

"I Personally Think That if We Were to Take Nuclear off the Table Entirely, it Is Really a Declaration of Failure."

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Interview with William D. Magwood, IV

Director-General
of the OECD Nuclear Energy Agency (NEA)*

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Mr Magwood took up his duties as Director-General of the Nuclear Energy Agency (NEA) on 1 September 2014. He has extensive experience in both the regulatory and developmental aspects of nuclear energy, including at the international level.

From 2010 to 2014, he served as one of the five Commissioners appointed by the US President and confirmed by the US Senate to the US Nuclear Regulatory Commission (NRC). While a commissioner, he advocated the importance of nuclear regulatory independence and the necessity of maintaining strong, credible and technically sound nuclear regulation in the United States and all countries that use nuclear power.

Prior to his appointment at the NRC, from 2005 to 2010 he provided independent strategic and policy advice to US and international clients on energy, environment, education, and technology policy issues. From 1998 to 2005, Mr Magwood was Director of the US Government's civilian nuclear energy programme at the US Department of Energy (DOE). During his tenure, he established the Idaho National Laboratory; created activities that reversed the decline of US nuclear technology education; and launched important initiatives such as the Generation IV International Forum (GIF) and the US "Nuclear Power 2010," which helped restart nuclear plant construction in the United States. He was also actively involved in the work of the NEA, serving as a Steering Committee Bureau member from 1999 to 2005, including a term as Chair of the Steering Committee from 2004 to 2005.

Prior to his experience at the DOE, Mr Magwood managed electric utility research and nuclear policy programmes at the Edison Electric Institute in Washington, DC, and was a scientist at Westinghouse Electric Corporation in Pittsburgh, Pennsylvania. Mr Magwood, a US national, holds Bachelor degrees in Physics and English from Carnegie Mellon University and a Master of Fine Arts from the University of Pittsburgh.



the last couple of years, that are considering these new technologies. Many are countries that have never considered building nuclear power plants in the past. But these SMR--technologies, because of the safety performance, the economics, has gained their interest. So they are watching very closely to see these technologies come to the fore.

At the same time in some other parts of the world because of the way the markets are structured, which we think is largely dysfunctional, large baseload facilities are not rewarded for the value they bring to the market. They are often being shut down prematurely despite the fact that they provide large amounts of electricity on a reliable basis without emitting CO₂. And even as some of the nuclear plants are prematurely retired many people who are associated with them lament that they are going to regret this in ten years because we are going to have to meet very stringent targets and we won't be able to make it happen. We are watching this unfold, recognizing that the markets are not structured to accomplish what countries are trying to achieve. This is something that we all have to deal with as we are going to the future. But at the same time there are many places where nuclear has received a lot more attention.

What is the state of affairs of nuclear globally today, how is nuclear power doing?

It is kind of like the Dickens novel, it is the best of times and the worst of times. In many countries we have seen a resurgence of interest in nuclear that really hasn't been seen in decades. There are countries around the world that are looking at nuclear closely, especially new technologies, as the source of energy for the long-term future, both because of climate change but also because of energy reliability. And so, it's a very exciting time.

As you know there are many technologies that are being advanced. And there are countries that I have visited over

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So, it's a mix that really depends on where you look, on what part of the world you focus on. The different parts of the world develop different dynamics and different issues and the more you go down to an individual country, each country has its own push and pull, its own issues that it deals with and some of it is internal politics, some of it is perceptions about nuclear, some of it is the economic situation, the availability of resources like natural gas or renewables. Everything is different but on total I think there is a lot of reason for optimism that nuclear is going to have a pretty bright future globally.

* The Nuclear Energy Agency (NEA) is a semi-autonomous body within the framework of the Organisation for Economic Co-operation and Development (OECD), located in the Paris area in France. The objective of the Agency is to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally sound and economical use of nuclear energy for peaceful purposes.

You mentioned advanced reactor concepts and there is also much talk in the industry for a couple of years now about Small Modular Reactors and likewise of very small and micro reactors. What actual role can these small and very small reactors play in the future? Will they be something only for nuclear newcomers or small grids or isolated places or will they become mainstream facilities that might also be used to replace or complement existing large plants?

