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Investments in nuclear energy in Europe Building a long-term framework to allow the upgrading and financing of projects



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Investments in nuclear energy in Europe

Building a long-term framework to allow the upgrading and financing of projects

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Investing in nuclear power: A condition to achieve the climate goals, competitiveness and energy security in the Energy Union

With

Claude FISCHER, director of ASCPE

Myrto TRIPATHI, advisor to Brice Lalonde, president of Business and Climate Summit, and Climate policy director,

Michael SCHNEEBERGER, honorary member of the Austrian Nuclear Society and member of Sauvons le Climat

Opening

Claude Fischer – Welcome to all of you to this 16th edition of the Nuclear Entretiens Européens. The first edition took place in 2003 in Nogent, Haute-Marne, in which the European Commission was already a partner, with the participation of François Lamoureux, and several of you were there too. The Entretiens Européens then took place in various countries across Europe, in Brussels, Berlin, Budapest, Warsaw, and brought together about fifteen European countries each time as well as other countries of the world (Japan, Canada, USA, Morocco and Russia, who we are happy to see represented here again today...)¹

The Entretiens Européens are there **to dare to have a debate on a nuclear industry in Europe**. We need to build it before our assets weaken too much in a Europe that is currently dicing with its status as leader whilst more and more countries are opening up to nuclear. The debate is urgent and under pressure: technological pressure but also anti-nuclear pressure, and especially from the Greens who stop at nothing. They are monopolising the “for or against” debate in an ideological and irrational way. But the nuclear industry is not on the offensive. And yet these pseudo-ecologists (courted by the left whilst they only represent a minority of citizens) have picked the wrong battle: climate, demographics and sustainable development will need more than nuclear. There are many countries calling for safe electricity and even in Africa people are asking why shouldn't they be able to access it...

¹ See appended list of Entretiens Européens.

Nuclear is undeniably a technology that has some risks attached, but who can deny that Europe is leading the way in terms of safety, thanks to its directives on safety or waste management, but also thanks to the skills in industry itself. Europe needs to invest more in keeping it and developing it (in training for people, R&D and innovation, renewing the park, modernising power plants and building new capacities, decommissioning, waste management centres...), our market is not only failing to provide appropriate incentives but it is actively discouraging these types of investment, which are burdensome and lengthy. **Market reform is not on the political agenda** and we are experiencing a paradox which forces us to ask ourselves some questions: at a time in which the United Kingdom is intending to leave Europe, the UK is deciding to build 2 EPRs and reform their market framework, giving a boost to the European sector. Could this new market framework become a model for the European

market? They are guests here with the participation of EDF Energy, but also from the NSAN, and intervention from China. Russia (with whom dialogue is necessary) will also be present.

How can we do better at regulating, managing and anticipating a diversified and low-carbon energy mix in Europe in which nuclear has a rightful role to play? That is what we will be debating.

Last year, during the Entretiens Européens 2015, we proposed that nuclear States cooperated and created



a European industry for nuclear waste² –which, as we all know, is still the Achilles heel of nuclear. We were on the cusp of COP 21, and we asked for nuclear to be recognised as a low-carbon energy source in the world’s energy mix.

This year, the subject is investment, assessing the value of projects in a market that will have to adapt

to the long term: we will be debating the economic and financial stakes of nuclear. But before that we will hear two presentations on climate issues and the role of nuclear in the fight against climate change, with Myrto Tripathi, advisor at Brice Lalonde to the Business & Climate Summit and Michael Schneeberger, member of the Academy of Sciences and Sauvons le Climat.

² "Towards societal approval of nuclear waste management in Europe" See the *Les Cahiers des Entretiens Européens*, available on the ASCPE website www.entretiens-europeens.org

Hearings



Myrto Tripathi – Thank you very much Claude for that marvellous introduction. I have spent the last two years working on encouraging companies to engage with climate negotiations, firstly around COP21, and then looking ahead to COP22. **Climate change is much more serious than we think. Is nuclear energy one of the greatest solutions we have? Why shouldn't we be afraid of nuclear?**

We have a problem. Nuclear is a healthy industry that responds to humanity’s most dire needs, but it is scary. I am not saying anything new here: but this fear is fuelling some of the biggest challenges facing the nuclear industry. It has reached an all-time high and has led to reducing its share in the global energy mix, when it actually should be increasing rapidly.

When I chose to leave nuclear behind and enter the domain of the climate – I noticed that the majority of people did not realise they were related, and that was why I came back to nuclear.

I was the nuclear offer director for new reactors at AREVA, in charge of responding to the call for tender from Vattenfall to replace the oldest reactor in the

Swedish nuclear fleet. But the arrival of the coalition in 2014, which included the Greens, shifted Sweden off the nuclear track. At Vattenfall it was prohibited even to study the potential for replacing the ageing nuclear power plants. This all happened in a country with one of the most virtuous and efficient energy systems in the world. That is when I stopped selling reactors, not because I was losing bids, but because the bids would disappear before I had even had time to win them. Buyers were being met with economic and political conditions that made it impossible for them to buy new reactors and even where the conditions were favourable, they would never last.

This is why we need to build a long-term framework for investment. **Especially as the competition is not between providers but with other energy sources including some that are subsidised. It is a “rigged” competition. In a liberal Europe, we are not playing on a level playing field.** This means that the industry has a serious problem. Nuclear (which requires a lot of capital investment and over a long period) has to adapt to the rules of the European electricity market. These are not clear and they do not allow operators to be profitable with growing investments.

But the biggest problem (which could also be a solution to the first problem) is the mistrust and fear about nuclear energy when it could play a key role in combating climate change and improving quality of life.

	Les centrales nucléaires	Les énergies fossiles	Les énergies renouvelables	Les énergies fossiles	Les énergies renouvelables	Les énergies fossiles	Les énergies renouvelables	Les centrales nucléaires	L'agriculture et l'élevage	Les centrales nucléaires
2014	88	85	88	75	75	74	81*	53	66	30
2013	90	88	83	72	72	70	84	51	59	36
2010	90							61	59	42
2007	83							58	50	31
2004	90							63	41	28
2001	89	87	84	87	46	67	52	67	39	33
2000	85	83	79	84	39	57	80	59	33	30

Figure 1 Principaux émetteurs de gaz à effet de serre / Sondage auprès des français – 2014 (ADEME/LSA)

It is an efficient and cheap source of energy, a source of our energy independence and a creator of jobs which cannot be delocalised. Public opinion (which believes we have started a clean energy revolution) does not know that the clean energy revolution alternatives cannot replace the nuclear capacity. A certain number of highly credible people have spent a lot of time ensuring that the population remains uninformed. The situation must be put right. **Nuclear must be brought back to the heart of the discussion, where it is no longer present.**

My proposal is twofold:

- Not asking for favours, but asking for a level playing field, with a debate rooted in facts (and less negative media attention), more political support and a more long-term vision.

- Be recognised as the green technology we are. Financial centres in Europe and elsewhere are fighting a fierce competition in being the greenest financial centre, the ones to derive greatest benefit from the energy transition. They are setting the standards right now: what is green, what is not? How can we benefit from support from banks, enterprise, insurance companies, investors and the public?

I am going to add a third recommendation, made by Claude: let's build a nuclear energy coalition and next year take part in the G20 and the COP23, which will both be taking place in Germany. The nuclear industry needs to be more present, which is not the case despite the efforts of Sauvons le Climat, the SFEN and others besides. To ensure that nuclear benefits from this framework over the long term in Europe, the sector needs to stop operating in a minefield. The population now needs clean energy and to achieve this **we need to be ready to all get together as a sector to work on things other safety, efficiency, performance and draw some political courage.**

I would like to close with the words of the Dalai Lama, who travelled to Fukushima in November 2011: 'I support the use of nuclear energy for peaceful means in the absence of more efficient alternative energy sources'. Now that is what I call political courage.



Michael Schneeberger – I would like to present a study carried out by a team of engineers which will be published next month³. But before I do that, let me recount a brief anecdote: yesterday evening, I was asked the question: "You're a member of the Austrian nuclear society? Does

such a thing exist?" Yes, it exists. There are 150 of us, almost half of made up of young people, who we train on small-scale reactors for research purposes. This happens in Vienna. The majority of the students have gone on to take up important roles in the nuclear energy sector in Europe.

"What role could nuclear play with regard to global warming?" With this study, directed by Hervé Nifenecker in view of preparing for the COP21, we tried to understand as fully as possible the various scenarios underpinning decision-making processes. The basic scenario as it stands is incomprehensible and incoherent with the current state of technology. Essentially it is based on CO2 capture and storage and sets the objective of 50 billion tonnes of CO2 in 2100 whereas current experiences of CO2 capture and storage is approaching several million tonnes per year and no experiments have yet proven its worth. The scenario was also based on supply, efficiency and the mix compromise. Nuclear energy is tolerated but only as of 2060. Only wind and solar energy are considered acceptable ways of producing energy.



We contacted the authors of this scenario, who refused to meet with us. We therefore levied criticism at the scenario whilst looking at what the share of nuclear could be. We worked on the basis of two scenarios: those of the supply and mix scenario with nuclear energy starting now. Our analyses were based on the technology in use (especially for reactors) that have proven effective. We are convinced that nuclear energy will have a great deal to contribute in the first half of this century. The work will be published in November. It will be made available to you.

I would like to add a few words about China which is the largest emitter of greenhouse gases. 50% of China's emissions come from steel production with 3 to 4 tonnes of CO2 produced for every tonne of steel, the other half of CO2 emissions come from electricity production, based on coal. China has decided to switch to nuclear: from 30 reactors in operation, the figure will rise to 100 reactors in 2030 (a phasing in of 8 reactors per year), which is the largest nuclear programme in the world.

For several years I have been involved in the development of very high temperature reactors, originally developed Germany and now with Swiss companies. China will have the first high temperature IV generation reactor in use. This reactor will not only be used

³ Study by SLC 'Sauvons le Climat' carried out by Hervé Nifenecker, with André Berger, François-Marie Bréon, Barry Brook, Philippe Hansen, Frédéric Livet, Michel Petit, Gérard Pierre, Henri Prévot, Sébastien Richef, Henri Safa, Michael Schneeberger, Suyan Zhou, Ravi.B. Gravec, Claude Gue5, Weiping Liu.

to produce electricity but also for chemistry, coal gasification and the production of steel. As CO2 capture and storage programmes practically do not exist in China, its development will have considerable consequences for the climate and essentially will be based on nuclear.



Finally, a year ago, the largest Chinese hydro-electric producer called upon us to develop hydro-electric storage and pumping turbines, with China intending to open 30 hydro-electric power stations for pumping purposes. We signed a contract and are going to contribute towards the development of these electric plants – the largest in the world. An Austrian company asked us the same question about developing pumping turbines and a contract has been signed at the French embassy.

Claude Fischer – So the future looks bright for nuclear and for Austria too? What surprised me when reading *Sciences et Vie*, was to see that Germany, which has been waging a frenetic battle against nuclear, saw its Chancellor Merkel inaugurate a centre for R&D for the 4th generation . Maybe they haven't lost hope after all of coming back to nuclear one day if the need arises. Germany, which is having to close its coal-fired plants, will have to produce more clean electricity or import electricity...

Thank you to Myrto and Michael!



⁴ 3rd of February 2016 at the Max Planck Institute at Greifswald. Cf *Science & Vie*, « Fusion, l'expérience qui change tout », April 2016

Assessing the value of investment projects. What already exists? What are our assets for exports? What are the States and the Commission doing to promote them?

Chaired by **Claude FISCHER**, director of ASCPE

With

Guy BUCKENHAM, head of Generation Policy, EDF Energy

Massimo GARRIBBA, director of Nuclear Energy, Safety and ITER at DG Energy, European Commission

Zuzana KREJCIRIKOVA, public relations director, CEZ

Alain BUGAT, president of the Technologies Academy and founder of NucAdvisor

First round table

Claude Fischer – Assessing the value of projects is a major topic which we selected for Les Entretiens Eurafriains when we saw that before we speak about financing investments, we need more projects in the first place! There are not enough of them despite the huge needs for them, because there is a shortage of project funders or credibility. What is in the nuclear sector in Europe? I would like Guy Buckenham, from EDF Energy, to talk to us about how the Hinkley Point project all started.

Guy Buckenham –As Claude has just said, we have reached a crucial stage for the Hinkley Point project with the decision of the British Government that the project should go ahead and with the signing of many contracts which will enable that to happen. We can now start to build this power station. This has been an important journey which has taken us around a decade and when the new British Government, under the leadership of Theresa May, finally decided to agree with the decisions that had been taken previously, we were delighted.



We've gone through many steps and it has been important to have a clear and stable regulatory framework and be able to count on the support of various parties thanks to the consensus that **nuclear energy had a key role to play in moving towards decarbonisation, guaranteeing the security of supply, at an affordable cost. The reform of the UK's electricity market was a key part of this.** This was based on three instruments: the CfD, "Contract for Difference", the development

of a capacity market, a robust approach to carbon pricing. This political consistency is a key part in what allowed the Hinkley Point project to become a reality.

The United Kingdom is currently thinking about how it is going to leave the European Union but I think that Hinkley Point will continue to be an important part of the picture for Europe as a whole. For EDF Energy, Hinkley Point is very important. We are talking here about a considerable stake in our future. We are not only involved with Hinkley Point, or in nuclear, for that matter: **we recognise that the energy future of the United Kingdom** (and this is probably true for many other countries too) **lies in not one technology alone but in an energy mix that is as diverse as possible.** We are involved in coal-fired plants as they near the end of their lives, developing renewables, producing electricity from gas... But nuclear is undeniably an essential part of this energy mix, with the possibility of being able to count on an energy with a base load that is as low-carbon as possible.

We are therefore involved in quite a few other technologies: we are working on a battery project with the national grid which will no doubt be a useful part of the energy mix. Obviously, batteries alone cannot power the whole system, they cannot offer a profitable solution to allow for energy to be stored temporarily before a very long period. **We must continue to work on new technologies, but we must also respond to our energy needs now. This is exactly what we are doing with Hinkley Point:** we are making the best possible use of the available technology. Technology will continue to develop in the United Kingdom: I know that the government is interested in small modular reactors; they may be part of the future. In any event, Hinkley Point is part of the solution now.

The challenge is threefold: security of supply, affordability and decarbonisation. We know just how important these elements are for any modern society. The price needs to be affordable: some might challenge the costs involved in building Hinkley Point with regard to the current market. But in reality, no one could build new generations based on the current wholesale price alone. There is a great temptation to want to draw comparisons between the old project and the new: Hinkley Point is just getting started, people will be able to say, "look what will be possible in a few years' time at a lower price". **This is the key point: Hinkley Point is the first step towards a new nuclear that will lead to a second step, then a third and so on. This will lead to falling prices.**

We will do this in the United Kingdom, with input from French technology, Chinese investors, with the experience that we will make great use of from projects underway in the United Kingdom and elsewhere

(Flamanville, Taishan...). We will see how things develop, especially during the operational phase, and we will learn lessons from it.

It took 10 years of preparations. But the site is ready, the contracts have been signed and we can now enter the construction phase. We are ready to see the relaunch of new nuclear in Europe, take the lead and keep our promises. Thank you very much.

Claude Fischer – Thank you very much, Guy. I will now give the floor to Massimo Garribba. Massimo, you were in Warsaw in 2013 with Steve Hargreaves, on the day when the British Government at the time had just given the go ahead for Hinkley Point. Today we are now with Guy, this time the day after Mrs May has given her approval once more. **We can thank the Commission for having played a very active and positive role in accepting the CfD, without which we would not have seen this result.** The CfD did not enter into market rules in their current form. A derogation was needed, this took some time (approximately 3 years). Massimo, I would like you to tell us about the role of the Commission in



assessing the value of nuclear projects, to ensure they are safer but also that they can be implemented.

Massimo Garribba – Let me just set the scene by saying that the Commission has a vision where energy is

concerned. The Energy Union put on the table right at the beginning, in February last year, the three elements you mentioned: security of supply, decarbonisation and affordability. Nuclear obviously has some advantages from an affordable pricing point of view but I would prefer to focus on the two other elements: security of supply and decarbonisation.

On the subject of decarbonisation... We have 14 Member States using nuclear and 14 others that do not use it. Yesterday there was a meeting at the European Parliament, and **an MEP stated that nuclear was unclean energy. This morning, the first thing I heard at this symposium was that nuclear is a clean energy. Everyone has their own way of seeing things.** The situation at present allows the Member States to choose their energy mix but this decision is made in a context that is full of constraints: we, as a Union and as Member States, signed the Paris Agreement last year and we committed to further reducing CO2 emissions. There are three main economic players on the international stage producing over half of their electricity without greenhouse gas emissions (GHGs):

the European Union (27% thanks to nuclear and 28% through renewables), Brazil and Canada which arrive at the same levels using different means. If we want to achieve decarbonisation, we cannot simply allow ourselves to resort to one single technology. We need to make the most of all of the possibilities open to us, including energy savings. The approach needs to be as broad as possible.

Criticism has been levied at the Energy Union. We have been working on nuclear energy – we also published programme (PINC) in April. **Some welcomed it, others criticised it, with opinions more or less split evenly down the middle, almost perfectly.** If you look at the PINC forecasts, which are based on intended investments in nuclear, we are looking at a scenario that would see us with 21% nuclear electricity in 2030 and between 17 and **21% in 2050. This means building approximately 50 new reactors.**

The Commission has just published some other information which is the reference scenario. As far as nuclear is concerned, we are at the lower end of the estimates but it is also said that with current policies, we will not reach the decarbonisation targets of 85 to 90% which were set for 2050. So something needs to change. **This is why before the end of the year, the Commission is going to unveil an energy package and I believe that this will be a crucial moment and will allow us to take a long-term view on investments, the lack of which is currently hindering markets.** It is important to get things moving, to ensure that investment is possible and to offer a return on investment which is part of a long-term process.

Regarding security of supply... Nuclear is a high intensity energy source. We have a large technological lead and, given the situation, I don't need to mention that this is not a completely indigenous source of energy, but it may make a contribution towards achieving the security of supply objective.

When we talk about investments, we must also be sure to take into account nuclear safety. Starting in 2009 with the first directive on nuclear safety, we developed a unique, regional framework for nuclear safety and for waste management. Next year, we have to revise the nuclear safety directive post-Fukushima. We will then have to see if the safety objective, which applies in full to new plants, can be

applied and is reasonable for existing plants and whether this is achievable. Clearly, fresh efforts have to be made to invest in safety and they need to be carried out as part of this directive.

