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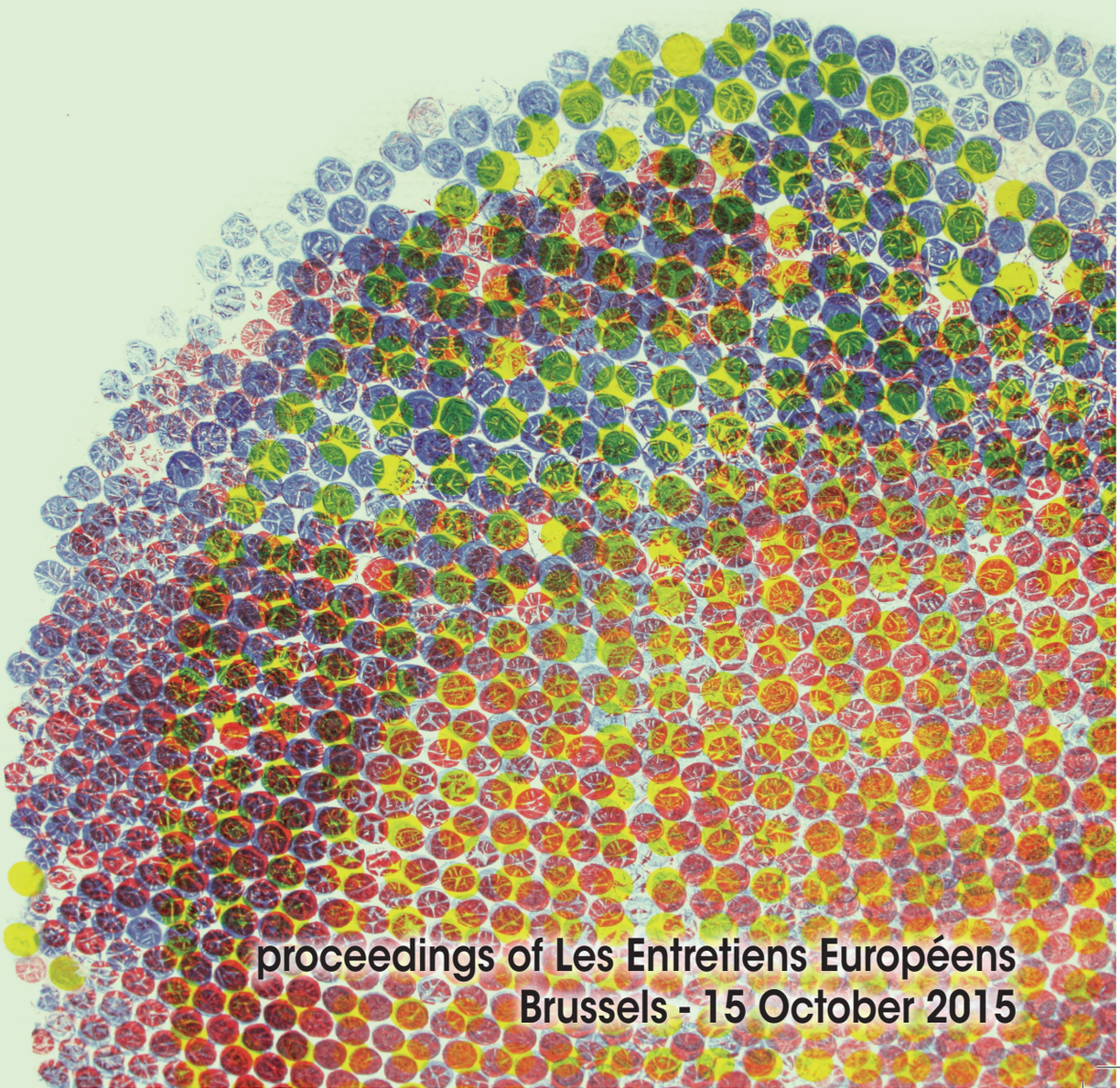
The societal ownership of nuclear waste management in Europe, a safety issue



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The societal ownership of nuclear waste management in Europe, a safety issue

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Foreword

The aim of these Entretiens Européens is to make a contribution to the public debate on nuclear safety and nuclear waste management in Europe by bringing together key players from the nuclear sector from several European countries to debate the issues among themselves together with other representatives of civil society and institutions.

These questions are at the heart of all considerations regarding the future of nuclear in Europe's energy mix: they must be kept firmly apart from the taboos propagated by the States which (for a variety of reasons) shy away from holding a debate on home soil whilst in the midst of drafting their energy transition policies.

These Entretiens Européens build and develop upon those organised in November 2014 in Paris on societal ownership of nuclear waste management. They also respond to the need to decentralise the European debate launched at the ENEF meeting last May in Prague and at the ENSREG conference in June in Brussels[1].

We wish to highlight the fact that if nuclear waste management is first and foremost the responsibility of the operator and the State as a last resort, **then nuclear safety can also be viewed as a European public good, in the general interest, and therefore the responsibility must be shared between citizens and key players.** Furthermore, we are seeking clarification regarding the heterogeneity of positions between the countries that have decided to halt nuclear production such as Germany, to pursue and develop it, such as France and the United Kingdom, and those that are seeking more regional solutions such as Eastern European countries or Italy.

More should be known about the specialists and areas of expertise that the European Union has, so that public opinion can be better informed about the subject and the potential solutions and so that stakeholders can shoulder their share of the responsibility. The excellence possessed by some European countries could represent a real asset in the transfer to countries that have made less progress in the search for solutions to safely manage their nuclear waste, management that is customised to deal with the type of waste and region in question, and an asset for a sustainable nuclear energy in the decarbonised energy mix. But could it not, however, give us a competitive edge and be an asset for exports as a response to the new challenges presented by the changes and developments in the world's nuclear sector? How, then, can we forge a genuinely European industrial sector for nuclear waste, where competitiveness and safety go hand in hand?

These «Cahiers des Entretiens Européens» present the proceedings of the hearings and round table discussions that brought together players from the nuclear sector, producers and waste managers, representatives from local areas and associations as well as scientists and academics from a range of European countries (Belgium, Finland, France, Italy, Poland, Czech Republic, United Kingdom and Sweden) as well as Canada.

[1] *See in the Letter of La Lettre des Entretiens Européens «Nuclear Energy: Special Issue», dated October 2015, and the proceedings of Les Entretiens Européens 2014 on our website www.entretiens-européens.org*

Acknowledgments

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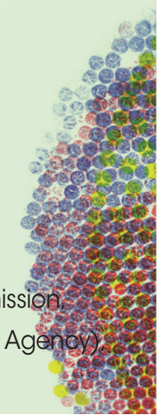
Current changes in the nuclear sector in Europe and in the world; the safety challenges



with

Gerassimos Thomas, deputy director general at DG Energy in the European Commission,

Ian Gordon, head of the Nuclear Waste section at the IAEA (International Atomic Energy Agency),

Moderated by **Claude Fischer,** director of ASCPE Les Entretiens Européens

Welcome

Claude Fischer: a warm welcome to all of you to this new session of the Entretiens Européens on the subject of societal ownership of nuclear waste management which follows on from the 2014 event held in Paris[1]. The 2011 Directive marked a new chapter in the domain of nuclear waste management in Europe with publication of the Member States' national plans…

16 States have submitted their plans but all of the States are involved, including those that have decided to "phase out nuclear"! A "phase out" of nuclear does not solve the problem of waste: we will be hearing from Italy which is working on solutions to manage its spent fuel following the closure of its plants in 1986, and the waste that was produced from decommissioning: a huge challenge which affects those wishing to put a stop to nuclear production such as Germany and those wishing to maintain or develop it further such as France or the United Kingdom or even countries such as Poland that wish to incorporate it into the energy mix.

The Entretiens Européens are a civil society initiative. They have been organised on this subject since 2003 in France in preparation of the law of 2006 and in Europe as part of the 2008 Safety Directive, and more generally on the future of nuclear in Europe and in the world. Since Fukushima, we have organised nine meetings and conferences in Europe, and what we want to see phased out is not nuclear, but the taboos surrounding it.

They are organised with the support of the European Commission, as a partnership and seeing participation from several key players: managers such as Andra, Ondraf, Sogin, SKB, producers such as EDF or Westinghouse, researchers from the CEA and the JRC but also representatives from academia and prestigious universities from Antwerp and the United Kingdom, and representatives of public ministries from Finland and Poland. I must not forget FORATOM, which represents the nuclear sector, without which we would not be in a position to debate anything.

I would like to start out by saying that what brings us all here today is the desire to reflect on two things: firstly, industrial solutions for nuclear waste, interim storage or storage in deep geological strata according to the properties of the waste or recycling capabilities, because you are all familiar with the adage, "today's waste is tomorrow's resources". We must recognise that from this standpoint, the nuclear industry has been a pioneer in the emergence of a "recycling industry" which distinguishes between levels of dangerousness. And then, the involvement of key players and all stakeholders, including territories, in this new industry which will require societal ownership of the management with one central objective: satisfying short-, medium- and long-term safety requirements.

We will therefore be seeking to answer several questions:

-Where are the Member States currently and how can the European Union promote cooperation between them (in addition to coordination) so that those who are more advanced in finding solutions can help the countries that are less advanced?

-Clarifying the information given out and the public debate on these issues which are still laden with taboo and, beyond that, how do we educate civil societies about this innovating technology so that they can take ownership of it and become involved in finding solutions?

-How can we create a European industry that will allow the Member States to satisfy the safety requirements in a way that encourages solidarity, and will allow Europe to contribute to global safety?

We will open the Entretiens Européens with Gerassimos Thomas, deputy director general at DG Energy, and we will conclude with Massimo Garribba, the nuclear safety director, and I hope that between the two we will be able to formulate some recommendations and a number of specific proposals for ensuring that the question of nuclear waste in Europe and in the world truly becomes a matter of general interest.

Hearings

Gerassimos Thomas: thank you very much ladies and gentlemen, for coming here today. I think this is a very important and timely event, and the focus on spent fuel and radioactive waste management is a key aspect of the social acceptance for nuclear energy. In fact, if we achieve to show and demonstrate that there are safe and adequate solutions for the spent fuel and radioactive waste management in the Member States in Europe, if we aim to demonstrate that this is possible, this would have a significant impact on the social acceptance for both existing and new power plants in Europe. But as Claude said, before going into the issue of radioactive waste management, I would say a few words about the overall framework of the EU energy policy, where the nuclear power is situated. There are a number of important energy challenges in Europe for the moment, but I will focus on three.

The first, the most important, is the impact of climate change. Climate change is accelerating, and it requires urgent action. We need to find a way towards a more competitive and low carbon economy that reconciles the climate change objectives with the needs of the society and the economy. That is as you know what the EU will promote for the COP21 discussions later this year in Paris, and we will try to get binding agreements from all actors in that direction.

The second reality for Europe is that we are vulnerable to energy supply shortages. There are too many European countries that are overly reliant on one energy source or one supplier, and this is an issue that we have to tackle. Security of supply has to be tackled. We have to be conscious that it has a cost, and this is a difficult aspect when we talk about competitiveness. We have to remember that in this context Europe will always be an energy importer. We are not going to be an exporter, and that also has to be taken into account.

Last but not least, we are also suffering like any other part of the world, but particularly in Europe, from economic underinvestment in energy infrastructure. So at this very moment where competitiveness is very important for Europe, we do need to have a large investment to comply with our objectives and also to keep our current energy sources active. So the challenges are multiple, and **the Commission in response has proposed the Energy Union Strategy, with an action plan.** The implementation of this strategy is currently moving ahead and we are working in a concrete way. We have to move forward fast, putting together elements that will accelerate the creation of the Energy Union. And for this, we have the political support as **the Energy Union is one of the few areas where the 28 Member States want to do things together, and they recognize that there is value added in doing things at the European level, but the time is pressing and we have to make sure that the implementation keeps up with the pace.**

Early next year, together with the initiative on gas security of supply and the LNG strategy, **we will come up with a PINC report, the new Nuclear Illustrative Program;** basically we provide a view on the investment needs in the nuclear sector. We look at the investments in safety: there are important new investments that have to be done, in the follow up of Fukushima, and we have to make sure that they are done in time and not delayed. We do have already some delays in the follow up of the stress tests, and we have to be vigilant on that. Safety is even more than waste an important aspect to keep the social acceptance in this area. Then we are going to look at new investment that need to take place, and for the first time we'll look at the investment needed in the back end, waste, deep geological disposal, and all these areas. When it comes to investments needed in Europe and most OECD countries, we need a new approach because the whole industry is changing: over the last 30 or 40 years, nuclear operators have been in a sort of cruising mode: they were just operating, and **now it's time not only to potentially prolong the life by a few years, but also to decide about new investments and technologies:** there will be a much more active debate about the new investment cycle in the next 10 to 20 years. This is very important in Europe, and because of the new legislation, the investment must have a new perspective: investments in new plants in the back end of the fuel cycle will have to be decided much more upfront by nuclear operators. I think in the EU we are therefore about to open a new frontier. **I believe we have one of the most advanced legal regimes for ensuring nuclear safety, and it is important to proceed rigorously with its implementation**, ensuring that things are not only in the texts, but are implemented on the ground. There are different challenges around implementation of waste and spent fuel management. There is the challenge of implementing final solutions for disposal of high level waste, and it is important to confront this challenge with all stakeholders, in particular with the civil society. In 2011, the EU adopted the new Radioactive Waste Directive: all Member States committed to address this issue and the first steps are being done. It is not easy. The directive requires that Member States detail their radioactive waste and spent fuel policies, the measures in place to implement these policies, and have national plants to address every aspect of these policies. This is the 1st time Member States are obliged with these binding measures, to take

formally a position on these aspects. The majority of Member States has developed a national program, this is quite encouraging, as in the past there was a sort of "wait and see" approach, but we have to see whether the national plans lead up to the ambitions in all cases.

We have already a preliminary analysis of the national plans, we are going to publish a comprehensive report on national plans and their implementation in the 2nd or 3rd quarter of next year, but we already see that there are areas where more ambition is needed. I will give you two examples.

There is already a need for additional effort to tackle the issue of funding. There are different assumptions used in each Member States on how you calculate the costs, there are different approaches on how you ring-fence the funding, the approaches all Member States are taking about the funding are still very different and this needs to be tackled. The Commission will work on this issue, both in bilateral discussions with Member States, but also through a more active engagement with the Decommissioning Funding Group. Moreover, this is an issue that will have to be reviewed through the peer reviews required by the Directive. We will have the first peer-review soon, and we will need to do more, to be sure the funding approach of all Member States converges more.

Second area where we see there is more to be done is the issue of the site selection and the construction of deep geological disposal facilities: In Europe there are several operational disposal facilities for low level waste; however intermediate and high level waste and spent fuel are stored at present at the generators sites (e.g. NPPs) or dedicated facilities. The disposal of these types of radioactive waste remains a challenge for most Member States. We have good examples like Finland, which is leading the way, in constructing the first geological disposal, conducting the needed research, ensuring the funding … this gives us a benchmark. In the next decade, this is an issue on which the Commission will push Member States to be ambitious and to engage the citizens in the discussions. **Political and technical choices will have to be made, and the Commission will make sure that not only technical and political discussions are advancing, but also that there is transparency and that the civil society is involved.** This is very important, because we will not succeed in engaging in such a long term project if we don't engage the citizens and the society. We have different tools to do this, to enhance transparency, through conferences, through dialogue, or through the Energy Transparency Centre of Knowledge (E-TRACK)-project. But it is a debate that has to accelerate. Just by highlighting these two issues you see how complex the situation is, the challenges about funding and having sites and long term solutions, we have a lot of processes and challenges ahead of us, and of course the Member States, the authority which has to make the decision, has a more important challenge than us. It is important to discuss here what opportunities there are for cooperation among Member States in this area; how can Member States learn in this phase of acceleration, how they can learn and operate together; are there best practices on repositories? Which issues remain to be solved to find legally possible solutions on how Member States can cooperate on managing their Spent Fuel and Radioactive Waste inventories? Can we work towards regional solutions? Is it possible to transport the waste? This is an important debate and an important issue. The timing is right to discuss this issue here. For the moment our impression is that most of these debates on coordination are very absent. What we would like to do in the coming months is to engage with Member States, to make sure they engage to look at these possibilities of cooperation, try to see concrete projects, but **what we will not accept is to postpone national action indefinitely, in search of ideal or visionary solutions, that have no anchor in reality.** So we will ask Member States to cooperate on the possibility of cooperating on building repositories or so, if they see it as being possible? But we will not have this kind of approach to stop the progress in national decisions. It is an important balance that we have to strike.

To conclude, Ladies and Gentlemen, I want to congratulate Les Entretiens Européens, Claude in particular, for taking the initiative to organize this event. We are at the beginning of the review of the national programs, we will have workshops with the Member States, peer reviews exercises, so we need to spend the next couple of years at debating these issues, this is done in parallel with the implementation of the revised Nuclear Safety Directive, so the dialogue with the authorities about these issues is very intensive. **I think this is the first of the events we are having in this phase of the debate, after the**

national plans, so I want to congratulate Claude, the sponsors of this event, all of you that are coming here for their engagement. We need both the countries, the people, the companies, and the civil society…I wish more of them were here, to engage in the debate; I want to give the message that we have a limited time to act, and not cooperate and discuss forever. We need to come with solutions, political decisions and technical solutions, we need to demonstrate what is possible and what is not, quickly, to gain the confidence of the citizens, and move forward. Thank you very much.

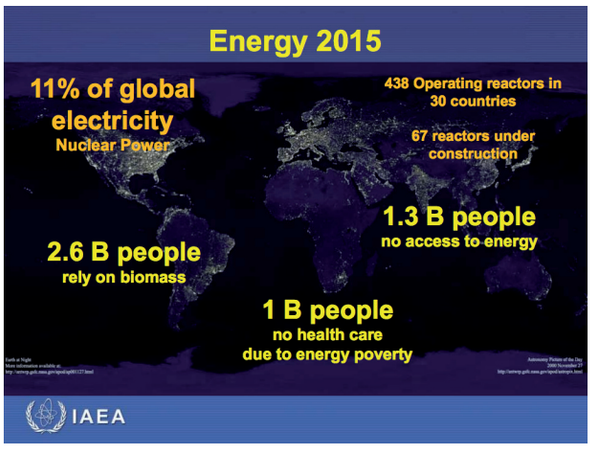
Claude Fischer: Evidently there would be a lot of questions for Gerassimos. I would like to suggest we hear from Ian Gordon who is going to place the work going on in Europe in the global context and talk about developments within the nuclear sector. The sector is facing multiple challenges with the creation of new production capacities, but also the decommissioning of part of the fleet and therefore will be facing the question of managing nuclear waste. **Whether we build or we decommission, there will be more waste to manage**. Is Europe in a position to provide solutions and contribute to global safety or not?

Ian Gordon: I work for the International Atomic Energy Agency (IAEA), and it a great pleasure to be with you here this morning, and to share just some pictures in the area of Radioactive Waste Management.

Of the 17 Sustainable Development Goals that were adopted by the UN a few weeks ago (25 Sept 2015), there is one that actually fuels all the others: goal 7, "Access to affordable & clean energy" will help us realize the others. And Goal 13, "climate action", also is very much related to low carbon energy production. And all of this is very much in line with the IAEA's statutes: Article 2 says that the **IAEA shall "seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world…"** It could not be clearer than that… Our work is purely based on science & technology. Our services are provided upon request of Members States – and that's an important and powerful concept – particularly in the context of some of the words already spoken: we work by bringing people together, sharing expertise and best practices, and promoting some of those through discussions.

One very important consideration we observe is the connectivity between energy poverty and real poverty,or, in other words, how energy can help a country develop sustainably. Let's have a look at the world. This is a NASA picture, a typical "earth by night". Please note the regions which are so brightly lit…

Now let's have some numbers: 1.3 billion have no access to energy, in any form. 1 billion people have



no access to health care, to a large extent because of energy poverty. And around 2.6 billion, more than a third of the world population still burn biomass for basic energy needs.

So what is the contribution of nuclear power in the current picture? Nuclear power makes up about 11% of the world's electricity production. There are 438 reactors in operation in 30 countries, with 67 under construction.

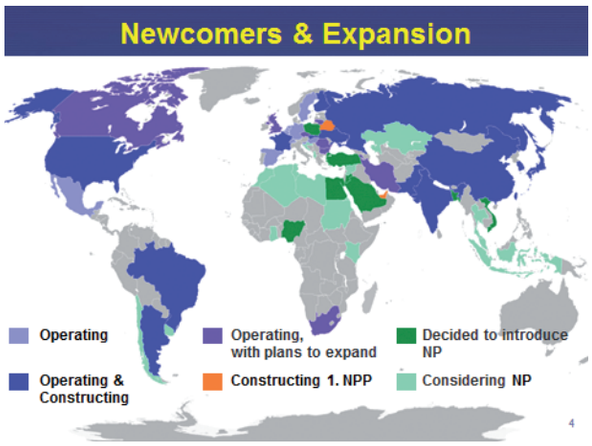
Add to this the concerns about energy security and carbon emissions… And then we move to the next chart, showing countries' interest, current and proposed, in nuclear power production…

The purple points the 30 countries that have operating NPPs. 25 of them have some form of expansion plans. The orange points are the UAE and Belarus, which are constructing their first nuclear power plants. And the green tones are countries that show interest in including nuclear in their electricity production mix. Some are more advanced in their programme, some are still studying. But the interest is there.

