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By J.K. Obatala

Nuclear Power will Guarantee A Long-time Energy Security for Future Generation (I)

Dr F. Erepamo Osaisai, Director-General and Chief Executive Officer of the Nigerian Atomic Energy Commission (NAEC), comes in the wake of the Federal Government's controversial memorandum of understanding with Russia, to collaborate in the mining and processing of uranium. Speaking with J.K. OBATALA, in his Abuja Office, Osaisai was reticent about the MOU row-- but surprisingly candid, concerning the programmes and operations of the semi-classified commission. He spoke on NAEC's short, medium and long-term plans for ushering Nigeria into the Nuclear age. Excerpts

Please tell us a little bit about NAEC

The Nigeria Atomic Energy Commission is a Federal agency operating under the aegis of the Ministry of Science and Technology; with a responsibility and a mandate for the development of the technical capacity and expertise for the exploration and the utilization of atomic energy.

It is primarily an operational agency. In being able to perform that kind of responsibility, you have a number of areas that have to be properly coordinated. First of all, there is the area of manpower training.

Then there is the area of R and D (research and development) infrastructure. And for that purpose, we have three operational Nuclear Energy research Centers. Two of them are university based: One at Zaria and the other at Ile Ife.

The third one is the Nuclear Technology Centre, which is located within the confines of the Sheda Science and Technology Complex (SHESTCO), along the Kaduna-Lokoja Road, about 10km from Gwagwalada, in the Federal Capital Territory.

In legal terms, the commission was established in 1976. But it did not take off till 1996. Why did so much time pass before NAEC became operational?

Well, ordinarily, you know how government works. But you are correct. It was created by law specifically, Act 46 of 1976. The Act was signed on August of that year. But it had not been activated when the Government that created it left office. It had remained dormant ever since. As things turned out, it was the Head of state that had originally created NAEC who was actually the person that activated it 30years later. That was President Olusegun Obasanjo.

I think, somehow, people didn't see it as a priority; and it didn't get activated.

You say you are going to be generating power at nuclear fueled plants; and you've selected some sites. Where are they?

Mr. Obatala you see, when you are trying to implement a national nuclear power programme, you need to do a lot of work. A lot of work entails being very meticulous-- being thorough. We might end up with about one or two of the sites. But before you do that, you need to look at quite a number of them.

You have to characterize them; and at the end of the day, you'll need to rank them. You then make a recommendation to Government, with regards to a final decision, as to where exactly the sites would be-- based on all the technical work. But the final decision will rest with Government.

We're doing quite a lot of work. I think I would simply want to leave it at the point that there are seven sites. Four of them are in the Northern part of the Country and three are in the Southern part. I'm sure, maybe in another one year or so, when Government has finally decided, you will know which one or two of the sites have been accepted.

What criteria would you use to make your decision, when selecting the places for the nuclear power plants?

Characterizing a site for a nuclear power plant entails a number of factors. You've got technical factors. You've got social factors. You've got human factors. You've got economic factors, environmental and so on. I want to tell you, we are looking at one of these factors. We want to ensure that we make the proper recommendation based on our findings.

First of all you need water to cool your reactors. So you want to make sure that there is a convenient body of water available-- and that it is large enough for that purpose. You also want to sure that you don't have much seismic activities in the area, that it's not an earthquake-prone area. You want to be sure as well, that the soil is stable and that there wouldn't be subsidence-- the sinking of the soil--in that area. Finally, you want to be sure that the reactor is not situated too close to population centers. But at the same time, it should be close enough to your national grid i.e. your electricity network etc.

Like I mentioned you have to worry about the flora and fauna-- the environmental factors, the biological systems. As you bring in the facility, you don't want it to imperil these life sustaining systems. So there are a large number of factors. We have to weigh them and optimize them before we can make a final determination...

Is there a nuclear reactor at SHESTCO, in the Sheda complex?

No. We have a small research reactor at the centre at Zaria-- the Centre for Energy research and training. It's a small reactor: Just 30 kilowatts. We call it a *miniature neutron source reactor:*

It's basically used for training purposes, for activation analysis for soil fertility mapping and all that kind of thing. But it's quite useful. We also have a small accelerator -- A 1.7 MeV standard accelerator-- at the Centre for Energy Research and Development, Ile Ife. At the Sheda Nuclear technology centre (NTC), we have a gamma irradiation facility, which has a large number of uses.

Which type of facility?
Gamma irradiation facility. It's a gamma irradiator.

In other words, you could produce gamma there?
Yes. You produce gamma rays and you use it to irradiate food. So you could extend the shelf life of food. You could also irradiate spices in such a way to kill the biotic substances within them. Then you can send them for export. You could also use gamma rays to disinfect clothing that is used for medical purposes. You can use them to irradiate things like onions and delay sprouting.
So the gamma irradiation facility is there; and it's fully functional. We are trying as much as possible to make Nigerians aware of the full utility of that facility in a way that will have them coming to use it. We've had a few workshops there to sensitize farmers-- so they will know that they can bring their produces and that it could increase the shelf-life of their produce. One other important thing is that it could also be useful in achieving food security: We've got certain food items in this country that are seasonal. If you are able to irradiate them, you can be having them all through the year.

