicitly excludes nuclear power projects. Countries would still be able to set up national policies to tackle climate change that could recognise the climate change benefits of nuclear power. However, exclusion at an international level would add considerable political leverage to those who would oppose national measures that treated nuclear power in this way.

Whilst attention has focussed on this explicit exemption of nuclear power it should be recognised that other clauses could be used to challenge nuclear power projects. Clause (a) sets out the requirement that projects must contribute to sustainable development. It is interesting to note that objectors to nuclear power are seeking an explicit exclusion of nuclear power from the CDM on the grounds that it would not meet the criteria of sustainable development. If the objectors were confident that this was the case then a specific exclusion of nuclear power would not be required, as a nuclear power project would fail to satisfy Clause (a).

Clause (d) raises the issue of technology transfer. In the absence of an explicit exclusion opponents of nuclear energy may seek to challenge whether nuclear power is an environmentally sound technology. Clause (e) introduces the concept of a positive (or priority) list. This concept has received some support from the UK government. Positive lists are discussed later in this paper. Clause (h) could be used to attempt to exclude nuclear power projects if the explicit exclusion (f) was removed. The clause is so broad in its scope it is hard to imagine many projects that could not be challenged by it.

It is important to recognise that the exclusion of nuclear power in the above text only recognises that at least one Party has proposed this exclusion. At this stage there has been no formal debate on the exclusion and at least one Party has objected to its inclusion. Indeed objections have been made to all the clauses. It therefore is possible that all, some or none of the clauses will appear in the final text.

The Position of Parties on Nuclear Power and the Kyoto Mechanisms

Opposition to the inclusion of nuclear power within the Kyoto Mechanisms was always likely to be an issue of contention because of the varying positions taken on the use of nuclear power by individual Parties.

Objections to the inclusion of nuclear power in the Kyoto Mechanisms were made by the Association of Small Island States (AOSIS) at COP 5 and by Saudi Arabia during the June 2000 subsidiary body meeting. During the same meeting, Canada objected to the exclusion of any options from the CDM. Thus an objection to the exclusion of nuclear power projects has been noted in the negotiating text.

AOSIS is one of several groupings of Parties, each with a different stance on the inclusion of nuclear power in the Kyoto Mechanisms. Other groupings of Parties include the “Umbrella Group”, the G77 and China, and the European Union.

The Umbrella Group consists of Australia, Canada, Iceland, New Zealand, Norway, the Russian Federation, Ukraine and the United States. This group

opposes the exclusion of non-emitting technologies from the CDM. It includes some Parties that have high energy consumption and wish to maximise the use of the Kyoto Mechanisms in order to meet their targets. Other Parties, such as the Russian Federation and Ukraine, are likely to have much lower emissions than their Kyoto Protocol targets and therefore will be opposing any arbitrary limit on the trading of assigned amounts.

The G77 and China consists of the developing countries. This group opposes any restrictions on the CDM that may restrict the flexibility of individual Parties in determining their future technology options. At present few countries in this group have plans to use nuclear power to meet their energy needs. However, some parties will face increasing pressures to increase their energy supply infrastructure and the use of nuclear power plants could make a major contribution to the avoidance of greenhouse gas emissions.

The majority of countries in the European Union are opposed to the inclusion of nuclear power in the CDM. However, France and the UK have opposed an outright exclusion of nuclear power. A compromise position has emerged where the European Union will support the concept of a "positive list" that would include technologies such as renewables and energy efficiency. This positive list would not exclude other technologies, such as nuclear power, from the CDM. As yet it is unclear as to what benefits would be gained from being on a positive list.

The opposition to the inclusion of nuclear power by Saudi Arabia is interesting. Saudi Arabia, a major oil exporter, has much to lose from an international agreement to reduce greenhouse gas emissions. It has recently played a key role in easing the rising cost of crude oil by announcing that it would increase oil output. The issue of oil prices has played a part in the run up to the United States presidential elections. The rising oil price resulted in gasoline prices reaching the US\$2 a gallon level. This had a negative impact on the popularity of the incumbent Democratic administration. It is possible that oil prices will still be high at the time of COP 6. There may be conflicting pressures to encourage Saudi Arabia to increase oil output in the short term whilst seeking to reach agreement on the long-term aims of the Kyoto Protocol.