And **we hear 3 reasons for why nuclear power remains an important option for many countries: Improving energy security, reducing the impact of volatile fossil fuels prices, and mitigating the effects of climate change**. And what the IAEA says is this: Nuclear power is as a stable base-load source of electricity in an era of ever increasing global energy demands. It complements other energy sources including renewables.

So what do we do at the IAEA? We don't pour concrete; we don't build plants of any sort. And we don't finance nuclear power plants, but this is what we offer: we assemble expert teams to peer-review facilities and national plans and to identify potential improvements. We maintain databanks on operating experience, uranium resources, waste inventories,

[2] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/AIEA%20Ian%20Gordon.pdf



etc. We disseminate operating experience, knowledge and best practices. We provide direct training and computer packages for distance learning. We publish standards, guidelines, technical guidance and reference documents. I would emphasise that we do that – we are the secretariat - through the engagement of experts from around the world, drawing them together, and asking them to share views, and to draft or write publications. **We see our role as facilitating dialogue and cooperation, building trust and maintaining the best practices.**

We coordinate research among groups working on common problems… And we have developed a 3 Milestones Approach to help the so-called Nuclear Newcomers (around 30 in the world). This essentially sets out the aspects that should be considered to reach a certain level of preparation for a nuclear programme. It covers 19 topics that are crucial to a safe & sustainable start and operation of a programme, ranging from the national position on nuclear power, to management, nuclear safety, legislative and regulatory framework… and also, that is particularly important in the context of today's discussions, development and training of human resources; it also includes radioactive waste management and stakeholder engagement.

Built on that framework, and at their request, we offer to Member States Integrated Nuclear Infrastructure Reviews (INIR). INIR missions are designed to assist IAEA Member States to assess the status of their national infrastructure for the introduction of nuclear power. The mission reinforces continual improvement in the planning process, identifies gaps and makes recommendations. So far, we have conducted 11 missions around the world, including Bangladesh, Belarus, Indonesia, Jordan, Poland, Thailand, the United Arab Emirates, Vietnam and most recently to Turkey. Key part of this is the legal and regulatory framework: safety, security, safeguards, and a clear understanding of liability aspects.

The importance of stakeholders' involvement, including open and transparent dialogue with the public, is clearly recognized as part of a successful infrastructure development programme. Experience from all around the world has shown that building and maintaining public confidence and trust throughout the nuclear power programme lifecycle is crucial for ensuring sustainability and feasibility of the programme. I mention knowledge management and human resources development and training. We support and facilitate Member States in their stakeholder involvement programmes and in strengthening of national competences: We run national and regional workshops, meetings, we provide very interactive e-learning, we publish guidance documents. It is essential for success that all involved parties are committed to developing and implementing carefully planned stakeholder involvement from the early stages of a programme. One example of our efforts in this area are the Nuclear Knowledge Management and Nuclear Energy Management schools that we have been organizing with different partners since 2010. So far, we have held such schools in Italy, Japan, the UAE, Republic of Korea and the US.

Turning to radioactive waste management, the Scientific Forum during the General Conference in 2014 was dedicated solely to this topic. You can read more on our web site, but the summary was that **practically all member states had some sort of responsibility in handling radioactive waste, from nuclear power program or from science, industry, agriculture and medicine**. And that's perhaps why Director General Yukiya Amano showed this small (inert!) canister of radioactive material, and said: «*all Member States should embrace, from the start, their responsibility for radioactive waste management; it is imperative that each country establishes a comprehensive plan for waste management and disposal as soon as they begin to use nuclear technologies.*» Within my own section, we are pleased to offer help and support on decommissioning of existing facilities, whether nuclear power plants of fuel cycle facilities, advice and guidance on the conditioning and packaging for waste material, and finally disposal. Away from the larger aspects of nuclear power programs, we have an expert team which can provide support in dealing with disused sealed radioactive sources, which have been used in medicine or industry, and which may not be fully controlled or under a regulator's supervision

And luckily, we have an excellent staff who help those Member States both in the conceptual level, as well as in practical cases, such as these examples from Honduras, Egypt or Sierra Leone.

Debate

Claude Fischer: I am not going to ask any questions, although I do have a few, but without further ado I will open the debate and give the floor to Saida Engström who is Vice President of SKB in Sweden, a country that is very advanced…

Saida Engström: I welcome the invitation and the requirements imposed on Member States by the EU and the IAEA. I think that as long as there is no financing in our hands, there will be just plans and programs, and no actions. That's the situation for many countries in Europe. How much are you stressing the fact that financing is a prerequisite for doing the job?

Elena Mantagaris: You mentioned that safety is one of the conditions for social acceptability. Experience we have in Canada shows that arguments about safety have actually not brought acceptance among civil society. Building social acceptance is often not solely focused on safety, but also on how to involve civil society in the decision making process, and ultimately, restoring trust and confidence in the institutions that we have to ensure safety, and so I suggest to turn the discussion around how to build the conditions of trust and confidence again, before we reintroduce safety into the discussion. Just comments on that would be useful…

Claude Fischer: *If I may, Elena, what would the level of participation be in the decision-making process? Would it only be to show whether citizens and civil society stakeholders agree with the decision or not, or would it be more about their involvement in the process, from vocational training for nuclear jobs or waste management, through to management?*

Elena Mantagaris: this is citizens taking part in the dialogue with the institutions involved, from the planning stages to the implementation and not only on the safety challenges.

Cécile Massart: as a Belgian artist, having visited many nuclear countries and been involved in many exhibitions and publications on the subject, I have met many people. I can tell you that there is a lack of knowledge and therefore an urgent need to start talking about it, right from primary school age. I've just come back from Portugal, obviously not a major nuclear-producing country, but I was working on an exhibition in the schools and I can vouch for the total lack of knowledge… I am waging my little battle: I come back from Fukushima, I am going to publish a book. It is an artistic book: there are high levels of sensitivity among the public which must be worked upon, I think that is how we can encourage the public to take part.

Claude Fischer: I would like to welcome Cécile, whom I have known from the start. She is working on the history of interim storage and storage sites, she has also worked on a great many sculpture projects to be set up on the sites, so that we do not forget about the waste packages stored beneath our feet today and within deep geological layers tomorrow. If you look at the Entretiens Européens folders: the small flecks of colour represent the packages according to decreasing levels of radioactivity. It's very nice. Cécile had offered me a painting representing this which is in my office. I have really taken this image on board, I like it a lot and I have been using it for ten years.

Berndt Dohnert: I appreciated very much what was said by Mr Thomas, who raised the issues of funding and planning. As far as funding is concerned, we should not forget who carries the responsibilities. Is it the operator? The supplier? Or is it the public? If I see the discussions going on in various European countries to pull out of nuclear, they go together with the destruction of assets, in particular in Germany: E.on, RWE, Vattenfall, EnBW will not bring any more the full funds required for dismantling and storage. So it is highly likely that the population will pay as taxpayer. And in addition to the discussions going on, should we not involve also at least the European suppliers who contributed to build the NPPs? Second, to come up with the plans: it is very good if few plans are overdue. Something is missing: it's public acceptance. The more you work on a plan, the more you work already on the implementation of something … Look at Gorleben and Asse in Germany: these site projects have had a very negative impact on the public acceptance. It contributed to the pullout of nuclear. So I wonder what kind of message the EU would provide to stop this on a general basis and say "we are in charge for all the countries" and not let this planning process combined with financing destroyed by the greens?

Claude Fischer: Gorleben is the example that we need to be discussing here. The public's refusal of Gorleben is due to the offensive launched by nuclear

opponents in Germany who have taken the issue of waste hostage: we have not been able to discuss waste for anti-nuclear reasons. This is an enormous problem which we are also seeing in Lorraine: the anti-nuclear brigade have twisted the debate on waste and made it "we must not build any more nuclear". Even if we didn't build any more nuclear – we have spoken about decommissioning, there will be a symposium on that, and the ENEF opened the debate in Prague last May – now more than ever we must manage the waste and find the right solutions. We must not miss the point and fight the wrong battle! We must ensure that waste management centres in Europe, Cigéo in France for example do not become Gorlebens. We are now going to hear from Michel Gueritte, who comes from Soulaines in France where there is an interim storage site, and who is opposed to Cigéo, the future geological storage site.

Michel Gueritte: dear Claude, I will not talk about the problems with Cigéo straight away. I would simply like to make a comment about the optimism of those in charge at the IAEA concerning the state of nuclear in the world. Ian Gordon announced there were 67 plants being built in the world. I would like to see the list of the 67… We must not confuse far-off projects that are unfinanced with those under construction.

Gerassimos Thomas: thank you for these questions. I would agree with the first two comments, I think I would agree with the third question, but I would say it is not my job. On the fourth 2 questions, we are in agreement with German government with this possibility, and for the last question on acceptance, we are driving through transparency and debates to solve this issue. Overall the questions are not very challenging, this is representative of the audience.

I will pick up financing as one of the issues I mentioned where there is more to be done. We have a first analysis of the national plans, and the first issue where you can already see it is not in order, is the way things are going to be funded, and we need more work. **So I agree with you that until the funding is there, until we know who is responsible for this, then the rest remains a plan**. We need to make it concrete and the financing is an issue we have to get in place. We have to start from somewhere, and I think it is important that we have obliged legally Member States to come up not only with a plan but also with a way to fund their radioactive waste management. So there is a legal obligation, and we are now discussing the quality of what we get. We would not have this debate, or only an academic debate, if we did not have a directive on radioactive waste management. We do have a step chance: **we come from an academic debate to a legal obligation and that's why I say that we will be very strict on infringement, taking Member States to court if we see there is unnecessary delay with decisions. Because of the funding or if some of the Member States say yes, but there is a regional solutions or whatever…** They can have this debate, but they have to have it now. We'll have it in the courts if necessary.

Secondly, on safety: I do agree that we have to involve the civil society: I expressed myself wrongly probably, but one on the objectives of radioactive waste management directive is to make sure that the civil society is involved in the decision making process. It is the same objective for the safety directive, we do need to get the civil society in.

Then it's up to the debate to see what is the outcome, and here I come to the last question: if the debate turns against…this is where all of the union stops: we are not there to influence the choices of the energy mix in the Member States, they are national, and we the Commission we will not overstep the debate. **We have to make sure that the debates are informed. And that is the reason we decided for example on the new PINC, the new report on the investments needed, for the first time not only to talk about potential investment in new NPP, but about investment that is needed across the fuel cycle**. We need to have an informed debate about this, and so far in Europe we have avoided this debate: how much does it cost? And now it is a good time to have a report that launches the debate, because the debate is there now through the press, notably in Germany: it is not that people don't talk anymore about the costs, they do talk but they talk with fragmented information. So I think that the Commission and the IAEA will have the responsibility to make sure that the debates happen on the basis of good information.

And, as an economist, I mean the information is not of very high quality, we will publish this report, we will start this process, but the cost of the treatment of waste, and for the geological disposal, is not of the highest accuracy standards. But we do have information that is not used, we need to share information that is comparable, and we need to start this debate. The debate is national but it has to be well informed, and we have a responsibility to put the start right, and we are going to do that.

I think that the responsibility has to be with the operators, so far from what I understand, it is a conviction also shared by the German government. We are so far working closely on this, the measures they have taken to avoid that the responsibility goes off the companies and goes to the public domain. I am not sure this is the situation in all countries, all over the world, but here I think it is the new benchmark: if you are in this business, you know that the operator has to keep the responsibility, and this cannot be not only an unfunded, but also an unquantified liability for the taxpayer. It is like pensions: so far we've lived well the last

50 years and people said the new generation will pay the pensions, and we come to an economic reality where you cannot do that anymore, because of the demography. It is the same with waste: we have to look through, look in the long term, and the costs have to be addressed upfront. I think this is not going to be very much of a challenge, this is not an area, for the moment, that people challenge, we have to look of course when you do the numbers, what are the implications, but so far the approach taken by Germany is very encouraging, it is making sure money is not diverted, I think we have a good way to confront these issues.

Is the existence of plans, whether it is radioactive waste management plans, peer reviews, nuclear safety workshops …good or bad for public acceptance? I don't know, and I am a bit provocative, I don't care: I do know that if there is no plan, then we don't know what people do, and if there is no debate, we don't know what people think. So I think **we need to have a plan, the nature of the business implies that plans are on the long term, and need to be debated and reviewed: it's unrealistic to have a plan a stick to it forever, so you need to review.** Could we have this notion of peer reviews? Peer reviews stimulate cross-border discussions, and if they are well done – and this is the responsibilities of people who do plans -hopefully they will stimulate best transfers of experiences, and we would have an upgrade of the quality of the debate, the more we discuss with each other. It is not my objective as the representative of the Commission to make sure that the public acceptance is better once you have a plan , it is not my job description, but I think eventually that if you have good quality plans, credible plans, and you make sure that this credibility is in hands, through peer reviews by international organizations or by countries among themselves, the quality of the planning and of the involvement of the civil society will increase, and eventually you will have a better outcome and a more informed debate.

Ian Gordon: Many of the topics quite properly are remit from our Member States, we can provide advice, support and input for these topics, but they remain the responsibility of individual Member States. Said that, on the question of funding, and in particular environmental remediation: just last week, I closed a workshop with some of my colleagues and with experts from around the world, pulling together sources of funding and identifying proper action for environmental remediation. It's some small part, but it is an indication of some of the work we do to bring funders in closer contact with the owners of each individual challenge.

As to the ultimate responsibility, I think we are also in the middle of this question: the IAEA publish safety standards, in various different grades, but the pinnacle of those is "safety fundamentals". And within the safety fundamentals, again the pinnacle is "safety fundamental number 1", which is: "the safety of the material is always the responsibility of the operator". So we are very clear about that, and about the level of consensus among the 165 Member States which actually contribute to the safety standards.

On the question about the list of plants, I am certainly not infallible, there might be an error in the slide, the data is drawn from our annual nuclear technology review, and I'll command someone to crosscheck my data.

And on the important question of stakeholders' engagement, some of the facts that we've seen from Member States, and from our experiences, has been that it is absolutely vital to build trust and respect, which in many ways come from consistency and engagement between nuclear actors and civil society, building serious relationships and understanding of the questions which arise, and an ability to provide answers to those questions.

Gerassimos Thomas: on this question of the 67 plants, I agree, there are more projects than constructions, but in any case I want to add an interesting comment: 9 of them are done by the Russians.

Claude Fischer: there is Russia but there is also India and China which is building 22 reactors alone, out of the 67 to which you have to add the projects… We are indeed seeing a renaissance of nuclear in the world that we are not seeing in Europe despite its experience and history… The risk is that we will lose our leadership and competitiveness in the sector. Besides the reactors being built in Finland and France, there are plans for the United Kingdom, Poland or the Czech Republic…

To conclude this 1st round table, I will say to Gerassimos that it is not enough to demand national action plans from the Member States, that must be done but **handing down orders to States has never produced a European policy. How does Europe encourage the countries to put in place national plans, and beyond that, create industries for nuclear waste?** Should we be building a European industry

for nuclear waste? A market is developing, there is a risk of competition, even between the waste managers, what incentives could Europe create to see more cooperation? Furthermore, on the subject of financing, Saida told us that these were long and costly projects: should we not be attempting to find financing, and mixed sources of financing? Whilst it is indeed the operators who are responsible, could the consumers, who in many cases happily use nuclear energy, not be more involved in the consequences of this usage in our countries? We could create financial incentives at European level: we have the **Junker** plan, for and in which you are heavily involved… **in the future, could these centres, which are public goods and infrastructure with a general interest, be defined as projects of common interest and benefit from European funding which would be European guarantees and which would allow public and private funds to be raised, in the communities or in the Member States?** This is a question I would raise for the continuation of our debates and especially in the 3rd round table. Lastly, on the role of education: shaping public opinion, that is not only about the public debate, and perhaps the media even less, given the way in which they sometimes relay the arguments of opponents who pay no heed to scientific arguments, and without seeking to clarify the terms of the debate. The States have a great responsibility here, in education: **from early primary school years, children must know how electricity is produced, and what the respective consequences are, including the aspect of waste and the risks associated with nuclear… but also what the positive effects of this technology are, in terms of access to electricity for all** these issues must be put on the table so that we can stop demonising nuclear and banish the taboos! Lastly, for me, the operators are the main stakeholders in the debate. They are the ones who produce the waste, who manage it, who innovate… When I see the technological innovation at Andra, I say that they are the ones who need to be heard first, and not the opponents, otherwise we will understand absolutely nothing: we need a debate, not a "for or against", but a debate on the "how" with arguments based on scientific, economic, social and ethical realities of this technology for managing nuclear waste.

Gerassimos Thomas: I think it is very good that you organized the debate, you stimulate the debate; there are a lot more things that we can do, but there are also some limits. Yes in the waste and decommissioning areas, there are huge opportunities of business, there is an opportunity to have leadership, as in the area of nuclear energy, but I think however this leadership has to be developed by the private sector which is involved. So we have to provide the framework, but we are not going to have a "Galileo" project on waste management. We have to be realistic, we just have to provide the bases. The floor is the experience of the industry: we start having experience of decommissioning in Europe, it's a huge opportunity, but the business part has to be picked by the private sector. Funding is the responsibility of the operators, also of the consumers when they have to pay their electricity bill, and it cannot end up as an unfunded liability for the taxpayer. I will be prudent in raising expectations about financing initiatives from Europe. There are many areas where Europe has priorities and needs to invest, there will be a prioritization. So I don't want to raise unrealistic expectations, I am sitting in the steering board of the European fund for strategic investment, and I think it is unrealistic for you to expect that anything related to the nuclear industry will be funded by the Juncker plan.

Nuclear waste management national plans

Moderated by **Claude FISCHER**, Director of ASCPE

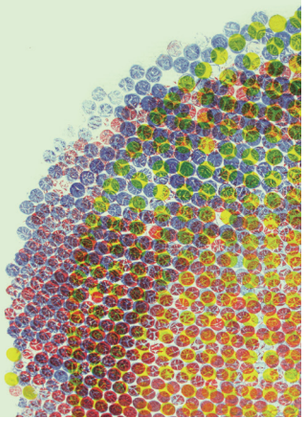
with:

Pierre-Marie ABADIE,
CEO of ANDRA, France

Maurizio BOELLA,
Head of Unit at DG Energy, European Commission

Riccardo CASALE,
CEO of SOGIN, Italy

Jiri SLOVAK,
Director of SÙRAO, Czech Republic



Round table

Claude Fischer: I would like to thank all of these participants, and especially Andra with whom we have been working for a good ten years in organising Les Entretiens Européens. It is also thanks to Andra that I first investigated this area of waste, their inventory, which is terribly complex, we must not lose sight of that in order to engage in discussion and debate. Maurizio Boella is going to present to us a first overview of the results of the national plans which all Member States had to submit by 23 August. Where are we at? Has the Commission received all 28 national action plans and do we have any inklings about their content at this stage?

Maurizio Boella: here is a brief presentation of the current status with regard to implementing Council Directive 2011/70 on the safe and responsible management of radioactive waste and spent fuel. The European Directive 2011/70 contained two deadlines: transposition into national law by 23 August 2013 and the sending of the programme as well as the national reports by 23 August 2015. Presently, the transposition has been deemed relatively satisfactory by the Commission, in the knowledge that some countries have not yet notified the European Commission of the transposition. Some of these countries, nevertheless, have essentially completed the technical work surrounding the transposition but the procedures underway within their parliaments have not yet come to a conclusion.

For the countries that have not transposed the directive or where the transposition was considered unsatisfactory, the Commission services have the power to initiate a multi-stage infringement procedure: firstly **the European Commission contacts the Member States concerned to identify the possible steps that would lead to a satisfactory transposition, before activating the infringement proceedings**. Regarding the national programmes and reports, 16 States have submitted their national programmes, and 4 submitted drafts in the form of documents that could not be accepted by the Commission. These documents, however, at least provide an indication of the progress made. The programmes and national reports are currently being analysed by the Commission services: DG ENER and the JRC are working together, each providing their techno-scientific competences. At the first reading, it seemed that the issue surrounding deep geological disposal installations was being addressed by only a handful of countries. There is a clear trend either to delay the matter by several decades or, in some cases, invest in building new installations for temporary storage of waste and spent fuel.

The effective implementation of the European Directive on waste also depends on communication with civil society and consistent societal ownership of the actions that are needed. The European Commission is intending to organise a workshop with a range of society stakeholders to debate the matter of waste. This and other possible initiatives are aimed at speeding up the process which must result in safe and responsible management of radioactive waste in Europe.

Pierre-Marie Abadie: this morning I will not do any technical presentation, I already did it many times in different fora. I would like to share with you more the institutional aspects of the challenges concerning waste management and disposal, and referring to the 1st discussion we had after the opening panel.