On the subject of nuclear waste and decommissioning, according to the PINC, we will probably have a number of long-term operations and we will commit to some large-scale decommissioning plans



for nuclear power plants as of 2025. This must not be seen as a negative point: **decommissioning is a market opportunity. There is technology, expertise, techniques, know-how that can all be adapted and could be exported not just in Europe but to the rest of the world.** This is why it is important to make positive commitments to

this type of market. With regard to nuclear waste, we are in the process of finalising the first report on the implementation of the directive for the Parliament and the Council on the basis of the national reports we have received. The national programmes set out the specific steps that the Member States are going to be taking to manage waste. This report will be finished before the end of the year and is part of the energy package that will be published before the end of the year.

The Commission will be putting a proposal to the Council to revise the regulation and especially article 41 of the package on the Energy Union, in other words, the way in which investments in new nuclear projects are notified to the Commission. We would like to see greater transparency, we would like to ensure that the procedures are more business-friendly and that the whole spectrum of the acquis is studied once the notifications have been given.

Claude Fischer – We will have some contributions on decommissioning and waste management. This is indeed an industry with a great deal of added value, it is a market with potential for growth. During the Entretiens Européens of 2015 we proposed having a European industry for decommissioning and waste which should be considered a common good and should therefore not be left to the market with no regulation¹. The idea of notifying the Commission of new projects could either be very good or very bad: we are therefore extremely keen to find out what this will entail. I will now turn to Zuzana Krejcirikova so that she can tell us how in the Czech Republic the European directives

¹ Also refer to the problems and questions drafted by Claude Fischer for the round table she chaired at the ENEF – Prague 2015. www.entretiens-europeens.org

or guidelines are developing nuclear or otherwise.



Zuzana Krejcirikova – The Czech Republic is close to Germany and Austria. My company CEZ is the only nuclear operator in the Czech Republic, we have two sites (Dukovany and Temelin) and we are hoping to develop them. I am happy to hear there is also a nuclear

society in Austria which has almost 150 members. A few weeks ago we launched an environmental impact study for the plant at Dukovany, and there is a petition from Austria with 80,000 signatures against the plans for a new construction on this site. **I hope that there will be greater objectivity among the public at large as well as politicians: in 2015, Austria imported 16% of its energy from Germany and the Czech Republic. One third came from nuclear.**

Everywhere, nuclear is subject to politics. In the Czech Republic, the government has adopted a national plan for new construction projects as well as a new energy strategy: achieving 50% of nuclear in the mix in 20 years, whereas current levels are at 30%. According to our calculations, however, no nuclear power plant can actually be built before 2037. There is therefore a major discrepancy between energy policy and the reality.

Moreover, the Czech Republic has proposed a standing committee for new nuclear builds, especially where financing is concerned but also for public procurement. **We are the only operator in the world that has to go via the public procurement procedure when selecting a vendor.** After 5 years, we saw that the process simply wasn't working: it is impossible to change the documentation during the procedure in a constantly-changing environment. Other countries such as the United Kingdom and Finland obtained derogations from the European Commission from having to go through public procurement rules.

We have a commissioner for new nuclear plant projects and this standing committee but that's pretty much all we have. We will see how things pan out in the future.

Why is the public procurement process not working? The first reason has to do with wholesale prices. We launched a public call for tender for the new construction project on the Temelin site in 2009 which had to be cancelled, no one was prepared to invest without State aid. Another reason is the elections. Before the elections in 2013, a contract and a draft bill were on the table, we were

prepared to start the discussions to obtain a process close to the "Contract for Difference". But the new party entering into office refused to continue the negotiations.

The aforementioned national plan states, however, that CEZ should continue to build new nuclear plants: we are therefore continuing the procedure to authorise a new reactor in Temelin, with an environmental impact assessment. Another impact assessment has been carried out for the plant at Dukovany.

From a company point of view, we are currently more interested in Dukovany than in Temelin. We were able to do the "Long Term Operation: until 2025 at Dukovany. But the question now is knowing whether we will be able to renew it up to 2035. If that is not the case, the site will have to be closed by 2025, which would be problematic for the region. This is why the Prime Minister and the government are focusing on Dukovany. Temelin is the EU's latest nuclear power plant, entering into operation in 2000, so the problems are not the same.

What has the Czech Republic done this year? There was a call for suppliers, various candidates were contacted (Japan, China, United States, France, Russia). Several working groups were set up to cover the financial, legal and technical aspects. At CEZ level, two subsidiaries were created for the two sites. We are prepared to sell these companies to the State if the State decides to build the plant itself.

The national action plan comprises different options. All of them include the "Contract for Difference", except in the scenario in which the State opts to build the plant using its own means. No work has been done for the "Contract for Difference" in the Czech Republic: elections are taking place within one year, so it is likely that very little will be done for nuclear.



Centrale nucléaire de Temelin.

Claude Fischer – Very clearly, it is a fierce battle in the Czech Republic too. You are the hosts of the ENEF, the European Nuclear Energy Forum, every other year, but it is still difficult. Is the proposal to

nationalise the sectors a real solution at a time when we need investor partnerships? The questions over financing are what stopped Poland from forging ahead with nuclear projects: it has not been possible to find investors, everyone is waiting; governments and companies are passing the buck².

Along with security of supply, nuclear is an asset for competitiveness, for exports. I would like to turn to Alain Bugat, the founder of NucAdvisor. Alain is going to tell us if there is a European nuclear industry and how Europe stands on exports, especially in emerging nuclear countries.



Alain Bugat - I will start by talking about the role and influence Europe has in nuclear investment in emerging countries and then in the BRICS- Brazil, Russia (which is a special case), South Africa, India, etc. On the slide you see on the screen³, you will see a table produced after

Fukushima 4 years ago. We made a list of all of the projects on the table in all countries and we looked at how likely it was that they would be built. Surprisingly, 4 years later, the majority of these projects have been confirmed, although some were behind schedule or had come with extra costs. This is surprising; everyone thought that after Fukushima, all of the projects would be put on hold. In these projects, we see that Europe is almost completely absent (aside from two or three projects in Turkey and in Asia). Europe's absence also applies to research reactors.

The most important thing for emerging countries is that there cannot be commerce while there are no packages including financing. At the moment, France does not seem to be in a position to offer this. I am exaggerating slightly: it can only offer this to a limited number of countries, and there is no example of a commercial package offered by Europe or France for emerging countries with a financing component.

There is one domain where Europe could potentially lead the way: waste processing. This is a domain where we could expand Europe's offerings. Europe has the best results in R&D but India is doing very well in long-term processing. Many European industries are present in waste processing and decommissioning, probably more than anywhere else in the world. My company is a consultancy which provides engineering services for emerging countries. We pay particular attention to the upstream phase of nuclear projects but there is a

weak European presence in this domain too. There is potential there but it is based around safety through the instruments of the European Commission. This is a good thing as, for example, the twinning of safety authorities. But these instruments are far-removed from operations and are disconnected from projects. We are spending money, almost 2 million euros per project for safety but this has no effect on business. It promotes legislation but does not help Europe's businesses. Competitors such as Korea or Japan are seeing their governments finance the upstream phases (pre-feasibility studies, preparatory work). Whereas in Europe, when responding to a call for tender, the hope is that the client is going to pay, but the funding package is missing.

For the BRICS (excluding the largest players: Russia and China), there are historic relations between France, Germany and the 5 BRICS in the domain of nuclear. There is a good substrate there but this substrate has weakened over time, allowing Russia, the United States and China to benefit instead. Whilst the EPR and ATMEA reactors are not up and running, it will not be possible to sell reactors. We should focus our efforts on the fuel cycle, safeguarding measures, research reactors and waste management... I hope that it is only a matter of one or two years before we are completely on top of these areas. Major BRICS players (Russia, China and I would also add Argentina) are developing small modular reactors for export.



In my view, SMRs represent a new nuclear paradigm which would serve to reactivate nuclear countries other than France and together with France. Italy, Sweden and the United Kingdom are all interested in these SMRs and this would enable them to get back in the game. We need to be looking at two or three European designs for these reactors - at the moment there aren't any, aside from two being studied in France.

Together with the EPR and the ATMEA, Europe could come together and collectively commit to entering a short-term battle with Vietnam, Turkey, South Africa

² See the minutes of the Entretiens Européens held in Warsaw and Krokova - October 2013

³ See slides www.entretiens-europeens.org

and Saudi Arabia, but we also need to anticipate the next competitors to emerge, once the EPR and the ATMEA have proven their worth.

Claude Fischer – There we are: some new hope for Europe in new technologies. In La Lettre des Entretiens Européens you will find an article written by Philippe Pradel about the future of SMRs. The ATMEA has not yet been built either. Looking at the world's needs, Europe must not lag behind: it is an important industry, even if it not yet organised at European level. We will now open up the debate to the rest of the room.



François Perniola - national secretary for CFE CGC Energies - I have a question for Mr Bugat: are you surprised that there are no clear proposals in hand with regard to financing for countries likely to be interested in nuclear projects? Personally, I am not surprised given the competition playing

out at global level between ROSATOM for example or other players given the constraints imposed by the European Commission.

Alain Bugat –Speaking under the watchful eye of EDF, when the first French reactor was built in China, there were three banks for the loan. For Taishan, with the new banking regulations, there were 15. Dividing risk is being used as risk management. It is very difficult to put together a package for the financing. For South Africa, I hope that Areva and EDF will have a good package. But EDF cannot invest in all countries. The question is about the financial potential at European level.



Philippe Herzog - We should perhaps take a closer look at the question of the European finance industry (I am jumping ahead to this afternoon's debates). There is enormous stress on the European banking sector. The major banks likely to enter into the package are universal banks and currently in difficulty, even more so as the Americans in

preparing for Basel 4 are making the situation worse. Could we see European asset management i.e. investment funds being created in the direction of this industry?

Zuzana Krejcirikova – I think that the problem of financing does not only affect nuclear, it is affecting all investments right across Europe. The only resources benefiting from new construction projects are REs because of the subsidies available. I hope that the package that Massimo was talking about that is expected to arrive in a few months will correct the electricity market. The other problem has to do with the ETS system: when it was adopted in 2012, the projections were based on a price of 30€/tonne of CO2, we are currently at 5€ per tonne. There are no signs of investment for decarbonisation. The Commission must send a message to promote investments in decarbonisation.

Guy Buckenham – I can only agree with Zuzana. It is difficult to find investments in any type of project at the moment. The challenge is massive. Finding a long-term price for carbon would help enormously. Claude Fischer – We often have competition issues on the global market between the States that finance new power plants (such as Russia) and States that have market-based financing, in which companies have to find partners, banks, where public aid is prohibited and modernisation of State aid is not on the agenda for nuclear. What would be the role of States and the EU? Recover projects and finance them? Or build a market framework for the long term? With existing market derogations or deep-seated market reform?

Massimo Garribba – Renationalisation does not seem the right solution to me. If we look at how markets have changed, the situation is clear: there are no incentives for a long-term framework for investments. This problem is not limited to nuclear. **Nuclear is nevertheless suffering from additional issues: it is perceived as a political subject. Reasonable assurance needs to be provided that the legal framework is sufficiently stable to invest in a timeframe that can be counted in centuries.** If we look at electric grids, they require a lot of investment but no one doubts that they will still be here – even if they may change. **The issue is putting in place a market that sends out the right signals.** In nuclear, as in other domains, we need the same rules. In my view, it is unfortunate that there is no clear guidelines on State aid. But there is very limited experience with new projects which makes it difficult to find the right direction. The experiences we have had (Hinkley Point, for example) show that there is good understanding of the challenges and that it is important to put in place a market framework that sends the right signals. With regard to China, which is a major player in new nuclear construction projects, the government has a strong

influence over the national industry. There is a paradox: potential European investors in search of profit have little interest in climate change. This makes investment difficult.

Claude Fischer - If we could marry profitability together with the fight for the climate, or safety with competitiveness... we would definitely have the

solution! Why not include climate criteria alongside profitability at the heart of the questions on managing nuclear power plants? Danone has put health at the heart of its management... that seems to have worked pretty well. Social and economic effectiveness need to be linked.



Investing in human capital, R&D and innovation

Chaired by **Fanny BAZILE**, Nuclear Energy Division, CEA

With

Jean LLEWELLYN, President of the National Skills Academy for Nuclear (NSAN),

Rita LECBYCHOVA, Head of unit Nuclear Fission, DG Research and Innovation, European Commission,

Philippe PRADEL, Vice-president of Nuclear Development, ENGIE

Eric PROUST, Chef Training Program Scientific Officer, CEA

Saïd ABOUSAHL, Head of unit EURATOM coordination, Joint Research Center, European Commission

Second round table

F **Fanny Bazile** – We are going to discuss investment in training, education, R&D and innovation. We know that nuclear requires heavy investment for the construction and maintenance of power plants, but we think less about the challenges in the area of training.



At a time when nuclear is going global, the international dimension of training is an important issue. Similarly, for R&D, timelines in nuclear are long. This could hamper innovation.

Who are the main players in R&D and training? What type of financing is needed, do we need public financing, public/private partnerships? What should the content of training and R&D? To what extent are the contributions from the EU, States and private players responding appropriately to the needs in training and R&D? Another major challenge: how can we keep our skills in the different countries, especially in Europe which has a high degree of know-how? How can we share and develop it? Is there a higher level of awareness at European level?

Jean Llewellyn, you are the president of the National Skills Academy for Nuclear. What are the main challenges for training and education in the UK, which has a development programme, and what are your main expectations of your European partners (Commission, industry, research bodies)?

Jean Llewellyn – We are in a very exciting phase of the global nuclear renaissance. We don't just need to look at nuclear new builds and the extensive decommissioning programme – which both require technology and skills, we must not forget. We have spoken about innovation with small nuclear reactors, research needs, investment and finance. **However, to see any nuclear programme succeed, we need a suitably skilled, qualified and experienced nuclear workforce.**



In the UK, we have had a nuclear programme for over sixty years. It works well but we still have a skills challenge. If that's difficult for us, how difficult must it be for emerging countries such as Vietnam, for example? In the UK we have number of programmes that have got the go-ahead. We are going to need about 9,000 new entrants to the nuclear sector each year. We have a very ageing workforce, **it is important to transfer the knowledge of today to the workforce of tomorrow.** We had a long phase when we stopped recruiting people: we have a real shortage of skilled workers in the age range 30-45. We need to attract people from other sectors. We also have an image profile in terms of attracting people into the sector.

We also need to work on mobility and transferability of the workforce. In the UK, about 10 years ago,

the government and industry took a bold and innovative step in creating the NSAN (Nuclear Skills Academy). It had a variety of purposes: create programmes and training courses for the industry... A key focus has been to create a collaborative, non-competitive forum where industry can work together. This is a key message: **if we are to succeed with a nuclear programme, people need to collaborate and cooperate without looking at their own vested interests.** We also need a common language of competence. This enables recognition of skills of the workforce and encourages mobility and transferability of skills. We have developed a programme called the NS4P, which now has an international dimension. This is a way of people recognising each other's skills and moving from one area of the industry to the other. **Nuclear countries (either that already were or that are new to nuclear) need to work together to enable development and ensure that our industry remains safe and continues to grow.**

There have been many discussions about Brexit; clearly from a UK and a European perspective this is a challenge. But whatever happens, **Europe and the UK must continue to work together and collaborate on nuclear skills.** We are part of a European-wide programme which looks at mobility and transferability across Europe. We are trying to see how we can recognise different competences on a European basis. A platform is being piloted as the basis to do that. We can make the most of this exciting global renaissance. We can maximise job opportunities, ensure security of energy supply and maintain economic growth, ensuring that electricity is available for everyone across the world.

Fanny Bazile – Thank you very much, Jean. I am now going to give the floor to Ms Lecbychova, who is Head of Unit for Nuclear Fission in the Research and Innovation Directorate at the European Commission. She is going to talk to us about the research and training programme of the European Atomic Energy Community.

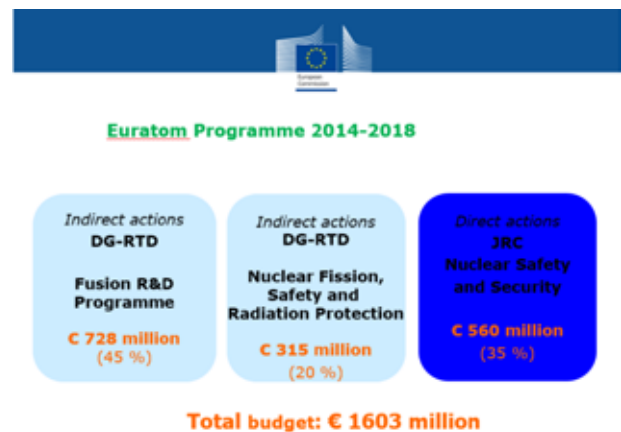


Rita Lecbychova – It is a great pleasure to be here, thank you to the organisers. I am head of the “fission energy unit” and my unit is responsible for the **EURATOM research and training programme for the 2014-2018 period for the part of indirect actions.** We operate based on Council

Regulation which means that we have a mandate from the 28 Member States of the European Union. **The general objective of our programme has an**

emphasis on continuous improvement of nuclear safety, security and radiation protection. These are key words in my presentation.

The programme runs for five years and has a budget of 1,603 million euros and the “fission” part covers 315 million euros. Our objectives: supporting safety of nuclear systems, contributing to the development of safe and long-term solutions for waste management, demonstrating the feasibility of fusion as an energy source, promoting innovation and industrial competitiveness....



For 2014-2018, 2-year working programmes have been put in place, for 2014-2016 and 2016-2018 divided into the following chapters: nuclear safety¹, radiation protection, research reactors, fission and fusion, radioactive waste management. Education and training is an extremely important part of our programme.

For the period 2014-2016, we signed grant agreements for 23 projects, including 28 million euros for safety, 20 million euros for radiation protection – a novelty for this programme. If we look at the distribution of the EC grants per cluster, the biggest part is safety, and in budget distribution per country, the biggest grant we signed was with the German coordinator.

Concerning Framework Programme (FP) 7 and FP 7+2: we have 23 grant agreements resulting from the call for tender, with 235 participants. Now we are starting the working programme 2016/2018 this month with clusters of the various topics (5 categories for safety, 3 for waste management, 3 for radiation protection...). We also have some innovative instruments in cooperation with the EIB (European Investment Bank). The EURATOM contribution is 20 million for research and innovation in fission. The aim is to be able to use them in 2017. We hope that in cooperation with the EIB we will be able to fund loans for 3 projects of pan-European importance. We have almost 55 million for the safety programme in 2016-2018 compared to 28 million in 2014-2015.

¹ See slides on www.entretiens-europeens.org

Concerning the timeline: we are now preparing the process of evaluation. We have received 72 proposals under the working programme 2016-2018 and the deadline was 5 October. This can be compared against the 66 proposals we received for the 2014-2015 programme. According to financial regulations, we have to sign all grant agreements in 8 months, which means by May 2017.

