



Nuclear energy

The discovery, in the 1950s, that nuclear energy would provide an “infinite and benign source of energy”, led to this form of energy becoming tremendously popular in some Western countries. Nowadays, nuclear energy accounts for 16% of the total global electricity production. The positive approach to nuclear energy has suffered greatly over the past few decades, due to serious accidents involving nuclear power stations, such as in Chernobyl (Ukraine, 1986) and Three Mile Island (US, 1979). Since then, debates regarding nuclear energy have been shrouded in an atmosphere of intense controversy. The following explanation rids the debate of its veil of subjectivity and lists the pros and cons of nuclear energy.

1. What is nuclear energy?

Nuclear energy is created through the splitting of uranium, plutonium or thorium or through the fusion of hydrogen to helium. Nuclear fission produces 10 million times more energy than burning coal, though nuclear energy also produces waste that consists of gases, fluids and radioactive solid waste.

Nuclear energy as a source of electricity

PRO	CON
<p>Nuclear energy provides a substantial contribution to electricity production.</p> <p>Nuclear energy accounts for 16% of the world's electricity production.</p>	<p>Electricity production accounts for 9% of greenhouse gases that arise as a result of human activities.</p> <p>(1) In practice, nuclear power stations only produce electricity. The surplus thermal energy is not valorised.</p> <p>(2) Nuclear energy necessitates large, inflexible network systems, whereas the trend is growing more and more towards small production systems for safety and efficiency reasons and as a result of efforts to achieve greater independence of energy sources.</p>
<p>Nuclear energy is a reliable and stable source of energy.</p> <p>Electricity production by means of fission does not depend on weather conditions, as in the case of wind and solar energy.</p>	<p>Nuclear energy does not guarantee an energy independence.</p> <p>Uranium is necessary for the production of nuclear energy from fission. This material is generally not available in the country in which nuclear energy is produced.</p>



Waste processing in the case of nuclear energy

PRO	CON
<p>The quantity of waste produced in the case of nuclear energy is very small. Safe storage of radioactive waste is possible.</p> <p>(1) The quantity of waste is very small in comparison with the quantity of waste produced when electricity is generated from fossil fuels. Radioactive waste is first of all temporarily stored. Afterwards, radioactive waste is stored at the final storage location, where it can be stored safely for a long period of time.</p> <p>(2) The emission of classic substances that pollute the air (such as sulphur, nitrogen oxides and greenhouse gases) is negligible.</p>	<p>In the case of nuclear energy, the quantity of waste produced is not the problem, but rather the dangerous radioactivity of the waste.</p> <p>(1) Mildly and moderately radioactive waste amounts to 97% of the total volume of nuclear waste, yet represents just 5% of the total radioactivity,</p> <p>(2) Highly radioactive waste is believed to be stored deep under the ground, however this process requires a great deal of time, in view of the fact that the implementation of such a waste programme involves pressure for political bodies and as a consequence is hindered by public protests (the 'not in my backyard' principle) and political discussions. In addition, it is also the case that highly radioactive waste remains radioactive for up to 240,000 years, as a result of which the monitoring costs are immeasurable over such a time scale.</p>
<p>There is possibility that the radioactivity of waste can be reduced.</p> <p>Transmutation methods can convert highly radioactive waste into mildly radioactive waste. This shortens the natural decomposition of the radioactive element and reduces the radioactivity.</p>	<p>Transmutation methods have not yet been successful.</p> <p>Although the theoretical possibility of reducing the radioactivity of the waste exists, the transmutation methods have to date proved to be unsuccessful in practice.</p>

Safety and health risks of nuclear energy

PRO	CON
<p>Nuclear energy has a low environmental impact in comparison with electricity generation via coal, oil and gas.</p> <p>According to the AMPERE commission and taking into account the private and external costs, nuclear energy constitutes one of the cheapest technologies for electricity production in Belgium. The commission primarily takes into account the external environmental costs and the accident risks. Other pros and cons, such as the contribution to the security of supply of uranium, the production in basic load, vulnerability to terrorist acts and public perception were not taken into account in this exercise.</p>	<p>Nuclear energy has already had serious environmental and health impacts.</p> <p>(1) Besides the large-scale historic disasters in Chernobyl and Three Mile Island, it is suspected that various smaller leakages and problems have not been reported.</p> <p>(2) As a result of the privatisation and liberalisation of the energy market, electricity producers may be forced to increase their efficiency and reduce their costs. This could increase the risk of accidents.</p>



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<p>Nuclear reactors and means of transportation are equipped with well-developed safety systems and as a result of this, risks are kept to a minimum.</p> <p>With the expansion of the EU, the safety of nuclear energy is taking an increasingly higher position on the agenda.</p> <ol style="list-style-type: none"> (1) No accidents have ever been reported during the <u>transportation</u> of highly radioactive material. (2) Until now, there have been just two serious incidents within <u>nuclear plants</u> within a span of 50 years (Chernobyl, 1986 and Three Mile Island, 1979). 	<p>A single disaster and radiation from radioactive elements have a far-reaching effect on human health, the environment and society.</p> <ol style="list-style-type: none"> (1) Transport of radioactive material is risky. Containers filled with highly radioactive waste contain the quantity of radiation that was released during the Chernobyl incident. (2) Health effects as a result of serious incidents in nuclear plants: <ul style="list-style-type: none"> • critical effects, such as death and burns, etc. • long-term effects, such as cancer, hereditary disorders, etc. • non-radiological effects, such as headaches, depression, sleeping disorders, etc. • social and psychological health effects, such as the collapse of the social structure of society, etc. • environmental effects.
<p>Nuclear power stations are sufficiently solid to withstand a terrorist attack and extreme weather conditions.</p> <p>Studies have reported the possible risks in the event that a terrorist attack is committed on nuclear power stations. The Electric Power Research Institute concluded that nuclear power stations are sufficiently solid to withstand a terrorist attack. They can withstand hurricanes, tornados, flooding and atmospheric objects.</p>	<p>Nuclear reactors may constitute a target for terrorists or may have to face extreme and unpredictable weather conditions.</p> <p>Some studies are not certain that nuclear power stations could offer sufficient resistance to such conditions. They do not exclude the possibility that an aeroplane could penetrate through a 1.5 metre thick concrete wall. The possibility of terrorists receiving inside help must also be taken into account.</p> <p>In addition to the danger of an attack, there is also a risk that terrorists could come into possession of radioactive material (including plutonium 239), on the basis of which the terrorists can build a 'dirty bomb'. This material is frequently derived from clinical waste, which is stored at easily accessible storage locations.</p>