I think it is all the above. The one country where I have seen the most enthusiasm about small and microreactors is actually Canada. Canada operates large water-cooled reactors as well as other power plants and finds that these small reactors can be a game changer for them. Small reactors will be excellent complements to the large reactors providing flexibility as they try to reduce their CO₂-emissions. But then the microreactors can be used in remote communities, in mining sites which are in the more remote northern reaches of the country. This is something that we are very excited about. We had a virtual trip to Canada during the Summer. We met with government and industry and power operators and we were listening very carefully as they talked about how these new technologies could make a huge difference. This is the case of a country that is determined to reduce its CO₂-emissions, for them this is not just a rhetoric, they are really trying to put it in practice. As a result, they look at these nuclear technologies as really the pathway to achieve what they are trying to do.

Some of these small reactors are also advanced reactors. Maybe there is a new dynamic coming to this issue. So, in your opinion, will these advanced modular reactors bring a breakthrough for GEN IV technologies?

Maybe. We started the Generation IV International Forum almost twenty years ago now. At the time we thought, that some of these technologies might come into play in the long-term future. But what we are seeing today is, that these technologies are being developed for now. There are entrepreneurial companies and governments very focused on molten salt reactors, high temperature gas reactors, fast reactors, many technologies. There are many people I talk with, convinced that these technologies can be brought to market within a decade or so. It remains to be seen.

There is reason to remain cautious because there are still some challenges to be overcome, but people are spending a lot of time, a lot of money and a lot of work to try to get this to happen. They really seem to believe that they can make this happen. I think among the Gen IV technologies the high temperature gas cooled reactor is probably the closest to market, because we have the fuel, we know how to make the fuel and it's a proven technology that I think can be built quickly. There are several countries looking at high temperature gas reactors particularly for replacing industrial heat applications that are currently fed by fossil fuels. There is a lot of interest in many Gen IV technologies and I think that they certainly do bring game changing qualities that we can achieve today both in terms of safety and flexibility, ability to deal with nuclear waste in a different way. All these things are really interesting, but it depends on exactly what specific technology we are focusing on, but there is a lot of enthusiasm.

**Governing body:
The Steering Committee for Nuclear Energy**



Figure 1
The NEA in Brief – 2019

Talking about dynamics of debate and of development: The issue of climate change strongly dynamized the debate about nuclear in the United States. Seemingly also US democrats, long time rather opposed to nuclear now support it and there are more and more civic initiatives launched pro nuclear even in Germany. Can a tidal change that we witness in the US occur in Europe too?

Well, anything is possible. I think that many European countries do look at nuclear as an option. They don't talk about it as much because it is not the first thing on which they are focused. Some have open discussion about new nuclear and some are building new plants today, e.g. Finland, France, the UK. But there are others as well, certainly in central and eastern Europe there are many countries developing nuclear projects, but even in western Europe there are countries at least keeping an eye open on nuclear, particularly the new technologies. In every part of the world, each country has to make decisions. Europe has the advantage of the interconnected grid that enables power to be moved across quarters quite readily. So, it takes some of the pressure off individual countries to make these decisions quickly. But they have to also make sure the countries from which they are importing are able to continue providing reliable supplies for decades to come. I think that as technologies come to the market there will be more and more countries that are going looking to nuclear as a possible option particularly as they start to see the results of the current paths. I think some are going to find that they are not going to meet their environmental goals on their current paths and will make some adjustments. That doesn't mean that they are all going to run off building nuclear plants but I think it will become an option for more and more countries.

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Currently in Europe a number of large investment schemes is prepared for the green deal package of the European Commission for post-corona stimulus packages on the European and on national levels. Do you think this might become a breakthrough for EU nuclear new build in the long term?

