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Nuclear Now for Sustainable Development

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Introduction

Around two billion people have no access to electricity services. For another two billion people electricity supplies are unreliable. The remaining two billion people have adequate electricity services, but the way in which the majority of electricity they use is generated results in unsustainable levels of greenhouse gas emissions.

How can we meet the expected sharp increase in demand for affordable, reliable electricity without putting the Earth's climate in jeopardy? One answer is with the new generation of nuclear power stations.

The need for clean, secure, reliable energy

In the United Kingdom, the government is undertaking an energy review. The review will be looking at the UK's energy strategy for the next fifty years.

Reducing greenhouse gas emissions must be one of the key objectives of a new energy strategy. But equally important in the pursuit of a sustainable energy infrastructure is security and reliability of supply.

The government predicts that, over the next twenty years, the UK will become increasingly reliant on gas for electricity production. And most of that gas supply will have to be imported, putting security of supply at risk (*Figure 1*).

Globally, the demand for secure, reliable and affordable electricity is expected to increase dramatically over the next fifty years. But at the same time global greenhouse gas emissions may have to fall by more than 60% if we are to remain on track to avoid the worst effects of climate change.

Most developed countries are reliant on a high proportion of their energy supplies coming from burning fossil fuels. Developing countries need energy and developed countries need to change the way they produce energy.

Nuclear meets the challenges of sustainable development

The World Summit on Sustainable Development in Johannesburg has drawn attention to the fact that energy is a key requirement for sustainable development.

BNFL believes that, to be compatible with sustainable development principles, electricity generation should:

- avoid greenhouse gas emissions to minimise climate change;
- minimise the environmental impact of operations and meet appropriate standards;
- generate enough power for everybody's needs at an affordable price; and
- use fuel reserves and land resources responsibly.

Nuclear power meets these challenges and should be a key component of future energy supply strategies to meet the needs of the environment, society and the economy.

Answering the challenge – new designs for sustainable energy

Over 400 nuclear reactors are already contributing positively to the world's energy mix. And new designs, such as the AP1000, can make an even greater contribution to all three pillars of sustainable development.

Electricity must be affordable. The AP1000 is a cost-effective solution because it uses tried and tested components in an innovative design that eliminates the need for between 35-80% of key components, compared to a typical two-loop design (*Figure 2*). This reduced component requirement also helps to reduce the overall size of the AP1000, and the land area required to site one.

In certain countries, some fossil-fuel generators may be able to sell electricity at a lower price than an AP1000. However, this is largely because fossil-fuel generators are not required to internalise the cost of their greenhouse gas emissions. If those costs are included, as was determined by the European Commission's ExternE projects (*Figure 3*) it can be seen that new designs such as the AP1000 are amongst the most cost-effective forms of generation.

In terms of the environment, the AP1000, if compared to a gas-fired power station, will avoid the emission of around 3.5 million tonnes of greenhouse gas emissions. Just ten AP1000 reactors could reduce the UK's greenhouse gas emissions by 6%. In comparison, more than 25 000 1MW wind turbines would be needed to save the same amount.

Of course, nuclear power stations produce wastes. But the key difference between nuclear power plants and fossil-fuel power plants is that nuclear includes provisions for waste management and disposal in its generation cost so that financial resources are available to those who will have to deal with the waste. Unfettered, the social costs of the effects of climate change could last for generations.

While the continued use of fossil fuel presents a clear danger, it is the perceived danger of nuclear power stations that represents one of the challenges to improving public acceptance of nuclear power. The nuclear industry needs to dramatically improve the way in which it communicates the benefits of nuclear technology to the general public.

The PBMR – progress from partnership

Innovation is helping to bring new solutions to the electricity supply market and progress will not stop. BNFL has entered into partnership with Eskom, the South African energy company, and others to develop the PBMR – the Pebble Bed Modular Reactor.

If the project can realise its goals, the small size of the PBMR would make it more suitable for emerging electricity markets where there may not be sufficient demand for a conventional reactor. It could also be used to meet gradual increases in mature energy markets, offering more flexibility to operators.

The PBMR is being developed by Eskom as a solution to South Africa's energy needs. However, if the project can fulfil its promise, PBMR reactors could play a significant role in new nuclear build programmes in other developing and developed countries.