The Position of Non-Governmental Organisations

Non-governmental organisations (NGOs) participating in the climate change discussions fall into two main subdivisions. Organisations are either Environmental Non-Governmental Organisations (ENGOs) or Business and Industry Non-Governmental Organisations (BINGOs).

The ENGOs are very effective in portraying a common opposition to the inclusion of nuclear power in the Kyoto Mechanisms, even if the status of nuclear power is not a priority issue for every ENGO. Various reasons are put forward for the exclusion of nuclear power, only some of which are directly related to the terms of the negotiating text. A key issue raised by ENGOs is the issue of sustainability. They argue that nuclear power is not a sustainable energy source and therefore it does not meet the criteria set out for the CDM.²

It could be argued that as uranium reserves are finite nuclear power is not infinitely sustainable. It should be noted, however, that the potentially exploitable reserves of uranium are very large, particularly if one includes the

uranium resource in seawater and the use of fast reactors. It is also worth remarking that many renewable energy sources are not infinitely exploitable because they are constrained by a finite number of suitable sites.

Furthermore, the negotiating text states that CDM projects should “assist the host Party in achieving sustainable development”. This clearly allows projects which are not wholly sustainable to be eligible for the CDM provided that they contribute to an overall programme of development that is sustainable.

It is also worth noting that if it is accepted that nuclear power does not “assist the host Party in achieving sustainable development” then it would not be necessary to include an additional clause in the negotiating text specifically excluding nuclear power.

Another objection to the inclusion of nuclear power in both the CDM and JI is that there may be so many opportunities for projects involving nuclear power that it will significantly reduce the number of opportunities for other projects, including renewable energy projects. This is a somewhat confused argument that could be interpreted as demonstrating the important contribution that nuclear power could make to reducing emissions. It also suggests that some nuclear power projects would be more attractive investments than renewable energy projects.

In the short term this objection is not likely to be valid in relation to new nuclear build projects because of the current long lead times. However some ENGOs have suggested that securing additional output from, for example, life extensions to existing reactors, could also take up a considerable proportion of projects.

In the longer term significant growth in energy demand is expected globally. If this demand is met with conventional fossil fuels then the resultant greenhouse gas emissions could pose a serious threat to the environment. Therefore it should not be surprising if a significant proportion of CDM projects are related to the energy sector.

It is also worth noting that CDM projects will earn emission credits only where it can be demonstrated that emissions are being avoided. In general this would mean, for example, a nuclear power plant being built in place of a large fossil fuel power plant. It is likely that large fossil fuel power plants will be built where there is the existing infrastructure to support the transmission of electricity through electricity grids. In comparison many renewable energy projects will be better suited to where there is a lower level of energy demand and the energy supply infrastructure is not suited to large power plant.

Further objections are raised to the participation of nuclear power on the basis of existing arguments against the use of nuclear power. One lobbying activity suggested that the inclusion of nuclear power would turn the CDM into the “Chernobyl Deployment Mechanism”. There was a significant effort by some ENGOs at the meeting of the subsidiary bodies in June 2000 to use the accident at Tokai Mura as a lobbying point against the general inclusion of nuclear power in the CDM. The strategy would appear to try to create a climate of fear against nuclear power.

The nuclear industry recognises that some countries have made the decision not to use nuclear power. However, it also recognises that some countries are using nuclear power to meet their greenhouse gas emissions reduction targets and some developing countries want the option of using nuclear power as part of their specific sustainable development programme. Individual developing countries are best placed to determine their own sustainable development needs.

As previously remarked, the ENGO community is able to adopt a unified position of opposition to the participation of nuclear power in the Kyoto Mechanisms. In contrast the BINGOs do not have a unified position. Indeed, the issue of the participation of nuclear power in the Kyoto Mechanisms is not a key issue for the BINGOs as a whole.