Focusing on institutional aspects, there are four prerequisites for managing those changes:

First you need an institutional tool to deal with very

long term challenges, because it is a very long journey. The solution we found in France was to create a dedicated public agency, independent from the waste producers, under the supervision of different ministries (Research, Environment, Energy), but also evaluated by specific committees of scientists, under the control also of the Parliament. It is very important to have various bodies controlling and evaluating what we are doing. Another choice was to have an agency responsible for all waste management. It is important because it gives us the opportunity to present a global picture, of all waste, all inventories, and all the solutions, included in the managing plan. It is very important to find proportionate solutions, according to their lifespan and their noxiousness. The agency is now 650 people, the great majority financed by the producers, according to the polluter – payer principle. We were talking about support from the European Commission: clearly we don't ask for that. That's doesn't mean we don't want support for R&D, but the implementations of the solutions are financed by the producers. Financed by the producers means financed by the consumers, because money comes from the electricity produced, and is included in the electricity costs.

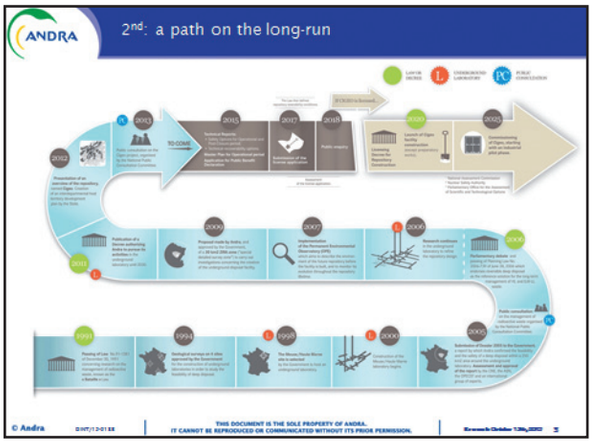
The 2nd prerequisite is to have time and to take time. This long story began with the law of 1991, and even before there was a story. Every 2 or 5 years, there's been a specific step forward. It takes time, we are not wasting time but there is much to do: on R&D, on legal and institutional processes, scientific process, design, implementation… We began with the underground laboratory, an important tool to get information about the geology, the physical processes, and later to launch experiments on the technological aspects. Then 2006, an important step with the 2nd law on this matter, stipulating that underground disposal would be the reference solution, then we moved later to the siting question, and the design period.

The 3rd important point is to keep in mind that it is a progressive step by step approach. Typically, we started with the demonstration of the feasibility (2005), then after the law we moved to a more precise siting, from an area of 250 Km^2 in 2006, to 30 km^2 in 2010. And now we are finishing the basic design, and we start at the end of the year the detailed design for 2 years.

The 4th point is that if the preparation is progressive, the implementation itself also is progressive. It will take many decades to build and fully operate the repository. After a pilot phase, we will start operations with intermediate level waste, and with high level waste in a pilot area, and finally **we will start the high level full scale disposal operations around 2085.** It shows you it is very progressive! So we have to organize a governance scheme together for many decades, up to 120 years. It represents around 4 generations, so you cannot pretend to take all the decisions in 2020 for 4 generations. We will take a global decision in 2020, and then we will have a very progressive and incremental approach. That means that we need regular appointments with all stakeholders: evaluators, reviewers, safety authorities, and also residents and decision makers. This is in fact the basis of reversibility. **Reversibility means that as we work on an underground disposal during 4 generations, all decisions will not be taken from the beginning:** there will be different steps, with safety evaluations, discussions with all stakeholders, and additional decisions, typically when we will close areas and open new ones. It is a scientific and technical question, but also a question of safety and dialogue with the population. It means that from one generation to the following one, you have the opportunity to reevaluate, and to go back on a decision already taken if necessary, or to follow or modify the reference path because of additional knowledge, change in energy policy etc. You thus need a controlled process at each generation; you need to keep options open as long as possible, and to have opportunities of corrective actions.

For implementing reversibility, you need a large toolbox, with technical tools, governance tools, dialogue with populations etc. To summarize, you need first to get additional information as long as you are implementing and operating the disposal: you will get this information through additional R&D, specific research to be monitored, and of course return of experience. You need also progressivity and adaptability. **You must be flexible on the agenda, because you may have surprises, and adaptable to –typically - energy policy changes:** if in 2 or 3 decades we stop reprocessing in France for any reason, we must demonstrate today that we are able to adapt to spent fuel direct disposal: that doesn't mean we will design the repository for direct disposal, but me must demonstrate that there is no physical impossibi-

[3] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/ANDRA%20PM%20Abadie.pdf



lity, that there are no decisions taken that will prevent to adapt in few decades. Of course, in this context, retrievability is one of the tools. It is necessary to have retrievability during all these operations, these famous 100 years, in order to be able to adapt and go back if necessary, if there is new knowledge due to specific cells evolving differently than planned… whatever you can imagine. And of course in the toolbox you need also public involvement tools: transparency, knowledge management, involvement of the society, and control by the State, the Parliament…It is important to realize that the objective of these tools is "working together"; in this context, retrievability can't be an objective by itself, .because you cannot have retrievability on the very long term. It is part of the reversibility. It is a tool, and if the next generation or the following one wants to have more retrievability, they can reinvest, readapt, to increase it.

What is the cost of retrievability? It is in fact not so much: it is linked to the global structure of the French CIGEO concept. It is between 2 and 10% of cost increase, depending on the way you are accounting for it. The point is, it is directly linked to the choices that have been done of a very progressive building, of a single structure for all kind of waste, intermediate or high level waste, and the fact that it can be readapted.

In conclusion: of course, I focused today on institutional aspects, but there are also many scientific aspects – 25 years of R&D on these matters- and this experience is shared of course with our colleagues; we have much to learn from them, and they also share their own experience, for instance on surface disposal or on geological projects with our Swedish and Finnish partners.

Claude Fischer: We are surprised by this long and responsible process which ought to offer reassurance not only to the local population but the French too and this marks a shift from the sweeping statements made by some of our politicians which are muddying the debate rather than clarifying it. This is only temporary, but it pushes us even further away from having a responsible debate, and I for one am determined to re-open this in France: we had a very successful symposium in November 2014, we will start it up once more, it deserves this and I would invite the countries of Europe to come and witness it as we need to demonstrate that everyone shares these issues and that everyone is seeking solutions. Riccardo Casale: what are you doing in Italy? You are the director of SOGIN, the company in charge of nuclear waste management in Italy… You haven't been producing any nuclear since Chernobyl, but you are still faced with what to do with spent fuel and waste arising from decommissioning, where you are slightly ahead of the curve. You don't yet have a site for managing this waste: could you please tell us more about how far along you are in the search for a future site and how you could benefit from experiences from France and possibly other countries too?

Riccardo Casale: Thank you for the invitation and to Gerassimos Thomas and Maurizio Boella for setting the scene. Things are very clear. I was extremely interested to learn that only 16 national plans have been submitted. But given the complexity of the subject, that isn't bad and the Commission can afford to be happy with that result. Others will certainly come in. I would also like to thank Pierre-Marie Abadie, for working with us. We value the Andra model, it is a good waste management model, but we are not yet at that stage in Italy. **The most important feature of the French model is its independence. That is the fundamental pillar in preventing a possible conflict of interests between those producing the waste and those having to manage it for future generations**. Things are complicated in Italy: we have 60 million nuclear waste management experts, 60 million football coaches, 60 million singers! Among the 60 million, however, some are better informed than others… Let me tell you a brief anecdote: in 1987, we had to stop the nuclear programme overnight, following a referendum, confirmed in 2012. We therefore no longer speak about nuclear production in Italy… but for how many years? 30, 40 or 50 years ? **When the reactors were shut down overnight on 31 December 1987, we were asking what to do, how to do it, where to do it, who ought to be doing it... There was no clarity. There was also the upsurge in ecological movements in the 80s and 90s, and the complexity of nuclear waste management was used for energy policy purposes** which I won't go into now. It was a difficult start: Sogin was created in 2000, 100% controlled by the State, and I was responsible for managing it at that time. Sogin took charge of decommissioning 4 nuclear power plants, of 3 research laboratories and a fuel fabrication plant: this means that there are 8 centres currently being decommissioned. I greatly appreciated the fact that Gerassimos Thomas spoke of the difficulty

of economic estimates, and at the same time of the need to have these economic estimates and national plans. We have been faced with these plans several times and the problem is not only an Italian one, it is a European one. There is a need for standardisation, and the IAEA could certainly assist with this as we are going to have to have good programmes and plans, from both a time and economic point of view, as the sums at stake are enormous. I would therefore urge the Commission to assist the Member States with their long-term planning, with the possibility for margins of error. All scientific and technical literature, especially that of the IAEA, is telling us that any project in the design stages may entail margins of error of 40-50%; for a provisional project it is 30%, and only 15 to 20% for a definitive project which has not yet been implemented. The more progress that is made in defining a decommissioning project, the closer we are to the final decision, the more we have a project that is clearly defined in time and needs. It is all the more important not only because the financing comes from electricity bills and therefore from consumers who want to know how their money is being spent but also because **until a decision has been made regarding an installation, we cannot simply leave sites as they are. They have to be kept safe and secure, which increases the cost**. This is why it is important for us to speed up the decommissioning process.

- Regarding waste management, there are several different approaches across Europe. In Italy's case, almost 98% of spent fuel has been sent abroad for reprocessing: some went to Sellafield, some to La Hague. There are still approximately fifty elements which I hope will be leaving shortly for France and which are expected to return in the form of canisters. In terms of volume that may not amount to much, 14 or 15000 m3, but obviously it is a lot in terms of activity and in terms of social acceptance, it is a problem. **Whilst technically we have the answers, from an acceptance point of view there are only questions.** And given the problems we have faced in sending a train of spent fuel to France, we may expect a worse reaction still when it comes to receiving the canisters of waste. That being said, as far as fuel is concerned, we are cutting edge.
- Concerning the decommissioning of 8 installations: the fuel plant is almost in a greenfield state, or even almost brownfield! In order to achieve greenfield status, the national plan is first needed. Whilst there are some plants and research centres where things are more advanced, we are still waiting…
- Regarding the final management of waste: here too we have a rather difficult legacy. A government decree passed in November 2003 designated a farming region in the south, Basilicata, as a future national site for the permanent storage of radioactive waste, without any process of participation. Obviously this resulted in public outcry over a 4-week period and the decree was subsequently withdrawn. That did not get things off to a good start. And the controversy left its mark on public opinion. It was only several years later that work started again on explaining to people that this nuclear waste had to be managed somehow, the waste produced from plants and the waste generated in medicine… The conclusion at present is that Italy currently has to make do with temporary surface storage of approximately 80000 M3 of waste, a centre based on the model in Aube in France (on a smaller scale) or that of El Cabril in Spain. I will not go into detail on the different technical possibilities for containing radioactivity. An information campaign was launched aimed at the public at large using a website containing a wealth of information: via newspapers and the television we invited young people to come and visit the site; and I would encourage you to visit the site and send us your feedback. Alongside this, this summer we sent a letter with a map to the government, containing our proposals on identifying possible sites for temporary waste storage based on the initial criteria. The government is currently involved in analytical work. **We are respecting the law, albeit with a delay of several months on the roadmap, but for a 40-50-year programme, that's negligible!** I hope that next time we meet I will be in a position to tell you how we started discussions with the regions, institutions, associations, ecologists… We want to make sure that the process involves as much participation as possible as this is a national matter.

Claude Fischer: You have provided a map with possible sites and I hope that it will be met with acceptance from your government so that the consultation can get under way. But the directive also opens up the possibility of regional centres in Europe. Croatia and Slovenia are intending to share a common centre: might Italy be interested (or even tempted, given opinion at present)? Rather than Europe resembling a 28-hole block of cheese, could we contemplate common storage centres and allow the "smaller" nuclear countries (small in the sense of having fewer plants in use and/or fewer sites to decommission) to share a storage centre? Is this feasible or is it a completely outlandish suggestion?

Riccardo Casale: No, it is a serious question and I would like to thank the Commission for having put forward this possibility: I think that whilst in terms of short-lived low to medium activity each country has to have a national storage site, for long-lived high le-

[4] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/SURAO%20Jiri%20Slovak.pdf

vel activity it doesn't make much sense to have a geological site for 10000 m3 from an economic or strategic point of view and therefore the possibility for smaller nuclear countries to come together for high-level activity ought to be seriously investigated by several Member States.

Jiri Slovak: Good morning ladies and gentlemen, and many thanks for inviting me to present on the subject of nuclear waste management in the Czech Republic. I will start with some important legislative principles, which began with the New Atomic Act in 1997, with the guarantee by the State of safe disposal for all waste produced in the Czech Republic, establishing SURAO, as the authority and as a state organisation which changed in 2001 into a government organisation. The Atomic Act also created the "nuclear account", operated by the Ministry of Finance.

In the year after SURAO was established as a government organisation, we prepared the first waste management concept, something resembling a mission plan. This plan was updated in 2014, and the government took it into account when preparing the strategic environmental impact assessment, to be approved next year, and we are expecting public hearings to take place. In May 2015, the Ministry of the Environment approved licenses for the first steps of geological surveys for 7 sites, preselected as possible deep geological repositories. A new energy strategy was also approved, planning the construction of 4 nuclear units, the construction starting in 2025, for commissioning between 2033 and 2037.

There are 3 repositories in the country, for Intermediate and Low level waste, including from research and medicine. The newest one is in Dukovany, in the area of the Nuclear Power Plant, operated since 1985. For the future, after 2020, the plan is to have only 2 repositories: Richard, mainly for Intermediate level waste, and which should be reconstructed. We are beginning the feasibility study for this reconstruction, for operation after 2020 and which will hopefully run until 2100. The Dukovany repository has enough space for all waste coming from NPPs, whether planned or pre-existing.

The main way to manage spent fuel is direct disposal in deep geological repository. An option is to have a central interim storage, but the main stream is to have fuel stored in casks at the NPPs sites, before their transfer to the repository. The main two milestones are as follows: selection of a final site in 2025, and beginning of operations at the repository in 2065. There will be time between 2025 and 2050 to make a responsible decision on either waste disposal or reprocessing of the spent fuel, it is now time for finding and discussing the best options for this programme in the Czech Republic. Today, our society believes that fuel is stored for potential re-use in the future.

Concerning the selection process for the repository site, this year we will begin geological surveys, and our wish is to reduce the number of potential sites from 7 to 2 around 2020, and after a detailed characterisation to select the final site, keeping an alternative site. We have established what is being referred to as a "working group for dialogue", which will prepare an Act to be included in the normal procedure for the decision-making process, by involving local municipalities. We will reinforce our programme through cooperation, at three levels: general level with our partners in Europe (we have regular meetings with Germany and Austria), we have a cooperative Memorandum of Understanding with ANDRA, and at technical level we have different contracts, in particular with Swedish SKB and Swiss Nagra.

Debate with the floor

François Chevillard: French consultant, I would like to ask a question in three parts about long-term radioactivity and, firstly, what waste are we referring to? In Europe, some countries are reprocessing and some are choosing not to reprocess: yet reprocessing makes it possible to envisage long-term storage of waste without plutonium, which is no small feat. Will the Commission issue recommendations on the subject or will it leave the Member States to decide? Then concerning how the long term is taken into account: Pierre-Marie Abadie insisted on the R&D programmes that must be put in place: where is innovation currently at? How can we mobilise it? How can we use the industrial substrate for the processing and storage of waste? And finally regarding the reversibility taken into account by Andra: this would represent a shift from a technological concept to a more societal, ethical and political concept. What would the role of agencies then become, beyond their technical and regulatory role?

Bernd Döhnert: how do national agencies work with Joint Research Centres? At Ispra you had institutes that saw remarkable levels of activity since the beginning of nuclear in Europe. What is their future with regard to nuclear waste? What results could

be used to assist agencies in speeding up their research efforts?

Maurizio Boella: if a country opts for recycling, and therefore reprocessing, the Commission is not entitled to pass comment, this is part and parcel of a national decision. We may of course imagine the consequences that arise from one decision over another, in terms of the volumes of waste to be processed, in terms of safety and total investments needed; we can draw up financial comparisons. There are the non-proliferation aspects but in my view this is not a major point as Europe has optimal safety checks in place. And if I refer to the evaluations we carried out for the PINC (Nuclear Illustrative Programme), whilst a deep geological repository project costs 3 billion, it is barely a third for a new storage/interim storage project on the surface. I would also like to underline, as Gerassimos Thomas did, that the cost assessment has been plagued by uncertainty, not only for the Commission services who are preparing the PINC but also for all of those working on the subject.

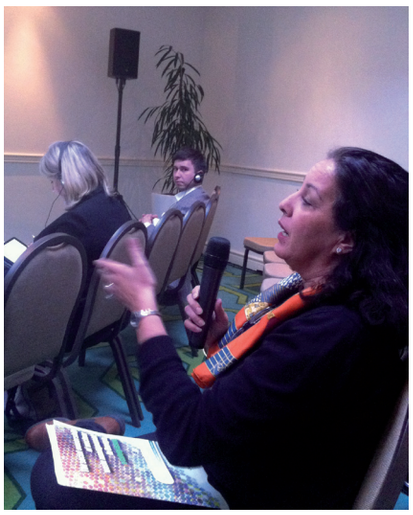
Finally, as pointed out by Claude Fischer, there is a very strong and inextricable link, from an ecological point of view, between decommissioning and waste management, as the costs of decommissioning are even more difficult to assess given that the costs of processing the waste are sometimes only partially accounted for, or even not at all. **As the Commission is responsible for the Union's use of decommissioning funds in the three beneficiary countries Lithuania, Bulgaria and Slovakia, it is subject to an audit by the Court of Auditors and, following the Council Regulation from 2013, it has an obligation to produce a mid-term report on how the funds are being managed.** Is all of this enough? Have the costs of decommissioning not been underestimated? We must reduce the uncertainty surrounding cost evaluations and this is why DG Energy has decided to launch a study on the evaluation of decommissioning costs.

Claude Fischer: Pierre Marie Abadie, could you please explain the difference between disposal and storage? Is it the same waste in both cases and is the same length of time required to manage the waste?

Pierre-Marie Abadie: it depends. In the world of nuclear, we now draw a distinction between disposal and storage: storage being temporary and disposal being a definitive solution. Certain types of waste can be disposed of on a permanent basis straight away, if a solution has been found, and other types of waste are placed in interim storage whilst awaiting a definitive solution. We are also looking at all types of waste on the inventory, from the VLLW (very low level waste), LLW (low level), ILW (intermediate level), HLW (high level): some enter disposal straight away, such as the waste generated by nuclear power plants, short-lived low and intermediate level waste. Behind storage and disposal there is also a more ideological debate going on about the subject of whether it is better to have very long-term interim storage whilst awaiting a solution that has yet to be found or should we be developing a definitive disposal solution? This is a question asked about very, very long-lived waste which presents us with a societal challenge: as they will last far longer than we could hope ever to remember and keep our societies as they are, we will have to come up with a solution to protect people over the very long term from entering into contact with these extremely dangerous forms of waste. **We have tended to oppose solutions described as temporary but which consist of deferring the problem for future generations: long-term interim storage or deep disposal. By putting in place progressive solutions with reversibility, this distinction seems to settle down somewhat.** Our responsibility is to offer future generations a solution without confining them to our solutions. Doing nothing means forcing decisions upon them. Leaving them the option of reversibility, evaluation, changing course, re-evaluation means leaving them possibilities to adapt. We decide upon a definitive solution to serve as a reference and we pay for these decisions and if they wish to exercise these decisions at any point they will pay to get them back: if they wish to extend them by renewing the alveoli, they will pay. But we are leaving their options open. On the other hand, the interim storage solution would leave them in a closed situation that is not definitive. This is how we can distinguish between the concepts of storage and disposal.

Concerning R&D and innovation: a great deal of research has been done in the last 25 years. It has resulted in a robust concept which must be demonstrated from the very moment that the authorisation request is made, with current knowledge, methods and technologies. But we were wrong in recent years to believe that the work had been done and the demonstration was complete, that there was no more scope for innovation. Innovation is a continual process. There is a major milestone for us in 2017-2018, with the end of the preliminary design phase, and at the point at which the authorisation request will be filed from the safety authority, at that moment, obviously the full demonstration will be performed, but the consequences will take shape over several decades, and there will still be a large share left over

for progress and technological innovation which will have to be maintained for the duration: if we want deeper and larger alveoli, for example, we will have to learn as we go. Are we capable of putting new, more innovative materials in place at a later stage which will bring operational savings? It is essential to keep up with the progress underway. The second point also has to do with maintaining the competences that have been mobilised; some will be used continually, relating to excavation technology, others will be used every ten years, for example, during safety reviews, other every 20 or 30 years when the project's first surface plant is built and some decades later, a second surface plant. Then comes the question of maintaining competences, preserving memories and the disassembly/reassembly of skills. The third point is that some forms of technology and innovation are not linked to waste, for example, monitoring and surveillance but also excavation and tunnelling technology or the construction of voussoirs, in contexts where there is massive convergence: that may work for us but also for the Lyon-Turin tunnel, and that is why it is being developed… Obviously Andra is not intending to do all of this alone; it can work in terms of innovation transfer with partners or industrials such as CEATech, IFPEN…



On the question of reversibility, you are completely correct: at the beginning we considered these issues from an extremely technical point of view – I put waste packages and I take them back. Then we became aware, through discussion and debate, that it was a very societal and political subject, a matter of governance. With reversibility, the government's objective was to offer the next generation a number of options, with the possibility of re-visiting these options later. That doesn't mean being able to go back on everything (waste placed in glass will remain in glass) but it means not having to make decisions in haste that didn't need to be made straight away, and granting the possibility to re-evaluate and redirect the programme on a regular basis based on developments and lessons learned through experience. Obviously, the agencies and processes have a role to play: does this mean a new concept for agencies? We have already decided they would be public establishments, over the long-term, with State longevity, but beyond that the agency has to interact with society, probably in a more innovative way than at present: this was just raised by our Canadian colleague, there are many challenges for co-building, co-operation, this means involving more players, moving along from the traditional internal dialogue between partisans or with opponents only, and with new subjects of discussion… Also giving thought to how some questions could pave the way for working together: this was the case for the restricted area of investigation, the move from 250 km2 to 40 km2, and the same could happen for documents in support of reversibility: this would be part of a master plan, granting long-term visibility, typically a document on which the stakeholders could interact by drafting successive, more detailed editions. This is also true of territorial development, of course. We could also develop new forums: the citizens' conference that took place during the public debate is a good example. I did this before on carbon capture and storage. These are always worthwhile exercises as in theory they allow people to delve into the subject matter. We may also consider the idea of having committees there to enlighten us on the ethical and social challenges posed by our processes and we are currently working on setting up such a committee to support the agency.