We still have to work on the programme for 2018. We are waiting to see which proposals will be successful and which have the greatest chances of receiving financing. We have to carry out a detailed analysis and see if there are still gaps to be addressed or if certain topics have not been addressed sufficiently. For the Commission this is a binding commitment and everything contained within the Council regulation has to be addressed.

Fanny Bazile - Thank you Rita for that presentation. I would now like to turn to Philippe Pradel, Vice President at Engie in charge of nuclear. I have two questions: to what extent do we need to innovate in the domain of SMRs? What are the benefits and challenges? What is the interest of SMRs in a European context in terms of a flexible and low-carbon energy mix?



Philippe Pradel - The history of SMRs dates back a long way. In the 70/80s, we spoke of Small and Medium Reactors. This period was characterised by progressive and continuous growth of the individual power of each nuclear power plant (going from 300 to 1,500 MW). These Small and

Medium Reactors (from 50 to 300 MW approximately) sought to find their market - either small networks, poorly connected networks or energy islands, the potential use of cogeneration or a new entrant in nuclear. **Today we see that this very concept of SMRs (making something small that used to be big) did not work. Why not? Chiefly for economic reasons.**

The scale effect that led industry players to increase the power of plants is due to the fact that there is no linear link between the cost and the power. The costs were also relatively low for small fossil fuel powered plants (greenhouse gases were not yet considered a global challenge), as well as the huge efforts that had to be made in terms of investments, skills, safety and administration for new entrants. Finally, the timescales did not decrease according to the size of the reactor: 10 to 15 years were still needed for small installations. It was deemed uncompetitive.

Are there any new paradigms that allow us to believe in new developments? This would appear

to be the case: new technologies, more decentralised production methods (smart grids), dealing with financial difficulties for large installations on the European electricity "market", industry being asked to be more agile (supply quick solutions with short deadlines)...

For about a decade, there has been renewed interest in SMRs, but in the new sense of the term: **Small and Modular Reactors, reflecting a form of innovation capable of facing up to the disadvantages that have been highlighted. The main idea of having module construction (a new technique but already in use in the naval, sub-marine and aerodynamic domains) is to compensate for the effect of scale by reducing construction costs.** With a slight series effect, it is possible to obtain a significant reduction in costs and remedy the lack of a linear effect in costs based on power. There is a second point which is more about society and innovation: passive safety. This applies well to smaller powers and less well to bigger powers. The larger a volume reactor is, the more difficult it is to cool it down because of its surface area. There are also the drawbacks that were raised this morning, about finance firstly, and duration and planning secondly. Is it reasonable to start a project when you will only start to see profits being made from it ten years later at best? For the first time buyers, is there still the same enormous effort to be made in terms of skills and financing?

There are many innovative concepts currently being proposed and developed, especially following the initiative of the American energy ministry which revived interest in the subject about ten years ago by financing projects.

Modularity may range from modularity of the reactor, to the total modularity of the whole installation ("plug and play"). There are some terrestrial concepts: the New Skill reactor, developed and financed (500 million dollars) by the American Department of Energy, fully modular on the reactor itself, but not transportable. The first of its kind will be found close to national laboratories - there is therefore strong public support.

Second type: transportable concepts. **The floating reactor that can be transported by barge, developed by ROSATOM, is almost ready to enter the operational phase.** It is more difficult to determine the nature of the financing but we imagine it will be public financing. This is a plug and play model. In a few years, for a new country needing from 50 to 500 MW, it is possible to have nuclear electricity available. The advantages, in non-proliferation terms, are that there is no access to the general core. In terms of cycle management and decommissioning, there is reversibility and the principle may be undertaken by the service provider.

In this domain, **there is also a French or European proposal for plug and play but underwater, installed off-shore.** It has the same advantages as the previous example in terms of timelines and intervention but also of safety, infinite cold source, protection and especially total or near-total independence of the site. There is indeed a major difficulty for the small reactors: finding a design for each site subject to seismic activity, extreme wind, etc... Even if the generic concepts exist, they always need to be adapted. This is not the case for this model.



The main ideas around these concept are reducing costs, reducing timelines, passive safety, reversibility, everything backed up by innovation. Concerning the three models, the first two are entirely supported by the corresponding States. For the latter, there is nothing. If we want to enter the race, which has started in the world today, we don't know where it will go, but a market is being created, we need to demonstrate our desire to be part of it. The prototypes have to be financed by State or European public structures. What is true for SMRs is also true for generation 4. **It is hard to imagine in an industry such as nuclear that companies alone are going to bear the financial risk without any real support, which either barely exists in Europe or not at all. The competition (Russia, China, United States, Japan) have such tools. It will not be a fair fight if we do not obtain the same guarantees in Europe.**

Fanny Bazile – Thank you Philippe, I'm sure there will be some questions during the debates. I am now going to hand over the floor to Eric Proust, head of the programme on training at the Science Directorate of the CEA's Nuclear Directorate. What are the main needs in innovation and also for R&D? To what extent are the European framework and the tools put in place to boost the development appropriate and sufficient?

Eric Proust – "Cooperating in R&D to innovate and share costs" is not the only reason to cooperate in R&D, and I would like to talk about the drivers of innovation before examining the instruments for cooperation in Europe and we will look at the extent to which they meet our needs.



1. There are several types of R&D drivers in the area of innovation.

-Benefiting from the existing nuclear fleet (power plants beyond 40 years) improve performance, reinforce safety and adapt to post-Fukushima standards. Investing in the building of a new reactor of over 100 MW

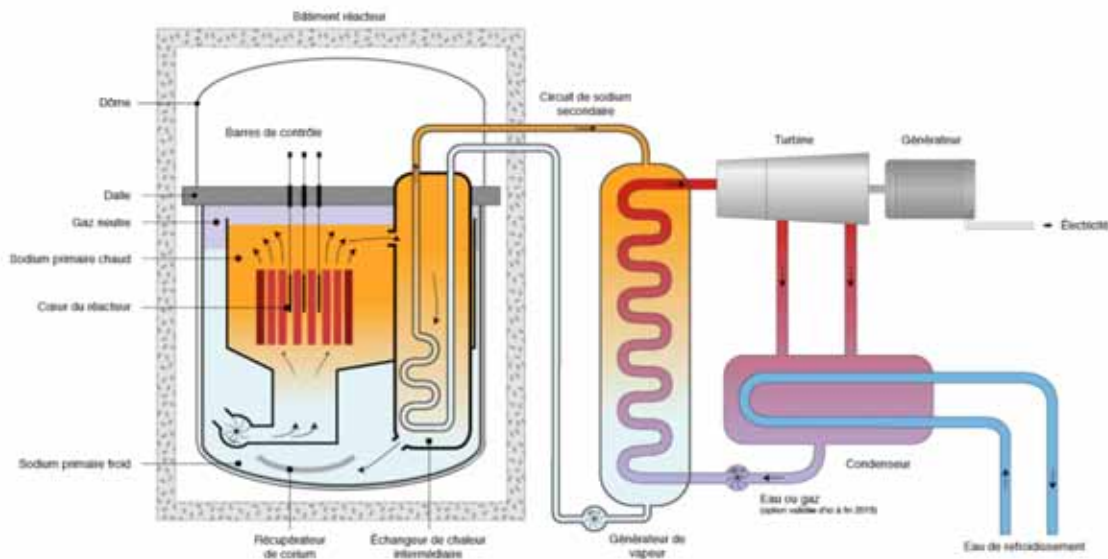
(with French and foreign investors) in the domain of fuel radiation allows for some experimentation and modelling operations can benefit from a high level of safety and maximum availability of the plant.

-Reinforcing economic competitiveness of the research into third generation reactors. We must continue to keep pace with the dynamics of other energy sources which have increasingly competitive production costs, in an attempt to reduce the building costs.

-Pave the way for 4th generation reactors. France is an interesting example: we are investing in the ASTRID project, which is a technological demonstration reactor entering the basic design phase. We are building on the know-how accumulated with the sodium-cooled fast prototypes. Several different types of innovation have meant that safety and performance objectives could be met looking towards horizon 2030. ASTRID project has introduced a cooperation-based approach to innovation between the 14 French and foreign partners in industry.

All of these programmes are for the medium and long term. Based on skills and expertise accumulated over several decades of learning, they require costly, large-scale infrastructure (reactors, laboratories, installations that are essential in gaining a deeper understanding of elementary phenomena and for the qualification of nuclear components and processes...). One of the main needs in the area of cooperation is to share the costs of R&D, those of maintenance and those of modernisation. This is particularly true for demonstrators, in order to reap the benefits of unique installations and develop our R&D programmes. Research into the 4th generation is financed by a certain number of French and European partners, including the European Commission. For ASTRID, we also have cooperation with our Russian and Japanese colleagues about how to benefit from Russian fast neutron radiation capacity or Japanese model installations that have been tested with sodium.

Safety is another motivating factor for R&D, which should benefit from scientific consensus that is as broad-ranging as possible, on the results and



Principe de fonctionnement du réacteur ASTRID (d'après CEA)

their application. A certain number of projects are financed by the EURATOM project in this field. R&D linked to safety requires some very heavy infrastructure: sharing costs and reaching a broad-based scientific consensus are linked. Many cooperation projects are carried out under the aegis of the OECD.

2. What instruments are put in place in order to construct a shared vision for R&D?

The main instrument is the SNETP, the EU's nuclear technology platform, created to implement the SET Plan in 2007. It has over 120 members: universities, research organisations, companies... In spite of companies competing, the SNETP platform has established effective cooperation between these stakeholders. It has developed a shared vision of the future contributions of nuclear fission in Europe, has published a strategic research agenda and a programme with a deployment strategy. The structure is an R&D programme based on three technological pillars: generation 2 and the current generation 3 fleet firstly, sustainable energy with the generation of systems next, and the non-electrical applications of nuclear energy lastly. Each of the pillars has a body attached to it, responsible for implementing this part of the strategic agenda.

The association Nugenia created in 2011 thus brings together over 100 members; it deals with R&D cooperation for small reactors and has put in place a transparent project creation process. It has identified common research needs and published a consensus-based 13-page roadmap setting out the challenges and objectives of the programme. It is intending to take on more and more importance in the private/public R&D programmes. The ESEII (European Sustainable Energy Industrial Initiative) is the body putting in place the programme for the 4th generation. It has defined a roadmap with different

priorities and is promoting 4 projects for gas fast reactors. The third body in charge of the application of non-electric projects is the ENCII (European Nuclear Cogeneration Industrial Initiative). I also ought to mention that there is a technology platform aside from the SNETP which deals with the management of nuclear waste: the IGDRWTP (Implementing Geological Disposal of Radioactive Waste Technology Platform).

The priorities of the SNETP agenda and these 3 pillars are taken into account by the Commission when developing the European framework programme. These European instruments have given rise to a scientific and technical basis in a transparent and visible way to support R&D projects and the programmes, including their implementation and publication of results.



The picture is much less positive when looking at the budget allocated by EURATOM to direct R&D measures in nuclear fission: this is almost 50 million euros per year, or 1/10 of France's public investment in nuclear R&D. Even if we add the 20 million envisaged next year in the EURATOM budget to support research investments, it is difficult to

see any consistency between this budget and the stated ambitions of maintaining the EU's position as a leader in nuclear, reinforcing independence and energy technology. **If we compare this budget with the R&D budget for renewables, or even against the nuclear fusion budget, the EU seems to be neglecting investment in nuclear fission, even if the European Commission just reminded us this morning of the fact that nuclear fission will represent 20% of European electricity in 2050.**

In conclusion, the SNETP estimates that the funding necessary for 4th generation projects was 11 billion euros. Two of these projects will be financed to the tune of 3 billion as part of the investment plan announced by Jean-Claude Juncker. That is a good start, we will see if it actually materialises. It is clear that the development and demonstration of nuclear technology need to go hand in hand with European financing. Technology is moving on so quickly here that, without corresponding support from the EU, we will lose our position as leader in the face of Russia, China, India. We cannot preserve the influence and knowledge which are so essential in ensuring that the highest possible levels of security, safety, waste management and non-proliferation are achieved and maintained across the whole world.

Fanny Bazile – The final speaker is Mr Saïd Abousahl, head of the EURATOM coordination unit at the Joint Research Centre: what are the main challenges in allowing the JRC's research and development programme to run smoothly and, following on from what has already been presented, do you think that the funding is sufficient to meet the objectives?



Saïd Abousahl – I can answer the second question very quickly: no. But I would like to give some concrete examples of how we can move forwards at European level. Moving on together is a real challenge. As a body of the Commission, the JRC can play a role that a national organisation can't.

I will mainly focus on how we can rise to the challenge of maintaining our skills, our know-how and our expertise within the European Union. There is R&D but mainly also education and training and the better use of our nuclear infrastructure.

Several years ago we launched the European Human Resources Observatory for the nuclear sector. Is it a good instrument because it provides us with figures. The results from the study carried out by this observatory show that we are and will continue to be faced with a critical situation. **Between now and 2030, 50% of nuclear staff will be retiring, leaving us with a shortage of highly qualified**

experts. The peak will occur between 2020 and 2035. Quantifying the situation in this way allows us to think of solutions.

Within our centre, we have developed a number of training programmes, we have our research laboratory and we try to link our training facilities to the research programme. But there are some things that cannot only be done at JCR level: our role as the Commission is to support other networks such as the European nuclear education network. There are a great many initiatives and they need to be supported in order to be sustainable and we offer support in the form of administrative assistance.

This morning we spoke about decommissioning. We have many strategic documents on the subject, many agendas, but we need to take our responsibilities seriously and begin implementing them, even on a small scale. Promoting dedicated, tailor-made training is a first step. We have spoken to national and European organisations. There are a certain number of modules, every country has its own, but there are no links between them. Therefore we decided, together with a number of national organisations, to pool these modules. The initiative will be launched on 2 December this year. A memorandum of understanding will be signed between the JCR and several other organisations. By bringing together all of these stakeholders and all of these programmes, we can offer young people and experts the chance to receive training in other countries. So this is one concrete initiative.

We can also be active in many other areas, such as nuclear infrastructure and optimising their use. We have been talking about this for years, but someone has to take the initiative. This is why we organised last year a symposium on the subject which was extremely well-attended. But inevitably it is difficult to make progress with so many people. We realised that there are other aspects which are rarely taken into account: administrative and legal issues. It is not easy to access a nuclear facility, there are legal procedures to go through. There is the question of who will pay, who is involved etc, this is all very complex. We reached the conclusion that we could start to work with a handful of countries with pilot projects and then we could broaden the scope from there.

We are signing bilateral agreements with national organisations (Belgium, Poland...) and we are also working with the SNETP. We would like to organise meetings with 8 or 9 nuclear States to talk about infrastructure but also national research programmes, and examine the ways in which we could build on the existing programmes in the Member States. We are also working on other activities: we have the institute for reference material and measurements in Brussels, as well as some other nuclear

facilities built as part of the Euratom treaty. We host scientists, students, PhD students, who all work in our centres. We cannot send them to all of the nuclear sites but we talk to our partners and see how we can organise this issue better. My colleague Rita is in charge of indirect actions and I am dealing with direct actions. Together we will see if there is a way of obtaining support to promote having more open access to nuclear sites as part of our exchange initiatives and training programmes.

We are a European body and this is how we undertake these initiatives. We are representing EURATOM at the Generation 4 international forum. Next month we will sign the framework agreement for the 4th generation, all Member States will be taking part in this forum to discuss innovation and R&D; one group is dealing with training and we are involved in that with the IAEA to share our resources and knowledge with other partners.

I would like to make one final comment about the nuclear safety instrument. This instrument is probably not playing its full role in supporting the industry; we should not place too much responsibility on this instrument: it has a small budget – 200 million euros over seven years. This instrument has to cover safety and safeguards which we promote in other countries (Armenia, Belarus...). The idea is to use these instruments as an example in Iran. The EU can cooperate with this instrument (also used for Chernobyl). All of these projects are implemented by the Member States, industry. Industry therefore needs to be stronger when it comes to building nuclear power plants or promoting nuclear energy beyond the EU's borders.

Fanny Bazile – I will now open up the floor.



Valdim Malkin – Main associate at Transitional Markets Consultancy. **It would appear that the bulk of the effort in skills and training is concentrated on the supply side (training centres and programmes...). Don't you think that one of the major obstacles lies on the demand side?**

In other terms, young people have to be convinced that nuclear has great prospects. It is important to convince them that they will not have to retrain in 20 years. Don't you think that something should be done in terms of information in schools' curricula and public awareness? Young people hear different things and they are not sure that it is an attractive profession.

Mr Pradel, could you tell us how SMR vendors are going to address these concerns: firstly supply chain flexibility. In-situ construction enables the vendor to localise a significant portion of the supply chain in the country of construction. This creates jobs and is attractive to newcomers especially. On the other hand, SMRs amount to plug and play, so the challenge is the external impact of safety issues. How can plants offer protection from direct heat or radiation? This drives the cost up. Wouldn't it then follow that building a set of 10 to 12 modules in Europe would require comparable investments for external safety as a large reactor?

Philippe Pradel – First of all, with plug and play and other types of modular reactors, we can mix the national requirements for industrial policy for a country. The main idea for SMRs is to have a smooth implementation of the nuclear industry in newer countries. If we start with a large reactor, for skills, for safety analysis, for administrative bodies, safety checks, major steps have to be taken. Usually, there is a first period of 10 years which is very calm and then in the 5 years before starting operations there is a lot to do. The idea of SMRs is to have a smooth ramp-up in all of these areas, especially in the industrial bodies. It could be the first step towards a large nuclear programme. **For example, if you require 1500 MW in 15 years, there are many possibilities with an EPR, etc. but in the same duration of time, there is also the possibility of having 2 or 3 SMR modules in 5 years and then a large plant 15 years later.** This allows for a smooth ramp-up of skills and administrative bodies, etc. The idea is not to say that plug and play is a way of having minimal involvement; it is a service. **And this solution is particularly interesting for countries aiming at industrial development.**

Regarding safety criteria for 10 to 15 modules, it is true that there are the same issues as for a large reactor. It is slightly more subtle: upon first analysis, there are no external issues (especially climatic issues) – although there may be some human aggression. It is always possible to deal with this issue and to find a solution that is adapted to the site or the country.

Saïd Abousahl – On the issue of public awareness, we have this initiative starting on 2 December on training and education related to decommissioning. This is a major question for us about how to attract young professionals to the sector knowing that decommissioning suffers from this misconception of appearing to be a thankless task. We started a module on this initiative to tackle this issue and communicate better within universities. Decommissioning is technology, engineering, science, and not cleaning.