This is hard to tell. I think that these are things that are certainly internal European issues that are discussed among the member states of the European Union in which there are countries that have strong feelings on both sides. But I do think that as these conversations go forward into the long-term future the analysis that we have done and others have done have shown the cost of achieving the goals set by the COP process, particularly COP 21, the Paris Agreement, are extraordinarily expensive and difficult to meet if nuclear is not part of the mix. I would even go further and I personally think that if we were to take nuclear off the table entirely, it is really a declaration of failure. I don't think the goals are possible without a significant global component of nuclear. That doesn't mean that every country has to use nuclear – as I said before – but I just don't see how the world could be successful without a major contribution of nuclear energy. The IPCC has spoken to this as well.

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The NEA recently published a study "Unlocking Reductions in the Construction Costs of Nuclear". What can be the main drivers to make nuclear new build more time and cost efficient in OECD countries? What could be done to improve the track record of these projects?

Recently I was talking to someone on this subject and I made the analogy where I reflected back on when I was very young and I started to build plastic models of airplanes and things like that. When I first started to do this, I was terrible. I was sloppy, I didn't get the paint right, didn't wait for the glue to dry, but as I did a few models I actually became quite good at it and was actually capable to modify the models myself and got quite proficient. I even started to make my own models from plastic construct which was a lot of fun. Nuclear plants are kind of similar. If you don't build for a long time, if you don't have people who have the right training, you don't have the supply chain in place, you don't have the regulatory infrastructure ready to deal with new projects, and as a result, you are going to run into problems. And that's what we have seen in France, Finland and the United States. We simply weren't prepared to do the projects effectively. We had to learn, we had to go through the hard experience and now we have been through the experience. Our recent report that you cited analyzes the fact that having learned those lessons, these countries and vendors now have in place the expertise and the supply chain, the regulatory infrastructure, everything is in place to make the construction of the next plants much more successful. Of course, the trick is, if we don't build plants for another 10 or 15 years, we start all over again. That's the pattern of the past. We are very confident that we get these costs down and if you look at the estimates for how much the plants built, say in western Europe and the United States cost, the numbers look more like 12.000 Dollars per installed kilowatt which is just incredibly expensive. But if you look at the plants built in the UAE (United Arab Emirates), the plants built in China,

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the plants built in Russia which reflect a well-established supply chain – in the case of the UAE it's the Korean supply chain – well practiced managers who know how to put these projects together you see more like 3.000 US Dollars per installed kilowatt which is very much in the market. I don't think there is any technical reason why plants built in western Europe or the United States could not be very close to this 3.000 Dollars per installed kilowatt target. But we have to get proficient at it and that means to build plants and making the mistakes and learning the lessons. This is what the report reflects. So, we will see if we have an opportunity to do that. For example the AP 1000 plants, which have been very expensive first-of-a-kind projects in the United States, have been through this process and now I think the next AP 1000 could be very cost effective. The lessons have been learnt, the supply chain is in place and I think they are much better prepared to have a successful project. But the question is, will they get the opportunity to build a plant like that. This we will see.

Concerning the opportunity to get such a plant built and also for the other manufacturers, the main obstacle next to construction costs is of course financing, for the established nuclear countries and all the more for newcomer countries. Financing makes a major contribution to the overall plant cost. So, is there some sort of proven financial path to boost nuclear new build and get these plants really financed and get new build really going also to bring costs down?

In just a few weeks we will be introducing a new report on the projected cost of generating electricity that we developed jointly with the International Energy Agency. This will be coming out very soon, so keep your eyes open for that. This emphasizes the point you make, that the cost of financing has a big impact on the cost of building a new nuclear power plant, a big impact on the economics of a nuclear plant. The only way, in particular in places where nuclear hasn't been built before, that you can control those costs, is really through some kind of government policy. Going to private markets to build these plants with the uncertainties and the lack of experience is just too risky and so you have to go to pay a lot. And if you have to pay a lot for the financing that has been shown to impact the overall viability of the project. We are seeing some of that. And actually, in some places they can't even find a financing. So, it is just not even a question of how much it costs but of being able to do it. There is going to have to be a governmental aspect to this. Either like we have seen in places like the United Kingdom with contract for difference or some other regulated approach or loan guarantees or some other mechanism to get these first plants built. And then once the markets see that plants can be built on cost and on schedule, then I think the money will be there. I think there is lots of money out there, but it is just that who wants to take the risk of having a big project fail because of the lack of experience. But once you show how we do it, then I think financing will follow. But to get things started there is no question in my mind that policies will have to come into effect to enable cost effective financing to be provided.

