

## **Atomic power essential for Nigeria's energy source diversification programme, says Osaisai**

The Nigeria Atomic Energy Commission (NAEC) was established by Decree 46 (Now Act 46) in August, 1976 as a specialised focal agency with the mandate to develop and deploy atomic energy for the nation's socio-economic development.

In February, 2006, the Federal Government endorsed the roadmap developed by the commission, which consists of a three-phase technical framework for the deployment of nuclear energy for electricity generation in Nigeria. The framework, designed such that if meticulously implemented, it would lead to the generation of at least 1, 000 megawatts of electricity by 2017, and up to 4, 000mw by 2027, from nuclear plants.

In this interview with Business Editor, ADE OGIDAN and EMEKA ANUFORO, in Abuja, the Director-General of the commission, Dr. Erepano Osaisai, explores the possibilities inherent in nuclear option for electricity generation, stressing that Nigeria has all it takes to join the global renaissance for electricity generation, given the successes stories of some 31 other countries that have been generating electricity through nuclear energy source. Excerpts:

YOU have been in the saddle now for about a year. How has it been with your operational activities?

The work at the Nigerian Atomic Energy Commission for now has been developmental. We are trying to start a particular activity and the agency was inaugurated around July, 2006. We are just about one year. So, we had to start building the organisation from the scratch. It takes a lot of planning; a lot of hard work. It hasn't been easy.

Besides, the mandate of the commission is a fairly serious one, involving the development of the framework and implementation of the national nuclear energy programme and utilisation, including quite a number of applications ranging from energy to health and all that. So, it is quite a serious mandate and it requires strong elements of commitment. And what we have been doing in the past one year is sitting down, know what our mandate is and plan it in a way that it could be implemented on a sustainable basis over time. It hasn't been easy.

How far have you gone now in your operations, in specific terms?

Part of my mandate is to exploit, explore and develop atomic energy and use it in whatever way possible for the social economic development of Nigeria. Utilising it for electricity generation is one of them and at present time, electricity generation is a major problem in this country. And since we know that nuclear energy could be utilised for electricity generation, moreso as it has been done quite successfully elsewhere. In the global community, nuclear contributes 16 per cent of the electricity that is being generated. And we have to look in that direction. What we are doing is a sort of sensitising government. Solving an energy problem requires long-term planning. It is not

just about the resources that are available. You also have to look at the nature of the resources, which are the wasting assets that could be depleted over time; what are the environmental consequences, how do you define and model what you might characterise as optimal use of energy resources?

And we believe that solving the energy problem will involve looking at energy sources beyond oil, gas and hydro that are presently being utilised. We need to look at nuclear, coal, and maybe, some of the other renewable sources, like solar and wind. And so, we are simply saying that we can't be satisfied with what is on ground, what is available and that we have to look beyond what is needed presently to what we need in generations to come and all that.

By and large, as a country, we also have to look at our aspirations for the future. We can talk about various energy resources, what is available and all that, and how long it will take to deplete them and if you have, maybe, a lot oil, gas and other resources, what other alternative uses that they can be put into use. And if you don't start developing an energy base and then these ones get depleted, where do you get the funding and resources to develop other energy resources? So, we are looking at the comparative advantage on how we can tackle these.

Talking about atomic energy, what are the resources available now in the country for developmental purposes?

If you are going to get involved in any energy programme, there are basic prerequisites. One is the availability of resources. That is the comparative advantage we have in the case of oil and gas. Number two is the technology to develop it. That, we have not done quite well even with oil and gas for now. After so many years, we are still talking about local content, building the local capacity.

And then, finally, having the human resources to be able to exploit these. Then, you also have to talk about the required economic comparative analysis of these resources. And having looked at that, in Nigeria, we do have the required material. But have we exploited them? No. And so, the question will be the need for us to have nuclear electricity.

What are these material resources required?

The material resources would be the fuel. Just like I said in the case of gas, you need gas and oil to go into the generation of heat and then the electricity is supplied through the different processes. The raw material in this case is oil and gas. In the case of nuclear power, the raw material is uranium. But the point I am trying to make is that you don't necessarily have uranium reserve to run a very successful nuclear energy programme. And I can tell you that the first set of reactors, if government goes through with our own plans and implements them faithfully, will necessarily be powered by uranium that is developed within Nigeria. That also is because the fuel cost in a nuclear power plant is small compared with the other cost components.