Jean Llewellyn – On the demand question, I totally agree. It is very important to raise awareness about

these exciting careers and this needs to start very early. In the UK we have a programme in which children aged 5 and 6 start to develop their interest in science and technology. We bring industry experts into schools to work alongside teachers. These experts inspire the young people and make them feel much more engaged. It is important to carry this through and embed it into secondary education because it is too late once people have reached university age.



Mohamed-Raja'i Barakat – I have a question for Mr Pradel: the aim here is to promote nuclear energy, but when a company such as yours says to consumers that you want to invest more in R&D, renew reactors and that means increasing rates by 20% to 25%, is this not an

obstacle to promoting nuclear energy?

Philippe Pradel – I think that the majority of the large increases in electricity costs that we are currently seeing in Europe are not due to nuclear. Nuclear energy globally contributes towards reducing the huge increases that we could expect to see if nuclear were not present. With that in mind, the fact that investments need to be made and financed, that is part of energy costs. We currently have studies that say (I am speaking about Engie but I imagine other electricity companies have found the same): extending existing nuclear facilities with investment is the most economical solution, and when we talk about massive solutions, generating power for the 20 years to come is still going to require some investments.

Miroslav Zimermann – Energy attaché at the permanent representation of Slovakia to the European Union. I have a first question for Mr Pradel about licensing of SMRs: the licensing process is the same as for a large reactor. Huge efforts therefore still need to be made, especially regarding discussions with the public. What is your opinion on this subject? I also have a question about potential timing: when will the first generation 4 reactor be operational – and connected to the grid?

Philippe Pradel – On the licensing process for SMRs, this is a complex question. Essentially, there are two scenarios: if you consider an SMR as a downsizing of a large reactor, the process is the same and it takes the same amount of time, with the same safety considerations, etc. If you want to have a licensing process that is unique to SMRs, available in all countries around the world, you need a design and installation that are independent from the site (which is difficult but not impossible). This solution

could be used as part of bilateral agreements, with the licence issued by the same safety authority as the constructor then transferred to the safety authority of the utility. The bilateral agreement could then be made larger. But that is the only way of gaining time in the process.

Eric Proust – If your question regarding generation 4 is about our timeline, for the ASTRID project (technological demonstration reactor of 600 MW), we regularly update our timeline. The first criticality study will be towards the end of the decade 2020. I don't have any information on the German research centre.

Saïd Abousahl – Neither do I. Concerning generation 4 on the other hand, we are happy to see Germany contributing to R&D programmes.

Myrto Tripathi – I have a question for Ms Lecbychova. I have seen that prior to recently taking up your current position, you were head of the unit research fund for coal and steel. What comparisons can you make between the two units? Are there any recommendations you could make for the nuclear community?

Rita Lecbychova – That is a very interesting question. I think the main difference is that they have different treaties. The ECSC treaty expired after 50 years, in 2002. The community therefore disappeared and, based on the decision by the Member States, the assets were liquidated and were put on a special account. The account is managed by the European Commission. The interest generated through this account is purely used to fund research in the area of coal (27.2%) and steel (72.8%). The legal base is therefore different: this programme operates under decisions of the Council. This places it outside of any programmes such as Horizon 2020 (even if there are some complementary features of both programmes). The budget for fission is larger – even though it decreased during the financial crisis of 2008. We work on the basis of the EURATOM treaty, with the regulation being revised every 5 years. There are of course common features between the two.



Question - Concerning research and innovation, it has been said that we have the wrong perspective in terms of funding. I also think we have a faulty perspective on research. We are really at the beginning of

the nuclear era and research can solve all problems we have with nuclear energy through generation 4 systems. **China has announced that this system will be able to cover all of its R&D needs within 15 years.** This system will not have civil accidents, safety will cost much less, there will be no proliferation risks, and waste management will cost less. In 30 or 40 years, 90% to 95% of nuclear will come from outside of Europe, so even if we manage to join the race, we will be in last place.

Eric Proust – It is clear that investment in new investments in nuclear projects are coming from Asia and in particular China. So the question is: to what extent do we want to be part of this investment and get inside these technologies?



Manolatos Panagiotis – from the European Commission, nuclear fission research. Question for Mr Pradel: are SMR appropriate for Europe's energy needs that are beyond electricity? The second question is for Mr Proust: you said that we need to share R&D costs. The AEC is mandated to implement a programme, especially safety where there is a lot to do.

At the Commission, we have technology platforms designed to share costs. Can we go further than that? Are you prepared to dedicate part of the budget to the common management of safety?

Philippe Pradel – Obviously there are other uses for SMRs aside from electricity: cogeneration, heat, hydrogen production, etc. We have to bear in mind that innovation is important.



Claude Fischer – Concerning investment and innovation. Money will be needed. The Commission's envelope for research is too low. **We have heard the alarm bells: we will be out of the race!** When innovating, there are some questions to answer: take EPR as an example. Is it viable? Will we be able to make a series? There are other technologies too: ATMEA,

SMRs... Will we be able to apply them so as to have a possible range of technologies in accordance with demand because the needs are not the same in China, on an island, etc? **What are we doing to defend and construct an industry that will allow us to keep up with global competition?** Because, as Philippe Pradel said: our competitors are off the starting blocks. Furthermore, out of the 375 million euros to support research, 19 million have been granted to Germany: but to do what? Decommissioning? It is costing us to see Germany promoting renewables and unilaterally shutting down nuclear, and it gets extra help! On the subject of training, I heard that 9,000 technical engineers are needed in the UK. How many in Europe? Do we know? Shouldn't we create pan-European universities and bring young people into hubs of competitiveness?

Philippe Pradel – **To get back in the race, we need to have strong financial support and define the priorities for Europe: in innovation for SMR and generation 4. For larger reactors, we need export credits.** All of our competitors have them, with low rates of interest and strong guarantees. We don't have this in Europe. On the domestic market, the market needs to be consistent with investments. The current market is not in a position to allow long-term investments.

Saïd Abousahl – Just a few words about the budget and R&D: there is a report that will come out about the 10 years of EURATOM's contribution to the international forum on generation 4. This report contains facts and figures, there are no conclusions. It is very interesting. France is separate because it is a member. **90% of the contribution comes from the Commission and its R&D budget from EURATOM. The effort from Member States is minimal.** There are no incentives coming from national level. It is good to have a budget for the JRC, but it needs to be complemented by national R&D budgets. Otherwise, the strategic decisions made within the JRC are difficult to see through. If the resources continue to decrease, we will be going nowhere.

Rita Lecbychova – The Commission always tries its best to allocate the budget according to the needs of the programme. The question of allocation and use of resources is crucial. We have just started to work with a new instrument, the European joint programme, which is an instrument for public/public partnerships in R&D. We are pooling public resources, from the Member States (30%) and the Commission (70%). This is how we will find, in my view, **an efficient means of distributing resources by making shared financial commitments, defining a vision and a common strategic agenda.** On decommissioning, the Commission is paying a great deal of attention to it (the PINC is a good example of this); we are aware of its importance in the cycle. Our responsibility

is to address research, education and training needs. My unit will have to cooperate with that of M. Abousahl's on this and with DG Energy.

Philippe Herzog – We have a fundamental problem with Europe's identity in the future: this is its capacity for innovation. What we are saying about nuclear today we could also say about digital too. **There is a huge shortage of skills in Europe, the inability to have an industry based on a situation that is not preparing for the future.** This is a much broader problem and this is why, to me, the absolute priority is **to found a community for education, work and innovation.** I would call for a general fight for this question of regenerating innovation to become the priority. Currently, education and skills are a strictly national matter, they are off-limits. If we don't have this generic fight, all sectoral efforts will not pay off.

Not all us lost: after years of effort, we have opened up the subject of long-term investments. After 2008 we saw secular stagnation. There is no growth and in order to create some, we need long-term investment: human, technological, productive. The battle starts here. We need to make the connection with the Juncker Plan (even if this is difficult for the nuclear sector). What is the role of long-term investment in regenerating the sector's capacity to innovate? We need to ask for figures. It is a black hole, as for education and skills. To create the Juncker Plan, the funds for R&D have been reduced to put them into public guarantees. However, there are no industrial experimentation projects, no industrial innovation. All that has happened is that budgets have been cut. In the generic battle, there will be one specific battle: we cannot regenerate long-term investment in Europe if there is no industrial innovation in a subject of common interest. This is not possible at present.

Jean Llewellyn – I think a lot can be learned from what has happened in the UK. We were a world leader in the 50s and 60s, right into the 70s, and then in the 80s and 90s the government lost faith in nuclear and stopped investing in the sector, in research and skills. **Now we have a leading nuclear programme with French and Japanese technology and Chinese investment. I cannot believe that the UK has lost the ability to be a world leader in technology.** Our government has woken up, but unfortunately this came too late. I hope that the SMRs will be our saviours. They are currently looking at a policy for growing UK

skills and technology in SMRs. The skills agenda has been tackled well, there is a good industrial strategy. My plea across Europe is therefore don't leave it too late because once you have lost the know-how, you can't get it back.

Philippe Pradel – The JRC has research centres only in Western Europe. This is not normal. **It needs to create some in Eastern Europe which would start out, for example, by producing an SMR prototype or generation 4.** That would be a real programme. Rather than managing shortcomings, there need to be strong proposals.



Philippe Herzog – Well said! The first time I travelled to Lithuania, the Lithuanian MEDEF was asking for European technology universities. We forced them to shut down their nuclear industry without giving them any compensation. They felt they were being deprived of a major asset – they had an energy surplus and now have a deficit. **This proposal is a prime example. We always forget Eastern Europe. That is scandalous and a serious mistake.** It is also the after-effect of enlargement

which has not been accepted by our populations.

Saïd Abousahl – We have to think about how things would work in practice. We can say we need to create a research centre in Lithuania or anywhere else. But who decides on this kind of thing? That is not decided on my level. It's not all that easy.

Claude Fischer – What we need are partners, including within the Commission. You can help us!

Saïd Abousahl – I am already fighting it out with my colleagues to keep my small budget. **We often ask for things to be done at European level but we forget that what happens at national level has a huge impact on the European level.** When I was fighting to negotiate the EURATOM budget in 2012/2013, and when the budget was reduced, my national colleagues were saying, "we are making budgetary cuts at national level, we cannot increase the European budget". We are all feeling the heat. **There is no reason to increase the budget of the JRC or EURATOM whilst cutting the AEC budget.** Support work needs to be carried out at national level too. We must stop passing the buck and waiting for others to make the first move.

Claude Fischer – Beware! If the collective European decision is not made by the States and by the EU as a whole, we can always point the finger at someone

else. **The problem has to do with our priorities: are we going to come back, yes or no, to investment and innovation in Europe?** These two things have nourished Europe's development. The Juncker Plan, despite the increase in awareness of the long-term investment needs, only represents 375 million euros which have not even seen the first euro spent. Is the

choice of nuclear going to be a decision made by Europe including the States that do not have nuclear at home?

Fanny Bazile - Well, the alarm bell has been sounded; I think this is the main message of this round table.



Russia, how do they do it?

With

Claude FISCHER, Director of ASCPE

Alexey LOKHOV, Deputy Director for business development, ROSATOM France

Dmitry SUKHANOV, Director General of Atomenergopromsbyt

Hearings

Claude Fischer – Our Russian guests are here to talk to us about their nuclear ambitions, at home and in the wider world. They are talking about investing 130 billion dollars between now and the end of the year¹. We have left the field wide open and they are coming to make the most of it. What should we do? Work with them? Leave them to it? Compete against them? These might be slightly blunt questions, but they need to be asked. A few years ago, I had organised a symposium on the relationship of competition and cooperation between Europe and Russia in the nuclear sector². **I have the impression that we are at a more advanced stage of cooperation in research but the competition has started up again extremely quickly, especially in the Eastern European countries – which we tend to forsake for the West.** I will give the floor to Alexey Likhov, deputy director at ROSATOM France and Dmitry Sukhanov, director general at Atomenergopromsbyt, who are going to speak to us about competition and cooperation and talk about a touchy subject: Kaliningrad.



Alexey Likhov – Thank you for this opportunity Claude, we are delighted to be here. ROSATOM is the group which brings together all of those working in Russia's nuclear industry. We are the operator and provider at the same time. Here you can see our construction plans in

all four corners of the world³. We have some major national programmes (8 units currently being built in Russia) and 36 international projects, at different stages of development.

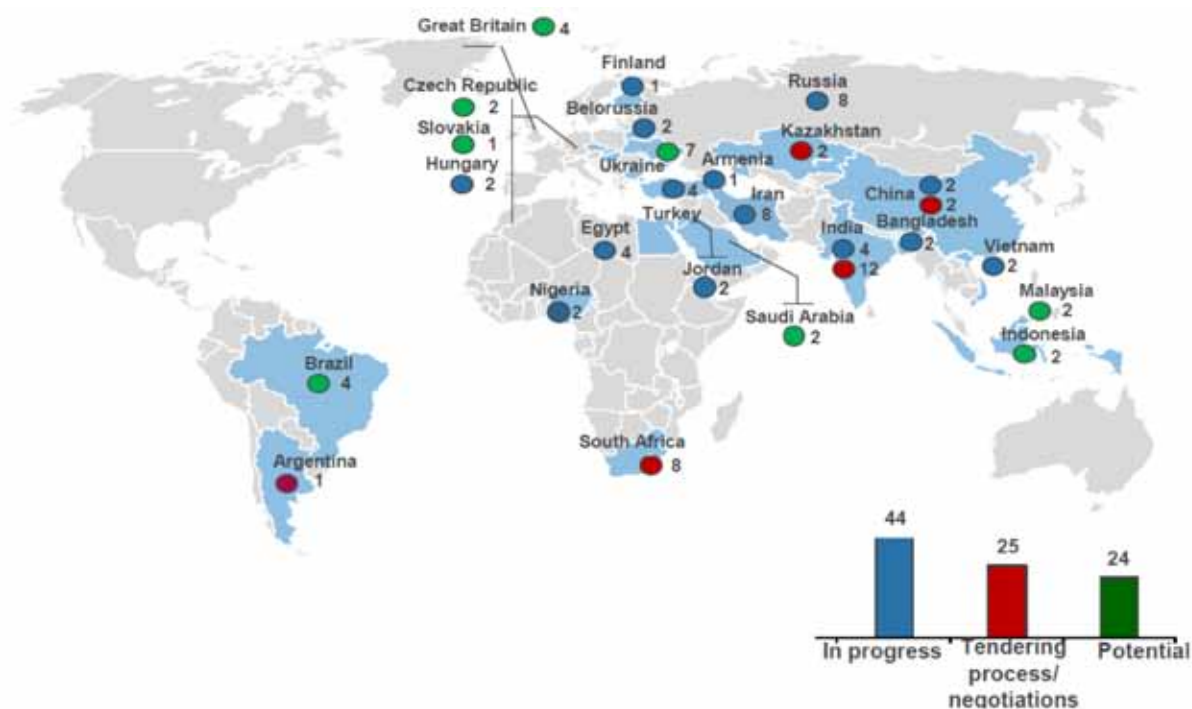
When making contact with our clients, we tell them what we have to offer them and that means almost everything: **creation of infrastructure, staff training, financing obviously, etc. The key word is flexibility, except where safety is concerned.** We offer our best technology in safety and security. Just a few words about the financial solution we offer: everything depends on what the client wants, but here too we try to be flexible. In Turkey, we have followed a system of construction and operation. With PAKS in Hungary, we worked with State credits. **These foreign projects are possible because we have solid and robust national projects. We are not talking about new builds but extending the life span of the fleet.** We tend to overlook this aspect of nuclear activity, yet it is a rather important aspect. This is why France is spending 50 to 55 billion euros on it, which is more or less the same as a programme aiming to build 10 new units; that is a lot. We have a programme for long-term operations underway in Russia: we have expanded the life spans of 24 units and we hope to continue to maintain 9 units between now and 2025.

But we are equally proud of our new builds. We have finished the construction (and reached the first critical level) of the G 3 +, equipped with a VVER-type reactor. In addition to light-water reactors, we also work on fast reactors. Last year, we collected the BM 800, a sodium-cooled reactor. We are also contemplating some of the other solutions that have been mentioned this morning: SMRs mounted on barges which are currently being made in St Petersburg. Let us come back to Europe. We are talking here about the European Union but in our opinion, Europe extends beyond the EU. **We are in Europe; we are neighbours. This is why we take care to consider the region as a whole.** We have different projects happening in Europe, at Hinkley Point,

¹ See the interview of Kirill Komarov, in *Les Echos* from July 2016

² « EU/Russia dialogue in the nuclear sector : competition and cooperation », *Les Entretiens Européens*, April 2013 in Bruxelles

³ See map opposite



Les projets de nouvelles constructions nucléaires de Rosatom dans le monde

in Finland, in France, and several VVER projects – some more advanced than others, as in Slovakia, or more recent ones, like in Finland. We mustn't forget the 8 units being built in Russia and the Turkish project.

ROSATOM plays a role in developing nuclear infrastructure in Europe. Claude said that we had a strong presence on the market. In reality, European companies are involved in various stages of construction, with instruments and controls, turbines and financing. **We open our projects to external financing, and companies from Europe and elsewhere are invited to invest in our projects – with the majority of these projects being able to be sold to foreign investors.** ROSATOM is focusing on the equipment of nuclear islands. Our share of reactor projects represents 15%. When we invest in Europe and are building a plant in Europe, the money remains in Europe and this translates into job creation in Europe. You have some examples here: AREVA, ALSTOM, EDF...

The question we were asked was: how does it work where you are? Well, it works well, very well thank you, thanks to a strong national programme and innovation which allows us to offer projects that are financially and technically viable, which allows us to attract foreign clients. **Europe is a key client for us and an essential partner for ROSATOM.** ROSATOM plays an important role in the programme of building European nuclear power plants but also in the maintenance programme and lifespan extension

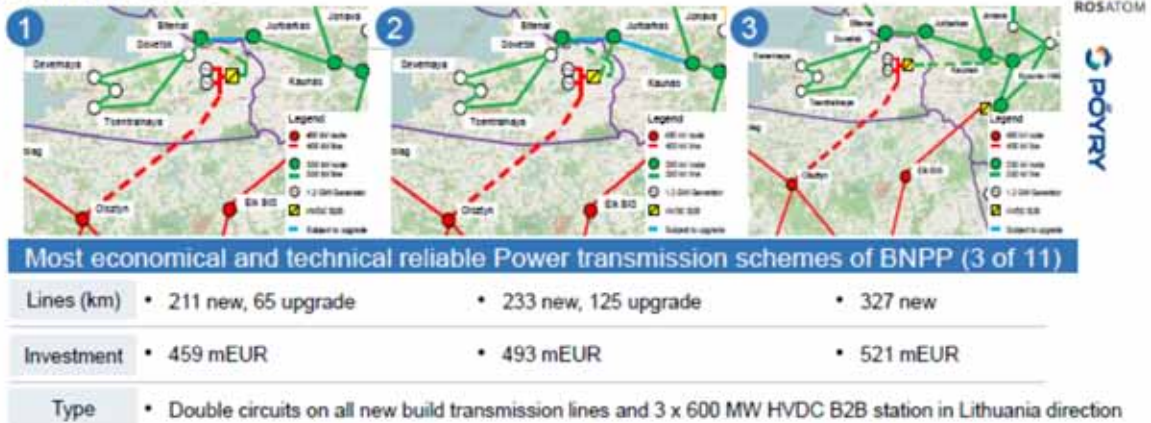
programme. We work on this with quite a few European companies.