Cost price of nuclear energy

PRO	CON
<p>Nuclear energy is cheaper than alternative energy.</p> <p>Once the nuclear reactors have been built, they produce useful, low-carbon electricity for many years and at a low cost. As a result of this, it is more profitable from an economic point of view to continue to produce existing nuclear energy than to switch off nuclear reactors.</p>	<p>Nuclear energy is too expensive and does not constitute an economically competitive equivalent for electricity generation by means of gas and oil.</p> <p>The construction of a traditional coal or gas power station is cheaper than the construction of a nuclear power plant. The production costs entail investment, personnel and fuel costs. In addition, the external costs, including for example dismantling costs, accident risk and waste processing, are often not taken into account. Finally, the costs of nuclear energy are continuing to rise, whereas the costs of renewable energy are falling reasonably quickly, due to technological advancement (efficiency and economies of scale).</p>



Sustainability of nuclear energy

PRO	CON												
<p>Nuclear energy is sustainable in respect of the energy supply.</p> <p>The availability of uranium is exceptionally large, but nevertheless is limited. Despite the limited supply of uranium however, nuclear energy is sustainable from an economical point of view. This is due to the fact that the adaptation of the markets and the technological evolution create a tremendously large number of possibilities.</p>	<p>Nuclear energy is not sustainable in respect of the energy supply.</p> <p>Uranium is a non-renewable source of energy and as a result is exhaustible. The more consumption increases, the more dramatically the price of uranium ore will increase. Given the current consumption level (37,000 tonnes per year), there is enough uranium to last approximately 50 years. New reserves (14.4 million tonnes) can be tapped, but these are expensive to mine and the degree of usable uranium is low. If a decision were taken to replace all electricity generated from fossil fuels with electricity generated by nuclear energy, there would be enough fuel for 3 to 4 years.</p>												
<p>Nuclear energy is ONE solution for the reduction of CO₂-emissions.</p> <p>The International Atomic Energy Agency states that nuclear energy has a CO₂ –emission equal to that of wind energy and which is significantly lower than the emissions released during the burning of fossil fuels.</p> <table border="1" data-bbox="219 1060 743 1333"> <thead> <tr> <th>Production method</th> <th>Greenhouse gas emissions (CO₂-eq./kWh)</th> </tr> </thead> <tbody> <tr> <td>Wind</td> <td>20</td> </tr> <tr> <td>Hydroelectricity</td> <td>33</td> </tr> <tr> <td>Nuclear energy</td> <td>35</td> </tr> <tr> <td>Gas combined cycle</td> <td>400</td> </tr> <tr> <td>Coal-fired power plant</td> <td>1000</td> </tr> </tbody> </table>	Production method	Greenhouse gas emissions (CO ₂ -eq./kWh)	Wind	20	Hydroelectricity	33	Nuclear energy	35	Gas combined cycle	400	Coal-fired power plant	1000	<p>Nuclear energy is not THE solution for climate change.</p> <p>(1) In the context of the projects introduced by the Kyoto protocol, nuclear energy is excluded as an option for combating greenhouse gases.</p> <p>(2) The reclamation process of uranium is an intensive process in terms of energy and CO₂. The dismantling process and waste processing activities also require energy.</p> <p>(3) Nuclear energy stands in the way of an effective approach to the problem of greenhouse gases. Investments for renewable energy are lost in investments in nuclear energy.</p> <p>(4) The construction of additional nuclear power stations requires time: Once the infrastructure is present, the expected time between political decisions and the commercial application amounts to between 7 and 15 years. In the event that there is no previous experience, this process can take even longer. It is impossible to take advantage of the potential benefits of nuclear energy in the short term.</p>
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Sources:

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2. Nuclear energy policy KBC Asset Management (with the approval of the External Sustainability Analysis Advisory Board)

Nuclear energy is clearly a controversial technology. In the context of the sustainability screening, KBC Asset Management views nuclear energy as a controversial practice and technology and as such is condemned.

KBC Asset Management Vision

Nuclear energy is not the **LONG** term solution to the energy problem, but is, in the SHORT term, **one of the solutions** for bringing about the transition to a new era of energy.

In concrete terms for companies in the sustainable investment funds

For companies that own or manage a nuclear power plant (= code 3 nuclear energy), the following policy applies:

Condition 1. Companies are excluded

- if more than 50% of the energy production is derived from nuclear energy;
- OR the company does not produce any energy from renewable energy sources;
- OR the company is not sufficient transparent with regard to its nuclear activities;
- OR the company has been confronted with nuclear accidents.

Condition 2. Companies can be included

if the share of nuclear energy in the total energy mix reduces in favour of an increase in the share of energy produced using technologies that are more environmentally-friendly (these include renewable energy).

Details condition 2:

1. The share of nuclear energy is the same or reduces.
2. The share of renewable energy increases.
3. The annual CO2 emissions reduce in terms of t/GWh.
4. The future vision is oriented towards renewable energy.