The BINGO community is open to representatives from all areas of the business and industry community. Some representatives are opposed to the whole Kyoto Protocol process. Some oil companies distribute literature highly sceptical of the concept of climate change. Other oil companies such as BP Amoco have accepted the importance of climate change but clearly have no interest in assisting the nuclear industry.

Representatives of various nuclear trade associations have put a considerable amount of time and effort into supporting the nuclear industry at the COP and at meetings of the subsidiary bodies. However, additional support, both during the meetings and in the intervening periods, would be welcome, particularly from the more senior members of the industry who may be better placed to communicate with government officials.

The Potential Effect of Economic Instruments on Nuclear Energy

As has been described in this paper there is considerable debate over whether nuclear power projects should be included or excluded from participation in the Kyoto Mechanisms. One important issue to consider is whether the inclusion or exclusion of nuclear power from the mechanisms will have any impact on the prospects for new nuclear build.

Answering this question is difficult, if for no other reason that the strong influence of fuel costs on the overall generation costs of fossil fuel plant are such that it is difficult to make a valid assessment of the future costs of different generation techniques. However, the potential credit for the avoidance of greenhouse gas emissions can be illustrated by converting the value of carbon from the price per tonne of carbon to the price per kWh for different generation technologies.

This conversion is shown for coal-fired generation in Tables 1a and 1b, and for gas-fired generation in Tables 2a and 2b. Values are shown for permits with units of tonnes of carbon dioxide (tCO₂) and tonnes of carbon (tC).³ This is because both these units are used regularly when defining quantities of greenhouse gas emissions and it is important to be certain as to what units are being used. As can be seen in the tables, the difference between the two units in terms of the equivalent value is large, therefore care is needed to ensure the correct conversion is used.

The future trading price of emissions permits is a much-debated issue. However it is not unreasonable to assume a trading price of around US\$25/tC as a possible price over the first compliance period. At this level the value of carbon emission reduction credits for a nuclear generator would be worth around 6.5 mills/kWh in comparison to a coal plant and 3.0 mills/kWh in comparison to a gas plant (1 mill = US\$0.001).

The impact of carbon emission credits valued at this level would depend on the individual circumstances which would vary from country to country. In the future more demanding emissions reduction targets may drive the value of carbon emission reduction credits higher.

Another way of considering the impact of assigning a value to the avoidance of carbon emissions is to off-set the capital costs of reactor construction by trading in futures for the carbon permits that would be earned from the project. Greenpeace has used such a scenario in its briefing: “The Clean Development Mechanism: An Instrument for Sustainable Development or a New Nuclear Subsidy.” The Greenpeace data considers replacing a 700 MWe coal fired power station with a similarly sized nuclear reactor.

According to Greenpeace, the 700 MWe coal fired power station would emit around 4.5 million tonnes of carbon dioxide every year. If instead a nuclear power station was built the carbon offset could be traded. Likely carbon dioxide permit levels are estimated to be US\$10–30 per tonne of carbon dioxide. The carbon offset earned by the nuclear power station would be worth between US\$450 million and US\$1.35 billion (ignoring the discounting of future credits). Greenpeace suggests a new 700 MWe nuclear power station would cost between US\$2.5–3.0 billion. On this basis the value of the trade in emission credits futures would reduce the capital cost by between 15–40%.

The nuclear industry is seeking ways to improve the economics of electricity generation from nuclear energy, including reductions in capital costs. Therefore it is possible that trading in emission credit futures will be able to cover a higher proportion of the capital costs than suggested by the Greenpeace calculation.

The Cost of Excluding Nuclear Energy

To conclude it is perhaps worth considering what would be the effect of excluding nuclear power from climate change policies and measures, both nationally and internationally.

It is a mistake to consider taxes and emissions trading permits as subsidies for nuclear energy, renewable energy, or any projects that can help reduce greenhouse gas emissions. Under the current situation electricity generation from fossil fuels is being subsidised. We will all pay for the cost of dealing with economic, social and environmental damage caused by climate change. Perversely it is some of the poorest countries that are most at threat from climate change, whilst it is the developed countries who are primarily responsible for causing climate change through their use of fossil fuels.