Claude Fischer – You are telling us about what is working well. Does everything run as smoothly? No obstacles? No reluctance?

Alexey Lkhov – Isn't it always better to look on the brighter side of life? Obviously, **one of the obstacles (and this is not really an obstacle) that we face with our European partners is the structure of the European market and the price levels.** We know what the current situation is; it is very different from the situation in Russia where we have a capacity market and a powerful electricity market. Despite the low level of electricity, we mainly pay ourselves through capacity in particular. It is different in Europe and this limits our expansion. We have to wait until a certain price level is reached, prices are abnormal at the moment. It is difficult for everyone, especially for the LTO programmes. **At 20€ per MW/hour, that is enough to cover running costs of the plant, operational costs, but it is not sufficient for giving new investments the go ahead.**

The other challenge in Europe is the acceptance of nuclear. In Eastern Europe, in Finland, countries where we are present, nuclear is associated with technological and scientific progress. It is the solution for affordable and low-carbon electricity. We still have to convince society in the countries where we would like to be present that we are on the right track. The example of the United Kingdom is an excellent one; it shows that it is possible.

Baltic NPP interconnection is efficient in different scenarios of synchronization



Dmitry Sukhanov – I would like to present to you the vision of Atomenergopromsbyt for investment and incentives for the European market to invest in new power plants.

There are many similarities with the United Kingdom's approach with the Hinkley Point project: **we have the same mechanisms for**

guaranteeing investment in Russia, comparable to the Contract for Difference. We think this could be a good pillar for European development. On the acceptance side, we think that climate issues are very important, Europe but also the rest of the world has to face up to it. Nuclear could be a solution with renewables for the world's energy system.

Here are a few images, some of them you will probably be familiar with, which show the concept and the strategy of the European Union's energy policy, presented recently by Mr Juncker. The priority is a new design for the European electricity market to guarantee the sustainability of energy systems, to allow energy to be produced at a cost that people can afford and to make Europe's economy low carbon. **The energy sector is undergoing some changes: the European objectives are ambitious. We think that Kaliningrad could help us to support and achieve this objective in Europe and in the Baltic region.**

In fact, the base produced by nuclear energy will be one of the pillars of a safe and economically viable energy supply and for carbon free electricity. There is great potential, even if it is limited by the boundaries of the European market. Nuclear plants are a viable solution for the much longer term thanks to the possibility to control the cost of production

given the ability to predict prices. Primary fuels could support the implementation of the energy market in Europe.

For the region of the Baltic countries and Poland, we think that transforming the energy system with programmes emerging from continental Europe will be an opportunity to contribute towards synchronisation (which is important for implementing a technical and viable solution). The Baltic NPP (Kaliningrad project) will support the integration of energy systems, enlargement of electric cables in addition to the already existing lines – but are insufficient for completely integrating the system into the electric grid.

The Kaliningrad project is made up of two VVER units of 1200 MW with each being able to supply electricity, from the Kaliningrad region to Poland (which is the largest market in the region), Lithuania and the other Baltic states. Poland faces the challenge of having to reduce CO2 dramatically⁴ (because of the fact that coal currently dominates its energy mix). With this project, we could help it to achieve approximately 20% of the reduction needed to achieve its objectives and conform to the requirements of the Paris agreement, as well as those of the EU. According to our estimates, the CO2 reduction should commit 0.5 billion euros, which is a high sum for Poland. From our point of view, this is a win-win solution for integrating electricity systems in the region.

Here are 3 options out of the 11 that we evaluated in terms of technical feasibility of the interconnection. All are similar in terms of CAPEX – it is half a billion euros in investment. In addition to the plant itself, it will have to attract private investors which we evaluate at 49%. We also propose a separate interconnection project which could be a different commercial solution without direct financing from Member States: interesting for the region, the States,

⁴ See slides on www.entretiens-europeens.org

the European Union and its institutions, whilst contributing towards achieving the objectives of European policies. On the export side of this project, it is estimated that 100% of the electricity produced would be sold on the European market according to the rules.

The infrastructure and the plant would be managed according to the N3 codes. This could mean keeping a safe and secure energy supply.

Claude Fischer – Before we open up the debate to the floor, I have a question: the impression we get here is of a neatly packaged project, well-planned, with objectives that correspond to some of the Energy Union objectives. Can the same be said of Poland and Lithuania? When I organised a symposium in Poland in 2013, the Polish people were ferociously holding onto their independence and didn't want either Russian nuclear or gas. They are planning to incorporate a nuclear project into their mix with the future building of 6 reactors in Pomerania. For its part, Lithuania had to close its plant in order to enter into the Union. The EU provided funds to help with the rebuilding of another plant. With the two Kaliningrad reactors, located very close to the border, it would be easy to make a connection. But what do we do about the willingness of States and people? What stage is the dialogue currently at?

Dmitry Sukhanov – Poland and Lithuania are indeed two countries bordering the Kaliningrad project. Discussions are underway; they started in 2012. Currently, the systems in the three Baltic countries work in synchronisation with the Russian energy system. They are now migrating towards the European system which takes on the technical considerations and the technical and network infrastructure. Decisions are expected to be made shortly as a result of these discussions (end of this year or beginning of next year). Depending on these decisions, we will develop various scenarios for interconnections.

This image⁵ shows the 3 scenarios that we have selected and for which we are prepared. It is important to mention that the plant and the interconnections imply major energy systems, as opposed to gas, for example, and that this project does not represent a large share of the capacity in Poland. Poland is aspiring to some interesting developments in energy, with nuclear in particular. We see this as a positive sign: this is a positive message for the market, which is not the case in all European countries. There are some challenges: we have to have investment



guarantees for this project. To do that, someone has to pay. The CfD mechanism may be a good option but that will not help in stabilising energy prices. Lastly, our project could be an interesting solution for the energy transition. This will take time. But we think that the

project will help Poland to diversify its energy mix and that there is room for everyone.

Claude Fischer – We will now take questions from the floor.

Question – Poland and Lithuania need energy and also to guarantee security of supply. The two countries would like their own nuclear programmes, Poland in particular. They know that Russian nuclear will be fast, inexpensive and almost at a fixed price. Are there any plans to sell?

Dmitry Sukhanov – As I said, we are prepared to sell electricity on the market in accordance with the European framework. Regardless of future developments in market conditions, we are prepared for every scenario. We are flexible. There are certainly some economic vectors which have an influence: our currency is competitive at the moment in Russia, which could help to build various partnerships with energy companies in Poland and in the region. That would be a win-win situation in terms of economic and commercial development.

Myrto Tripathi – It is striking to look at the ROSATOM order book. The financial framework is impressive, especially for projects' financial packages. What weighting does this represent for ROSATOM and its shareholders? Are there limits to your financial capacity to back such projects in Europe and in the rest of the world?

Alexey Likhov – Without going into the figures, there are limits to everything. **But Russian banks see nuclear as an interesting technology. They have no problems investing in it:** they know that there is a credible programme that will be followed. As with construction, we do not do everything. You may get the impression that ROSATOM takes care of everything but we are assisted by our partners, from an industrial and financial point of view. And as I said in my presentation, we gladly welcome foreign investment.

Question – We are seeing some heavy opposition in Lithuania towards the Belarusian plant. Why do you think this project will be welcomed?

Žygimantas Vaiciunas – As the energy attaché at the Representation of Lithuania to the European

⁵ See image below

Union, I would just like to make a comment: **it has not been said clearly that the Baltic countries and their neighbours are currently discussing the possibility of moving away from the current system to come in line with the European system as part of the BEMIP** (Baltic Energy Market Integration Plan). Neither ROSATOM, nor Russia, nor Belarus is taking part in this discussion. There is no dialogue. I just wanted to clarify that.

Dmitry Sukhanov – Regarding the BEMIP, the discussions are indeed internal at the moment between the Baltic countries and the European Union. But then they will open up to third countries such as Russia and Belarus.

Alexey Lkhov – The discussions could go on for years. In a more pragmatic way, what does the Kaliningrad project amount to? There are people living there. If this area becomes an energy island, there will be a need. Energy capacity currently depends on gas. We think that the plant is a good solution for the region.



If we now look at it from a European perspective, what is the best nuclear option? It means being able to count on a connection between the plant and the network, without an accreditation process, finding financing, dialogue with the population, waste management. **To obtain energy, all you need to do is make the connection. That is what we offer.** You can always refuse our proposal, of course. I am not a big fan of ideological decisions. **Some people refuse to buy Coca-Cola because it comes from evil capitalist America. Some people refuse to buy goods from Russia. But we live in Europe, we are neighbours, we are not going to disappear off the map and neither is Europe.** Perhaps we ought to leave politics to politicians and focus on finding pragmatic and useful solutions for the local population. If there are other nuclear projects in Poland, Lithuania or elsewhere, that's great! It's going to drive down prices and create jobs. That truly would be welcome. It wasn't the Russians who closed the plant in Lithuania. The request came from the European Union. And now we are in a delicate situation because there is no more energy in Kaliningrad. We have to supply gas there.

Claude Fischer – The ambition is clear. With the Commission being present in the room, could anyone tell us where we are in terms of building the Lithuanian plant: financial support, the project? Is it credible to build a Lithuanian plant? Have discussions started between Russia and the European Union? Has the Commission come forward with the money to start to finance feasibility studies? The Russians are very rational indeed: there are needs and with no offers from Europe, they are proposing to build a plant.

Philippe Herzog – The lack of a European Union position is a real problem. The Russian proposal is indeed a rational one. **The Union must adopt clear positions not only on Lithuania but also on Poland - in which we are not sure there are public guarantees or sufficiently solid reference operators.** The only criticism I would venture towards Russia is the decision to deal differently in negotiations with Poland than in those with Lithuania. This will sow discord in the region. If the decisions of Poland and Lithuania do not have a certain regional coherence, this will raise an interconnection problem: can we deal with the interconnection with Russia in a different way to the interconnection with the European network? No.

Saïd Abousahl – I will not reply about the Commission's position and will leave that job to Gerassimos Thomas. From a technical point of view, how are you going to ensure that your Lithuanian, Latvian neighbours etc. are going to accept a new build close to the border from a safety point of view? What about public acceptance? Relations between Lithuania and Belarus are tense. There are discussions underway at the moment to ensure that safety standards are respected and the views of the public are heard. **Energy has been moved from the technical ministry for energy to the diplomatic ministry for foreign affairs. It is becoming a political instrument. How can you ensure that the security of supply is not politically dependent on the supplier?**



Dmitry Sukhanov – Regarding safety, we are prepared and we are very transparent about access to technical expertise. We have a platform on the

subject – whether we are talking about the Kaliningrad project or any other project. As far as security of supply is concerned, there is a technical component and a commercial component. From a commercial point of view, it would be stupid for someone selling electricity to cut off the supply: we are talking about cash liquidity. There is no dominant position: the project does not represent a large share of the region's energy capacity. But as you have mentioned, there may be political discussions about transferring energy from a specialist ministry to the ministry for foreign affairs. We are open to discussion.

Alexey Lokhov – The electric system is very different to the gas system. At every moment, the system is prepared for blackouts in the largest units. We have to ensure that if there is an incident in Russia, it does not have an impact on security of supply. This is the way the electricity market was designed. The more interconnections and capacities we have in the region, the safer it is. From a technical point of view, there is no problem with security of supply. As it is the political component, we can take the example of the Belarusian plant. **We cannot speak on behalf of Belarus, which is in discussions with the Commission, but we know that the stress tests used for the project conform with European methods.** The results will be evaluated in Europe. I consider this a very open approach. We are behaving like good neighbours, we are transparent and we conform to your methodology. We are prepared to work on this basis. What else could we possibly do?

Mytro Thipathi – About what you said about the inhabitants of Kaliningrad, who need energy, would you be prepared to pursue the project (on a smaller scale) if Poland, Lithuania and the European Union didn't follow suit?

Dmitry Sukhanov – There are several options. There may be energy incentives around infrastructure and production that are geared towards exports but not electricity. That could be an alternative. We don't believe that the SMR alternative would be feasible at present: we would like to set up a commercial project, not an unprecedented project, unless there are particular economic circumstances.

Oliver Adelman – Journalist from Platts - London. I understood you could sell up to 49% of Kaliningrad's production? Are you in discussions about interconnecting this plant? Is there a deadline?

Dmitry Sukhanov – we are prepared to sell up to 49% of the plant's social capital. This is the first Russian project in which the government has agreed to sell to private and foreign investors. There is no temporary prescription. The most effective way would be to wait for the project to be finished in terms of prospects for entering the market. But we are prepared to discuss it earlier if it proves popular with investors.

Alexey Lokhov – The dynamic is determined by the project. If the project is on track, the accreditation process is concluded, if budgetary and time constraints are respected, then two years would be a minimum deadline. Once the project is finalised, the share price will rise.



Peter Faross – Mr Sukhanov, you describe this as a win-win situation. To win, you need to be interconnected. To be interconnected, a feasibility study is needed. Have you undertaken a study of this nature? Why are we not working together?

Dmitry Sukhanov – We have carried out a sort of prefeasibility study and I showed you the results from it. But I completely agree: a more comprehensive study is needed and this involves national stakeholders. At the moment, whilst the BEMIP discussions are underway, there is no dialogue about ways of integrating the Baltic countries into continental Europe. But we are prepared to conduct this study and involve all relevant stakeholders.

Claude Fischer – We talk about BEMIP, i.e. the interconnections planned and financed in the Baltic region and the East in general. The Russians are therefore not part of the project. There are networks being put in place (750 kilometres have already been carried out), which is not enormous but it is a start. We just held a symposium on energy security: electricity and gas are two different subjects but the interdependencies are enormous⁶. The market needs clear positions. We are finding that political problems are underpinning a good commercial and cooperation-based relationship.



Alexander Tsibulya – Permanent representation of Russia to the EU. Kaliningrad is one of the projects that ROSATOM is currently working on but I don't want today's session to focus on that project alone. We have to take a step back to have a better

⁶ See *Les Entretiens Européens*, April 2016 : « Energy security in Europe : which interdependence with third countries? »

view of what is possible in terms of global cooperation and offer a vision of the future for the nuclear industry. Europe is larger than the European Union and the European nuclear industry is stronger than the Union's nuclear industry. It is very likely to remain this way in the years to come: if we look at new construction projects, there are more projects outside of the EU than within it. I might add that Russia is investing heavily in R&D, and especially in different generations of reactors. We follow the concept of

the closed fuel cycle. We are also investing in fusion: the Russia/EURATOM coordination committee for fusion is meeting today. We are also present in fission, for nuclear safety. We are working in cooperation with EURATOM on the uranium heritage programme in Asia. We previously cooperated with the stress tests. We are neighbours; we cooperate on many different subjects. I hope that thanks to today's Entretiens Européens you have been able to gain a better understanding of how we work.



Reforming the European market for long-term investment

Chaired by Pierre Jean COULON,
President of the TEN Section, EESC

With

Jean-Pol PONCELET, General Director of FORATOM

Amjad GHORI, Managing Director in Structured Finance Advisory, Crédit Agricole

Guy BUCKENHAM, Head of Generation Policy, EDF Energy

Minhong ZHU, General Manager in International Nuclear Business Development, CGN

Xavier URSAT, Director of New Nuclear Power, EDF

Third round table

Pierre Jean Coulon – Hello everyone. I work at the European Economic and Social Committee. As president of the energy section, I deal with questions on nuclear, an important

resource in the energy mix: roughly 30%. After a slight decline for several years, this figure is expected to rise again. Aside from the technical issues and political decisions which have been debated, there is one other extremely important point: financing. This is a vast subject: financing the extension of power plants' life spans, decommissioning and reconversion, new production methods...

One hundred billion euros are needed, a considerable sum. On the other hand, this financing is carried out over a very long period of time: 80 to 100 years elapse between the decision to build a plant and its decommissioning. I am going to turn to a staunch defender of nuclear but also a representative of his industry, Jean-Pol Poncelet. Will industry invest over the long term?

Jean-Pol Poncelet – You don't need to be "staunch" to recognise that we need investment, and enormous investments in Europe too if we want to make our electricity production entirely carbon-free and achieve our zero

carbon objective. At this stage, we have managed to decarbonise by 33%, and half of that has been thanks to hydropower and a third nuclear. How do we go from 33% to 100% without more nuclear? It is the future.



In Europe, we have to work with current market conditions. 25 years ago, the market existed nationally and together we deregulated it... I did this in my country of origin: I hold my hands up. Today we have a situation where we are trapped between the national markets which are still regulated and a European market with a

regulator. We are halfway there. The challenge is enormous. **We need investment and there are many companies wanting to invest. But there are no incentive-giving price signals** to encourage them to invest 10, 15, 20 billion euros in this technology: we don't know if in a few years' time, or even next year, we will have the political stability needed to guarantee returns on these investments. **Political stability and support for nuclear are ineffective.** And the situation today has completely changed because of climate change. Member States have been asked to subsidise renewables because it is impossible to invest in these new technologies if they are not subsidised.

So this is what we are dealing with: it is impossible to finance or invest. We look forward to hearing from the Commission and we hope that in a few weeks the Commission will undertake a real initiative to redefine the market conditions we need.

I have three affirmations: firstly, we have to invest in current capacities, next we have to invest in new capacities and lastly we should then invest in R&D.

- 1st affirmation: the EU's 130 reactors currently allow us to produce the cheapest electricity. The technologies are well-known, they are efficient, they contribute towards security of supply and we don't trust anyone else to operate them. This is also a contribution to the zero carbon strategy. Of course, the safety authorities are there to take the necessary decisions as was the case after the Fukushima accident, for example. **These reactors have to work for as long as possible:** they contribute to the Energy Union's three objectives: security of supply, competitiveness, combating climate change. **In Belgium, Finland, Bulgaria, Hungary, France, the Czech Republic and the United Kingdom, operators spend between 500 million and 1 billion euros per reactor to continue using them as it is the best economic option.**

- 2nd affirmation: we have to invest in new capacities as, between now and 2050, a large share of these reactors will have to be replaced. **If we want to keep nuclear's 25% share in the mix, we will have to build 100 to 150 new MW in capacity.** That is the scale of the project, in the knowledge that it will be more expensive: there are safety requirements and new technologies to be integrated. Is the industry capable of building these new capacities, as it was 20 or 25 years ago? We have to demonstrate it: be capable of building reactors in series, supplying them on time and within the parameters of the budget. **That is a real challenge for the industry, one it is ready for, but it will not be possible given the current market conditions.** There are no price signals, on the contrary, there are more and more obstacles for investors.

