COMMENTS OF **SLOVAKIA** to the
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[…]

Introduction

The European civil nuclear power sector is an established industry generating 27% of all electricity consumed in the EU and contributing to competitiveness, security of energy supply and limitation of CO_2 emissions as part of the EU's 2020/2030/2050 energy and climate policy objectives. In its Energy Union Communication[1], the Commission stated that *"putting the EU at the forefront of smart grid and smart home technology, clean transport, as well as clean fossil fuel and the world's safest nuclear generation, is central to the aim of turning the Energy Union into a motor for growth, jobs and competitiveness",* and that *"the EU should also ensure that it maintains technological leadership in the nuclear domain, including through ITER, so as not to increase energy and technology dependence"*.

Fourteen EU MS currently operate nuclear power plants (NPPs), though all MS benefit through the electricity grid from nuclear-generated electricity and have an interest in ensuring the safety of operating NPPs no matter where they are located. In addition, all MS benefit from the use of ionising radiation in industry and medicine and have accumulations of radioactive waste from either the nuclear power sector, research and/or medical and industrial applications.

In the European Commission's Energy roadmap 20 50[2], all scenarios include continued reliance on nuclear power, though the ageing of the existing fleet implies an increasing role for long-term operation (LTO) as well as the growth in decommissioning and related waste management activities. The projection in the latest Nuclear Illustrative Programme (PINC)[3] shows that after an initial decline in EU nuclear generation capacity up to 2025, the trend is reversed by 2030 with new reactors connected to the grid together with extensive LTO of the existing fleet, because nuclear is zero carbon technology which helps to improve the total environment. After a slight increase, the capacity then remains stable at between 95 and 105GWe until 2050, by which time approximately 80-90% of installed capacity would be new build. The PINC figures not only underline the significant investments in new build, but also in LTO of existing plants that will play a crucial role in bridging the gap between now and the availability of the new plants.

At the global level, the Energy Technology Perspectives (ETP2015)[4], in the scenario limiting increase in average global temperature to 2°C, assume that world nuclear capacity will more than double to 930GWe by 2050, with nuclear power then representing 17% of global electricity production. Moreover, the Paris

1 COM(2015)80 final, 25/02/2105 (http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2015%3A80%3AFIN)
2 COM(2011)885 final, 15/12/2011; Publications Office of the EU, 2012, ISBN 978-92-79-21798-2
3 'Programme indicatif nucléaire communautaire', or 'Nuclear Illustrative Programme presented under Article 40 of the Euratom Treaty for the opinion of the European Economic and social Committee', C(2016)177, 04/04/16
4 IEA Energy Technology Perspectives 2015 (http://www.iea.org/etp/etp2015/) and the joint IEA / NEA Technology Roadmap for Nuclear Energy (https://www.oecd-nea.org/pub/techroadmap/)

COP21 Agreement on Climate Change, 12 December 2015, emphasised the need to limit the increase in the global average temperature to well below 2°C above preindustrial levels.

The EU legislative framework has been significantly strengthened in recent years: a Council Directive on the management of spent fuel and radioactive waste was adopted in 2011, followed by a revised Basic Safety Standards Directive in 2013 and a revised Nuclear Safety Directive in 2014 (more details in Annex 1). This represents the most advanced legally binding and enforceable regional legal framework on nuclear safety and related issues anywhere in the world. In addition, there are a number of relevant Strategic Research Agendas, Deployment Strategies, roadmaps and/or coordinated research programmes prepared by or under the auspices of a range of key stakeholder groups, technology platforms and international bodies (refer to Annex 1 for an exhaustive list)

Furthermore, actions were already summarised in the input to the SET-Plan integrated roadmap discussions in 2014, and key elements are presented in Annex 2.

The targets in the present document are consistent with the research and policy base as listed in the annexes. In addition to the targets themselves, a number of important cross-cutting challenges are also listed. The targets concern primarily the energy sector, though non-energy applications such as supply of radiopharmaceuticals, use of radiation in medical practices and related health effects of low doses, are also important and are closely linked, particularly as regards research infrastructure and availability of irradiation facilities (refurbishment / construction of research reactors).

Targets

1. **Maintaining a high level of safety and security**

   The priority is maintaining a high level of safety and security (current fleet, LTO, new-build). This involves organisational, operational and regulatory aspects, as well as further research & innovation, the latter often depending on the availability of research infrastructures of pan- European relevance. Relevant targets are:

   - by August 2017, transposition by MS of the Nuclear Safety Directive, followed by timely realisation of the new 'Nuclear Safety Objective' through a clear schedule for implementation;
   - by 2020, availability of conclusive research findings on (i) ageing of structures, materials and components (LTO of NPPs and extended spent fuel storage) and (ii) more robust and accident-resistant designs (passive systems, accident-tolerant fuels, improved containment designs and protection strategies); recommendation is to amend also reactor in operation, and erection mode
   - by 2020, implementation by MS of all actions to improve nuclear safety as follow-up to the stress tests[5];
   - optimisation of NPP operation as a function of predicted demand, and integration with more intermittent suppliers in evolving electricity grids: (flexibility generation as result of unpredictable generation of wind and solar)
   - observance of strict non-proliferation regime and physical protection of nuclear materials and facilities.