Jiri Slovak: I could give some information on the criteria and the Czech Programme costs. Sometimes, when we have public hearings or discussions with municipalities and the public, this question is on the table, but we consider retrievability is against safety. We have time for a future optimal decision on disposal of spent fuel or reprocessing. Spent fuel is our main material for potential retrieval, and we should not wait too long before taking a decision on a site.

Riccardo Casale: concerning the question asked about the JRCs I can only really give a general answer. In the beginning, Ispra was an Italian centre which moved to Euratom at the end of the 50s. There is a reactor to be decommissioned and spent fuel to process and the Commission should be doing what is necessary. We are faced with the need to speed up the programmes, act quickly, find innovative solutions... we are under pressure on all sides! **But rather than acting in haste we should focus on getting things right.** This is because we are dealing with the most dangerous of substances, in the absolute sense of the term. Obviously, we should try to act quickly too as each new evaluation increases the time factor and the costs involved. **We need to have independent evaluations in the medium term, not in the next 5 years: assessing an activity in 6 months or in 2 years makes no sense for 50- or 60-year programmes… We are living in a society where things are moving faster and faster but in this sector time works in the same way as geology!** Not

thousands of years but at least on a human scale we have to take the time needed to carry out serious and precise evaluations… If we are swept up by the understandable willingness of all civil society players to reach a solution quickly, we will go nowhere and even run the risk of disasters occurring. We have a solid system in Europe which allows us to take our time when making decisions.

Claude Fischer: but does that not require decisions to be made which do not change with the changing tides of governments and partisan solutions and long-term stakeholders? How can we shape these decisions? Do we not need a particular status for these players? We could have a whole symposium on the subject, could we not, Saida?

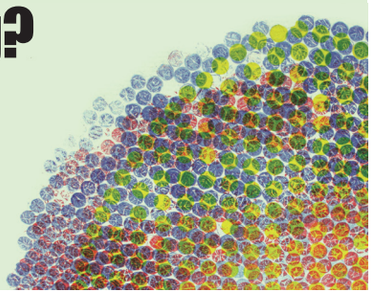
Saida Engström: It is just a commentary. In Sweden, we have been working on this project for the last 35 years. And the costs have been escalating, each time you looked at them, because you are at a higher degree of precision, and then you know the cost of things. On the other hand, you have the opposition to the project, that say: "because we are treating waste that should be isolated from man and the environment for one hundred thousand years, you can take another hundred years to do the job!". If you couple that to the problem of funding, then you have huge problems. **We cannot say, "act fast rather than correctly" nor can we say, "do it right rather than fast", no, we need to "act fast and correctly",** so that we take care of the finances. When both things are combined, things become very difficult indeed.

Claude Fischer: we will come back to this in the other round tables but I wanted to say that yesterday evening we suggested to Gerassimos and Maurizio that they set up a small working group that could discuss the issues of competitiveness and safety. "Being safer and cheaper", if we want this to happen. Without talking about speed, how can we reconcile the notions of lengthy time periods and urgency?

How is Canada doing?

Hearing of

Elena MANTAGARIS,
Government and External Relations
Director, NWMO, Ontario



Hearing

The Nuclear Waste Management Organization (NWMO) was founded in 2002 under the Federal *Nuclear Fuel Waste Act*. It is a not-for-profit corporation responsible for implementing Canada's plan for the long-term management of used nuclear fuel. The name of Canada's plan is Adaptive Phased Management (APM), consistent with key guiding principles: it should be implemented in realistic, manageable *phases*, and it should be *adaptable*, meaning that it can evolve in response to new technologies and changing societal expectations.

Like most countries that use nuclear power to generate electricity, Canada has opted for a deep geological repository as the safest and most responsible way to contain and isolate radioactive waste over the long term. Implementation of Canada's plan relies on an ongoing dialogue and collaboration with a large number of groups and communities, including the communities that initiated their region's involvement in the site selection process, their First Nation and Metis neighbours, and nearby municipalities.

The origins of this collaborative approach can be traced back to the 1980s and 1990s, when an earlier proposal for a deep geological repository foundered for lack of broad public support. A clear demonstration of safety, in other words, was not enough for the project to go forward: there also had to be acceptance from those potentially affected by the project.

When, therefore, the NWMO embarked on the first part of its mandate, to develop a plan, it did so in dialogue with the Canadian public. Over the course of its first three years of operation, 2002 to 2005, it met with more than 18,000 Canadians, including 2,500 First Nation and Aboriginal people and 500 specialists. There were 120 information and discussion sessions, held in every province and territory of Canada. During these dialogues, the NWMO sought to understand from Canadians their values and priorities and identify the common ground that should inform a long-term plan.

APM is the plan that emerged out of this extended dialogue.

The same principle of thoughtful dialogue and engagement informed the development, between 2008 and 2010, of the site selection process the NWMO is currently implementing. Hence, in addition to the paramount importance of safety, the process for identifying a site is also critical and is anchored around finding an informed and willing host community, providing communities with the resources to learn more about the project, involving surrounding communities, including First Nation and Metis communities, and encouraging an ongoing public learning. . Just as importantly, the request to be considered as a potential host must be initiated from the community, and it is the community that must confirm its interest in continuing through the steps in the site selection process. Working collaboratively with communities, the NWMO is currently conducting preliminary assessments of potentially suitable sites to host a deep geological repository. In addition to a wide range of geoscientific and other technical studies designed to assess safety, these

[5] *See Elena's presentation* http://www.entretiens-europeens.org/attachments/article/108/NWMO%20Elena%20Mantagaris.pdf

studies also address the crucial issue of whether the project is a good fit with the values and priorities of the communities in the area.

To help ensure that the decision to host a deep geological repository is both informed and willing, the NWMO provides communities with resources to learn as much as possible about the project. Community Liaison Committees, groups independent of the NWMO and comprised entirely of local volunteers, play an active role in facilitating learning in their communities and region, including visits to nuclear sites, talks by regulators, and presentations by independent experts. Through dialogue, the focus is on addressing questions and concerns and building confidence in the safety of the project and the management approach.

As the site selection process moves forward, the NWMO's engagement activities have broadened to include not just the communities that initiated their area's involvement in the process, but also their neighbours in the surrounding area: First Nation and Metis communities as well as nearby municipalities. Their involvement is crucial because the project will only proceed with all three groups working together in partnership with the NWMO to implement it. At a later date, the NWMO will also be expanding its engagement activities to provide opportunities for communities along potential transportation routes to participate in learning more about the initiative.

The site selection process is now sufficiently advanced for the NWMO to have begun the process of narrowing down potential siting areas to those demonstrating stronger potential to meet the project's robust technical and social requirements. Twenty-two communities expressed interest in being considered for this project; thirteen have been screened out by the NWMO and there are nine communities that continue to be assessed. There are many more years of assessment before a single preferred site will be selected.

To acknowledge the extraordinary leadership shown by all the communities it has worked with, the NWMO has set aside funds for communities to invest in their own well-being: $400,000 each for community completing the first phase of preliminary assessments, regardless of whether they were selected for more detailed studies; $250,000 each for communities and their neighbours screened out during the second phase of preliminary assessments; and, in acknowledgment of the early contributions made by Aboriginal peoples to the process, $250,000 each to Aboriginal communities in study areas, and $150,000 to Aboriginal organizations.

The NWMO's engagement program is robust and recognizes that a collaborative approach with citizens is critical to ensure a respectful process that reflects the interests and priorities of Canadians.

The participation of all stakeholders, a responsibility to be developed in the territories.

Moderated by **Saida LAÂROUCHI-ENGSTRÖM**, Vice President, SKB, Sweden

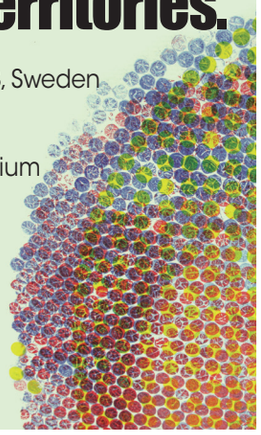
with:

Anne BERGMANS, Senior Researcher at University of Antwerp, Belgium

Andrzej CHOLERZYNSKI,
director of ZUOP - Radioactive Waste Management Plant, Poland

Marc DEMARCHE,
Deputy Director General, ONDRAF, Belgium

Jo TIPA, Operations Director,
National Skills Academy for Nuclear, United Kingdom



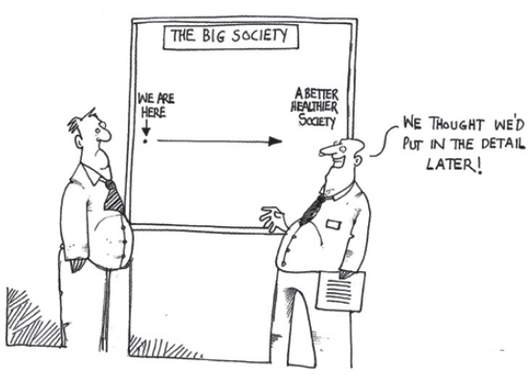
Round table

Saida Engström: Thank you Elena. I think for this session we'll proceed as follows: because Anne Bergmans has to leave soon, she has to be the first speaker, and you will be able to ask her questions just after. Please Anne .

Anne Bergmans: I will be brief, as many of the things I will highlight have already been illustrated very well by the previous speaker, Elena, and also Pierre-Marie this morning. I'd like to speak about the notion of moving from "siting" to "hosting" facilities for long term nuclear waste management, building a sustainable relationship with host communities and future host communities, which I think is along the lines of what the Canadians are trying to do and many others.

The first observation from an outsider is that the notions of participation, engagement, dialogue with all stakeholders… seem to become the prevailing standard, but it remains an ambiguity maybe on the fact we don't share norms on: what to participate in? At what level? Is it about planning or about where to host a facility? Is it on the societal aspect? Is it about the facility, the technology? How to organise the participation itself? There is no one-way solution that fits all situations in all countries. But it is good that there is still some ambiguity on certain points, to avoid too much standardisation.

My second observation is that at least one part of the waste is already there. This is not brand new. Any decision on long-term management (including the decision not to act) has implications for communities where waste is currently being produced, treated, and/or temporarily stored. And thus there needs to be some involvement in defining long-term solutions with those communities. It is important and should not be overlooked. **Ownership is in the title of our conference, this is about ownership of the problem: these people "own" the waste, and solving the problem starts with them.** Evidently it goes further than that, because it is a nationwide problem, and there are different problems for different people. So from my perspective, it is about reversibility and adaptability. Geological disposal is an ongoing social and technical experiment; whatever you build will be the "first of its kind". You have to take into account that you may encounter problems or issues that you had not completely thought about before, it is about testing and implementing something you think is good for the community. There are also issues with trust, doing things together, explaining what you are doing, and as Pierre-Marie explained this morning, technologies may change. And as was also explained by Pierre-Marie, it will take several decades and several generations before we reach the final goal of passive safety. So we need to build a long-term



[6] *See the slides: :* http://www.entretiens-europeens.org/attachments/article/108/Antwerp%20Univ.%20Anne%20Bergmans.pdf

relationship between the surface and the underground, the community and the facility.

The third observation derives directly from the second one: geological disposal is a technology in the making. The idea is: we have something, and we have to fill the gap as we go. We have quite few challenges, and I think Canada is a good example of a country that is taking that into account: **there is no begin nor end with siting, there is a continuous process with technological assessment.** The story will not end with the choice of a site, there will be more and more dialogue and exchanges: we see it from the Belgian experience of the Low Level Waste repository.

Then we come to the ownership of the solution. Don't ask people to buy your project, but to buy into your process, to come and think with you, to find a way moving forward together.

One last remark maybe on trust: it is not easy to gain, it's easy to lose, but it's slightly easier if you admit you don't have all the answers, and you are willing to find others, but for technical people this is a little harder to admit.

Jean Chevillard: We are already the second generation. We are the generation that followed those who first decided to produce electricity using nuclear sources, which followed the research generation, meaning we have an even greater responsibility but we must also grant some consideration to our role in the future. From that point I would like to ask Ms Mantagaris about her comments on the host communities that are present and willing: what happens if the community says no? And who is facilitating the discussion in Canada? Is it the NWMO directly? Or is it organised under the aegis of a structure such as the National Commission for Public Debate in France? And finally, you gave us a detailed explanation of the principles of co-decision but on which points could this co-decision be based? How can civil society be involved in the implementation process but also in the management of sites?

Elena Mantagaris: so there are a few questions there… On the first one, "what happens if a community says no?", I should have made it clear that all communities involved in our siting process have volunteered to come forward. It was not a state decision to identify areas that may be suitable, and then say to people "would you be willing to talk to us?". We led a national dialogue, to learn about what the plan should be, so the communities themselves learned of the initiative, through presentations we gave to municipalities, conferences, there was a project up there, and they came to us. We never sent letters to anyone. This means **they can withdraw from the process at any point in time, so far they haven't, we are the one that screens them out of the process, but they don't have to say "yes".**

In terms of who animates the discussion in Canada, the federal government has oversight over all things nuclear, but is not at all involved itself in the discussions with the communities. It is the NWMO and the community that will make the decision over whether or not they will be a suitable host for this project, technically or socially. So this dialogue process I talked about is a very intensive one for the entire NWMO staff. There is no separate national dialogue that takes place.

To what extent are the communities associated in the process and the decisions made around the initiative? They are quite heavily involved. And we are already hearing from the communities, even if we have not yet elected a site: "If we were to be chosen as a host, here are some of the things we would like to see that would facilitate our wellbeing as a community." But we also wanted to know what their visions were, because we didn't want them always to imagine the project in their mind, so the reverse proposal has been: "how do you see the project in your community? What might facilitate your wellbeing?" It is not only about the jobs, jobs are an easy matter, but what kind of training might be in place? What would be the social and cultural impact? And how might we work with the community to mitigate those impacts? What are also the opportunities for R&D that go beyond our project? Already we have communities saying: "if there are all these engineers and all these geologists around for this project, are there other types of activities that require their expertise that a business could grow around?" Broader economic development is also part of their thinking, and they are shaping the way the project will have impact on their community.

Michel Gueritte: I did not hear the answer to the first question: what happens if the answer from a community is "no"?

Elena Mantagaris: I think I mentioned that the communities lead the process, so if it is their choice to say no, I think from among the 22 at the beginning, we now have 9 communities, even if at the end with the last one, we have a no, we have to start the process again, we will not impose anything upon a community.

Saida Engström: actually what you touch upon is the core of the matter of a site selection. It is like having in

a society the possibility to say no, and everybody has to respect that. What makes a society different from a jungle is actually not having everybody pushing his/her own interest all the way at any moment. In the site selection process, we are managing to give them a say in solving a national challenge that we cannot escape. If we do not succeed to do that, in a democratic society, we are failing at so many levels that we are more of a jungle than a society. So I think that is actually one of the huge challenges: nobody should be given a free pass not to be in a site selection process. If you are part of the society, you should be a part of solving the national challenge on a local scale.

I think we have to move on, we'll come back to that at the end. Thank you Elena, and the next speaker is Andrzej Cholerzynski. Please take the floor.

Andrzej Cholerzynski: I am the director of ZUOP, the radioactive waste management plant in Poland. We are a facility, not an agency, but we play the role of an agency. The level is very high, my boss is the Minister of the Economy. It is a completely governmental institution, because we depend on the national budget.

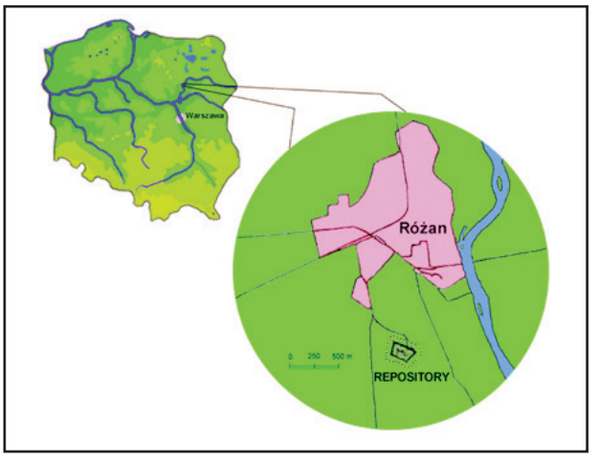
The situation will change with our project for a nuclear power station, because we now manage waste only from isotopes production and application. We are governed by the 1986 law, promulgated after Chernobyl during the communist period.

After the communist time, we had problems with the people, because we had no tradition of debate. For example, the uranium mine in Southern Poland was top secret, it did not exist on the map! After its decommissioning, there were big volumes of waste, including long lived ones...

This year we have had many elections, so it was very difficult to discuss anything. We now have an ambitious programme for 3rd generation nuclear stations. The choice of the supplier and contract should be signed by the end of 2017, and permits and construction will occur between 2018 and 2028. We have to choose the site within 2 years, and it is a big problem, I have discussed, visited many places with experts, and people say no, without giving any explanation. That's all. In Poland we have no empty spaces; many places are in private hands, people do not want to move to other places, so we are now looking for places which are in governmental hands.

We now have a small repository, open in 1961 in Rosan. **In the next 20 years we will have waste from nuclear power plants, so we are looking for a new repository which will contain the majority of this waste**. It will have an influence on the legislation. In the past the law focused only on waste production and management. Now it has completely changed, focusing on power station design, construction...

Following the European Commission requirements, our national plan for radioactive waste is ready: participation of the society is an important issue in the management of radioactive waste. So the plan includes discussions, transparency, information, education, especially for young people. Principles for informing the society and their participation in the



decision-making process concerning radioactive waste and spent nuclear fuel management are regulated by the 2008 and 2010 legislative acts, and the atomic law. We also had consultation with IAEA experts.

We now have to proceed with the decision, and it will be difficult. We are open to discussions but people are sometimes very nervous.

The national waste repository will be closed before 2020-2025. Waste, including historical long-lived waste, will have to be removed before it is closed. The design of the new repository is similar to the installations in France and Spain for short and intermediate level waste, short lived. Spent fuel and long-lived high level waste will be stored only in a deep repository, to be open only in 60 to 80 years. We will also build an underground laboratory with Andra's support.

Saida Engström: *thank you very much Andrzej, the next speakers will give their presentations and we will take questions at the end. So the next speaker will be Marc Demarche, deputy director general of Ondraf in Belgium.*

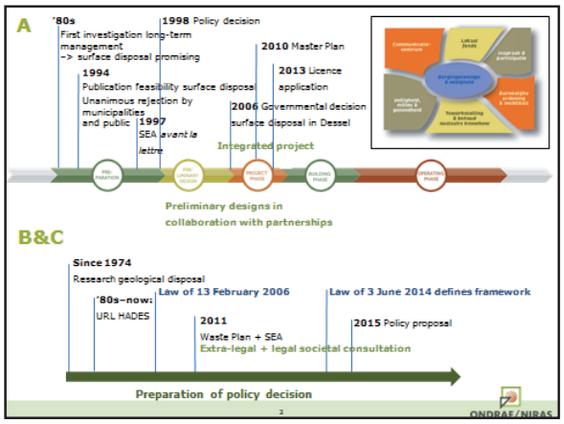
Marc Demarche: I will talk in this presentation about the evolution of stakeholders' involvement in the long-term management of radioactive waste in Belgium over the last two decades. Let's go up to 1994, after a moratorium on sea disposal in Belgium, we had to look for a sub-surface disposal for short live

[7] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/ZUOP%20Andrzej%20Cholerzynski.pdf

[8] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/ONDRAF-Marc%20Demarche.pdf

radioactive waste. The approach at that time was purely technical, we issued a report with a list of appropriate sites, we announced this to the public, and it was of course unanimously rejected. So in 1997 we issued a report where we proposed different alternative solutions to the government: in addition to surface disposal, we proposed geological disposal or long-term storage. This was done in fact without any involvement of the public; there was no framework for this at that moment. In 1998, the government decided to go for disposal. But this decision was not taken in a clear framework, and not anchored to any legislation, plan or programme. This policy decision was also stipulating that we should talk to local communities having nuclear installations, or we should start looking for volunteer communities. This process was organised by Ondraf, without a framework, and we started by talking to communities and organising partnerships, with certain characteristics: at any time of the process, there was a possibility to say no. We also wanted to see broad participation from the population: not only politicians, but socio-cultural organisations... **We also didn't want to implement just our technical solutions, but an integrated project in co-design, taking into account the expectations from the public.** This was also to be integrated in larger projects at a regional scale. So we set up 3 partnerships: in Fleurus, Mol and Dessel, and at the end of the process, Fleurus withdrew. After receiving a report on the last two partnerships, the government decided to go for surface disposal at Dessel, and asked for the continuation of the successful participative approach, with Dessel but also with Mol. We set up a steering committee, with Ondraf and the mayors of the two communities, and published a master plan in 2010, which was a roadmap for the implementation of this integrated project. So today we are in the license application phase, but I will not elaborate on that.