Waste – something we can manage

The nuclear industry is often told that it cannot contribute to sustainable development because it 'has no idea how to deal with its waste'. This is simply not the case.

The wastes from the UK nuclear industry are being stored and managed safely. Such storage systems can be used to safely isolate nuclear waste for many decades while permanent disposal options are developed.

Solutions for permanent waste disposal are being developed now. In Finland and at the Yucca Mountain site in the US, good progress is being made in turning well-developed technical designs into practical solutions. In the UK, we look forward to the government concluding its review of nuclear waste and implementing a sound strategy.

Part of the solution to managing nuclear waste is to avoid producing it in the first place. New reactor designs produce far lower volumes of waste than previous designs. Of course, the economic assessment of new nuclear reactors includes the cost of management and disposal of its wastes. New plant is also designed to facilitate eventual decommissioning.

From safe to sustainable

Over its nearly 50-year history, the nuclear industry has taken greater strides. The early industry had one priority – to develop an industry that was safe.

Today the industry is going beyond that, to develop solutions that minimise environmental impacts over and above those related to safety.

However, the way in which the nuclear industry is regulated is challenging its ability to truly contribute to sustainable development. Arbitrary tightening of discharge limits may bring negligible environmental gain and the new limits are set with little regard for the economic or social impacts. Future regulatory regimes

must consider the triple bottom line to ensure limits meet the criteria of sustainable development.

Governments need to deliver

The Johannesburg Summit has highlighted the importance of energy for sustainable development. Now governments need to show that they will support all technologies that can help deliver sustainable development.

In the Asia-Pacific region, governments have supported nuclear power as a low-carbon emissions component of their energy mixes. In the US, the government has shown a lead by establishing the 'Nuclear Power 2010' programme to support new nuclear development. The UK would benefit from a similar programme.

The UK government is currently undertaking an energy review, which will set a strategy for the next 50 years. The future role of nuclear in the energy mix is a key question to be answered. The government should take advantage of the opportunity the energy review provides to overcome some inequities in the electricity supply sector. These inequities threaten to make the UK reliant on CO₂-emitting gas-fired power plant, and reliant on imports that threaten this country's security of supply.

The government should reform its climate change strategy and introduce economic mechanisms that will recognise the value of the greenhouse gas emissions avoidance provided by nuclear energy. In addition, it should reform the way in which planning approval is granted. It is important that there is full and open consultation on any major project, such as the construction of a new nuclear power plant, but the current protracted process is preventing the right decisions being taken.

Conclusion

The Johannesburg Summit has shown that, now more than ever, it is important that governments show leadership and commitment to sustainable development.

It is important that we, as nuclear companies, embrace sustainability principles and ensure that the way in which we carry out our business supports sustainable development. We need to do that because nuclear energy is an essential part of sustainable development.

Nuclear generation is part of the electricity mix in countries with more than half of the world's population. And it supplies electricity without irrevocably damaging the world's climate. It can help supply the clean, safe and reliable electricity that is essential for sustainable development.

Figure 1: Projection of increased reliance on gas-fired generation.