The initial capital cost in building the power plants is enormous but the maintenance, operation cost and fueling for nuclear power plants is small compared to others. For instance, if you have a doubling of the price of gas, that could lead to almost a 50 per cent increase in the cost of electricity that is being generated in the gas power plant. But if you double the cost of uranium fuel, it can only lead to a maximum of about a five per cent increase in the cost of the electricity you will get from nuclear power plant.

Why is that so?

It is because the power generation technology, the economic component, from the actual power plant does not rely so much on the fuel. The fuel is a small component of the cost elements. That is it!

Again, the other thing you will need to look at is that the technology that you may need to get uranium, to enrich it and then to fabricate it to fuel is a fairly sensitive one and in quite a number of cases, you can run a very successful programme without going on to invest in that technology and even if you have the resources to invest in it, because of the international concerns and all that, they prefer that you buy the fuel.

In looking at nuclear power generation as a possible complement to power generation from hydro, what are your targets?

I don't like talking about targets. The programme that we have developed, which the government has accepted and we are trying to implement, is that if we are working meticulously and with a lot of commitments, Nigeria should be in a position to generate electricity from nuclear power plants in 10 years. Our own thinking is that we might be able to generate at least 1000 megawatts. And if we continue with it, in another 10 years thereafter, that is, in 20 years time, we should be able to generate up to 4,000 megawatts from nuclear power plants. In saying this, we are saying with all amount of responsibility because you also have to develop other sectors and other sources of energy. So, it is not all about nuclear. At that point in time, we can be thinking about nuclear being able to supply up to some five to 10 per cent of the total energy generation within the country.

If you are investing in new technology, you have to get it up to a particular critical point, before it pays off. There is a lot of infrastructure you need to build. There is a lot of technology you need to build. There is also a lot of human resources you need to produce to be able to man this facility properly and that will require that you should have a given level of the industry to support that and to make it attractive and also meaningful to a country like us. So, those are some of the things that we have planned, and we believe that if government goes on to implement them, we should be able to achieve these targets, but like I am telling you, these are just plans that we have in place.

Again, we are also trying to be cautious. What we are recommending is that government will take up the responsibility to develop the infrastructure, the human capacity, the human resources and also the enabling environment for this kind of an industry to thrive. Government will also provide the impetus and drive, but you also need to involve the

private sector, because it is also known that the private sector has more power in being able to run enterprises.

If you go to quite a number of countries, like Brazil, they have two power plants from nuclear sources. And if you go to Korea, they are government owned companies but they are run like private companies. Government has funded it and developed it and so that is something that is likely going to happen here. But private sector has to be involved in a way.

Talking about the manpower for nuclear power development, do we have the required local capacity to be able to drive this project at this initial stage?

Yes! Yes in the sense that we know what it requires to run a nuclear industry. We also know what time frame it will take to develop that needed capacity. And part of the mandates of NAEC is being able to develop the technical framework whereby we should be able to have this cadre of professionals at the time that we have the power plants ready to go. And what we believe in essence is developing a manpower development scheme, manpower training both local and overseas facility related training and so on and so forth. So, at the time we have power plants ready, we will have Nigerians, probably with some assistance. But we are particularly conscious of the need for technology domestication and all that. So, in another 20 years when we should go up to 4000 megawatts capacity, we should be in a position to fabricate certain components; we should be in a position to do quite a number of things and not relying on foreigners.

Let me also tell you, there is something that we must take note of. Even with the other sources of energy like gas and hydro plants, you ask a question, how much of that component, how much of that technology is indigenous? In most cases, about 90-95 per cent is still imported. And in building them, you still bring people from outside. When you have serious problems, you have to rely on technology from outside to deal with it and all that. Nuclear does not suffer any disadvantage in that sense.

And so, I don't think it is right when people once in a while give the impression that we are getting into an area that is totally alien.

The salient point I am trying to make is that we don't have the people right now if you bring a nuclear plant and dump it right here and then say that Nigerians should go on, we don't have enough. It will take time. Even by the time we put the first concrete, it will take you about five to six years to finish a nuclear power plant. If you have to plan for it, you need sufficient planning and time to develop the needed human capacity, with the assistance of countries who have gathered the needed experience over time to be able to run a functional, safe and I think a productive nuclear power industry.

When do we expect the first turning of the sod or something like that?

There are quite a number of things involved when you are talking about a nuclear plant. One, you will worry about the suitability of the site. When you want to build a power

plant, there are a number of factors: one, the site related activity around the place, the nature of rock, soil, water supply that you require in cooling the reactor processes and then human population, settlements, the type of vegetation that you have got and so on and so forth. So, you need to study all these properly and have a proper environmental impact assessment. You need to go through your safety analysis and so on. That will take time.