2. **Radioactive waste management and decommissioning**

   - In line with obligations under the spent fuel / radioactive waste Directive in particular, MS are putting in place and carrying out national programmes, including necessary research. Key target is, by 2030, the operation in Europe of the world's first deep geological repositories for spent nuclear fuel and/or heat-generating high-level radioactive waste.
   - By 2030, the development of a world-leading decommissioning sector, building on the EU's safety culture and know-how in waste management.It is difficult imagine that 30 deep repositories will be developed and build. It would be good to initiate of upgrade of Directive 70/2011 and open market with radioactive waste.

3. **Advanced and innovative fission reactors**

   Towards 2050 the availability of designs offering increased uranium resource efficiency and lower long-lived waste production may become attractive for utilities, and taking into account the increasing requirement for more flexible energy sources and recent MS initiatives in this regard, small modular reactors (SMR) and co-generation plants may develop on a shorter timescale:

   - licensed SMR design(s) available in the EU by 2025, with operating plant(s) by 2030;
   - at least one Generation-IV demonstrator fast reactor operating in Europe by 2030, including associated fuel cycle facilities (pilot fuel fabrication and processing plants) this is not very brave future. Since 2000 when 6 types of gen IV reactor were stated it is very small development .

[5] ENSREG: Compilation of recommendations and suggestions - Peer review of stress tests performed on European nuclear power plants (http://www.ensreg.eu/sites/default/files/Compilation%20of%20Recommendationsl 0.pdf)

- Reprocessine of spent fuel.

4. Fusion

Successful ITER construction and operation in line with agreed baseline, and progress to fusion electricity in line with European roadmap and EUROfusion Joint Programme (see Annex 1 - targets to be further developed following publication of revised ITER baseline and revised European roadmap).

Cross-cutting challenges

To achieve the above top-level targets, and to enable nuclear to remain a safe and competitive option in the future energy mix, a number of cross-cutting challenges need to be addressed that also involve concerted efforts amongst stakeholders and MS, in particular:

- **stable / predictable investment conditions**, which for new build means the availability of appropriate financing schemes such as contracts for difference, an effective supply chain and a more appropriate carbon price[6];
- **diversification of nuclear fuel supplies**, in line with the objectives outlined in the Energy Union Communication (see footnote 3) and the European Energy Security Strategy Communication[7];
- availability of a **trained workforce**, including the education and training of scientists, engineers and other skilled workers, e.g. benefitting from a European Credit System for Vocational Education and Training (ECVET) but also ERC, MSCA or ERASMUS+ grants;
- **harmonisation of licensing rules and standards**, including mutual recognition by regulatory authorities, streamlining of design approval and harmonised classification schemes;
- ensuring **synergy between safety, security and safeguards;**
- **standardisation of reactor codes**, enabling a common reference to be established between all actors involved in the design, construction and licensing of nuclear facilities;
- a conducive **socio-political environment**;
- availability of **state-of-the-art research infrastructures** (in particular for materials research, including irradiation facilities, research reactors, hot cells, etc.);
- availability of **all potential EU funding options,** e.g. InnovFin, EFSI (European Fund for Strategic Investments), ESIF (European Structural and Investment Funds) and possible Euratom loans, with established mechanisms such as ESFRI remaining important in the setting-up of collaborations between MS in the development of new research infrastructures.

Regarding the exploitation and development of major research infrastructures, including demonstrator facilities, the European fusion research programme (implemented by EUROfusion) has shown the **effectiveness of joint programming** based on a detailed and resource-loaded roadmap, with clear milestones and deliverables, a risk register, coordinated use of and access to all priority facilities and centralised programme management.

Finally, though the achieving of the above targets will contribute significantly to maintaining **European**

6 For recent information on cost of nuclear electricity, from new-build Generation-III / III+ and LTO Generation-II, refer to, for instance, (i) William D. D'haeseleer *"Synthesis on the Economics of Nuclear Energy*", Study for the European Commission, DG Energy, Contract N° ENER/2012/NUCL/SI2.643067, November 27, 2013 (https://www.mech.kuleuven.be/en/tme/research/energy_environment/Pdf/wpen2013-14.pdf) and (ii) *Energy Technology Reference Indicator projections for 2010-2050* (https://setis.ec.europa.eu/publications/irc-setis- reports/etri-2014).
7 COM(2014)330 final, 25/5/2014 (http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52014DC0330&qid=1407855611566)

technological leadership in a number of areas, in line with the objective stated in the Energy Union Communication, **it will not be easy for Europe to retain leadership in all areas**, especially in view of the increase in nuclear generating capacity in the rest of the world. This underlines the **importance of international cooperation**, especially in areas such as development of advanced and innovative reactors.

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