What did we learn and what are the developments for the high and intermediate level long-lived waste? An important step was the February 2006 law,



transposing a European directive, which gave us the opportunity to prepare a policy decision in a clear framework on the interaction with the public. We performed an environmental impact assessment, we compared possible solutions, we made many legal and extra-legal consultations, and then issued a waste plan in 2011. Through this plan, we proposed that the government opt for geological disposal in clay. What was lacking in the law was a stipulation on how the policy decision was to be taken: by Ondraf? By the government? Should it be a law or a royal decree? The transposition of the waste directive in June 2014 clearly defined the process: it is Ondraf which proposes the decision to the government, and if accepted, a royal decree is promulgated. So we submitted the proposal for policy decision in May 2015, and we are now waiting.

What could be the future? If the answer is a policy decision to opt for geological disposal for this type of waste, the next step will be: developing the technical conditions to which the disposal should answer, retrievability in particular. We should also define the decision-making process for the implementation, the operation, the closure etc. We should clearly define the roadmap, and the roles and responsibilities of all stakeholders in this process. **If we want a sustainable solution, we should not only take the public into account, but also the technical, safety and financial aspects.**

Saida Engström: I think we should proceed to hear some remarks from Emilia Janisz, Institutional Affairs Manager at Foratom.

Emilia Janisz: I am Polish, and I will intervene on behalf of the Knowledge Management Task Force of Foratom which I head up. Education and training play a key role in shaping the future culture of waste management and decommissioning, for which the market is expected to grow. So we need specific knowledge and competences. A number of programmes were developed in countries such as the UK, Germany and France, at bachelor, master and PhD levels, at university, but also in JRC at Ispra, where a summer school programme was set up, in Slovakia there is a decommissioning school...An important point would be to harmonise the programmes. It should be at the European level, through cooperation between programmes and training providers. Moreover, a joint modular training programme on decommissioning would be needed.

There is also a Human Resources observatory in nuclear: the JRC in Petten developed a survey on the Human Resources needs regarding nuclear and decommissioning, and according to this analysis, around 60% of the current workforce for decommissioning will have to be replaced within 10 to 20 years,

[9] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/FORATOM-Emilia%20Janisz.pdf

which means we should think about how to replace it in the near future.

Among the members of the European Nuclear Society Young Generation (ENSYG) network, we discussed how to show the attractiveness of jobs in the decommissioning sector. This is a reliable work environment, with the almost certainty of finding a job afterwards, with perspectives of career development, with growing responsibilities...There are many technical challenges, and opportunities to mix competences from various disciplines. There are also possibilities for mobility. The last and most crucial point for young people is that it could be treated as a noble cause: it means that we save and restore the environment. So the Commission should promote it together with the young generation network, already at the secondary school level.

Saida Engström: The lack of confidence, or the fear for lack of competence in the future, I think it deserves one workshop on its own, because that's something very important since this part of the world is not going nuclear, more the contrary, and the demography in most of our countries does not help. But we can come back to that in our discussion at the end. The last speaker is Jo Tipa, from the National Skills Academy for Nuclear in the UK.

Jo Tipa: I am glad Emilia moved into skills, because my presentation will be about skills, and I will ask specific questions to answer across the presentation[10]. Just a bit about NSAN: we are a not for profit organisation, we were set up about 8 years ago, using some government funding to begin with, but for the last 5 years we have been a self-sustained organisation. We are funded by industry in the UK, we have 123 members, and we have 57 training providers: it could be universities, education colleges, private training providers... And what we do is: we develop skills solutions that support the industry. **One such program is the nuclear skills passport, developed and launched five years ago, very much with a repository for qualifications and skills in the UK, with the idea that it would help mobility of staff around the country.** It is very important for people to demonstrate that skills while moving from site to site.

When we launched the passport, there was not enough content, and we started a couple of years ago to develop specific competencies, that could be included in the passport and could be managed. So competencies have been put together for waste management by organisations such as Sellafield, Magnox, the Low Level Waste Repository, EDF, Dounreay... that come up with the whole range of competencies that support waste management in the UK. I will show now a very short film, literally one minute, which will just give you an overview of what the NS4P is like now, that's the new name for the skills passport.

So key question I was asked is how successful is the implementation of the NS4P? We are 123 members, 64 of them have now decided to use it, for small to medium-size organizations it is much easier to start to use this framework from a spreadsheet...but the larger organisations, the tier one companies, come to us and say: actually the NS4P is far better than what we have in-house, but the decision to move to it is an enormous decision...So what we are looking for, for the success of the passport in the UK, is having larger organisations to support the passport, to use its framework, and support the use of the NS4P by supply chain companies. So particularly they start to upscale themselves and make sure they are working to increase competences for waste management in the UK.

Other question was who in the UK will provide courses on nuclear waste management? We have quite a developed route for waste management, with levels 1 to 3 in decommissioning and waste management, which is available through a number of federal education colleges, we have master level learning in universities… and specialists of soft skills are required. We have also courses within the Entech programme set up at the European level. And we also have in-house courses, as you can imagine, a lot of organisations in the UK have their own in-house organisation, like the Low Level Waste Repository.

As regards civil society and local authorities, I have to say it's not been a particular area in the UK we must train. The last ten years, local authorities have been involved in nuclear, and **in a lot of sites, the nuclear decommissioning authorities and the supply chain have spent a lot of money and a lot of time working with local communities, local schools, helping children and teachers particularly understand about nuclear.** And we have now quite a good acceptance of nuclear in the UK, and all this work with local communities sounds to pay off now, and it is important that it keeps going.

And finally our skills are recognized all over the world: in the UK we are quite developed today, but our waste management techniques are indeed coming to a stage where, from a financial point of view,

[10] *See the slides :* http://www.entretiens-europeens.org/attachments/article/108/NSAN%20Jo%20Tipa.pdf

decommissioning has been slowed down, with uncertainty for the industry, it's expensive, remember the conversation we had this morning. I guess there are opportunities for work in the UK, and perhaps in other parts of the world.

Saida Engström: we have seen here many aspects of the nuclear waste management. Elena talked more about engaging dialogue with different communities, the field work, Anne talked more about how academia would look at it as a process, and we have heard about other parts of experience in Belgium, the very interesting journey you made from former stuff to new one in Poland...and Emilia put the finger on the competence issue. When we talk about waste management, we tend to go into tunnels as a discussion. So I'll try to make us hold many talks at the same time. Actually I am asking this question, and ask if anyone of you to reflect on that: what are the keys for success? If you can give me 3 pin steps, if you have those 3, you are very good...

Anne Bergmans: I am not sure I can make it to 3, but one thing I was thinking about skills, competences and training, is the importance not to forget the societal aspects. As underlined by Elena not to sell that from people like you and me, soft-skill trained, but we have to train also technical people in that. They're going to be on the job, on the field, it's more than building technical competences and educating society into nuclear issues, it's also to put nuclear ticks into societal issues, because I often have the feeling that what's working with you here will not work with people in laboratories, who will throw me out ! All people "in the back" have to come to the notion that they must work with society. So that would be my main message.

Elena Mantagaris: I agree with you Anne, completely, but a different take on it is, that a sense of societal responsibility is fundamental to be able to move forward, and I guess in Canada and surely in many other countries, you can't move forward if people don't own the issue, and that's been critical regarding environmental responsibility, intergeneration responsibility...To go beyond the option of saying 'no' which is always on the table.

Cécile Massard: in our nuclearized civilisation, we probably ought to **attach the proper value to territories, give them a positive, non anxiety-inducing role, that of being a "guardian" of a place, an innovative enterprise** of the twenty first century that will create new and unique monuments. Civilisations need monuments. Once there is agreement with the technical and financial side, the challenge for these players is to become the guardians of something positive.

Saida Engström: Let me go to the panel, but also to the audience, with this question: how have we evolved in engaging the dialogue? I think the more the stakeholders have been conscious, the better quality is the dialogue. What we have learned in early days on nuclear waste management in many countries is actually: the situation is very polarized; you have the "yes gang" and the "no gang". This is very 60-80ish, in a bad way, and it also applies to the societal responsibility you are referring to. Do you think that the situation as it is today in Europe such that we can have a dialogue that is more responsive, intergenerational, egalitarian, and also fair, on short term and long term? Because we still have, in site selection with municipalities, people in "yes gang" or "no gang", and that is, in those days, very hard to understand or grasp, given our situation.

Elena Mantagaris: I don't know if this comment is particular to Europe, but I'm struck by what we do learn from our communities. Because you can have a "yes" or "no" camp whatever you do. But what we've found is that, for any large project, put nuclear aside, historically a lot of our communities have seen outside forces come to create those types of divisions, call them NGOs if you want, and that over time **the communities have started to say "you can comment and say what you need to, but we are in learning process". And all these voices just saying no were informed that's not acceptable.** So we have started to work on the social responsibility of communities, which say "we are prepared to learn, we may still say no at the end of the day, but we will do so in an informed manner, not in an idiot reaction because we are worried about the word"nuclear" and we are all afraid of what it represents". So in Canada, if none of the communities in our process have committed to host in the project, they all clearly indicated they are in a learning process, and will only make decisions after they feel they've acquired the information they need.

Emilia Janisz: I wanted to add something: building trust will be easier if we have in our societies a safe, clean energy, and the competences. In the framework of COP21, there is this campaign "Nuclear for Climate", that tries to show that nuclear is part of the solution for climate change, and one energy source for the energy mix.

Evelyn Hooft: I do believe you have to take people with you in elaborating the project. It has to become their project. If you just ask them "do you like my project?", then you get in a "yes" or "no" situation. If you don't involve people in elaborating your project, then you are in serious trouble.

Marc Demarche: I'd like to go a little bit further on that. Everything is bound to a clear framework, when you have different stakeholders, in which way they should be involved, when, how... it should not talk only about the public, but also about safety authorities, waste producers etc. The aim is to have a

"win win" situation for everybody, to have a sustainable solution. But I think, on the other hand, that when we talk about extreme points of view, they always leave aside the sustainable solution.

Saida Engström: We have talked about a lot of stakeholders, but I think we didn't talk about one category, decisive: at the end of the day, you can have a willing community, a good technology, a good atmosphere, but you have crippled decision makers at the political level. For any set of reasons...How do you deal with that?

Evelyn van Hooft: I do believe it is more or less the case in Belgium. Politicians take a decision if the decision is already taken. We've seen it at different levels. If you have a project that is agreed by the majority of people, then it is easy for politicians to take a decision. So they only take decisions if there is no risk at the decision.

Saida Engström: I think it is an accurate comment. Actually I heard it from a senator in the USA, 10 days ago, he said: "the worse you can do as a politician is to solve a problem that your constituency is not aware it is having." So you have to push him, and make him a hero, making a decision that everybody is waiting for. **Hence I think they are the last people to drag in, but they are nevertheless very important if you want to have a decision at the end of the day.**

Bernd Dohnert: I like very much the word trust, and some speakers talked about the way to build it up. I think it's very ambitious, and I would replace it by confidence. The first question I have is: who controls the process of giving coherent messages? That we are not stepping up on our feet and destroy the good message? Second question is how do we build up trust, when in particular for politician, getting out is easier and easier. What about new builds? Is that really a destructing factor? Or should we concentrate on nuclear as it is, and go ahead? How do we work with this kind of dilemma?

Marc Demarche: I will respond to the first question. It is also a part of the clear framework. What is the role and responsibility of everyone in the whole process? Who talks about what? In Belgium Ondraf organizes the whole process, but maybe there are some issues or aspects that should be treated by the safety authorities, which should go to dialogue with the partners. It is one example. I think also that if you have clear roles and responsibilities in your framework, you can facilitate political decisions. This was done by the transposition of the waste directive, where the policy proposition on geological disposal or long term management of high level waste was put in the hands of Ondraf, and the decision in the hands of the government, and the way the decision was to be taken was clearly defined also.

Michel Gueritte: I have several questions. Firstly I would like to raise a problem whilst Pierre-Marie Abadie is absent. I do not regret making this journey as I have heard that for future generations, interim storage was a definitive solution. I would like him to explain why this is.

Saida Engström: No, he said the opposite, but as Mr Abadie is not here, what is the next question?

Michel Gueritte: Here we are only talking about the choice of site, and ensuring that local populations are in agreement. I would in fact question the decision made concerning deep disposal. This is where the problem is as when the decision was made, apparently after meetings and symposia such as this one, it was an international decision. I would question Cigéo as the risks and problems associated with this project are enormous. There has been very little communication, in other words. I would like us to talk about it. And to conclude, with regard to what Elena Mantagaris said, I feel that things are happening on a voluntary basis in Canada. In France, an experiment was carried out by Andra regarding the choice of site for storing long-lived low-level waste (LL-LLW), also based on a voluntary approach. Resistance from activists, whom I counted myself among then and still do, was such that we managed to encourage all of the local authorities to say no to the project. And the LL-LLW project was shelved, even if it is being brought out again today. That means that this voluntary method allows us to fight more effectively, not to search for a solution...

Saida Engström: I am very familiar with this question, as I was President of the research committee for the LL-LLW project, as part of the High Commission for Nuclear Safety in France and I know that things happened differently. From a technical evaluation of Cigéo standpoint, there is no one here to talk about it. But when we speak of dialogue between all of the stakeholders, technicians, decision-makers... it is to do precisely this: issue an opinion and debate. Then, and it is absolutely true for Sweden too, as an industrialist you have to ask the State for a building permit. It is up to the safety authorities and the government to decide. This guarantees that things run smoothly for the citizen. This is a comment but the answers on

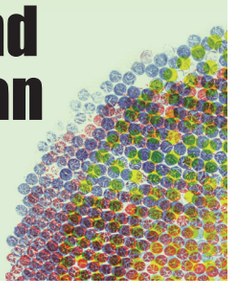
the technical decisions that were made would have taken up too much time. Perhaps we can send the questions on to Mr Abadie.

Claude Fischer: Pierre-Marie Abadie replied this morning but I could say a few words. This morning's debate was inspiring: the step-by-step decision-making process must offer security to all citizens and, in addition to that, the whole population given that at every stage an evaluation is offered with the possibility to modify it, correct it, proceed or wait. The French solution of deep geological disposal with recoverability and reversibility allows for both: immediately protect the populations by taking as few risks as possible and allowing future generations to carry on using this solution or not. **We are connecting the short term with the long term, with the lowest possible level of risk with very high-level technological solutions.** I would like to say at this point that Michel Gueritte is one of the activists opposed to everything, all the time and at any price. When we hear the arguments that are sometimes put forward, such as the fact that Bure would not have been chosen for its geology but because there were corrupt officials (I have the press article on me, sent by Michel himself) we wonder: but where are the scientific arguments? The major argument for me is that from the scientific community which is practically unanimous at global level. Where is the responsibility for defending the general interest? That of industry and that of the populations? As soon as there is a nuclear industry, whether you are for or against it, the waste needs to be managed; this is a matter of general interest. There are several management solutions: reprocessing or not, reversibility or not, French, Finnish or Swedish model... **It is this question of "how" that needs to be debated. And it is indefensible that the States or governments give way to pressure from opponents on the offensive, and that we wait until the debate becomes more advanced and has greater clarity.** Yes to debate, but what debate? The local authorities in France have opted for this storage solution, the bill has been passed, and now, under pressure from some opponents who incidentally were paid by the CLIS (local information and monitoring committee), and therefore by the producers themselves, we are witnessing a very surreal debate in our country, in which even the ministers are calling the law into question. We therefore need to be clear and responsible, I say this in a friendly way to all of you, a decision will need to be made.

Saida Engström: Yes, but between having a debate and the questions that are not being asked, we would prefer everyone to turn up and speak their mind. And that is a very good thing. There are two decisions to take at the end, with full knowledge: either we do our part and leave something decent for the next generation, or we decide to leave the problem for our children to sort out. And I think that the majority of countries in Europe are searching for the first solution. On that positive note, I would like to thank all of our panellists.

A high added value industry and qualified skills. How to pool research and innovation and build a European industry?

Moderated by **Jean-Pol PONCELET**, Director General of FORATOM



Jean-Pol PONCELET: I hope that this round table will be an opportunity to discuss the practical aspects of reality in industry which may be slightly different to what the public expects, and to put forward solutions to the challenges raised during the morning's extremely stimulating debates. The aim is to identify avenues that will be successful in structuring industrial activity around waste management, if possible, incorporated into European structures. From this perspective, we will be asking: what is the next step in the industrial process? Do we need more research and development? Do we have the necessary funds available? Do we need a demonstration project and, if so, where and how? From an industrial point of view are we capable of creating the equipment needed for starting operations, safety, security, etc? There are just as many questions linked to the management and implementation of this specialised industry. Of course there is another major problem given that we are in the European Union and Community policies apply to the Member States. We have a European regulation for the back end of the nuclear cycle, are we capable at the end of this process of building, sharing and harmonising something together? As you know, paradoxically, we have set ourselves the ambition of creating an "Energy Union", but we have no European energy policy! If we look at the Lisbon Treaty, it is the Member States that make decisions regarding the subject of energy policy. Therefore, if we consider that we need a common policy for managing nuclear waste, how can we be successful in creating it?

Firstly, it may be helpful to remind ourselves of some figures: across all of the Member States there are some 135 nuclear reactors in operation, of which 19 reactors will be ceasing activity shortly. They will therefore have to be decommissioned which will produce nuclear waste. However, and it is not only where reactors are concerned (this is an essential point), European industries in the sector are global leaders in the whole nuclear cycle, ranging from uranium extraction to the back end of the cycle. We also have a wealth of experience in the area of decommissioning and deconstructing nuclear installations, and Europe can afford to be proud of how this sector of industry is developing across the Community.

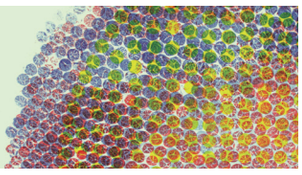
In addition to our experience of decommissioning, we also have legislation at European level that applies to the whole cycle but also the management of nuclear waste, with Council Directive 2011/70. Within this framework, we have genuine commitment from industry, we have mechanisms for financial support, a dedicated structure for research and development and finally we have a solid national and European institutional fabric which offers the public a guarantee.

Overall, we begin this discussion with good arguments. We ask ourselves about the capacity and the appetite within our industry to move towards creating a genuine European sector. Can it demonstrate its excellence? Do we have the necessary capacity (technical, scientific, financial and training needs)? Are Member States prepared to share their competence in all domains relating to waste management and possibly also share infrastructure?

Firstly we will hear from Dominique Minière, the director of nuclear production at EDF.

Hearing

Dominique MINIÈRE,
Group Senior Executive Vice Président,
Chief Operating Officer, Generation and Existing Nuclear and Thermal Fleet, EDF, France



Dominique Minière: EDF is the world's primary nuclear operator which means it has particular responsibilities. The Group is involved in the whole value chain, from production to distribution, with 40 million clients, 160,000 employees and 172 billion euros in capital. EDF is a global leader in carbon-free electricity production thanks to the nuclear fleet and development of renewable energies (RE). **Its ambition for 2030 is to become a champion of carbon-free electricity, taking into account the enhanced role of regions and to develop the RE/nuclear mix,** with 900 MW reactors, which could produce more or less power, as the demand fluctuates. In France, we can develop renewable energies by up to 30/40% of the mix between now and 2050, whilst retaining a large capacity to produce nuclear energy.

There are several challenges ahead: make the new EPR projects successful; improve fleet safety so that they can be better used over the duration (approximately 50 years); master all stages in the cycle, through to the management of waste and decommissioning…

EDF is responsible for waste and decommissioning, two safety requisites, and which are also required for greater acceptance of nuclear by the public at large; it represents 30% of the electricity in Europe -50% of carbon-free electricity-. In the world, out of 400 reactors, EDF operates 20% of them. EDF operates 16 reactors in the United Kingdom which represents 18% of electricity: the closure of almost all of our reactors before 2029 is pushing EDF to commit to renewing the fleet.

Regarding the decommissioning of the first generation reactors, EDF has started at Brennilis, Creys Malville, Chooz A, and Bugey. The solutions are diverse, some have to be finalised, but the lessons learned from experience will allow us to find the best solutions.

With regard to waste, the characteristics have to be known first to be able to process them, defined in an inventory ranging from long-lived high and intermediate level waste (LL-HIW), short-lived high level waste, long-lived low level waste, or short-lived…

It is Andra that is in charge of managing them: sites exist for 90% of types of waste and **for 10% of LL-HIW there is the Cigéo project for deep geological disposal. It is a responsible industry which has been part of the legislative framework since 2006, supervised by a body specialising in financing sites with 20 billion euros (with yearly increases).** The goal is to protect the public and to minimise the quantity of waste produced. Whilst waiting, they are sorted, processed, vitrified and placed in containers.