This is why it is interesting to look at the example of those who have done well, especially in Europe, and look closely at the achievements in the United Kingdom. What the British Government has done in the past 10 years should be replicated by the EU. A driving force behind deregulating the electricity market at the time, they are now looking at the issue with pragmatism, realism and courage. **The British have brought the government back to the heart of the process: this should send out long term price signals for securing investment.** Recognising the needs for security of supply, it intervenes in order to be able to guarantee it. It will also provide the same guarantee to private investors so that they can be assured a return on investment. That's what market



reform is. This is not exactly the Union's line but the Commission gave the green light to Hinkley Point C. **What the UK has done, is a paradox, but that is what we must do,** in other words, take into consideration this demand for investment and financing. Another example: that of the Finnish Government. With a very different model, it has also successfully supported long term investment. We need this type of updated public support to make long term investments possible – and I am not only talking about nuclear here: we have exactly the same start-up capital needs for renewables. Regulation is important: it doesn't make any sense to grant a licence to a Finnish reactor, because when the same investor wants to invest in the United Kingdom, they have to take it to the British authority. **If we don't make progress on harmonising regulation, every time financing is needed, we will have to repeat the whole process. That is nonsensical.**

- Third affirmation: the industry has to take the initiative and build an industrial product that can be replicated. There is a need to improve the system and standardise equipment. Long term operations, new builds and **R&D: no industry can live off existing technologies; you always need to be looking to the future.** The capacity to innovate exists in nuclear technology: optimising the fuel cycle, making better use of uranium, progressively rolling out new technologies with what we call 4th generation reactors and SMRs. When we talk about R&D and innovation, we need public support. That is where we have a problem with the EU: if we look at the budget allocated to R&D, and fission in particular, it is negligible in comparison to other programmes (such as fusion). **The budget is not in line with the needs.** I would appeal to the Commission to re-think the way it spends its R&D budget.

Essentially, we have to re-think the way in which the market(s) is/are organised. It is for the EU to do this. I hope that between now and the end of the year we will be reading some interesting proposals after lengthy discussions and negotiations have taken place within the Commission and with governments. **We are optimistic and hope for some good news from the EU and we hope it will be spurred on by the willingness of the UK (who have decided to leave us), to think about copying and revising its strategy.**

Pierre Jean Coulon – To finance, you need financial backers. We have skirted around the possibility of major companies putting their hands in their pockets. There is also the banking system: will banks (which, we are sometimes told, have difficulties financing SMEs) suddenly dive in headfirst to finance the huge sums needed for the nuclear sector? I will now turn to Amjad Ghori, international banker at Crédit Agricole in London.



Amjad Ghori – It is very interesting, the banks are often asked: “so then, are you prepared to finance nuclear projects?”. We have just spent the whole day explaining just how difficult it is from a technological, operational and political point of view. You have all of these challenges you have to face as members of

industry and you expect the banks to come along and say there is no problem? It doesn't work like that! When Claude asked me to speak, I thought about it for a long time and I was somewhat reluctant.

The last time was three years ago, just after the Hinkley Point project had been announced. We were in Warsaw¹, it was all very exciting: we thought we had found the right structure, it was going to work. But since then, even though I have been asked to speak on many panels, I have turned them down: from a financial point of view, not much has changed. Very little progress has been made. 10 years were needed for Hinkley Point, 3 years since the CfD had been announced – and the structure of that has changed in the meantime.

So there isn't always the structure that would allow a bank to intervene as a lender, to evaluate a project on the basis of risk and say that the risk-sharing is good. Lenders often have a precise capital structure in mind where projects are concerned. The watchword is prudence, and ensuring that the risk is evenly shared. In a financing model for a traditional project, this is merely common sense.

When we talk about nuclear, unfortunately it is very difficult to find a financing model that works.

Every project that has been successful had no other choice than to see a relatively high level of participation from the government and/or heavy sponsorship. With all due respect to my Russian and Chinese colleagues, there are no real plans or references for the new generation that have proven effective. Some projects have been pushed back (the EPR...). We talk about generation 3, and generation 3 technologies but they still have to prove reliable. That is the only way financiers can step in with any real peace of mind.

Some seem to be on the right track: there is the Russian model, the Chinese model. The latest model is that of Mankala, which has been relatively successful. Finland is a small country, with a solid industry and its people behind it, with shareholders who are prepared to take the risk in order to reduce energy prices. This doesn't always work. Whenever different countries decide to try to do something together,

success is not always guaranteed.

There are challenges, there are models, – some more successful than others. **The CfD is an essential component and projects must absolutely be planned to ensure that the lenders do not have to bear the technological or operational risks or risks linked to legislation. Once you have a model that has taken into account all of these different risks, the banks will be waiting.**

Pierre Jean Coulon – Thank you for your frankness. The fact that Amjad Ghori has come back after having declined so many requests perhaps points the way to a new direction; one that we will embark upon together. Guy Buckenham spoke this morning about the challenges of Hinkley Point, I will now ask him to speak about the financial challenges.



Guy Buckenham – Some remarks, firstly: Mr Poncelet spoke to us about the importance of investing in R&D, in existing capacities. In the United Kingdom, EDF Energy runs at 9 GW of capacity. We are doing everything possible to make the best use of these plants. But we know

that these plants will not be there forever and that we will have to invest in new capacities. Mr Poncelet also drew our attention to the fact that the British Government was very pragmatic in the way it approached authorising and releasing the investments needed to decarbonise the sector.

We have also spoken about the difficulties in obtaining support from banks. There are no miracle solutions, but if you look at the EPR of Taishan and Flamanville, I am sure that slowly but surely, confidence will grow. The CfD is no trifling matter. I know that the models will evolve over time. You have to start somewhere, to know how to divide the risks and manage them better. Things have changed in the last 3 years: the project may be slightly different but the CfD hasn't changed, it is the same model that was approved at the time.

I think we need to remind ourselves of the characteristics. **Firstly, the CfD was designed following an initiative from the British Government to support all low carbon technologies.** This was not only something for nuclear. There are similar contracts for wind farms (even if they have a duration of 15 years, whereas for nuclear it is 35 years, but this reflects the longer lifespan of the resource).

CfDs are long term contracts, which provides a certain security and removes a large part of the

¹ See *Les Entretiens Européens*, October 2013, « A civil society initiative for nuclear in Poland »

political risk. I think that regardless of what you put in place, you cannot guarantee what the world will look like in 30 or 40 years. I am sure that many things will change. On the other hand, it does provide you with levers that can be used as a plant operator to ensure you are working within the context of a contract that could stand up before the courts.

Let's talk about revenue: this does not only come from governments, but governments will have the right to recover the money they have invested, with a certain number of rights covered by the contract (such as increments in the rates set). **This is a relatively well-known financial instrument in which the difference is paid between the price stipulated by the contract and the market wholesale price. It is a contract that works both ways.** I would like to point out that Hinkley Point is a good way of getting your money back: it shows that wholesale prices will evolve in such a way that the project remains viable. If this is how it works, we will be the happiest people in the world: we will have the money needed to support the project. If it doesn't go that way, we will still have the revenue needed to ensure the project runs smoothly.

This structure allows us to manage the risks associated with the generator, but also those linked to consumers. Consumers will only have to pay what is needed, no more. There are some renewables projects in which premiums have been established. But there has to be a certain level of comfort for the operator, to ensure that everything runs smoothly in terms of the wholesale prices on the market. Lastly, the risks associated with the building phase are mainly shouldered by the developer.

The contract is a lengthy document which attempts to cover as many scenarios as possible. We will always find something we are not happy with, as is the case for all contracts. But we have tried to distribute the risk as evenly as possible and to fully understand the basis on which the various investments can be made. We know that competition tends to drive prices downwards. Having a competitive process for a nuclear CfD is not the same as it would be for any other sector. **We don't know what the future has in store for us: in safety terms, it may well transpire that we have to pay a higher price than we have negotiated. We are aware of this.** Don't be fooled into thinking that safety has been taken out of the document: we had to demonstrate very clearly to the British Government that the aim of the adjudication process was to negotiate the best

value for the contract. We had to make the same speech before the European authorities. That wasn't easy but it is important to show that we can have value in return. I am sure that this will be useful with a view to the forthcoming projects that will be getting underway.



Pierre Jean Coulon – We don't want to get into an exegesis on the costs and prices of energy – two very different things. We are going to hear another perspective on the Hinkley Point project: Mr Minhong, from CGN, Chinese electricity company.

Zhu Minhong – I am the director general in the international development department at CGN. I would like to talk to you about the importance of investments in nuclear. **In particular I would like to talk about the importance of creating solid partnerships between investors on the basis of a certain number of regulatory and financial parameters,** such as those we have seen recently in the United Kingdom with the Hinkley Point project in particular. We were able to count on our strategic partner EDF as well as the government. **This is a flagship programme which brings together China, the United Kingdom and France. This is the result of years of cooperation between the three countries.** CGN has over 30 years of experience in the field of nuclear construction. With EDF, our aim is to offer British consumers the most accessible energy possible, we want to maximise opportunities for British suppliers and workers.

Last month, in October, an agreement was reached: we signed the definitive financial agreement for Hinkley Point C with EDF and the British Government. The agreement that was signed allowed CGN to make its technology available to the UK. EDF and CGN worked hand in hand and this partnership formed the basis on which 3 new nuclear projects in the United Kingdom could be built. **The strength of this partnership will give the United Kingdom a source of energy that is low-carbon, safe, reliable and sustainable.**

It is important to have a long-term framework in place. This is essential for framing the partnership, if we want it to be able to embark upon new construction projects. The government recognised that nuclear is an essential part of our plans for a 21st century energy system that supplies electricity to companies but also to homes. **The commitment undertaken by the government towards nuclear was a key part of the project's success.** This commitment

to new nuclear construction projects allowed us to count on a long-term framework which in itself will allow us to develop a safe form of energy. The CfD was an essential component in this commitment. I am very much looking forward to being able to update you on how the projects are progressing.

Pierre Jean Coulon – Delicate subjects: investing in the future, financing future electricity production, new industrial processes that are going to give European citizens and businesses the capacity to access energy at prices that are as competitive as possible and create activity and jobs. We all know that at the end of the process comes decommissioning. That is very costly. Are there any projections over time and into the future, Mr Boucau?

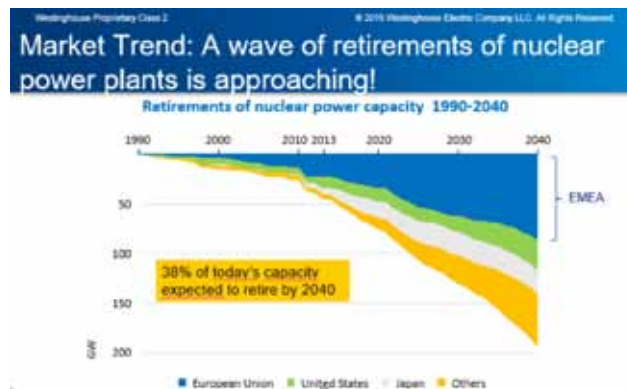


Joseph Boucau – We have spoken about building new plants but it is also important for a provider like Westinghouse, which I represent, to be able to deconstruct and decommission. We have been involved in these activities for over 30 years now, initially on a small scale. **Now, decommissioning is set to become an interesting market and commercial activity.**

My presentation consists of 4 points: what is the decommissioning market in terms of size? What are the national funds for decommissioning? How do you calculate the cost of decommissioning? What are the different decommissioning business models?

Regarding the decommissioning market, there are 442 reactors running in the whole world. 273 reactors have been running for over 30 years. They are not all going to be stopped after 40 years of operation (normal duration for a reactor), but it is an indication. Another diagram shows when and how these stoppages will occur. Between now and 2040, a large number of these reactors will have to be stopped: **200 reactors will be retired between now and 2040. This is a large quantity. The PINC shows that more than 50 of the 129 reactors running in the EU will have to be stopped between now and 2025. That is even closer.**

Regarding national decommissioning funds, national funds are put in place by the operators from the first few years the reactor is running, in principle. These resources are collected in the form of specific funds, sometimes they are divided into two funds: one for decommissioning and the other for processing the waste that decommissioning produces. In the majority of cases, there is a flat-rate contribution, based on consumption or the production of electricity. The PINC estimates that approximately



253 billion euros will be needed for future decommissioning and waste management up to 2050. Half will be used for decommissioning and the other half will be used for waste management. **Funds for the expected investments currently stand at 133 billion euros. This means that the funds will continue to accumulate based on contributions from the levers of electricity and interest rates.**

One of the difficulties is that today there is very little return on investment. You all know what current interest rates are. It is difficult to continue to accumulate and increase these funds through interest rates. The method used to calculate these funds is important: it needs to be carried out according to international standards. **The price of electricity is what it is: there are nuclear taxes, post-Fukushima safety requirements, many additional pressures that have an impact on the profitability of nuclear energy production.** This cost has an impact on the price of electricity. Premature stoppages (as in Germany) are an extra difficulty: there is no production of megawatts that equals what was planned. In some countries such as Italy, there is a problem because of a lack of decommissioning. And sometimes, the data is not sufficiently precise in terms of design. There is also the difficulty of predicting the costs of deep geological disposal.

On the subject of calculating the cost of decommissioning, it depends on decommissioning plans which today have to be developed before the plant is built, because it is important to be able to anticipate costs. The plan is reviewed periodically. You can't compare a cost estimate from one case to another: it depends on the prototype, the plant's stock, the decommissioning strategy, the availability of storage areas or disposal methods and the number of plants per site. Precise rules have to be followed in the way that costs are calculated. There is a guide entitled "International Structure for Decommissioning Costing" from the ISDC, this is an international approach. It is generally followed. It is interesting to break down the activities to see where the highest costs lie.

One final point concerning the different decommissioning business models. These depend on suppliers

but also on clients. Depending on the experience of the supplier or the client, different models may apply. In the case of a client not wishing to dispose of everything (and wishing to resell the plant, for example, even if that is rare), there is "license stewardship". This is the model used in the United States and the United Kingdom: the supplier takes the client's funds and manages these funds whilst assuming responsibility. When the client wants to be more involved, there is a partnership, the EPC (used by France and Slovakia) or the work package (Germany) in which the client supervises the supply chain for the work packages involved in decommissioning the reactor. In the future, we might imagine the client taking care of everything with their own personnel. Germany may shift towards this model with plans and network managers who will perhaps increasingly become stakeholders.

Pierre Jean Coulon – This last piece of information about the potential role of network operators is interesting. We are now going to give the floor to Xavier Ursat. What exactly happens at EDF? Is there a financial rush? Or is it about putting down deep roots in the global nuclear landscape with innovative partnerships? These are exceptional challenges, whatever the outcome.



Xavier Ursat – EDF follows the line that has been traced since its creation now 70 years ago: supplying electricity in all countries where the group is present at the lowest possible cost, in the long term, in the energy mixes which manage competitiveness for the clients, installation

in the landscape and regions and an environmental logic – in particular with limits on greenhouse gas emissions. The low-carbon strategy was reaffirmed a year and a half ago with the new strategic plan that coincided with the arrival of Jean-Bernard Lévy in the presidency, and is strongly based on two pillars: the development of renewable energy all over the world, long-term use of nuclear installations which it is responsible for and the development of new nuclear assets. **EDF has 58 reactors being used in France, 15 in the United Kingdom. That provides us with a respectable number of years/reactor, experience and feedback.** We are involved in several developments: Hinkley Point C in the UK, Taishan in China, Flamanville in France.

Hinkley Point is a great source of pride, it was anything but rushing in. The stakes are very high for EDF of course. You know about the budget for this project, financed 2/3 by EDF and 1/3 by CGN. This is part of EDF's financial trajectory. It is an impor-

tant project on many levels: it is boosting nuclear in Europe. It was a bold decision for the United Kingdom, which is certainly going to be facing difficult negotiations with Europe but which brings its actions in line with its discourse. It chose to have a mix that would bring security of supply and decarbonisation, and it has the political means needed to launch projects to achieve its objectives. This is fully in line with EDF's strategy. We have trust in the EPR. We are currently in the final stages of building at Taishan, which will be starting hot trials in just a few weeks. We will finish construction at Flamanville in the first quarter of 2017. At Hinkley Point, we have the opportunity to use a technology in which we believe in a country that is opting to renew its nuclear fleet with third generation reactors. This is not rushing in headfirst: this is the continuation of EDF's history. If we have the opportunity to organise a large share of financing in projects rather than financing hatches, we would be all ears!

We are convinced about what nuclear has to offer: a low-carbon base energy: this is uncommon. Not all countries are fortunate enough to have a hydraulic source that allows them to implement other low-carbon options. Security of supply is guaranteed as well as independence from the fluctuating prices of hydrocarbons and raw materials in the world. It is also a way of securing electricity production costs over the long term, even if this is also one of the drawbacks which has to be covered by financing. Finally, there is also employment to consider: it is an energy source which offers advantages (at least for Europeans) in securing or even generating a large number of jobs (220,000 in France, between 800,000 and 900,000 in Europe). That is significant.

EDF has to think about partnerships and work with major partners. Our choice for 30 years has been to work with China. We were involved in starting up the Chinese nuclear fleet. Today we have strong ties to CGN. We are convinced that even if Europe has a head start from a technological point of view, as well as engineering and supply capacities, there is still a lot to gain from organising the supply chain so that it progressively involves players from other countries and in return grants us access to their markets. **If we look at the forecasts over 15 or 20 years, there are predictions that half of the reactors being built in the world will be built in China. There is therefore some sharing of experience and bringing in of countries to guarantee outlets for Europe's nuclear industry.**

The subject of les Entretiens Européens is financing and the long-term perspective. Nuclear has this advantage of securing its costs over time. This is also a disadvantage: **this is an industry in which it is a gamble to spend billions of euros over a 5 to 10 year time span to then make a living over sixty years.** It requires careful study of the possibilities

of financing and also the way in which revenue can be secured. It is difficult to organise such an investment in the face of current market prices. But the market is made to organise spot trades as well as those in the short and medium term (up to 1 or 2 years) and is therefore subject to the push and pull of supply and demand. It is also rather volatile depending on the seasons and regulatory decisions. It therefore comes as no complete surprise that this market price, which aims at the short term and which is subject to many hazards, does not send investment signals for investments that need to be profitable over 50 to 60 years. Other means are needed.