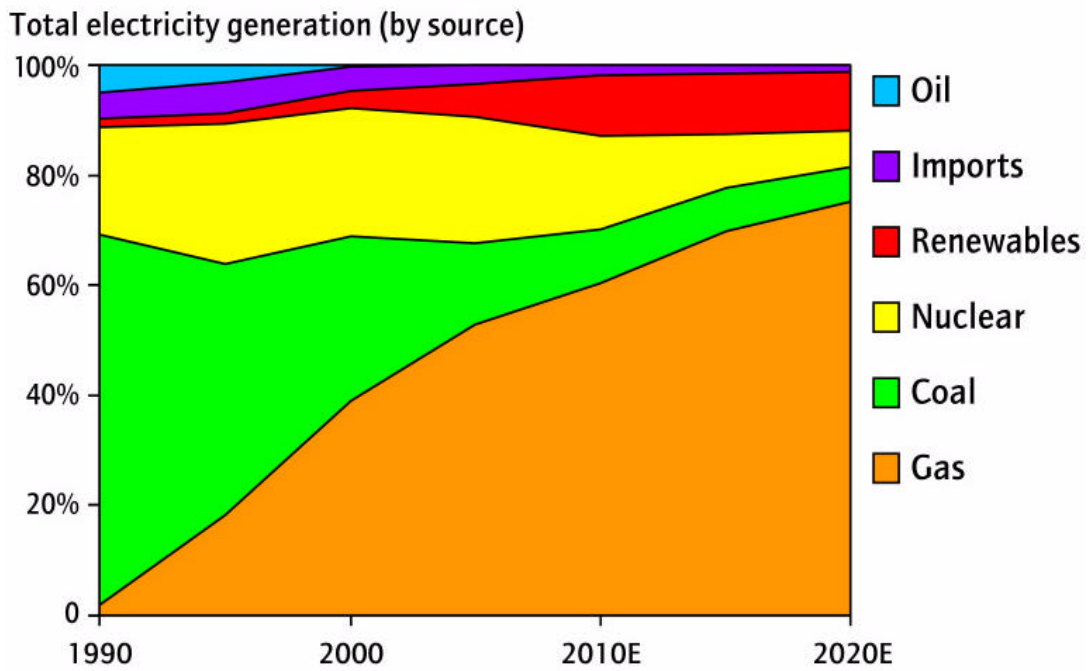


Figure 2: Improving efficiency of plant through reduced component requirement

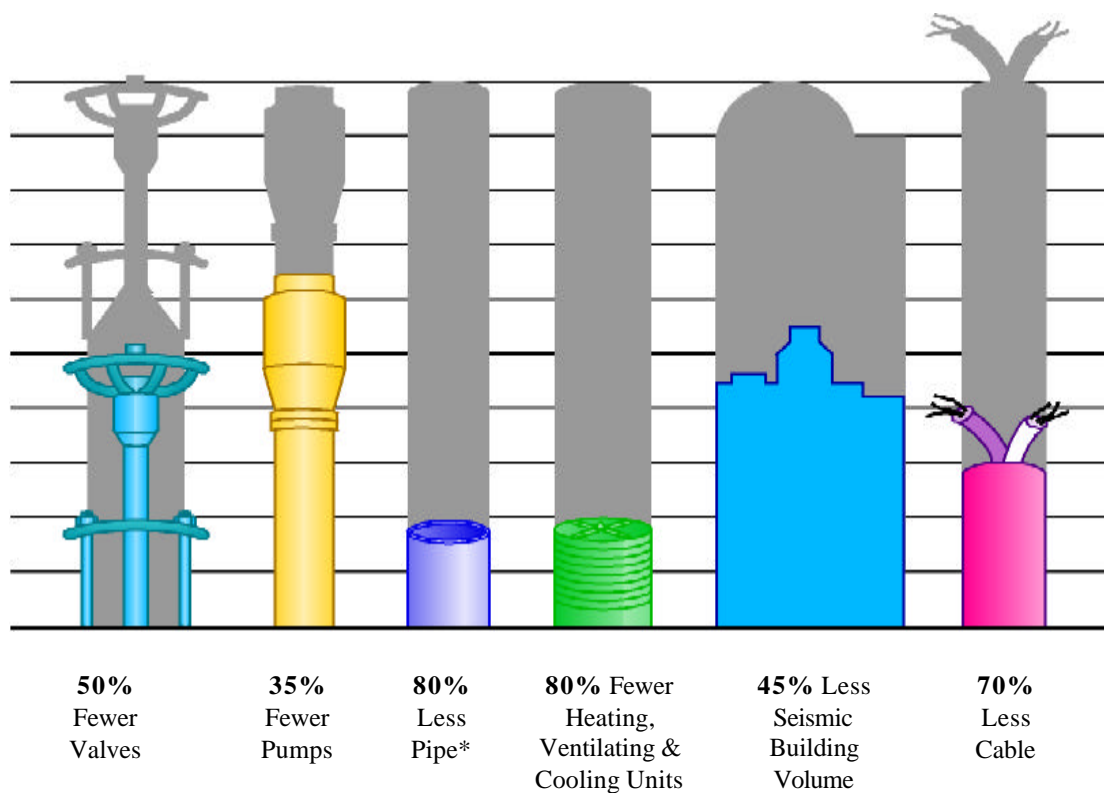


Figure 3: The cost of electricity including generation costs and externalities