96% of waste can be re-used: plutonium is recycled and turned into MOX, and uranium is reprocessed to be used at a later stage (a type of reserve for the security of supply). This way we were able to reprocess 10% of LL-HIW and divide the short-lived high activity by 3 since 1985.

With regard to protecting the public and the environment, safety (management, transport…) is supervised by the ASN, the French national safety agency and information is provided to the public via debates with local authorities. This model is incorporated into the European Directive of 2011.

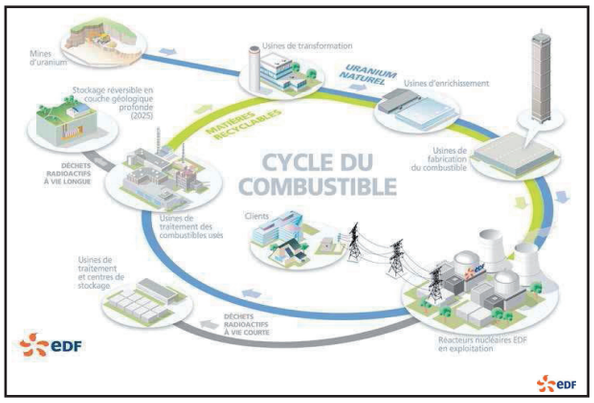
The decommissioning of the first French nuclear plants, of UNGG (natural uranium graphite gas) technology, is more difficult than the second generation's, and, the waste deriving from «graphite» is in interim storage whilst awaiting definitive disposal, with the Cigéo project, or another. Indeed, we still have to define these categories of waste: this is still a grey area and Andra must develop a concept of sub-surface interim storage.

The nuclear waste industry is innovative and has high added value: new installations for very long-term containment need to be invented. In France, AREVA (with whom we work "hand in hand") has been

[11] *See the presentation* http://www.entretiens-europeens.org/attachments/article/108/EDF%20Dominique%20Miniere.pdf

the only company to develop solutions (and China, which is developing nuclear, wants to have access); SOCODEI, an industrial subsidiary of the EDF group, specialises in the treatment and processing of waste with a low level of radioactivity by smelting in the case of metal waste or by incineration; and Cigéo is a technological project, made more sophisticated by Andra.

Our ambitions for 2030: decommissioning (the challenge consisting of extracting radioactivity from buildings and reactors), and managing the waste with a team of 450 people around Sylvain Granger. With 5 axes which will equally be about opportunities for the industry and finding outlets for it: occupy a cutting-edge position, be a leader, satisfy our needs and the needs of others too; work in partnership with Andra;



decommissioning and management of graphite; decommissioning of 2nd generation plants; and finalizing the decommissioning of Superphénix.

Questions for Dominique Minière

Mohamed Barakat: after having seen the images of the storage site, I am wondering about the fears that large numbers of citizens might have, especially in the event of an earthquake, as was the case in Japan which led to the Fukushima accident. With more and more emerging countries displaying an interest in nuclear, is Areva intending to store the waste produced in these countries?

Dominique Minière: I understand citizens' concerns. But Cigéo was not created overnight; it is the result of 15 years of research and of a geologically stable land. In the case of Fukushima (which was located 100km away from the seism) the root cause lay in the design of the plant. The Onagawa platform (30km away from the earthquake's epicentre) remained safe as the priority of the operator Tohoku was safety. Regarding our waste, French law prohibits storing it outside of France. Equally it is illegal to store foreign waste in la Hague, or to store them in France.

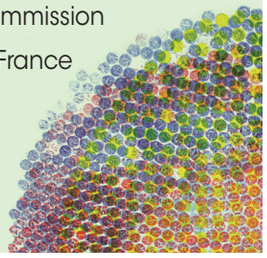
Michel Guerrite: what is your road map for 2030? Will the company EDF still exist? Like AREVA which is currently in dismantling?

Dominique Minière: EDF and AREVA are not comparable, EDF has a 70 billion turnover, AREVA represents 8 billion. EDF uses its hydroelectric fleet which allows it to have a very clean and inexpensive kWh. At the same time we are developing renewable energies and nuclear so that eventually only low-carbon energy will be produced. As far as whether we will exist in 2030 or not is concerned, that is a good question. We are looking ahead by investing special funds in other domains and other companies, should EDF ever go bankrupt.

Claude Fischer: I think it is too early to talk about the demise of AREVA. Refocusing on its original purpose is important in order to preserve its unique know-how. AREVA's strategy is to think about the long-term from a nuclear perspective in France and in Europe. The energy transition law in France and the Energy Union in Europe have not clarified the debate on how nuclear is to be brought into the mix. With regard to comparisons between nuclear and REs, presented as one and the same in the decarbonisation fight, it important to be reminded that REs create many negative effects for our energy systems. Intermittent electricity has a priority on the networks, with a high cost, and companies have to adapt their economic models, with necessary restructuring , as RWE did, to give just one example. We must be careful not to mix up the technologies. Nuclear has no adverse effect; it has risks that we are aware of and it produces consequences if not properly managed. That is what we are discussing today. How can we manage these risks, i.e. our waste? At European level and in the field of waste management, a market has developed. How can we make waste management a European public good by encouraging operators to share costs between them and how could the European Union offer incentives for the financing of infrastructure? Do we need market regulations? Financial aid or public guarantees?

Dominique Minière: When faced with such a surge in demand for energy in the world, we will have a need for energy of all kinds. Currently the world is seeing major developments in nuclear, like all other sources of energy. A RE and nuclear mix can only work if there is a nuclear ratio that takes into account RE intermittency. The main thing is that everyone reduces their carbon footprint as much as possible. Regarding waste management, we have observed a number of bottlenecks. Our responsibility as the world's primary operator is to ensure that the best solutions are found.

Saïd ABOUSAHL, Head of Unit, Joint Research Center, European Commission
Bernard BOULLIS, Nuclear Cycle Back End, Vice President, CEA, France
Véronique DECOBERT, Director, Regulatory Affairs, EMEA, Westinghouse
Herkko PLIT, Deputy Director General, Energy Department, Ministry of Employment and Economy, Finland



Round table

Jean-Pol Poncelet – Thanks a lot, Dominique Minière, and after hearing the strategy of EDF, we will hear research centers' one, then another large industrial group, Westinghouse, and finally a representative of a public authority, from Finland.

Saïd Abousahl: the JRC is the European Commission's technical and scientific right arm in the domains of safety, security and nuclear guarantees. These three areas of expertise are used in the area of research, education-training and support to European research and development policies. The JRC provides its expertise on two geological disposal options, for semi-open and open cycles and for closed cycles. Several activities are underway at the JRC and even if there is unanimity on deep geological disposal, we will nonetheless continue to explore other solutions. The JRC is also working on the separation of minor actinides and on transmutation. Concerning research, we have a decommissioning programme for our research reactors. This allowed us to create a link between both programmes: development and decommissioning which is still a problem but which is currently the subject of discussion.

Regarding education-training, we organise training courses in our institutes. We are also working with a number of Member States (France, UK, Slovakia and Germany) to develop specialist courses on decommissioning with modules for each country. The third area is technical support on European policies when implementing European directives and monitoring reports from the Member States. We have skills needs in the area of education and training. The JRC heads up an observatory which monitors developments at scientific level, the needs in the field of nuclear in general and specifically in the area of nuclear waste management. In the area of support to policy-makers, we also work on transparency in the nuclear sector.

We also have mechanisms for working outside of Europe, in particular on nuclear safety cooperation. This highlights a future problem: **if the Member States do not manage to work together and harmonise competences within Europe, it will be all the more difficult to export our industry in this domain.**

Bernard Boullis: in France, the management of high-level waste is a good illustration of how research can bring about relatively major changes of approach. It is guided by two very simple principles contained within a law entitled "towards sustainable nuclear waste management", adopted by the French Parliament in 2006. The first principle: recycling everything possible to reduce the source term for a whole section of the materials that can be recycled, within reasonable limits. The second principle, for residues (i.e. end waste), reversible geological disposal is used, which was presented this morning. **Reversible disposal is designed to be definitive whereas storage/interim storage is not designed to be definitive.**

[12] *See the slides:* http://www.entretiens-europeens.org/attachments/article/108/CEA%20Bernard%20Boullis.pdf

[13] *among radioactive waste, minor actinides represent a very small quantity, about 600 grams per ton of irradiated fuel*

Fuels in France are charged with enriched uranium which is placed in water reactors, where it transforms and releases energy. Some of the uranium is not split, it releases neutrons and essentially turns into plutonium and minor actinides[13]. France has opted for

both reprocessing and recycling. Uranium and plutonium have energy potential, this makes them worth recycling. Regarding final waste, it is vitrified and placed in a container measuring 1 metre high and 20cm in diameter. To give an order of magnitude: per reactor and per year, 10 to 15 containers of this type are produced once all of the spent fuel has been recycled. The use of glass and placing it in clay offer us several benefits. The glass effectively "digests" the whole range of very diverse fission products, which produces a homogenous material. Furthermore, it is not easily alterable by water: currently calculations stand at one micro metre every 1000 years. The most dangerous elements for the long term, minor actinides, are absorbed and are almost immobile in the clay if the glass has been dissolved. It is this combination of the properties of glass and clay that form the basis for the safety of deep geological disposal. Plutonium is also recycled and produces a new fuel called MOX, which is placed in the same reactor. At present 10% of French electricity produced comes from MOX. Upon exiting, they still contain plutonium and minor actinides. They are not reprocessed, as this type of waste has an isotopic quality which makes it difficult to recycle for a second time, but they are placed in interim storage in pools with the idea of doing something with it one day, once we have new reactors.

Nevertheless, reprocessing this waste will allow us to obtain fission products to be incorporated in glass, and to produce fuels for use in fourth generation reactors, known as GEN 4. These are fast reactors which can use plutonium regardless of its isotopy. This means being able to "multi-recycle" the plutonium as long as it is not burned. **It is hoped that one day it will be possible to re-use all of the uranium and use all of the waste. All being well, we could multiply by a factor of 100 the quantity of energy that derives from one gram of natural uranium.** These fast reactors are capable of burning plutonium but perhaps also the minor actinides which are where the bulk of the waste's radioactivity is found. The only waste we would then be left with would be the fission products with a short life cycle. The French Government has commissioned the CEA to study these types of reactors; this is the ASTRID programme, in partnership with EDF and AREVA. At present there is financing for the design stages. All of this illustrates how research in terms of waste storage also raises the question of progress made in research to reduce the mass of waste that has to be stored.

What could research focus on to resolve these storage issues? Today it is more a question of engineering rather than research. **We know how to manage waste yet there are still problems with regard to the public who see waste as the main problem with nuclear.** There are very divergent points of view between those in charge of the problem and the public, and research constitutes a real means of bridging this gap. Research and the teaching that accompanies it are excellent ways of understanding and explaining concepts.

To conclude, research must continue as no one can predict what will happen in 10 million years. As Pierre-Marie Abadie said this morning, **we need to consider the long-term perspective and attempt to tie together the strands of research on a European scale.** This is important because when we work on the short-term, industrial interests very quickly come to the fore. Transmutation is a European flagship programme. A scientific community has been built around this research programme for decades. One of the major challenges is to preserve our competences in the future, especially in the area of managing nuclear waste where we are dealing with the very long-term.

Véronique DECOBERT: Westinghouse was founded in Pittsburgh in 1886 by George Westinghouse. France decided to purchase the Westinghouse licence for light water reactors, and 54 of the 58 reactors that are active in France come from Westinghouse's technology.

Innovation is the cornerstone of Westinghouse's vision. Today Westinghouse Electric Company delivers existing nuclear plants with the full range of safety products and services, but Westinghouse also produces new plants, nuclear fuel and manufacturing. Westinghouse is also involved in decommissioning and the reprocessing of waste. This company manages local projects across the whole chain. Everything is based in a centre of engineering excellence. Westinghouse

[13] *among radioactive waste, minor actinides represent a very small quantity, about 600 grams per ton of irradiated fuel*

[14] *Voir sa présentation* http://www.entretiens-europeens.org/attachments/article/108/WESTINGHOUSE%20Veroniquee%20Decobert.pdf

is an American but also European company as there are 4,000 employees in Europe and Westinghouse has installations in 10 countries in Europe.

With regard to managing nuclear waste in Europe, what expertise could Westinghouse share in a competitive environment? In Europe, concerning the situation with regard to the back end of the nuclear cycle, a regulatory structure has existed since the waste directive of 2011, and 16 States at present have submitted their national plans to the Commission for managing their nuclear waste. From my point of view, the technical capacities do not impose limits on the development of a European nuclear waste industry. One of the key obstacles is resistance from the public who are poorly informed and who are unaware of the technical and scientific reality of waste management. How can we address the major hostility expressed by the public regarding ways of managing nuclear waste? **This is, however, a common good. The waste is there, we are going to have to deal with it somehow. As an industry we will have to find long-lasting and safe solutions. We must not use the public's disapproval as a pretext not to develop Europe's waste management industry.**

So, where are we heading? Operators are responsible for managing nuclear waste and we should continue in this way. Currently, European directives allow the possibility of regional solutions. Perhaps it is too early to say, but it is possible. Nuclear operators, even until recently, were the day-to-day managers of waste, whereas now European directives require operators to have a long-term vision, including those from dismantling. In France, for example, solutions for very low level waste are not necessarily viable for the 58 reactors…

Westinghouse is a service provider. It has several contracts with European companies such as SKB in Sweden and Almaraz Nuclear Plant in Spain, to whom we offer our services. **We are an industry and so we have to be profitable, a question which must also be asked for this branch of European industry which must not be reduced to public acceptance but which has to do with implementation processes.**

For a project manager, the political, financial and technical implications of launching a project are different. As far as the financing and fundraising are concerned, there is always an advance for long-term risks (between 5 and20% of the cost). For very long-term projects, such as those in the area of nuclear waste management, the funding needs at the end of the project will not be the same as those at the start of the project.

Operators are owners of the waste and they provide the funds but that does not mean they manage the project. In order to launch a partnership project correctly, we must identify where the competences lie and what type of partnership it is going to be, which means having clearly defined roles. For example, as EDF and AREVA have a lengthy experience of managing nuclear activities, it would be stupid to develop a project for Cigéo that did not make use of their experiences.

The final point concerns the execution of the project. In the Cigéo case, we would like to carry it out, we would like a solution for the waste but we should proceed step by step. When climbing a mountain you have to adjust your stride and speed in line with your own abilities. You have to look at the overall picture and set out markers when deciding on the various stages, identify successes and failures and know how to overcome them. To move to the next stage, it must be ensured that it is profitable for the industry and that the public is convinced of the project's viability. To conclude, like the public, the industry needs long-term visibility and assurance that the investment will be profitable, but it also needs a short-term approach.

Jean-Pol Poncelet: we will now hear the point of view of the Finnish Government and a description of the strategic decisions made by Finland regarding nuclear waste management and storage without reprocessing.

Herkko Plit: Finland is a European and global leader in the domain of nuclear waste management. In 1993, the Finnish Government adopted a public policy for nuclear waste management and this policy is still being applied today. The national company, Posiva, is managing nuclear waste . There is a nuclear waste management fund which combines dedicated funding streams from various players in the nuclear sector who pay into it (this is compulsory). There are currently four reactors in activity, one is being built and another one is in the planning stages. **For our country and its low level of nuclear activity, it was not considered economically viable to have a site for reprocessing used fuel; we therefore opted to build a direct storage site without reprocessing.** In 1994, just before Finland joined the European Union, **the Finnish Government passed the "Nuclear Energy Act" which contained a ban on importing**

and exporting nuclear waste. Everything that is used in the country has to be processed on Finnish soil. In 2001, the government and company Posiva started a debate on the opening of this direct storage centre without reprocessing, with local authorities having veto rights. They are the ones responsible for making final decisions to build a nuclear power plant or a waste management and storage facility; **the government cannot make a decision without approval from the communities. Once the project has been accepted, it is impossible to reverse the decision.** Regarding the follow-up on the project, the government continues to inform and work with the communities but they have no additional decision-making powers. The Finnish Government will soon be handing down its final decision. If positive, the first direct storage facility without reprocessing will be opened in 2020.

If Finland continues to build new nuclear infrastructure, it is because we have the necessary provisions: a stringent regulator, a level of expertise, responsible management of waste with a solution attached to it. **The solutions we are working on are unique to Finland. We are happy to assist other countries but it is essential to understand that every country is unique and must develop solutions that are appropriate for that country.**

Debate

Saida Engström: the difficulty with public acceptance must not be a reason for going ahead with a project or choosing not to. Furthermore, must we wait for the perfect solution to appear before taking action? If we had waited for the perfect computer or the perfect car, there wouldn't be any computers or cars.

Bernard Boullis: I agree; we cannot afford to wait, and we must proceed step by step. Whenever we talk of research and future possibilities, **it is essential to have the scientific requirements, at the same time it is important not to discredit the means we currently have.** The glass and clay solution would seem to be an excellent solution given that minor actinides cannot move in clay. Furthermore this explains why some researchers do not consider it necessary to try to eliminate them. The focus of the research is relevant but we must not wait until it is complete before taking action, we must make use of some of these technologies today.

Véronique Decobert: it is important to use whatever means we can. We need research but research that pulls… and research that pushes developments forward, in line with the industry's immediate needs; the research that pulls being more of that of the dreamers. Perhaps there will be no need to destroy the minor actinides, but if we know how to do this then maybe our grandchildren will do it.

Baptiste Buet from AREVA: there is no question in France at present of dismantling AREVA, quite the contrary in fact, it is more a question of ensuring a number of permanent industrial activities and developing them, adding value to Europe's technical and industrial know-how. It is very clear that in the world, **the EU is a global leader in waste management, whether it is with a closed cycle or an open cycle. How can we keep up this technological leadership? How is the sector's industry planning to do this? These are the questions we ought to be asking ourselves.**

Regarding AREVA's future, the refocusing of the activity will naturally be on processing waste and recycling. The prospects are good; a number of countries such as China and the United States are turning to AREVA to find back-end solutions. Question for the Commission and the JRC: you are looking at long-term prospects for waste management, especially with fast and 4th generation reactors. How can we reduce the "gaps" we have in the fields of research and development, especially for special fuels, and respond to the long-term and very long-term objectives?

Said Abousalh: this is no easy matter. As you are aware, we are still working on reaching an agreement. There is no official agreement but the discussion process is underway between the Member States to decide whether we should focus on generations 3 or 4… The issue does not only concern the Commission but all of the Member States.

Michel Guerrite: why are we still spending money on research on eliminating minor actinides whilst storing them in glass and clay at 500 metres into the ground?

Bernard Boullis: there is no antagonism here. The best we can do today is to dispose the waste in glass and clay but that does not stop us from seeking better solutions. And just achieving a certain level of innovation does not mean having to replace all existing installations. The United States have 80 000 tonnes of spent fuel in interim storage which have not been reprocessed as they began highly ambitious research which ultimately did not lead to anything. If we wait for the perfect solution, we risk missing the boat entirely.

François Chevillard: would forming an industrial sector not constitute part of the response to publicise knowledge and speed up the process of public acceptance?

Said Abousalh: creating an industrial sector must come from the Member States and industry but not the European Commission.

Philippe Herzog: there is a problem of methodology. We need initiatives that come from the European Commission. We must prepare for the future and whether we like nuclear or not, we have to solve the problem of waste management, there is no way avoiding this problem. On the question of long-term investment applied to infrastructure in the nuclear sector, we have had discussions with Confrontations Europe and the long-term investors club in an attempt to understand the challenges at European level. In 2013, the Juncker Plan constituted a type of basic first response to the needs we have.

Riccardo Casale: the problem is raised. It is hot, and we must act on the basis of our current knowledge. Europe is a leader. And Italy educates the Chinese on dismantling, who will be facing this problem ... in 20 years! They anticipate. As for our cultural heritage, we claim it as the world's best, and I wonder if «changing software» is not already a little late.

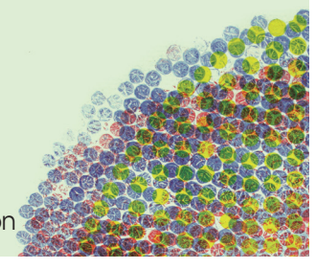
Claude Fischer: I thank all the speakers and participants of this busy day, especially the European Commission which has supported this event very actively. The discussions have led to progress on the prospect of a European industry of nuclear waste, even if we are still at the beginning of a European thinking, and I hope that financial incentives can be put in place to ensure the construction of this new industrial sector. This issue of funding came as a «leitmotiv» and we could put it at the forefront of our next Entretiens Européens, with the question of investments in nuclear waste management projects, that will develop with the dismantling and renewal of nuclear fleets in Europe and in the world...

Waste management, an issue of nuclear safety. Building a European public good.

with:

Claude FISCHER,
Director of ASCPE

Massimo GARRIBBA,
Director Nuclear Safety, DG Energy, European Commission



Conclusions

Claude Fischer: Sixteen Member States have submitted their national plans; twelve are overdue. It will be necessary to understand why and see exactly how the EU and the States leading the way such as Finland, France and Sweden are going to assist them in finding waste-processing solutions. **Ultimately, national safety (even at the highest level) will not be enough. It has to be European and everyone has to play a part.** Finland is playing its part… but only for Finland.