At EDF, we think that work is needed on three levels: firstly the question of the price of CO2. In the post-COP 21 mindset, the discourse must be brought in line with actions and a CO2 market that is worthy of its name must be organised with a floor price that is three or four times the current price. **Then, we have to organise a capacity market that is worthy of its name** in the majority of countries, probably involving European cooperation: it is healthy to ensure that new renewable energies such as wind and solar can penetrate electricity markets in a significant way and at the same time, it is laudable to ensure that production and consumption roughly balance each other out and to ensure both throughout the day as well as the year that there are the right balances - with a capacity market that covers any uncertainties. Nuclear has some real assets here: the French fleet modulates its production a great deal; it goes beyond the base and manages spikes in consumption. The new reactor that we are currently designing the new EPR model, is a reactor designed at the outset to adapt to fluctuations in renewables. It will allow renewables to penetrate the markets where it is present but there must be some compensation for this service.

Finally, the question of long-term contracts and securing income over the long term. For Hinkley Point, we were able to negotiate a "Contract for Difference" with the government which is a formula that seems to us both fair and worthwhile, both for a country wishing to develop its mix as for the investor and company prepared to undertake the risk involved in its construction. The model does not cover the whole of the reactors' life spans (35 years out of 60), but it is enough to organise the project and obtain the investment. The CfD is the model we selected as it allows for investment whilst securing income and organising third party funding at a later stage or project funding on major nuclear assets.

There is space for nuclear, as long as it is competitive. This means it has to resolve a certain number of challenges and continue to innovate. We have to continue to industrialise our reactors at all costs, both in the French sector as well as all sectors

in the world, to turn around the curve of experience (which is currently heading downwards) and aim at a simple equation: obtain a production cost over the 60 years of the reactors' life spans that is lower than the cost of the renewable energies that will be on the market at that point in time.

Hinkley Point will go online in 2025. Behind that we will have the construction and renewal of the French nuclear fleet. That is an essential stage of EDF's nuclear trajectory and for its renewal.



Pierre Jean Coulon - We will now open up the floor to the room.

François Perniola - National Secretary of CFE-CGC Energy, in charge of European and international affairs. My federation has been somewhat of a "thorn in the side" in the discussions around the Hinkley Point project. With the financial arrangements having changed since 2013, it provoked a certain number of questions from several trade unions to EDF who had the honour in a certain way of challenging the decision-makers of the group on this complex project which has the whole group on board. **I recall that the success of the nuclear fleet was possible because the whole social body was entirely behind the decisions made.** Today, the decision has been made, we support the project but keep our eyes open: there are a certain number of risks: industrial, financial, contractual. On the contractual risks in particular, taking into account that the UK will be leaving the EU, has the full impact of this event been taken into account?

Philippe Herzog - I have always supported the Hinkley Point project. Now the reference price (92 pounds) of the CfD, which was the subject of some reluctance in the United Kingdom, needs to be revisited in the new situation arising after the Brexit vote. We have little information about the content of this calculation: the question of the cost of capital, understanding of the risk, value of the currency...

Jacques Masurel - Ex-president of "Sauvons le Climat". Mr Ursat tells us that EDF is seeking to update reactors so that they are supple enough to follow fluctuations in renewables. Is this not a factor that

will send the cost of nuclear back up because these machines will not be running at full capacity?

Roberto Passalacqua – DG Research and Innovation at the European Commission. Decommissioning has a cost, but why spend billions of euros on disposing of spent fuel, when we are perfectly capable of recycling it? It has a value. Furthermore, we don't know about the political framework in Russia or China. In Europe, we have high-risk investments but this is after having spent over 30 years working on the safety of EPRs, I honestly think that this is the safest way of producing electricity. Perhaps we will find an environment that is more favourable for investments in 10 years... to allow things to progress, we need to improve the research environment: new technologies are going to cost 10 times more than EPRs. Why don't we try to convince the public? In 15 years, China will have solved all of the problems with R&D for 4th generation systems.

Xavier Ursat – There was a debate within EDF before the decision on Hinkley Point, we all know this. Our company often has this type of debate. And that is positive. It allowed us to fortify the project and push for a complete risk assessment. The decision was voted on by the board. All of the risks were examined, whether they were industrial, financial or contractual risks. **We have not as yet identified any significant contractual issues that could be subject to a major interruption linked to Brexit.** We will have to be careful, not so much on the contractual side, but on the questions surrounding the free movement of people and goods in Europe, an area that will be sensitive for us when carrying out Hinkley Point which is, by its nature, a Franco-British project and therefore European. The contracts will withstand Brexit. As you pointed out, the decision has been made. The discussions I have held internally show that the social body is coming in line. **The feedback in France in opinion polls has been very positive on this investment decision.** We are happy and proud to launch this project which we and all of the teams are ready for.

On the question of the reference price, I cannot enter into the details of the negotiations. It is the culmination of several factors: analysis of the building costs of the EPR adapted to the United Kingdom (the British safety authority having had a certain number of requests about the design which is different to that of Flamanville), project completion schedule, cost of capital, resistance to certain sensibilities including the pound as a currency – which is currently completely compatible with the project trajectory. The amount of 92 pounds appeared reasonable to the British Government. **Theresa May called upon a certain number of economic and technical experts to carry out another analysis of the project. Other governments and other experts examined the project and all issued a positive opinion. This**

is therefore a project that has stood up to several analyses. The cost is simultaneously the result of merging the cost of capital/cost of building, planning, risk cover and also a cost which, over this time lapse, was correct in the view of the British Government to guarantee a low carbon form of production for 7% of electricity production.

The fact that EPRs are able to adapt to load fluctuations, production/consumption balances and/or renewables is positive for their insertion into the market and for the services that nuclear provides. This does indeed create minor additional costs. **The main extra cost is not so much linked to output but rather linked to the fact that the installation does not run at 100% of power the majority of the time whereas the installation itself carries fixed costs.** This does not generate enormous extra costs: only a handful of percentage points. This was also why I asked the question about compensation for certain services and a capacity market: this is an interesting service which could be remunerated and provide extra remuneration.

For generation 4 to cost less than industrialised generation 3, at least 30 years have to have gone by. This is a very interesting generation. There may be many forms of generation 4. If we think in particular of reactors which have fast-breeder capacities or plutonium consumption capacities, it is interesting in the management of the fuel cycle for the countries where they are located. **This is how Japan, France and a number of other countries cooperate as part of the ASTRID project.** We have euros/MW production costs that are incomparable with those of generation 3. **We are either still at an R&D stage or still at the tool stage, which is marginal in the electricity system but very useful in the management of the fuel cycle and its closure.**



Joseph Mbeka – Change In Congo. I have heard that by 2050, we will need at least 50 reactors. Mr Ghorri was saying that often, when you ask for money for nuclear, there are no real financing prospects and the project unfortunately has to be abandoned. Our reality is not the same as China or Russia, we are in Europe with social constraints, we have to take civil society into consideration. Where will the money come from?

Peter Faross – Secretary General of UEAPME. We have spoken about risks and competitiveness. The strike price is four times higher than the wholesale price

currently on the market in Germany. Is it tenable for the British authority outside of the single market?

Philippe Herzog – Earlier, my question looked at the British point of view on the costs. My question is now for the EDF side: is there not a risk for the domestic profitability of the project following Brexit and the value of the currency?



Xavier Ursat – The question of the **social acceptance of nuclear** has been discussed for Hinkley Point². The project has been well-received locally and nationally in the United Kingdom. This is also a question that will be opening up in the next few years when contemplating the renewal of the French nuclear fleet. It will also be asked in a certain number of countries in the East that are currently looking at the nuclear option. (Czech Republic, Poland...). **Our industry has to do a great deal of educating, that is a real need. It must move away from the discourse that states "there's no need to worry, our engineers have thought it through, nuclear is safe, clean and inexpensive"**: this line was convincing in the 80s, but is no longer appropriate for 2020. We have to move towards a real discussion about what nuclear is: how the risks in nuclear are managed, how a nuclear plant really works, etc.

On where the money will come from, I will let those representing financial institutions answer that. But nuclear projects will find the funding they need if they meet the conditions and revenue guarantees, with reactors that don't only demonstrate their capacities on the market but which (because this has probably been what has driven investors away in recent years) are built on schedule. Furthermore, this is why our first challenge for Hinkley Point was making sure that the first tranche was at 100% power in December 2025 on the British network. After the quality and safety of the construction (which are non-negotiable anyway), it is EDF's primary objective to keep the project on schedule. Our industry needs that, also when justifying its funding.

On Hinkley Point, the internal rate of return is 9%, to be carried forward over the 9 years of construction and 60 years of operation. That is a good yield and is the result of negotiations with our British partners. I cannot say too much about the sensitivity of the IRR with regard to the changing pound, but we have been carefully studying it in recent months.

Joseph Boucau – I will tackle your question about the social problems of decommissioning. When a

decision is made to close a plant, there is a major problem, especially for isolated plants. This social problem has to be dealt with. In other words, we cannot wait for things to happen as is the case in Germany. Managers are not able to anticipate correctly. But when everything is planned in advance, as was the case

in Spain, the transition is very flexible and easy, from operation to decommissioning. The strategy was in place, it had been properly carried out, with permanent involvement of certain people who had already been working on it during the operational phase, not only network managers but also site suppliers.

On the cost side, they were calculated and re-evaluated on a regular basis. In these calculations, there were obviously uncertainties, for example, climatic conditions, winter. There were also unknown and unpredictable risks that arose, such as a financial crisis.

Finally, we have a good approach in Europe, with the exception of the United Kingdom, with immediate decommissioning. We do not defer the burden and the risk and place them on the shoulders of future generations. Today in the United States, the majority of closed plants are "safe stores", the plant's doors are closed after having done the minimum and decommissioning is delayed by 60 years. That, to me, is not best practice. Immediate decommissioning as will be practised in Germany, Belgium, France, Switzerland and Sweden is better. The duration of decommissioning will depend on each country, each manager, with Sweden wanting to achieve it in under 8 years.

Guy Buckenham – Comparing the strike price of Hinkley Point with the wholesale price in Germany shows that the price no longer represents the real cost of production. This is a price traded on the market in the short term which does not cover the cost of any technology. The cost of support from various technologies needs to be integrated. You need to think about the cost, the capacity, the fact that different countries have adopted different approaches. As regards the share of base/consumer, who is going to pay the price? The residential client? The client in enterprise? We have to think about the market. Is it appropriate? Can we support the investments that are needed in all countries?

Pierre Jean Coulon – Good luck to you with this project. As president of the TEN section of the EESC,

² See list of *Les Entretiens Européens since 2003 in the annexes*

I would like to reassure you on the question of social acceptance (and I prefer the term "adhesion"). There are some people we hear a lot from, others less so. The organisation over which I preside represents 8,000 organisations from civil society in Europe,

and today, in our debates and discussions, and including opinions shared on the PINC which was voted through with 96% of the votes, we are in the process of having discussions that can modulate and change, all with absolute transparency.



Conclusions

With

Claude FISCHER, Director of ASCPE

Gerassimos THOMAS, Deputy Director General of DG Energy, European Commission



Claude Fischer – Dear Gerassimos, I am very happy to have you here. In addition to being Deputy Director General in charge of energy at the European Commission, you have also become a friend in this campaign on organising the public debate on nuclear. We do not necessarily always share the same opinions, but we agree on moderating the discussion on the subject.

Today (with some twenty countries represented) has been shaped by contributions from players in the sector and in institutions, **some of which have taken the form of battle cries. If there were any doubt: we will no longer be leaders if we do not create the conditions for nuclear renewal in Europe.** We agreed to focus on (without pointing the finger!) the Commission’s responsibility in conveying the exact situation and putting the question clearly to the Member States: **do we want to maintain this collective decision, similar to the one made for EURATOM, of having nuclear as a major European industrial policy? If yes, time is of the essence.** Whilst we are standing around hesitating, others are on the offensive. Our competitors are innovating, investing,

Should we leave them to it? Work with them? Compete against them – if we have the means to do so? These questions all came up in today’s debate, I wanted to put them to you.

We are entering a new nuclear age. European stakeholders want to be present. To make that happen, we need to invest in training, new technologies and fleet renewal. We need to have a market framework that offers incentives: this is the role of public institutions and States, rather than merely renationalising companies. Efforts were highlighted by the JRC: it has been possible to sign long-term contracts. But the challenges are enormous, from a democratic, demographic and climatic point of view. The climate should be the first and foremost objective of the Energy Union.

The risk is not about nuclear, but rather it is about no longer being in the race. Two examples were given:

-SMRs in new technologies. We have the technology, but it doesn’t fit in with the market. The Commission in one of its reports lamented a “death valley”; we must bridge the gap before it is too late.

-The case of Lithuania was also raised: the country had to close its plant. We are financing the decommissioning. But shouldn't we also be financing a new plant? In the meantime, the Russians are preparing for the Kaliningrad project and will be prepared, regardless of the scenario. We, however, are not.

We have the impression that there is a lack of political will. We don't have the market we need, we don't have the public policy either. Why? We have so many assets! This morning, Massimo Garrriba told us that 14 Member States were using nuclear, and the other 14 weren't. Is that what neutral decision-making is? Doing nothing? Shouldn't we rather make a decision together and allow the 14 Member States that would like to be in nuclear go ahead? For that to happen, we need to see cooperation on the market and create an industry. Those who do not decide on nuclear still need to resort to nuclear when the networks are intermittent. **We have to think in terms of the general interest, not in terms of national interests. We made a decision with EURATOM in 1957, we need to make another today.**

The Hinkley Point paradox is edifying, we have spoken about it a lot today. Long live the United Kingdom! Down with Brexit! They (and we) are going through difficult times and at the same time, **stronger cooperation is emerging in industrial policy which has to do with the public good. This is a cooperation that calls out for others.** The United Kingdom has undertaken a market reform which could set a precedent and become the European model. This also opens up another debate on the need to re-think cooperation with the United Kingdom and to make it an associate State, as suggested by Philippe Herzog.

Today the role of the EU and the Member States is not to pass the buck. Awareness is slowly building around the long-term needs but that is not a strategy. The members of the Commission are tied to their programmes but unfortunately these are not good programmes, they are not drafting any industrial policy. What is the priority today? If it is investment and innovation, we should accept it and create the conditions accordingly. This coupling of investment/innovation was the strength of the EU. Philippe Herzog had some interesting thoughts about European identity.

Today we want to rediscover this identity, to mobilise forces around a policy of industry and services, and move towards a new community. We want to rediscover our growth, build it sustainably with qualified jobs. This will require a great deal of investment. Some proposals came forward:

- Invest in human capital. There can be **no nuclear industry, no safety without people and skills.** We must therefore invest in pan-European training centres, which might be located, and why not, in the East. We don't even know how many workers we will

need in the sector! More serious work needs to be undertaken on statistics.

- Foster cooperation on new technologies to **add value to European projects on the market.** These new technologies exist, now they need to amount to something.

- **A market framework** with ETS, a CO2 bottom price that has to be multiplied by 3 or 4. State aid needs to be modernised. We also need **long-term contracts, running parallel to the SPOT market and the capacity market.** Otherwise, we will not be able to convince investors.

- **Promote stronger cooperation between nuclear States** to move towards a nuclear market that is open to our neighbours, making them associate States. I am thinking here of the Russians. The political situation is undeniably complex, but could this not be a factor in resolving conflicts? Russia has a presence in all European countries anyway...

- **Develop investor partnerships.** This is very original, it is a new model: the UK is doing it with France and China and it is therefore open to other global players and not only our European neighbours. What could be better for sharing safety and security? If everyone were involved in partnerships for new construction projects, everyone would be concerned about security. **Partnerships at global level are an asset. Also, we would have access to an international market. We have to look abroad.** Bringing players together is a must: we have to learn from one another - including on accidents. The various forms of cooperation could have variable geometry.

Les Entretiens Européens have reached a new stage. This was the 16th edition. We would like to proceed to other Entretiens Européens, perhaps more international. Gerassimos, I will give you the floor.



Gerassimos Thomas - I think a lot of the remarks and/or criticism are shared by a large number of people. **But we do not have a sufficiently strong political consensus to be as ambitious as you would like. The Commission is bound by the decisions of Member States, but I do think that we can listen to civil society and industry and act where**

we can. I agree with what Xavier Ursat said: we need a change of argument. We can rise to the challenge of preparing for the new nuclear age. Some aspects play in our favour: COP 21 and COP 22 were successes: they provide a framework for climate change. Europe has firmly committed to this framework.

We also need to change the argument by insisting on safety. A lot has been done in Europe. We have put in place legislation and we will continue our efforts in the years ahead – particularly concerning implementing post-Fukushima measures. This is how we will win people’s trust. **People are not only mistrustful about nuclear operations, but also when it comes to safety and end of cycle management.** We have an important directive that almost obliges the Member States to have a transparent roadmap which clearly reveals their sources of funding. In the months ahead, we are going to produce a first report about these different roadmaps. I do not think that what we have achieved is enough. But it has allowed us to lay down a transparent basis: it is a first step in ensuring appropriate arguments to win over the people’s trust.

Then comes technology and I do not think we are lagging behind. There may be discussions around the decisions on priorities and budgeting for activities and different areas. But we adapt: the SMRs which you mentioned are absolutely one of our priorities. We can decide to see the glass as half full or half empty. I am convinced of the need to look more closely at SMRs. We are doing things on research. We are not completely idle on training either: we support training indirectly. Whatever we do, we need to do it well to prepare fully for the years ahead, both with new builds and the waves of replacing of plants. **We need to ensure that long-term operations are correctly managed in order to solve any problems that come up (public opinion, safety), rather than creating them.** Long-term operations have to be a success. That is how we can progress to the next step of building new projects.

I am not certain that financing is a problem. Industry is not asking the EU for funding, it is asking for some sort of framing, a correct price for the electricity market in order to make investments possible. The debate here extends further than nuclear: long-term investments are also needed for renewables. **We are going to attempt to resolve these issues with the “Winter Package” in order to send out positive investment signals.** The main challenge therefore is the electricity market: we are committed to having a certain percentage of intermittent energy in our mix, we need to combine it with basic energy. The answer to the investment question will come from reconciling these objectives: electricity prices will perhaps not be regulated entirely by the market framework, but this is what will decide the future of all energy resources.

It is true that the size of nuclear plants is increasing. This requires a high degree of support and not all countries are in a position to provide this. We have to keep in mind that each country makes different decisions about electricity production.

This conference has set a number of objectives for industrial policy. They need to be combined with other industrial policies: President Juncker announced his intention to take a position on the subject of defence, via a Commission initiative. We are trying to roll out a global policy that combines different subjects, we are thinking about the links needed as, for example, in the domain of research.