Concerning financing, there is an important issue for the European market, the EU. That's the green finance regulation currently being established or in part already having been established in terms of legislation. Nuclear power is a contested subject with regard to categorization as sustainable and the place in the so-called taxonomy. When we look at this debate, does nuclear power really do significant harm to the environment as is claimed by the opponents of the inclusion of nuclear as a sustainable technology?

Well I guess I would say there is two answers to that question. One is a technical answer which I think has been well answered and the answer is no. We recently issued a report that compiles the current state of the art of understanding on nuclear waste management and disposal. There is a clear international scientific consensus that disposal of high level waste in deep geological repositories is safe and effective and that we can do it. In fact, in Finland they will do it in just a couple of years. So, there is really no scientific debate about nuclear waste. But the other answer is a policy answer: that is a political discussion that will take place in the context of the taxonomy and we will see how this emerges. Certainly, they have to go through their process and make their decision. Whatever decision they take, this will not affect the technical facts, but they certainly have every right to establish their policy on whatever basis they decide to establish it. But I think from the technical standpoint in my view there is really no discussion.

Let's return to a more global perspective again. For many decades the United States and Europe were major players in nuclear power and nuclear technology more generally, despite many political misgivings in several countries. Now, if you look ten or twenty years forward, how will the nuclear world map look like? Will it have turned from more of an Atlantic technology to Eurasia entirely?

Not entirely. I think Asia will certainly be at the forefront, China is building more plants today than the rest of the world together, that's notable. I believe that if you look around the rest of the world, certainly India will build a lot of plants, but you will see there is a lot of interest in Latin American countries, Brazil, Argentina for example.

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The United States remains to be interested in building nuclear plants. Of course, right now very, very low gas prices make it a bit unrealistic in the next few years. But we will see, as the new technologies come to the market. But what will be really interesting are two regions of the world about which we haven't talked much in the past - the Middle East and Africa. I am really quite impressed with what African countries have done for preparing to build new nuclear power plants. Some of them plan projects starting much, much sooner than people recognize. So, I do think that it is really a global phenomenon, not just an Asian one and most parts of the world are at least having a vibrant conversation about the subject, certainly eastern Europe, Russia, the UK, US, Canada, Latin America, the Middle East. It really is a global thing and there are only very few parts of the

world where this isn't discussed. And like I said earlier, those places that are not talking about it, they might have to start talking about it as they look for ways to meet their environmental objectives.

When we look at this picture and your organization, where does the Nuclear Energy Agency sees its role in the future development of nuclear energy also with regard to new comers from non-OECD countries?

Our job is really to provide a platform for cooperation among the developed, experienced countries. In our membership in the NEA we have 33 countries soon to be 34 as in January Bulgaria will be joining us. Most of our member countries have been operating nuclear plants for a long time. When you have that deep experience, the kind of questions and issues that your experts want to discuss are different from the issues people want to talk about that haven't built plants so far or having had plants in operation for a very short time. These are really different conversations. So, we don't play a big role with the newcomers, but we certainly have some members that are newcomers, like Turkey for example

that is building plants for the first time. But we provide information that is available to anyone. We provide analysis or policy information on areas like safety culture, or public communications or some other issue like that which is available to everyone. I do know that many new comer countries do devour what we put out and look at our reports and analysis and are very interested in reading it. So even if we don't work with them directly, they are benefiting from all what we are doing. For the most part we refer countries that are newcomers to our friends in the International Atomic Energy Agency (IAEA) which is very well positioned to provide support to them because we are not really funded to do training or give basic information to countries, though we are happy to help with individual questions. The role of the NEA is really to work with the experienced countries, to work together, to look for ways to solve difficult challenges, to push forward to the future and to deal with everything from radiation protection issues to waste disposal and future technology development.

Interviewer



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