Managing nuclear waste affects those who have decided to pursue and/or expand their production of nuclear energy; it also concerns those who have decided to put an end to it. This is because nuclear decommissioning does not solve the problem of waste: we heard from Italy which is working on solutions to manage its spent fuel but also that which comes from decommissioning. A huge challenge for the decades ahead! A 200 billion-strong market which already sees 15 major groups competing!

Germany, which will very soon be looking at decommissioning all of its nuclear plants, is experiencing delays due to pressure from anti-nuclear opponents. They have taken waste as a hostage in the debate on the future of nuclear to further their cause. Everyone knows that without waste management solutions, acceptance of nuclear will remain low: the opponents play on this, sometimes recklessly…

Whether for or against nuclear, the waste has to be managed somehow; it is a question of responsibility which must not be left for future generations to sort out. There are some solutions that exist which have benefited from consensus in the international community. Holding back on using them until THE risk-free solution has been found merely serves to exacerbate the seeds of doubt sown by the opponents that there are no such solutions. The European Union is right to demand action plans from the Member States and ask them to "hurry things along".

As part of the European energy mix, nuclear has a rightful place in the Energy Union and is going to be the subject of a Nuclear Illustrative Programme (PINC). Must we remind ourselves that it does not produce CO2 and that if we want to respect our climate-related commitments and targets, we cannot do without nuclear? It is a relatively young technology with bright future prospects and we are told that the fourth generation will produce less waste. But in order to get there, we need solutions to manage the waste that we have produced in the past as well as the waste we are producing today.

Research efforts have been under way since the dawn of the nuclear industry (1957). They are part of the technological and industrial sector. But we are in this for the long haul. 60 years of research and the solutions are still being debated: this can seem like an eternity in human terms. But the challenges are considerable: sustainable solutions have to be invented: disposal has to be organised for 1000, 10,000, 100,000, a million years. This is completely unprecedented and all of the world's scientists are working together to find the answer.

Deep geological disposal solutions for high-level long-lived waste (HLW-LL) have been proposed since 1957: discussions are currently underway on opening the first centres in 2020 in Finland, 2025 in France and in Sweden… In safety matters, this seems to make good sense: 500 metres of clay or granite, concrete and glass offer better insulation than temporary underground storage which can only be a provisional solution. Could storage with reversibility combine both approaches? Everything is being done to ensure immediate safety but we could catch up if new technologies emerge, as explained by Pierre-Marie Abadie.

Many questions have yet to be answered and both the scientific community as well as operators are hard at work. **Whilst awaiting THE risk-free solution, we ought to be taking as few risks as possible!** And if it has to take up all of our time, we must not forget, as Saida Engström said, that "time is money."

The day before yesterday, I attended a conference at the Serge Antoine Association: "in the face of urgent needs, what role is there for the long term?". We may well turn the question on its head: "faced with the long term (or even very long-term radioactivity), what role is there for urgent action regarding protection, safety and managing our waste?"

Short-term and long-term action have to be seen as two sides of the same coin because short-term action must always be incorporated into the long term and work must be done on all fronts, as well as incorporating the time for action into a long-term vision. Philippe Herzog, who opened the symposium, broadened this consideration to include space. **Think about the long term by all means but at global level. This is because we are not alone and we should think about how to deal with the risks (or even disasters) for the common good.** "We need to change our cultural software," he urged, by insisting on the fact **that this long-term culture would in future require participation-based democracy, giving civil society its rightful role to play.**

And this applies to nuclear in particular. Atom for the whole planet so that everyone can have access to light, heating or cooling: yes, but then the solutions to the risks and consequences are a global affair and call for global cooperation, the sharing of R&D and competences and some heavy investments. When we speak of societal ownership, this is literally what we mean.

There is growing awareness that safety is a global issue, a global public good and this is the scale on which we should consider it. How can Europe make a contribution? The European Union has adopted directives (2008, 2011) but the States remain divided over the problems, with each having their institutions and national sectors of industry, without even mentioning their investment difficulties… And yet, one thing is certain: whether we abolish or expand nuclear, we will always have waste, at least in the medium term.

A "market for nuclear waste" is going to develop but we have no European industry, and international standards will not be enough! Waste management has to be planned: we are hearing the dates of 2020 for Finland, 2025 for France and Sweden, 2040 for Belgium, 2065 for the Czech Republic… Andra told us that what matters is breaking down the planning process into stages.

The States (bearing ultimate responsibility) no longer know how to think in the long term and planning has become an unutterable word. We could hope for nuclear to be the exception but too many States act under pressure: this is what is happening in France! As part of the short term of elections, under pressure from the Greens or anti-nuclear supporters, some ministers are giving in, calling into question 15, or even 25 years of research, casting discredit on the solutions without clarifying the terms of the debate. Worse still, they are completely discarding the laws voted through in 1991, then 2006. **Nuclear (and waste management even more) needs stable political support, which must be independent of all partisan considerations.**

Today we have spent time thinking together about how to help our societies and its players to have greater involvement in the subject. Not so they can say YES or NO to projects but so that they invest in this new sector of industry, innovating, with high value added, and reinforce it so that it is capable of responding to these questions and putting in place solutions.

All day we have asked, "Where are the States in all of this? How do they cooperate? What political impetus is coming from the Commission? What incentives are there for increased cooperation? How do players in the sector (producers and managers alike) share information and expertise in order to involve civil society? How do States and regions train their workers and prepare them for management, both on the production side as well as the decommissioning side? **Decommissioning does not equate to a scrapyard, management centres are neither holes nor dustbins: we will need very high qualified and skilled workers!** How can we breathe new life into the areas where these activities will be taking place or should they be turned into deserts? How do we turn our know-how and areas of expertise into assets for exports?

A number of responses emerged: 1. Structure the debate to make a more effective contribution towards the public's decision-making: and once there is acceptance from the municipalities and the law has been voted upon, there must be no back-sliding. 2. Consider the conditions for a new European industry: before thinking about its content we still have to agree on the foundations: R&D must be shared

(this is happening already), training and education, more difficult, harmonisation of standards, more difficult still, moving towards a European Safety Authority, the national authorities are resisting… 3. Should we prioritise a waste market where competition and cooperation will centre around the general interest, where services and industry will become interwoven to create a public good, where public/private partnerships will form to finance long-term investments, both in human resources and in production, in training, laboratories and storage centres, and where public and private players work together (management agencies with producers, SMEs and groups with a diverse range of jobs such as tunnelers, to give one example)? The players are varied, the systems will vary and all will ultimately have to bear responsibility.

I will conclude with a number of recommendations:

1. The responsibility falls to each Member State, with the European Commission having the power to control the level of compatibility of national legislation with European directives, they in turn being compatible with international law (IAEA). We must go further still: Gerassimos Thomas suggests better coordination of States' policies. How can we offer incentives for this coordination and guarantees for investments? Modernising State aid? Creating long-term contracts on the internal market?

2. There will be no management without competences: there are some major training-related challenges in which, we have said, we will face serious shortages… Should we create European centres or rather encourage national centres to be set up such as the NSAN in the UK? Would funding streams be mixed, coming from the States and prorated according to the "students", and the companies and agencies whose needs would be better defined? The content of training is very sophisticated, we are not talking about training for road menders or refuse collectors but rather ITC for nuclear to build plants, decommission them, and manage waste. Why not create a European label in the interests of worker mobility?

How do we do this? Create centres of excellence? Should maintenance bases be close to the sites? What about local training for sub-contractors and elected representatives? Should we move towards a special European status to secure long-term jobs? "The sector is likely to face a loss of knowledge and know-how" we were told by the representative from WONUC last year, meaning that it needs knowledge that is adapted to meet the specific requirements of the centres, nuclear installations, with professionals monitoring health and environmental aspects… How can we pool our knowledge and mobilise more senior workers to support younger generations?

3. Develop R&D for the 4**th** Generation which will permit the ultimate valorisation plutonium and uranium and will offer prospects for adding value to the waste itself.

4. **Training civil society experts (not so they are opposed but to participate and "turn conflicts into a positive")** was suggested by Riccardo Casale. Seen from this point of view, the approach adopted by ONDRAF is interesting regarding the responsible participation of the population: **a partnership contract for a common project. This is exactly what is needed everywhere.** In France, the CLIS (financed by producers, researchers and managers!) discredits the profession ("nuclear dustbins") and uses this affront as an argument, relayed by complicit media: "Andra did not choose Bure because of its geology but for the level of stupidity/greed of its elected representatives": make up your own minds! There is obfuscation and confusion, mistrust in a country that demonises enterprise and industry. A pluralist CLIS, featuring those both for and against, but where those in favour have upped and left! The democratic debate must be built on the content of solutions and it must distance itself from the recurring question of "for or against nuclear". On the subject of waste, opponents all too often remove the complex issues of the "how" which deserve to be clarified. Democracy extends beyond the right to express opinions and this must be accompanied by a responsible attitude when responding to questions, taking part in creating solutions, implementing and evaluating them… without forgetting the respect for those who seek, lead and manage.

[15] *Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, OJ L 219, 25.7.2014, p. 42–52*

[16] *Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, OJ L 199, 2.8.2011, p. 48–56*

[17] *Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, OJ L 13, 17.1.2014, p. 1-73*

Massimo Garribba: While diverging views exist amongst EU Member States on nuclear electricity use, there is a common agreement on the need to ensure in the EU and worldwide the highest possible standards for the safe and responsible use of nuclear power and for the protection of citizens from harmful radiation.

With the adoption of landmark legislation on nuclear safety[2], radioactive waste and spent fuel management[3] and radiation protection[4], **the EU legal framework in place represents the most advanced legally binding and enforceable regional framework for nuclear safety in the world.**

Future nuclear investments to be made in the EU Member States will have to take account of these new requirements. A thorough implementation programme is henceforth on the agenda for the next four years, to ensure the full effectiveness of recently adopted legislative acts.

Due to the aging of the nuclear fleet in the EU, several Member States are faced with the need to take policy decisions on the replacement of nuclear power plants coming to the end of their originally foreseen lifetime or their Longer Term Operation (LTO), which means extending the lifetime on average by 20 years after having made the necessary investments into safety upgrades.

The back-end of the fuel cycle will also need increasing levels of attention. **On the basis of current projections, it is estimated that more than 50 of the 131 reactors currently in operation are to be shut down by 2025. Managing this challenge will require careful planning and would benefit from enhanced cooperation amongst Member States.** Politically sensitive decisions will have to be taken in the coming years by all EU Member States operating nuclear power plants regarding long-term geological disposal of radioactive waste. **It is crucial not to postpone actions and investments decisions related to radioactive waste and spent fuel management, as the acceptance of nuclear energy by the civil society is closely linked to the availability of solutions in this field.**

With the Spent Fuel and Radioactive Waste Directive, the EU has established legally binding requirements for the safe and responsible long-term management of radioactive waste and spent fuel, with **the objective of avoiding undue burdens on future generations.**

The directive requires EU Member States to define and detail their waste management policies and to explain the modalities for implementation of these policies in national programmes covering all stages of spent fuel and radioactive waste management from generation to disposal.

Member States have made important efforts in recent years towards implementing the directive. Disposal facilities for low-level and intermediate-level radioactive waste are already in place in the majority of Member States. Operators are also now moving from research to action for the management of high-level radioactive waste and spent fuel, with few Member States, i.e. Finland, Sweden and France, expected to have geological disposal facilities for high level waste and spent fuel operational by 2025-2030.

The focus in the EU must be on the effective transposition of the Directive, with robust national frameworks being established to ensure the responsible and safe management of spent fuel and radioactive waste.

Opportunities for cooperation between Member States exist, in particular through the sharing of best practices or even through shared repositories. However, several issues remain to be solved, such as determining the owner of the final liability for the waste to be disposed. This also requires sufficient political and public acceptance in the Member States concerned.

Three issues need close follow-up when it comes to achieving a strong Community framework for the responsible and safe management of spent fuel and radioactive waste.

Additional efforts are needed to come to a common understand between Member States and the EC on the adequacy of available funding for the programs. This is important, as the calculation of costs shows a considerable variation between Member States.

Member States and the nuclear industry have to move from the planning stage to the implementation stage in order to keep the exercise credible.

With respect to new build Member States need to ensure that the national policies (in consultation with stakeholders) also define the management routes for spent fuel and radioactive waste to be generated in the next decades.

Claude Fischer – I wish to thank all the speakers and participants to this busy day, and in particular the European Commission for its very active support. The debates allowed us to move forward on the prospect of a European industry of nuclear waste, even if we are only at the beginning of our reflexions and I hope that the financial incentives will be put in place to secure the construction of this European sector. The question of financing came back as a leitmotif in our discussions and we could place it the heart of the next Entretiens Européens along with that of human and productive investments in the nuclear waste management projects that will emerge following the dismantling and renewal of the fleet in Europe and in the world…

Speaker's biograhies

Pierre-Marie ABADIE was appointed as CEO of Andra, France, in October 2014. From 2008 to 2014, he served as Director of Energy at the Directorate General for Energy and Climate of the Ministry of Ecology, Sustainable Development and Energy, and represented the Government to the governing boards of Andra, and EDF to the Board of Governors of the IEA. Previously, he was Industrial Affairs Advisor to the Minister of Defence from 2002 to 2007 and led numerous industrial restructuring, and held before several posts at the TreasuryFrom 1994 to 1998 he. was Deputy Director at the Regional Industry, Research and Environment Directorate (DRIRE) of Lorraine, responsible for inspecting environmentally regulated facilities (ICPE). He graduated from the Ecole Polytechnique and the Ecole des Mines de Paris, and is a knight of the French National Order of Merit.

Said ABOUSAHL is Head of Nuclear Safety and Security Unit (including nuclear safeguards and non-proliferation) at the Joint Research Centre (JRC) of the European Commission. From 2006 to 2013 he was policy officer responsible for the coordination of the JRC Nuclear safety and security activities in Brussels. From 1998 to 2006 he held the position of Head of sector, Analytical Services and support to nuclear safety, safeguards and waste management projects at the Institute for Transuranium Elements (ITU - Karlsruhe, Germany), JRC, after having worked from 1993 to 1996 as scientific officer at the IRMM Institute (JRC) in Geel, Belgium. From 1986 to 1990 he prepared a PhD at the CEA in Saclay, France on Nuclear waste management, which he got in March 1990 from the university of Pierre & Marie Curie, Paris

Anne BERGMANS, Senior Researcher at University of Antwerp, Belgium, is lecturer and senior research fellow in the Social Sciences Faculty and the Law Faculty at the University of Antwerp. Anne holds a master's in international politics and maritime economics, and obtained a PhD in sociology in 2005. She focuses on science and technology governance and the sociology of the environment, particularly engagement in radioactive waste management. Anne has worked on the Ondraf/Niras programme launched in 1998 to site a radioactive waste repository in Belgium. She has participated in and coordinated several international research projects on engagement in decision making in radioactive waste management. Anne is part of the Horizon2020 project Modern2020, investigating monitoring technologies for geological disposal and how to involve citizens.

Maurizio BOELLA is currently Advisor for Euratom issues to the Deputy Director-General for Energy in Luxembourg. He started his career in the European Commission at the Joint Research Centre in Petten (The Netherlands). He later moved to the Commission's Directorate for Nuclear Safeguards where he has been Head of Unit for «Concepts, Evaluation, R&D and Technological Support». Maurizio Boella has been Head of Unit for «Nuclear Energy, Nuclear Waste and Decommissioning» in Directorate General for Energy.

Bernard BOULLIS is currently the Director for Nuclear Fuel Cycle Back-end Programs at CEA, Nuclear Energy Division, in France.

A graduate from Ecole Centrale de Paris, he joined CEA in 1977 and he has been involved for over 35 years in the back-end field, from La Hague reprocessing plants design, to final waste management and advanced fuel cycles for future nuclear systems, with both operational and program management successive responsibilities. He is Professor at INSTN, and member of the Scientific Councils of ASN, CEA, and Andra.

Riccardo CASALE is CEO of SOGIN SpA, Italy, since September 2013. He began his career as a researcher at the University of Liege and then worked with an engineering company in Turin. In 1992 he was a principal scientific officer at the Directorate-General for R&TD at the European Commission, responsible for programmes in support of civil protection, and also of programmes and projects in energy sector and waste management. He then became Chairman of IRIDE /IREN Energia SpA from 2008 to 2010 and Operating Chairman of AMIU SpA from 2008 to 2013. He is a board member of Confindustria Genova. A lead-writer on energy and the environment in "Il Secolo XIX", and a scientific editor, he received a degree in earth sciences in 1988 and a master in environmental engineering in 1991 at the Politecnico di Torino.

Andrzej CHOLERZYNSKI is the director of ZUOP - Radioactive Waste Management Plant in Poland. Since 1975, he managed the real radioactive wastes arising from isotope production and application (medicine, industry, science). He participated in the development of the national strategy on radioactive waste and spent nuclear fuel management and coordinated international projects in the field of radioactive waste management and spent nuclear fuel. He contributed in the development of the national inventory on spent nuclear fuel and radioactive waste, and in the review of a proposed methodology for site selection of a storage and geological disposal facilities for radioactive waste.

Véronique DECOBERT, Director, Nuclear Regulatory Affairs, for the Europe, Middle East and Africa (EMEA) Region at Westinghouse since April 2013. She joined Westinghouse in February 2009 as director, *Engineering Services* (ES) France. In June 2012, she was appointed director, *ES and Installation and Modification Services* (IMS) France. She previously spent 26 years at AREVA, where she held various positions, the last one being Nuclear Safety and Health & Industrial Safety Senior VP for the AREVA group. Experienced in licensing and in fuel cycle engineering, she served as QHSE director in the La Hague reprocessing plant prior to working as nuclear safety inspector.

Marc DEMARCHE is deputy Director General of ONDRAF/NIRAS in Belgium. He started his career as an assistant professor at the Université Libre de Bruxelles, during 2 years. From 1991 to 1996, he was project manager for the construction of storage buildings at Belgoprocess, the industrial subsidiary of ONDRAF/NIRAS. He then became head of the Acceptance Criteria Division (1996-1999) and worked for the qualification of radioactive waste processing and conditioning facilities. He was general manager of EURIDICE, Economic Interest Grouping of ONDRAF/NIRAS and the Belgian Nuclear Research Centre SCK•CEN from 1999 to 2008. He graduated from the Université Libre de Bruxelles (MSc in Electromechanical Engineering), the Solvay Business School (Business Administration) and the International School for Radiological Protection.

Claude FISCHER is director of ASCPE, an education and training company that organizes Les Entretiens Européens. Teacher training, graduate of the School of Political Science at the Sorbonne, she has been President of Confrontations Europe. Claude Fischer directs the thinking for sustainable nuclear power in Europe and in the world, organizes seminars for social ownership of nuclear and publishes *La Lettre des Entretiens Européens*. She created a network «EU / Africa (s)» in 2013, and prepares Les Entretiens Eurafricains in Ouagadougou in December in 2015. Member of the Scientific Council of the Bosphorus Institute, Claude Fischer also chairs L'AAFEE, the Association of Friends of Film Festival «Europe around Europe» held annually in Paris. She was made Chevalier of the Legion of Honor in 2010.

Massimo GARRIBBA was appointed Director Nuclear Energy, Safety and Iter for DG Energy, European Commission, in July 2015. From January 2014 till June 2015, he was Director of Nuclear Safety and Fuel Cycle at DG Energy, and from 2004 till end 2013, he was head of Unit for Euratom Coordination and International relations, responsible for the «stress tests» dossier following the Fukushima accident, and for the nuclear safety directive and its implementation. He had before various responsibilities from 1995 till 2004 at the DG Information Society, after starting its career at the end of the 80s at the JET nuclear fusion project (Culham, UK) until 1995, while preparing a doctoral thesis on a multivariable control system for the plasma shape and current.

Ian GORDON is Section Head of the Waste Technology Section at the IAEA (International Atomic Energy Agency) in Vienna. Before working at IAEA, Ian worked at Sellafield (UK), establishing a non-commercial bilateral agreement between Sellafield Ltd and TEPCO (Tokyo Electric Power Company, Japan) to support the sharing of experience. Ian also led the response of Sellafield to ENSREG post Fukushima stress-testing. In previous assignments, Ian led technical negotiations with the 10 Japanese Electricity Utilities relating to Mixed Oxide Fuel (MOX); and led project/design teams in both MOX and Effluent Treatment / Encapsulation Plants. Ian is a Chartered Mechanical Engineer and was elected to Fellowship of the Institution of Mechanical Engineers in 2003.

Emilia JANISZ works as Institutional Affairs Manager at FORATOM and External Relations Officer at the European Nuclear Society. Born in Poland, she studied at the Karlsruhe Institute of Technology and University of Tuebingen, Germany. She holds a Master of European Studies and accomplished the IAEA School of Nuclear Energy Management. Since 2010 she has been involved in the European Nuclear Society (ENS) activities dealing mainly with the education&training issues but also representing ENS towards the European Institutions in various working groups and at the international conferences. Within FORATOM she is responsible for two Task Forces: Education, Training and Knowledge Management and Management Systems.