We are creating a base for a favourable public opinion. Once we have this base in place, we can see how and to what point we are able to make progress.

Claude Fischer – The proposals we are making can become part of the Commission’s global policy as they correspond to the general European interest. The idea of the symposium is to have some continuity in tackling market reform. The battle is far from won, but we are not giving up! We have to keep moving forward and use the good models we have (such as Hinkley Point) to progress towards a more consistent market reform.



List of participants, 20 October 2016

- ABOUSAHL Said**, European Commission
ADELMAN Oliver, PLATTS
AHOYO André-Franck, ASCPE
ANIEL Sylvie, CEA
ARKER Isabelle, European Commission
BARAKAT Mohamed-Raja'l, ARW
BARTAK Jan, Engie
BATUT Laure, EESC
BAZILE Fanny, CEA
BEAUDAUX Emmanuelle, ASCPE
BLOCH Charline, British Chamber of Commerce (Brussels)
BODIN Christophe, Tractebel
BOUCAU Joseph, Westinghouse
BRAUN Pierre, Areva
BUCKENHAM Guy, EDF Energy
BUET Baptiste, Areva
BUGAT Alain, Académie des Technologies
CAMUNCOLI Luca, EDF
CASTILLA José, ASAJA
CHASSERIAUX Jean-Michel, Lysios
CHLOUPKOVA Jarka, Women in Parliament
COULON Pierre Jean, EESC
DALLE VEDOVE Mattia, Hitachi
DE L'EPINOIS Bertrand, Areva
DE MEREUIL Jacques, Fondation mondiale des Ingénieurs
DE SCHUTTER Krishna, Engie
DERONT Eva, Université Libre de Bruxelles
DESAINTEGHISLAIN Caroline, ASCPE
DESBAZEILLE Yves, EDF
DI LODOVICO Francesco, The European House - Ambrosetti
DÖHNERT Bernd, Westinghouse Electric
DOUMONT Pierre, Safety Connect
DUFOUR Vincent, EDF
FAROSS Peter, UEAPME
FERRAFIAT Alexandre, Confrontations Europe
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FURFARI Samuele, European Commission
GARRIBBA Massimo, European Commission
GAVAGHAN Ed, New Nuclear Watch Europe
GERON Anne-Malorie, FORTUM
GHORI Amjad, Crédit Agricole CIB
GIULI Marco, European Policy Center
GOICEA Andrei, FORATOM
GRINBERG Michal, AVISA Partners
GROS Valentin, Union Française de l'Electricité
HAJNOVICOVA Lenka, EFET
HERZOG Philippe, Les Entretiens Européens
IBANEZ Lucia, EFET
JOHNSTON Mark, Civil society
KORNEEV Ilya, Gazprom
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MANOLATOS Panagiotis, European Commission
MANOUSARIDOU Eleni, Permanent representation of Greece to the EU
MARTIN Carolyn, EDF Energy
MASUREL Jacques, Sauvons le climat
MBEKA Joseph, Change In Congo
MEERSSCHAERT Matthias, Forum nucléaire belge
MEGANCK Wilfried, OMP
MINK Frédéric, Bilbo Management Services
MISEVICIUTE Jurgita, AUSA Partners
MOISII Roxana, Permanent representation of Romania to the EU
MOKRANE Natacha, Civil society
MOULANDJA Jean Dault, Gabonese embassy in Belgium
NAVICKAITÉ Jolanta, Permanent representation of Lithuania to the EU
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PASSALACQUA Roberto, European Commission
PATAY Eszter, EDF
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PERRAUDIN Jean-Claude, CEA
PONCELET Jean-Pol, FORATOM
PRADEL Philippe, Engie
PROUST Eric, CEA
QUAGLIA Bruno, General secretary of European affairs
REIN Conrad, European Commission
SANDKVIST Madeleine, Vattenfall
RYZHAKOVA Katerina, ROSATOM
SCHNEEBERGER Michaël, Sauvons le climat
SCHORPP Julian, Contexte
SEMENOV Dmitry, Permanent representation of Russia to the EU
SERODES Fabrice, Commission Européenne
SLUSARSKA Danuta, APCO
SOCHOREK Jan, European Parliament
SORVIL Pierre, Hyinga
SOSSAH Edwige, Neshama & Vanda
SUCIU Simina, Baker Blotts LLP
SUKHANOV Dmitry, Atomenergopromsbyt
SUZUKI Fumio, International Cooperation Japanese Bank
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TANGY Norbert, Association Française de Gouvernance d'Entreprise
TANGUY Manon, ASCPE
THÉVENOT Caroline, Permanent representation of France to the EU
THOMAS Gerassimos, European Commission
TRIPATHI Myrto, Business and Climate Summit
TSIBULYA Alexander, Permanent representation of Russia to the EU
URSAT Xavier, EDF
VAICIUNAS Žygimantas, Permanent representation of Lithuania to the EU
VAKILI Ali, MindTracker
VAN OVERSTRAETEN Pierre, Service Public Fédéral de Belgique
VANDENPLAS Isabelle, ASCPE
VETEAU Lucie, Permanent representation of France to the EU
WARDY Marie, Civil society
ZIMERMANN Miroslav, Permanent representation of Slovakia to the EU

Les Entretiens Européens since 2003

- April 2016, les Entretiens Européens in Brussels :
Energy security in Europe. Which interdependencies with third countries?

October 2015, les Entretiens Européens in Brussels:
The social ownership of nuclear waste management in Europe, a safety issue

- November 2014, les Entretiens Européens in Paris:
Towards societal ownership of nuclear waste management

- October 2014, les Entretiens européens in Brussels:
How to finance the move towards carbon-free and competitive electricity on the European market?

- October 2013, les Entretiens Européens in Warsaw and Krokowa:
A civil society initiative for nuclear in Poland

- April 2013, les Entretiens Européens in Brussels:
EU/Russia Dialogue. Nuclear sector: competition and cooperation

- June 2011, les Entretiens Européens at the University Foundation of Brussels:
Bulgaria, Hungary, Lithuania and the Czech Republic... The economic challenges of sharing European safety

-2011 in Brussels:
Sustainable agriculture (4 lunchtime-debates)

-2010 in Budapest:
Nuclear energy in Europe, from acceptability to social ownership

-2010 in Paris:
Sustainable mobility and clean cars (after 8 lunchtime-debates on biofuels)

-2009 in Brussels:
Food and public health

-2008 in Brussels:
Nuclear energy, a global public good

-2008 in Paris:
The revival of nuclear energy in Europe and worldwide

-2006 in Berlin:
Europe invests again in nuclear energy

-2006 in Paris:
The legislative issues in France and in Europe for nuclear waste management

-2005 in Reims:
Ethical and democratic issues in nuclear waste management

-2004 in Bar-le-Duc:
Financial and economic issues in nuclear waste management

-2003 in Nogent:
Scientific issues in nuclear waste management



Minutes and summaries are available on
www.entretiens-europeens.org



Les Entretiens Européens &Eurafricains

Rapprocher - Débattre - Fraterniser

ASCPE's main objective is to **bring closer** civil society players to discuss the issues surrounding the European construction, energy in particular, which is vital in underpinning the development of our societies, and to discuss relations between Europe and Africa, putting our "otherness" to the test.

A consulting and training firm set up by Claude Fischer-Herzog, ASCPE debates questions facing society by bringing together the different economic and social players firstly at meetings and conferences and secondly

by organising film viewings through film festival « Une semaine Eurafricaine au cinéma » (A Euro-African week for cinema).

The use of various communication channels, speaking at debates, images and the imaginary in the world of film are all part of ASCPE's desire to understand the challenges facing Europe and the world, to contribute towards finding solutions for them and allowing our societies to work together and **fraternize**.

Forming a network

The method used by ASCPE is to work on subjects upstream of the public debate, within working groups that bring together its various partners (companies, associations, regional authorities, universities or national and community institutions...). Problems are approached by examining the strategic and political decisions made by Europe and especially its aim to build an Energy Union, and its external relations, with Russia and Turkey in particular, and with Western Africa.

The ASCPE team heads up working groups and prepares *Les Entretiens Européens et Eurafricains* as well as publications with steering committees which are open to its partners. **This network formation** makes the most of the benefits of the skills and expertise brought



by civil society players and opens up potential schools of thought and ideas for action in the public domain so as to contribute towards public policy reform and to create a Europe based on competitiveness and solidarity that is open to the world.

Les Entretiens Européens et Eurafricains

Les Entretiens Européens were created in 2002 to address the scientific, economic and social challenges of managing nuclear waste and, from 2007 onwards, those of the nuclear renaissance and safety stakes, in Europe and in the world. Then, the scope broadened to include societal questions associated with sustainable development: food and public health; sustainable mobility and clean cars; sustainable agriculture. Since 2010, the question of "societal ownership of nuclear energy" has been the subject of annual conferences

(in Hungary, in Brussels with Russia, in Poland, in France in 2015 and in Brussels in 2016 on investment in nuclear with the support of the European Commission and numerous other players in the sector).



Les Entretiens Eurafricains were created in 2014 following the Civil Society Summit held on 6 March in partnership with Confrontations Europe on the

subject of "Public/private dialogue for a new economic partnership between Europe and Western and Central Africa". The aim is to contribute towards forging new commercial and cooperation-based relations between stakeholders on both continents. The first meeting took place on 3 and 4 February 2016 in Ouagadougou: "Investing in Western Africa - developing and financing of projects on organised markets" and will be extended the 6th and 7th of March 2017 in Paris.



La Lettre des Entretiens et les Cahiers

La Lettre des Entretiens Européens was created in 2003. Eleven editions have been published upstream and downstream of the Entretiens Européens between 2003 and 2011 (in both French and English versions). From 2012 to 2014, ASCPE has helped to publish a number of issues of "L'Option" by Confrontations Europe, in association with the Entretiens Européens organised by ASCPE.

The new edition of **La Lettre des Entretiens Européens** appeared in June 2015. The issue of October 2016 was published on the subject «Investment in nuclear in Europe».

La Lettre des Entretiens Eurafricains is published twice a year. The first issue came out in January 2016, for the Entretiens Eurafricains in Ouagadougou on 16 and 17 December 2015. An issue « Supplément cinéma » was published. The third edition of La Lettre is in preparation for les Entretiens Européens in Paris on the 6th and 7th of March 2017

Les Cahiers restore the colloquiums organized every year on Energy and UE/Africa relations



Le cinéma

Cinema is an excellent vector of knowledge of men and women in society, of their suffering and their aspirations. It helps us to be more open to the world. It was therefore only natural for cinema to find its way into ASCPE's initiatives, into discussions and action for a Europe that is reconciled and open to the world.

ASCPE is a partner of the **film festival "L'Europe autour de l'Europe"** produced by Evropa Film Akt, and directed by Irena Bilic.

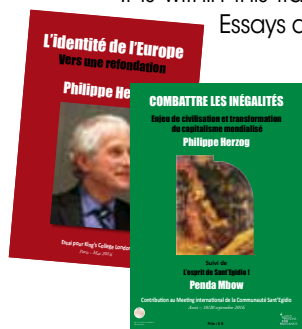
A Euro-African week at the cinema in Paris: created by ASCPE in 2015 as part of the Entretiens Eurafricains, this mini festival is sponsored by « Vues d'Afrique » in Montreal and partnered with FESPACO. It will be organized in June by EURAFRICALP, the brand new association created by the Euro-African week's friends.»



The EUROPE 21 Seminar

ASCPE is a partner in this new seminar led by Philippe Herzog to exchange reflections on the future of Europe and its civilization in the context of globalization.

It is within this framework that ASCPE publishes the Essays and Notes in the form of books:



- The identity of Europe, towards a Refounding, by Philippe Herzog
- Combating inequality, a contribution by Philippe Herzog, followed by a text by Penda Mbow, the Spirit of Sant'egidio.

Website

For all updates and information, dates and times of group meetings and events, projects run by the Entretiens, minutes from meetings and conferences, publications, archives, and those of our partners, visit:

www.entretiens-europeens.org

A team



Headed by **Claude Fischer-Herzog**, the team is made up of an assistant director and editorial staff of the Lettres des Entretiens, staff in charge of missions and research, and advisors...

André-Franck Ahoyo, assistant director of the Entretiens Eurafricains;

Jacques Bosc, cultural advisor;

Aïssata Diakité, youth policy officer;

Caroline Desaintghislain, policy officer, Les Entretiens Européens et Eurafricains;

Bineta Fall, external relations officer, Les Entretiens Eurafricains;

Manon Tanguy, energy policy officer, Les Entretiens Européens.

Partners in 2016

ASCPE concludes agreements with its partners. The partners take part in the working groups, receive the synthesis reports and proceedings, speak at the conferences, write articles in the publications...

Partners Energy / Environment: ANDRA, CEA, DG Energy of the European Commission, EDF, ENERGIES DE LA MER, ENGIE, FORATOM, INSTITUT DU BOSPHORE, ROSATOM

Partners EU / Africa (s): AGF, AIR FRANCE, ANF (association of French-speaking Notaries), EIFFAGE, FARM, INEADEC, IPS, MABUCIG, MAEDI (The French Ministry of Foreign Affairs and International Development), cabinet ORRICK, OIF, ORANGE, SCHNEIDER ELECTRIC, SEFI, TELECEL, 2IE

Cinema Partners: AfricaCultures, ARM, EVROPA FILM AKT, GIFA-LEPFIDA, La Fondation Hippocrène, L'ARM, Le Studio des Ursulines, VIDEOSPHERE

Media and Civilisation Partners: AFRICA N°1, Business Africa, IC Publications, Leaders League, OV5TV, UP FOR HUMANNES,



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Ask for La Lettre and Les Cahiers

Nuclear Energy: Special Issue

in English or in French

ASCOPE
La Lettre des Entretiens Européens
juin 2015
Spécial
Édito
Et si on...
Claude Fischer
Directeur des Entretiens Européens

ASCOPE
La Lettre des Entretiens Européens
October 2015
Nuclear Energy: Special Issue
Rapprocher - Débattre - Fraterniser
EDITORIAL What if we talked about nuclear energy?
The European Union has set out its intentions to create an energy union, to boost growth and employment. This is a wise decision. The diversity of energy sources in Europe presents several opportunities. The EU will have to assess how complementary these sources are when creating an energy mix that protects the climate and guarantees security, competitiveness and solidarity. This issue is a major political challenge. But the matter is not up for debate because the energy mix calls into question the decisions made by Member States. At nobody dares to discuss the choices of Member States? Never mind the decisions made some harm those of the others or if the market distinguishes as a consequence and gives at a weaker stance in the global competition.
Among the most difficult of questions, nuclear energy has truly driven a wedge through Europe. Member States are completely split down the middle: 14 against 14. Europe, however, refuses to interfere. The Energy Union plans to increase the share of renewable energy and energy efficiency, to reduce the emissions of greenhouse gases, but no scenario seems to contemplate nuclear energy. Neither for nor against? What does the European Commission mean by "technology neutrality" when nuclear energy represents 30% of our electricity production and 55% of our low-carbon energy and when Member States are encouraged to reach ever higher levels of safety and to manage nuclear waste? Should we decrease the share of nuclear in the mix? Maintain current levels? Or increase it?
Building new capacities, dismantling the old ones and creating storage facilities all require long-term investments, which are of interest to all Member States and which require public subsidies that the market does not allow. What reform will allow this to be addressed and enable Member States such as France to continue operating nuclear plants, or countries such as Lithuania to renew its capacities, or those such as the United Kingdom to develop its capacities, or other such as Poland to start their nuclear programme?
Why is this taboo? To avoid being a source of irritation to Member States who oppose nuclear energy? Or to the Greens who lobby within the European Parliament or in the Member States which support it? Who is shying away from the debate by advancing the risks for future generations as an argument, as if the risks were not as much worse? The climate change...
Claude Fischer
Directeur des Entretiens Européens

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Numéro 1 - Décembre 2015
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The societal ownership of nuclear waste management in Europe, a safety issue

ASCOPE
La Lettre des Entretiens Européens
October 2016
Investing in nuclear
Rapprocher - Débattre - Fraterniser
Édito
A societal choice and commitment!
A nuclear resistance is sweeping across the world, while Europe's main challenge is to stay in the race! The fear of the (ideological and rational) overreaction of the anti-nuclear lobby, industry and States have acted defensively, almost apologetically, for still being leaders. Nuclear energy has revolutionised access to electricity... Where the precautionary principle prevails at the expense of risk taking that fosters investment and innovation. On the world market, China takes over from a Europe in the lead. There will be no long-term investment without risks. These risks will of course have to be controlled. This is the role of Member States and the EU, which should not work power to a short-sighted and volatile market but must anticipate and organise a nuclear energy plan and nuclear safety to take up the challenge and make an informed choice! Market liberalisation in the past 20 years has seen a decline of nuclear industry in Europe, and of industry generally. And competition has been a poor substitute for industrial policy.
Investment in nuclear energy is not an economic but a societal choice among the great challenges of our time: climate, demography, the future of technologies. Dozens of thousands of jobs in SMEs and SMIs across Europe. Innovative high-added-value technologies, an export advantage... Does Europe want to keep its nuclear industry, and if so, how will it make the best of it?
Europe has the largest fleet of reactors (311) in the world. This fleet will have to be renewed. The need is massive, build new power stations, decommission others, enhance safety, create waste management centres, keep up R&D, train people... These significant and long-term investments: they will need firm guarantees and investor partnerships... States alone cannot provide policy decisions - and public procurement - and define common policies that promote investment. Currently, weak policies in Europe hamper the competition and investments.
Funding is just one issue among others and will be solved if projects are implemented and the investment. Currently, our internal market deters long-term projects and we no longer control our common future... States are tempted into entrenchment and renunciation of their energy policies, while we need multilateralism and cooperation more than ever. These are the issues that will be debated in the course of the Entretiens Européens.

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La Lettre des Entretiens Européens
October 2016
Controlling nuclear energy to preserve our prosperity
One year ago in Paris, nearly 200 signatory States to the UN Framework Convention on climate change validated an agreement committing them to contain worldwide global warming until the end of the century below +2°C relative to pre-industrial levels. They intend to pursue their efforts in order to limit the temperature rise to 1.5°C.
This binding commitment calls upon the world to drastically reduce and then eliminate greenhouse gas emissions generated by human activity. It is a virtual condemnation of the use of fossil carbon fuels. Humans find themselves confronted with an unprecedented challenge: to extend to an exploding world population the conditions for sustainable development at the same time forgoing the energy riches that have powered the industrial revolution for two centuries and have been the source of extraordinary human progress.
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Les Entretiens Européens du 15 octobre 2015
Investir dans le nucléaire en Europe, le cadre du marché pour valoriser et financer les projets.



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