I think I read somewhere that you predicted that NAEC would be generating 4000 megawatts of electricity by 2014. Is that a correct quote?
No. You are not quoting me right. I never said that. First of all, we are a little bit cautions, in terms of giving specifics about timing and all that. I think you will come to this later in the interview. But let me say now, that we have a *Nuclear Power Roadmap* that has been approved by the Government. That approved *Roadmap* indicates that we would be able to develop, first of all, the human capacity needed to generate nuclear power in this country constitutes the *first phase* of the Roadmap.
The *second phase* entails such things as details of site characterization and getting the needed licenses from the nuclear regulatory agency, so we will have reactors and other designs that have been approved.
Once the approval stage is over, we will go into *phase three*, which is the actual construction of the power generating plants. This, by our estimate will take a minimum period of about 10-12 years from the time Government approved the programme-- which was in February, 2007. Our own thinking is about 2017, earliest 2019. We are not quite worried about these time limits. But we've given ourselves enough time to plan and ensure that by then, we should be able to start generating electricity.
The 4000 megawatts you are talking about, is that in another 10 years--after commenced production--we should be able to increase the capacity gradually, from 1000 megawatts to 4000.

Now let's get to the critical question: Why does Nigeria need Nuclear energy in the first place, when we have so much hydrocarbon fuel, in the form of coal, gas and crude oil?
...For a large Country like Nigeria, with a population estimated at above 150 million, you have to think of energy security. Energy security entails exploiting all available energy resources in an optimum manner—i.e., in such a way that energy is not just available for us in our generation but also for our children and their children. We're talking about the long-term energy security in the Country.
I would also want to add that oil and gas can be burned to generate electricity. But these resources can also be utilized in a large number of other areas. One is the petro-chemical industry. You have gas refraction plants, where gas is liquefied, then made solid and shipped out for various industrial and chemical uses. So, what we are saying is that Nigeria is blessed with a number of energy resources. We must find an appropriate way to exploit them, to have what we can say is an optimal energy mix.
You must also remember that oil, gas and coal are fossil-based. When energy resources are fossil-based, that tells you that they have a finite period. You exploit them for a while, they get finished. So if we simply limit ourselves to the energy resources we know are available, at the point in time when they get exhausted, what do you do?
It means that rest of the history of this country is doomed. We also want to believe that, currently, we earn a lot of foreign exchange from oil and gas. That's useful money. We have to invest it wisely. "Wisely investing it", means we have to develop other energy resources in a way that will enable us to sustain a high standard of living over time.
So I think that exploiting nuclear energy in this country means that we are thinking about the long time energy security--not just for us but for the future generations.

In terms of equipment you have, can you just explain the difference between a "reactor" and an "accelerator"?
The simple difference is that in a reactor; the release of energy is sustained by a neutron chain reaction. You have a fissile material being fissioned inside a reactor core; and it give you a steady state of neutron flow.
Those neutrons are useful in doing a number of things. First of all, at the point of fission, energy is liberated. In the case of nuclear power plants, that liberated energy is used to create steam. It causes water to boil. The steam is then channeled through a turbine. There it generates electricity.
In small research reactors, that heat is not useful. It's the neutron flux that is of value. Like I mentioned earlier; the neutrons can be used in a number of beneficial ways, such as soil fertility mapping, activation analysis, etc.
In the case of an accelerator, you create ions; and then you use the high voltage to accelerate the ions to high energies, whereby they can impinge the surface of substances and, in doing so, tell you a little bit about the material properties of those substances. You can use this technology in material testing in the oil industry and in a number of other areas, such as environmental management...

You are installing dangerous machinery and working with radio-active material on campuses that are prone to unrest. How are you going to secure these areas?
I think you are right. But I would want to say that your question sounds a little bit hyperbolic-- i.e., when you speak of "very dangerous substances…"

But it's perceived to be dangerous

Exactly! When you don't know how a system works--and you are moving into a black box--then you have a problem. But I think that the basic elements, the fundamental of nuclear science and engineering, the fundamentals of nuclear technology have been mastered very, very well.

Part of the challenge in being able develop nuclear technology to the benefit of the society is being able to apply it safely. So every facility that we are going to build on university campus will, first of all, go through proper scrutiny.

It will be scrutinized, so as not to expose the installations to the public. The facilities are in confined areas, with all of the safety features. Careful scrutiny is also designed to ensure that the machines and materials we are working with are inherently safe.

Accordingly, I will tell you that in our own infrastructural development process, whatever we build on campuses will be secure. It will also be safe; and there'll be nothing out there, available for students to have access to..

Your answer is very interesting because Professor Shamsideen Elegba, Director General of the Nuclear Regulatory Agency, admitted that there are some security problems that remain to be solved..

Let me try to take it from there. You see, my colleague, Professor Shamsideen Elegba, has a very serious responsibility. He heads the nuclear regulatory agency in this country. It gives him the responsibility to ensure that every single nuclear installation, with different applications-- be it in health, research, water exploration, etc -- is constructed in a way that is safe..

But I can also tell you that I think we are reasonably well informed, within the system, so that whatever equipment we bring in, there is proper synergy--both on the side of regulation and on the side of promotion. Consequently, once equipment is put in place, it is safe and can exist and operate within the environment--be it a campus or any other place.