Saida LAÂROUCHI-ENGSTRÖM is Vice President, Strategy and Program, at SKB (Sweden). She has a background in chemistry engineering. She started her career in The Swedish Nuclear Inspectorate as a safety inspector of nuclear installations in Sweden. After 11 years, she joined SKB, first as a leader for feasibility studies in view to select a site for a final repository for spent fuel in Sweden. Under the site investigation project, Saida was in charge of the environmental assessment studies and licensing. Saida has been and still is in charge of the dialog between SKB and all the stakeholders in the Swedish society. She is now also in charge of coordinating licensing efforts of the disposal for spent fuel.

Elena MANTAGARIS is the Director of Government and External Relations at the Nuclear Waste Management Organization (NWMO), in Ontario, Canada. Since 2008, she has been responsible for outreach with Canada's federal government and 5 provincial governments involved in the work of the NWMO. Previously, she worked for 10 years with several federal government departments and was responsible for strategic planning and communications initiatives. Ms. Mantagaris holds a Master of Public Administration from Queen's University in Ontario.

Dominique MINIERE is Group Senior Executive Vice President, Chief Operating Officer, Generation & Engineering Existing Nuclear & Thermal Fleet, EDF, since January 2015. He joined EDF in 1982 as a maintenance engineer, being notably in charge of department for both the thermal and nuclear french fleets. He took part to the commissioning of the Golfech NPP in France from 1986 to 1989 and the Daya-Bay NPP in China, from 1993 to 1997. In 1999, he was Station Director for the Cattenom NPP. From 2002 to 2013, He was Deputy Director and then Director of the Nuclear Production Division. In March 2013 he was appointed Deputy Director of the Generation Division. He graduated from the Ecole des Mines de Paris, and is a knight of the French Legion of Honour.

Herkko PLIT is Deputy Director General at the Ministry of Employment and the Economy, Energy Department in Finland since January 2012. He is responsible for Nuclear Energy and Fossil Fuels in the Ministry. In the past, he served as TVO´s Responsible Director for Construction in Olkiluoto 3 project, CEO of engineering company Fortum Nuclear Services and General Manager of Fortum Corporation´s business unit Expert Solutions which had responsibility of group overall short term energy business. Chair of several high-level international and national committees in the energy sector as well the Finnish representative in the energy organizations (IAEA, OECD/NEA, Euratom), Herkko Plit graduated from the Helsinki University of Technology at Technical Physics faculty. He has been engaged in energy activities over 20 years.

Jean-Pol PONCELET is Director General of FORATOM, the Trade Association of European Nuclear Industry, and Secretary General of the European Nuclear Society. He was AREVA's Senior VP, Sustainable Development andContinuous Improvement from 2008 to 2011, having joined AREVA in February 2006 as an Advisor to the CEO. From 2001 to 2005, he was Director of Strategy and External Relations of the European Space Agency (ESA). He was Deputy Prime Minister, Minister of Defence and Minister of Energy in the Belgian Government from 1995 to 1999 and an elected Member of the Parliament from 1991 to 2001. Previously, he was the Chairman of the Board of Directors of ONDRAF. A member of the Belgian Royal Society, he earned a Master Degree in Nuclear Engineering from the École Polytechnique de Louvain (Belgium) in 1973.

Jiri SLOVAK is Managing Director of SÚRAO, the Radioactive Waste Repository Authority of the Czech Republic since 2014. From 2008 to 2014 he worked at SURAO as Deputy Director for Development and was responsible for the preparation of the deep geological repository programme and the coordination of research on of radioactive waste and spent nuclear fuel management. He is a member of the IGS-TP (Implementing Geological Disposal Technology Platform) and of the Working Group for Dialogue on a Deep Geological Repository. He began his career in the field of mining geology and the ecology of uranium mining and he has worked since 1997 on radioactive waste and spent nuclear fuel issues, and holds a doctorate in geochemistry and geology from Masaryk University in Brno.

Gerassimos THOMAS is Deputy Director General in the DG Energy of the European Commission since September 2014. He is a member of the Steering Board of the European Fund for Strategic Investments (EFSI). He was before Director for Finance and cooperation with EIB Group, EBRD and IFIs in the DG for Economic and Financial Affairs (DG ECFIN), member of the EIB and EIF Board of Directors and observer at the EFSF Board (2009-14) and Head of cabinet of Commissioner Joaquin Almunia (2006-2009), working for the DG MARKT (2004-2006), Spokesman for President Romano Prodi (2003-2004) and Commissioner Pedro Solbes (1999-2004), working at European Investment Fund (1997-1999) etc. He has studied economics, business administration and international relations in Athens, London and Brussels.

Jo TIPA is Operations Director, National Skills Academy for Nuclear, UK. She has been involved as a member of the NSAN team since its inception. As Business Development Manager she was part of the small business planning team that was required to set up NSAN. Since 2009 Jo became the Operations Director for the organisation and is responsible for a team of 9 regional managers who look after the needs of NSAN's employer and training provider members. 8 1/2 years in the nuclear industry represented a significant switch from Jo's earlier career working for Compass Group (20 years) and a BSc in Institutional Management.

Our partners

Andra, the French National Radioactive Waste Management Agency, is a governmental agency of 650 employees, independent from the producers of radioactive waste. Andra is in charge of finding and implementing safe solutions for the management of all types of radioactive waste in France in order to protect current and future generations from the hazards posed by such waste. Its activities include: R&D, industrial activities, public service and information, promotion of the French expertise in France and abroad.

Andra also develops scientific collaboration throughout France and the world, promotes its entire range of services throughout France and the world, and disseminates scientific knowledge and technical know-how as widely as possible.

Born in 1945, the **CEA** -the Alternative Energies and Atomic Energy Commission -is a French public organization of 16,000 persons, leader in research, development and innovation in four main fields:

- low-carbon energy sources (both nuclear and renewable)
- innovative technologies for information processing and health
- very large infrastructures for research (TGIR)
- defense and global security.

CEA relies on its fundamental research base to ensure a key industry supporting role.

The EDF Group is the world's leading electricity company; an integrated group that operates across the entire electricity value chain, from upstream to downstream activities.

• We operate in the deregulated sectors (generation, trading, sales & marketing, energy services) and in the regulated sectors (transmission, distribution, island energy systems).

• We have developed skills in engineering in all power generation modes, both directly (nuclear, hydro, and thermal) and through dedicated subsidiaries (biomass, geothermal, etc.).

• We manage our supplies, especially natural gas and biomass.

• We provide energy services in order to make the best use of energy.

Together, this range of activities has enabled us to build unique experience and expertise in the field of electricity.

FORATOM is the Brussels-based trade association for the nuclear energy industry in Europe. FORATOM acts the voice of the European nuclear industry in energy policy discussions with EU Institutions and other stakeholders.

The membership of FORATOM is made up of 16 national nuclear associations –active right across Europe and the companies that they represent, and two utilities, the polish nuclear company, PGE and the Czech energy company, CEZ. Over 800 firms are represented – from Europe's largest nuclear utilities and nuclear fuel cycle companies to other undertakings engaged in the transport of nuclear materials and the managing of radioactive waste.

ONDRAF/NIRAS, the Belgian Agency for radioactive waste and enriched fissile materials, is a public agency established in 1980 by the law: its mission is to protect man and the environment, for the present and the future, against the potential hazards arising from radioactive waste, without thereby imposing any excessive obligations on future generations. Its competencies cover transport, processing, conditioning, interim storage and final disposal of radioactive waste and spent fuel, as well as the decommissioning of nuclear facilities. The agency is also competent for technical research and R&D in the field of radioactive waste management, especially with regard to disposal and optimisation of current practices. Finding a long-term coherent and acceptable balance between four dimensions - science and technique, ecology and safety, economy and finance, ethics and society - is the first goal of ONDRAF/NIRAS's programmes.

SOGIN is the Italian public company responsible for the decommissioning of Italian nuclear plants and for the management of radioactive waste. Sogin is involved in the siting, designing, building and operating of the National Repository for radioactive waste. Sogin is wholly owned by the Ministry of Economy and Finance and operates according to the Italian Government's strategies.

In addition to the former power plants and manufacturing plants, Sogin is in charge of the decommissioning of the former ENEA research plants.

Sogin has been operating since 2001. It became a Group in 2004 through the acquisition of the majority stake (60%) of Nucleco SpA, the national operator responsible for collecting, treating, conditioning, temporary store radioactive waste and nuclear sources.

OTHER PARTICIPANTS

The **IAEA** was set up in 1957 within the United Nations family as the world's centre for cooperation in the nuclear field; the Agency works with its Member States and multiple partners worldwide to promote the safe, s cure and peaceful use of nuclear technologies.

The Waste Technology Section assists IAEA Member States in the management of radioactive waste resulting both from the nuclear fuel cycle and from nuclear applications in health, industry, science and agriculture. This covers all aspects of radioactive waste management – from decommissioning, through environmental remediation and predisposal to disposal.

NSAN was established in January 2008 and by the end of 2010 was well established as a self-sustaining employer led and funded business. Since then, NSAN has operated very successfully as a forum for employers to work collectively to identify and address the key skills challenges facing the UK nuclear programme. NSAN now has 123 employer members.

For 78 years NSAN has established a comprehensive High Quality Provider Network (HQPN) covering the whole of the UK. This includes: Flagship Training Centres; Colleges of Further Education; Private Training Companies; Universities and Employer Based training organisations. Most recently the NS4P has been developed, as a centralised repository of employee training records, qualifications and competence assessments, administered by organisations from a simple to use interface. It is an essential tool to manage skills and capability, and help identify skills shortages.

The Nuclear Waste Management Organization (NWMO) was established in 2002 and is responsible for designing and implementing Canada's plan for the long-term management of used nuclear fuel. Canada's plan – known as Adaptive Phased Management (APM) – grew out of a Canada-wide dialogue conducted between 2002 and 2005 and reflects the values and priorities of Canadians. The plan's end-point is the safe containment and isolation of used nuclear fuel in a deep geological repository within an informed and willing host community. Implementation involves realistic, manageable phases, each marked by explicit decision points with continuing participation by interested Canadians. Since 2010, the NWMO has been working with 22 interested communities to find a potential site.

Swedish Nuclear Fuel and Waste Management Co, SKB, is the company in charge of nuclear waste management in Sweden. Owned by the nuclear power producers in Sweden, it is fully financed by the nuclear waste fund according to the law. SKB has been carrying out research and technical development for all waste categories. SKB is also operating the final repository for low and intermediate level waste since 1988, an interim storage for spent fuel since 1985, and in situ laboratories. SKB has an extensive programme to engage in dialogue with all stakeholders in Swedish society especially u der the years of site selection for a final repository for spent nuclear fuel. SKB has submitted an application to the government 2011 to construct the repository for spent fuel which is under reviewing now by the safety authority and the environmental court. The decision from the government is expected by 2017.

Radioactive Waste Repository Authority (Správa úložišť radioaktivních odpadu - SÚRAO) is a state organisation to ensure the safe disposal of radioactive waste in the Czech Republic in compliance with the requirements of nuclear safety and human and environmental protection.

SÚRAO was established in June 1997 according to the Atomic Act. The principal obligations of SURAO consist of the efficient management of repositories for the disposal of low-level and intermediate level radioactive waste and the development of a deep geological repository. Since 2000, it has operated 3 near surface repositories for disposing low and intermediate level wastes. One of the main tasks of SÚRAO is to prepare a deep geological repository for disposing spent nuclear fuel and high-level radioactive waste, which is scheduled to be put into operation by 2065. SURAO is also responsible for coordination of research and development activities in the field of radioactive waste management in the Czech Republic.

The Faculty of Social Sciences (FSS) of the University of Antwerp comprises four Departments: Political Science, Communications Sciences, Sociology and Training and Education Sciences. We organise four bachelor programmes and ten masters in these disciplines. With roughly 3000 students and 300+ academic and administrative staff, we are a leading faculty in Flanders, Belgium.

Westinghouse Electric Company is the only company with a single focus on nuclear power, providing a wide range of nuclear plant products and services to utilities throughout the world. Our nearly 13,000 employees worldwide provide fuel, spent fuel management, service and maintenance, instrumentation and control, and advanced nuclear plant designs. With the world's largest base of installed plants, no company has more nuclear experience.

With the combined resources of Westinghouse and Toshiba, an even broader range of products and services will be available to our customers, furthering our commitment to providing solutions that help achieve reduced outage times, reduced operating costs, and clean, efficient plant operations.

The Directorate-General for Energy is responsible for developing and implementing a European energy policy under the political guidance of the European Commission Vice-President for Energy Union Maroš Šefcovic and Climate Action and Energy Commissioner Miguel Arias Cañete.

The DG develops and implements innovative policies aimed at:

- contributing to setting up an energy market providing citizens and business with affordable energy, competitive prices and technologically advanced energy services
- promoting sustainable energy production, transport and consumption in line with the EU 2020 targets and with a view to the 2050 decarbonisation objective
- enhancing the conditions for safe and secure energy supply in a spirit of solidarity between EU countries ensuring a high degree of protection for European citizens.
- Under the auspices of the Euratom Treaty, DG Energy deals with nuclear activities, and in particular **nuclear safety**, about the safe operation of nuclear installations, complemented by **radiation protection** and **radioactive waste management.**

List of Participants, 15 October 2015

ABADIE Pierre Marie, ANDRA
ABDERRAHIM Hamit Aït, SNETP
ABOUSAHL Said, European Commission, Joint Research Center
ARKER Isabelle, European Commission
ARNOUD Justine, IAE Gustave Eiffel, Paris Est
AUGE Morgane, AREVA
BARAKAT Mohamed-Raja'i, ARW
BEHESHTI Abolfazl, ESDEN
BERGMANS Anne, University of Antwerp
BEYENS Marc, ELECTRABEL
BOELLA Maurizio, European Commission
BOGAERTS Walter, University of Leuven
BONLIEU Marion, CEA
BOUDOVA Eva, CEZ
BOULLIS Bernard, CEA
BUET Baptiste, AREVA
CAMUS Gabriel, Representation of France to the EU
CASALE Riccardo, SOGIN
CASMIRO Pasquale, European Commission
CHEVILLARD François, Cabinet FCDevelopement
CHOLERZYNSKI Andrzej, ZUOP
CLAROTTI Paolo, Union of European Federalists
CLUZEAU Alain, European Commission
COLLANTES Y PEREZ-ARDA Teresa, Permanent Representation of Espana to the EU
DE BROGLIE Isabelle, Energies de la mer
DE LIMELETTE Caroline, SYNATOM
DE MEREUIL Jacques, ASCPE
DECOBERT Véronique, Westinghouse
DEMARCHE Marc, ONDRAF
DESBAZEILLE Yves, EDF
DOAN Phuong Hoai Linh, Itésé – CEA Saclay
DOHNERT Bernd, Independant
DUFOUR Vincent, EDF
FISCHER Claude, ASCPE
GADOMSKA Magdalena, European Commission
GARRIBBA Massimo, European Commission
GILLET Guillaume, Representation of France to the EU
GILLOCK Stuart Price, Confrontations Europe
GONON Erwan, ASCPE
GORDON Ian, IAEA
GRIMBERG Michal, AVISA PARTNERS
GUERITTE Michel, CEDRA
GUICHARD Anne, CEA
HEDIN Anthony, ENGIE
HERZOG Philippe, Confrontations Europe
HOOFT Evelyne, ONDRAF
IMBERECHTS Marine, EUROPEAN CULTURE CENTRE
JANISZ Emilia, FORATOM
JARLIER CLEMENT Chantal, EDF
LÂAROUCHI-ENGSTRÖM Saïda, SKB
LALIEUX Philippe, ONDRAF
LAZZERI Mario, SOGIN
LE NGOC Boris, SFEN
LEMBRE Pascal, European Movement
LESCOURANT-SAPOTILLE Régine, EDF
MANOLATOS Panagiotis, EC DG RTD
MANTAGARIS Elena, NWMO
MARTIN Carolyn, EDF ENERGY
MASSART Cecile, Artiste sculpteur
MBEKA Joseph Salomon, SIREAS
MINIERE Dominique, EDF
MITTERMAYR Eva, Representation of Austria to the EU
MOISII Roxana, Representation of Romania to the EU
NIMERICKA Michaela, Representation of the Czech Republic to the EU
NISSILÄ Rami, Representation of Finland
OUZOUNIAN Gerald, ANDRA
PAROT Mario, European Commission
PERRIEN Hervé, CEREZA
PETON Helene, IAE Gustave Eiffel, Paris Est
PLIT Herkko, Minitry of Economy and Employment - Finland
POMOZI Tünde, Representation of Hungary
PONCELET Jean-Pol, FORATOM
PRASIL Jan, CEZ GROUP
REBIERE Noemie, ASCPE
REIN Conrad, European Commission
SCHAEKEN WILLEMAERS Jean Pierre, Institut Thomas More
SLOVAK Jiri, SURAO
SURKOVA Maryna, FANC
TAILLEBOIS Christian, EDF Group
THOMAS Gerassimos, European Commission
TIPA Jo, National Skills Academy for Nuclear
TSIBULYA Alexander, Permanent Mission of the Russian Federation to the EU
VAKILI Ali, MindTracker
WAAGENSEN Bodil, Lollandmodatomaffald
WARDY Marie
ZIFCIAKOVA Jana, European Commission Joint Research Center
ZIMERMANN Miroslav, Ministry of Foreign affairs of Slovakia

Post-Fukushima

The ASCPE conferences for a sustainable nuclear sector in Europe

• 27 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

• 7 November 2012, lunchtime debate in Brussels:
Nuclear in Europe: future challenges

• 11 April 2013, les Entretiens Européens in Brussels:
EU/Russia Dialogue – Nuclear sector: competition and cooperation

• 24 May 2013, seminar by the "Energy" group in Paris:
Nuclear in Europe and in the world.

• 17 September 2013, screening of the debate in Paris:
Pandora's promise in partnership with SFEN and IFRI with the participation of the director
Robert STONE

• 22 to 24 October 2013, les Entretiens Européens in Warsaw and Krokowa:
A civil society initiative for nuclear in Poland

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

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

• 29 April 2015 in Brussels, seminar by the "Energy" group:
Nuclear's contribution to the Energy Union

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

Also see the 3 conference cycle run by our partner the ENELA, **European Nuclear Energy Leadership Academy**, in Munich on 9-10 February, 22-23 March and 26-27 April 2012
"Putting severe accidents into perspective: Learning from the past, preparing for the future of nuclear energy"
and the summary produced by Michel Cruciani:
http://www.confrontations.org/images/confrontations/coll/2012/enpartenariat/ ENELA-Resume-Thematique.pdf

ASCPE 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 seeks to **debate** the questions facing society by bringing together the different economic and social players firstly at meetings and conferences and secondly by organising film viewings and by supporting the film festival "l'Europe autour de l'Europe" (Europe around Europe).

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 and in 2015 in Brussels with 8 European countries and Canada - 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 next meeting is set to take place on 3 and 4 February 2016 in Ouagadougou: "Investing in Western Africa – developing and financing of projects on organised markets" (with support from the MAEDI {The French Ministry of Foreign Affairs and International Development} and from several civil society players from a range of European and African countries).

La Lettre des Entretiens

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 in French, « Nuclear special », with an English version issued in October.

There are plans to publish three more issues: in December 2015 "Nuclear Waste Management Special"; in April 2016 "Energy Security Special"; in October 2016 "Energy Union Special".

La Lettre des Entretiens Eurafricains will be published three times a year. The first issue will emerge in January 2016, just in time for the Entretiens Eurafricains in Ouagadougou on 16 and 17 December 2015.

Cinema

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. (11th edition "Chocs et harmonie" {shocks and harmony} in Paris from 16 March to 17 April 2016). **L'AAFEE,** the association of the festival's friends, is chaired by Claude Fischer-Herzog.

A Euro-African week at the cinema in Paris: created by ASCPE in 2015 as part of the Entretiens Eurafricains, this mini festival is organised in partnership with the Studio des Ursulines, AAFEE, Africultures, Phanie et Vidéosphère.

A new seminar **"Un livre, un film"** (one book, one film): 1st session yet to come, from Philippe Herzog "Identity and values: which struggle?" and by Krzystof Zanussi, a Polish director.

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, directorial assistant for the Entretiens Eurafricains;

Yvan Fischer, in charge of the site;

Christine Holzbauer, editor in chief of La Lettre des Entretiens Eurafricains;

Jacques de Méreuil, advisor and editor of La Lettre des Entretiens Européens,

Noémie Rebière, in charge of research for Les Entretiens Européens.

Partners in 2015

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, CONFRONTATIONS EUROPE, DG Energy of the European Commission, EDF, ENERGIES DE LA MER, ENGIE, FORATOM, INSTITUT DU BOSPHORE, ONDRAF, SOGIN

Partners EU / Africa (s): ADECS Phariyago, AGF, AIR FRANCE, ANF (association of French-speaking Notaries), ENGIE Rassembleurs d'énergies, FARM, INEADEC, MAEDI (The French Ministry of Foreign Affairs and International Development), OIF, ORANGE, PROPARCO, SCHNEIDER ELECTRIC, SEFI

Cinema Partners: AfricaCultures, EVROPA FILM AKT, La Fondation Hippocrène, L'AAFEE, L'ARM, Le Studio des Ursulines, PHANIE, VIDEOSPHERE

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Penly nuclear plant, Normandy.

** Source: PWC report: The European Carbon Factor – Comparison of CO_2 emissions by Europe's largest power utilities. European average in 2013: 328 kg of CO_2/MWh – EDF France: 35 kg of CO_2/MWh.*