Using nuclear power instead of fossil fuels is one way of combating climate change. In some cases it will be the best option. If that option is denied then the cost of either avoiding climate change or adapting to it will be raised. For

developed countries this may slow their progress in reducing emissions. Developing countries may find it harder to avoid the temptation of using fossil fuel generation to meet their energy needs in the absence of foreign investment.

The exclusion of nuclear energy will not stop the nuclear industry in its tracks. In some countries nuclear power remains a valued component of energy supply. New nuclear power stations are still being built. Those entering service over the next decade can be expected to be operating well into the middle of the twenty-first century. These new stations will require fuel supply, spent fuel management, and waste management and decommissioning services.

Even if nuclear energy is eligible for Kyoto Mechanism projects there will be considerable challenges to be resolved. Some governmental representatives and members of the public will still have the same concerns in relation to perceived risks from proliferation and safety as they do today. The nuclear industry will have to continue to engage in the debate on these issues.

Nevertheless, the treatment of nuclear energy in climate change policies is important to the nuclear industry. If nuclear energy were excluded it would not be because of doubts over its contribution to avoiding climate change. Instead it would be excluded because of other environmental and political issues. Any exclusion would send out a signal that Parties that may support the use of nuclear power in combating climate change, who support the right of developing nations to determine their own sustainable development needs, and who recognise that nuclear power makes a valuable contribution to securing a safe and diverse supply of energy, are willing to yield to those who take an opposing view.

Summary

The ultimate objective of the international action on climate change is to stabilise atmospheric greenhouse gas emissions at a “safe level”. Climatologists suggest that this will require a 60% reduction in global greenhouse gas emissions. The implications for global economic development and energy supply are huge. The world will change dramatically over the next one hundred years, either as a result of the programmes put in place if we are successful in reducing greenhouse gas emissions, or as a result of the environmental damage caused by climate change if we fail.

Nuclear energy can make an important contribution to meeting the increasing global demand for energy and assisting in the sustainable development of developing countries. However the scale of that contribution will depend on how nuclear energy is treated in the emerging environmental legislation.

If the climate change benefits of nuclear energy are not reflected in national and international climate change policies then the existing inequities in the treatment of different electricity generation technologies will be made worse.

REFERENCE AND FOOTNOTE

1. Statement by the international nuclear power industry to the Third Conference of the Parties to the UNFCCC in Kyoto (Available at <http://www.uilondon.org/uifostat.htm>).
2. The discussion relating to sustainability in this paper reflects only one definition of 'sustainable'. There are other valid definitions of 'sustainable'.
3. Tonnes of carbon (tC) may be converted to tonnes of carbon dioxide (tCO₂) by multiplying by 44 (the molecular weight of CO₂) and dividing by 12 (the atomic weight of carbon).

Table 1a. Emission permit values in terms of US\$/tCO₂ and their equivalents in terms of mills/kWh when comparing coal-fired generation to nuclear power (1 mill = US\$0.001).

Emissions permit values (US\$/tCO₂)	Value (mills/kWh)
5	4.8
10	9.6
15	14.3
20	19.1
25	23.9
30	28.7
40	38.2
50	47.8
100	95.5

Table 1b. Emission permit values in terms of US\$/tC and their equivalents in terms of mills/kWh when comparing coal-fired generation to nuclear power.

Emissions permit values (US\$/tC)	Value (mills/kWh)
5	1.3
10	2.6
15	3.9
20	5.2
25	6.5
30	7.8
40	10.4
50	13.0
100	26.0

Table 2a. Emission permit values in terms of US\$/tCO₂ and their equivalents in terms of mills/kWh when comparing gas-fired generation to nuclear power.

Emissions permit values (US\$/tCO₂)	Value (mills/kWh)
5	2.2
10	4.5
15	6.7
20	8.9
25	11.2
30	13.4
40	17.8
50	22.3
100	44.6

Table 2b. Emission permit values in terms of US\$/tC and their equivalents in terms of mills/kWh when comparing gas-fired generation to nuclear power.

Emissions permit values (US\$/tC)	Value (mills/kWh)
5	0.6
10	1.2
15	1.8
20	2.4
25	3.0
30	3.6
40	4.9
50	6.1
100	12.1