After you have been able to do these, you also have to go through the normal bidding process. It is a large project. For instance, if you are going to build nuclear power plant that is about 1000 megawatts, you are talking about an investment that will be between 1.5 to 2 billion U.S. dollars. And that requires a lot of proper planning. You need to have the proper processes of bid preparations and so on. There is also the need to get to raise the necessary finance to get it going. So, all takes time.

When you have put all these in place and you have been given the licences, we have a regulatory authority, you must have heard about it. It is the Nigerian Nuclear Regulatory Authority. Because of the complexities and because if you have any problem with a nuclear power, it could also have some fairly negative consequences and for that reason, the regulatory regime to license a nuclear power plant is very strict and so, you have to satisfy all requirements. Even before you can say this is the site you want to have the nuclear power plant, it must have been licensed. So, all these regulatory requirements before you have the design to be certified and accepted all have to take time. It is only when you have been able to obtain these that the actual construction starts. But even after construction, at a point in time, you need to have licences to run, test it and so on. That is why it takes quite some time. In many of the advanced societies, it takes about seven years for these to be completed. We are not there. We are going to rely on a few other technical partners in getting things done and so you have to give sufficient time to be sure that all these things are properly planned and implemented.

How are you strategising to get technical partners and the private sector operators involved in the project?

Are we really strategising for technical partners from outside? We will just leave that for now. But in terms of trying to get the private sector involved, government has to be the driver in this instance. There is no single country in the world where nuclear electricity has come to stay without government providing the initial incentive to keep it going: you can talk of U.S., you can talk of Korea, you can talk of China, you can talk about India. And in quite a large number of countries, it is actually government companies that are doing the power plants. But like in the U.S., you have quite a number of utilities that own them. But in the initial years, government does quite a lot. What we are saying in essence is that once government has bought into it and we believe government has, you will have to create the enabling environment. You cannot simply go and tell an investor to come and invest in nuclear power plants without him seeing some advantage of nuclear power to others. And in that area, it is government that will give the assurance. Government may need to have appropriate financial plan done, guaranteeing loans and so on. That is being gradually done. What we are trying to do is place all the needed cards. You see, you don't

need to run into a black box. You don't need to say, because they say nuclear is good, then you should run and embrace it, no. Make government understand what is involved; make the private sector to know what is there to be reaped and what is there to do. That is what we are gradually doing.

Essentially, if I may put it this way, this is the period of public information. Public information in two respects: the first components of it is first making Nigerians, like you and I, actually believe that there is a need for us to diversify to include nuclear. Two, in the other components, nuclear has the comparative economic advantage than others. And once you have been able to have that in proper place, then gradually, you can sell it as a business proposal. The person needs to be properly educated on what he is going into. And nuclear for now looks a little bit alien to this environment.

What role has the International Atomic Energy Agency played in all these?

The International Atomic Energy Agency has been quite useful in maintaining nuclear safety and security. And whenever a country gets to be involved in a serious energy programme, be it for health applications, or for some other uses other than electricity, you need to inform them. From the onset, we have made them understand Nigeria's peculiar energy situation and a large population base. For now, the per capita energy generation in this country is less than 30 watts per person. 30 watts can just burn like a small bulb. If you have a family of four to five people, for instance, and you are having two bulbs of 60 watts, then you know that you have already taken more than you should. About two years back, precisely 2005, the Director-General of the International Atomic Energy Agency visited Nigeria and I think he pointed out to our former president the need to think nuclear. They have more or less catalysed the process of Nigeria even thinking seriously about nuclear. But we are not taking that for granted. We are keeping them abreast of what we are doing. And from time to time, I will say, they have gathered a lot of experience over the years on this business, monitoring activities around the world. So, we want to be sure that we are well guided. They are not designing the programme for us, but from whatever we do, we want to reassure them that it is something that will work and that they have to see what we are doing. And I think they have been quite helpful in doing that.

How will you describe the politics of nuclear energy in the world today?

Let me tell you, nuclear energy is something that inflames passion in any society once you talk about it because of the way it started, with a big bang that was negative. And so, once a country thinks about utilising nuclear energy for any application, it raises eyebrows. But you see, I want to be able to look beyond that. In any society, whenever people attempt to introduce any new technology, it is always met with some kind of opposition. Why? It is just because of entrenched business interest. For instance, if you go to quite a number of countries, the coal lobby, the oil and gas industry will always magnify the supposed negative aspects of nuclear technology, because if it comes, it may be eroding their own market. In some cases, it is also due to pure ignorance. They don't just know what it is.

For instance, if you have to talk about nuclear energy in this country, people will protest that ah, we can't even feed ourselves. Why should we start thinking of nuclear, and we have plenty of gas, without getting to understand the issues that are involved. So, ignorance, then in some cases, there could also be some legitimate concerns. People worry that if you don't manage nuclear installations properly, the possible effects from release from radioactivity and so on and so forth. Some people will just raise any issue. And I tell you, a long time ago, somebody described or defined a politician as somebody that has opinion on any matter. So, even in some cases, just to elicit some debate, people will talk about it even when they don't know much about it.

There are quite a number of reasons why in some countries, it is the environmental issues and all that. But I will tell you, the founder of Green Peace is now an apostle of nuclear energy. But if you will recall some 10 years back, how they were going about picketing and all that. I think they have come to believe that if you are going to solve the global warming, if you are going to solve this carbon dioxide poisoning, if you are going to solve the problem you get from the burning of oil and gas and so on and so forth, the greenhouse effect, you have to think of energy sources that don't necessarily generate these products. I think there are quite a number of reasons. Introduction of nuclear energy in any country elicits a lot of controversy, some of them are legitimate, others are pure business and in some other cases, it could also be pure political considerations.

Technically speaking, nuclear is a energy source that quite a number of countries have considered. For instance, France generates about 78 to 80 per cent of its electricity from nuclear power plant, South Korea generates about 40 per cent. In the U.S., it is about 20 per cent. Worldwide, on average, it is 16 per cent. In Sweden, it is about 57 per cent. It is something that quite a large number of developed countries have come to accept. What we are saying is not accepting it hook, line and sinker. Compare the various parameters you would use in assessing various energy sources including the cost of the end product. And does nuclear compete well with others if you are going to introduce it to Nigeria?

I also want to remind you that for now, the cost of electricity in this country is subsidised, at least the one that is generated from the central power generator, now PHCN. Think of the situation that you have to pay economic rate for the gas that is going to the power plant? Then the cost of electricity will become much more expensive. What we are saying is that when we are going to operate a free market economy for which you have to pay the competitive price for very product you are getting, nuclear becomes very much competitive, better than some of these sources we have.

President Umaru Musa Yar'Adua has spoken so much about turning around the power sector, making sure that power works so that, at least, the cost of production here can be globally competitive. He has even threatened to declare a state of emergency in the sector. Since you came in, has your agency in any way been given any standing order, any extra task than your initial schedule, any extra fresh timeframe to get the project going; any extra push?

Let me tell you, when we are talking about technology development and its exploitation for the benefit of the human society, you would have to decouple the desires of politicians from what is pragmatic. I want to tell you that President Yar'Adua is a scientist and we have been given an opportunity to brief him on the country's nuclear energy programme. It has existed for about a year before he became president. He was quite positive and fairly firm, stating that we are to continue with the process of developing infrastructure; we have to continue the process of developing the needed manpower, because nuclear is a key energy source. What he has done in essence has been to encourage us to continue what we are doing. You cannot give us marching orders to generate electricity from power nuclear plant. It is just not possible. Even to tell us in the next seven years, no. We can only tell you what is feasible within our own context.

I know he is quite aware of the limitations and he is very supportive of the fact that we need to develop the capacity within Nigeria to be able to prosecute a sustainable and beneficial nuclear energy programme.

And the National Assembly?

First of all, NAEC is a government agency and if we are doing one or two things, it is obvious that the National Assembly would have given us resources to get it done. When we talk about energy programme for the country, we have to think about the short-term, the long-term, the medium term and again, the strategic interest of the country. But I also believe the legislative and the executive are all interested in sharing the believe and the need to develop the capacity for energy self-sufficiency in this country. So, in whatever it could be done reasonably, I think I see every organ of government supporting it.

If your question is if we have gone to the National Assembly since this government was inaugurated, we haven't. I believe it is an ongoing programme and if for some reasons the National Assembly is dissatisfied, I will get to know, but I don't believe there is any indications as to that.

So, can nuclear energy be the veritable successor to oil and gas?

God has been quite kind to us in this country. We have various energy resources. We have gas, oil, hydro, and gas. We are also in tropics, so we have very high solar insulation. These are all energy sources that could be exploited in various ways. What we are saying in essence, is that human society is a continuous one, and you have to be responsible enough to manage the resources in a way that you will be able to add sustainable development from one generation to another. If you must do that, you will have to think of a diversified basket of energy sources and optimally exploit them in a way that you will continue to meet your national aspirations.

But atomic energy will also play an important role in that as a strategic component of the strategic change.