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**Development, maintenance and implementation of the United Nations Framework Classification for Resources and the United Nations Resource Management System: Nuclear fuel resources**

### **Concept Note – The Role of Nuclear Energy in Sustainable Development: Entry Pathways**

**Prepared by the Expert Group on Resource Management Working Groups on Nuclear Fuel Resources and Sustainable Development Goals Delivery**

#### *Summary*

The scope and concepts of a proposed report “The Role of Nuclear Energy in Sustainable Development: Entry Pathways” are provided in this document. Some countries choose to pursue nuclear power with a view that it can play an important role in their energy mix, while other countries have decided not to depend on nuclear energy because of concerns, including about operating risks and long-term waste storage. The proposed report is intended to complement the report “Redesigning the Uranium Resource Pathway - Application of the United Nations Framework Classification for Resources (UNFC) for Planning and Implementing Sustainable Uranium Projects” that was developed by the Nuclear Fuel Resources Working Group in 2018 and that is due to be published by the United Nations Economic Commission for Europe in 2019. The proposed report will offer guidance to countries that have identified nuclear energy, including small modular reactors, as a potential part of their energy portfolio and show how the utilisation of local/regional uranium resources provide a platform for sustainable development. Information and support are provided for sound policy formulation in interested countries, enabling policy and decision makers to identify locally relevant pathways for the introduction of nuclear energy to support sustainable development if so desired. This process will be supported by the United Nations Resource Management System (UNRMS) that is currently being developed to complement UNFC. Both UNRMS and UNFC are offered as tools to support countries in meeting the Sustainable Development Goals, notably for affordable, clean energy and for climate action.

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## I. Introduction

1. This note provides the concept and scope of the proposed report “The Role of Nuclear Energy in Sustainable Development: Entry Pathways”. The report aims to support sound policy formulation in interested nuclear newcomer countries to define locally relevant pathways for the introduction of nuclear energy to support sustainable development. Attention, in particular, will be given to ‘newcomer’ countries — those that are introducing nuclear power and the deployment of Small Modular Reactors (SMRs). These would complement current large nuclear reactor technologies and other low carbon energy sources to enable integrated clean energy systems of the future. The report will explore potential pathways in the context of numerous “local and regional factors”, including the utilization of domestic uranium resources, which could facilitate nuclear energy and economic development by applying the United Nations Resource Management System (UNRMS).

2. The proposed report will be prepared by members of the Nuclear Fuel Resources and Sustainable Development Goals Delivery Working Groups, both sub-groups of the Expert Group on Resource Management, in collaboration with the International Atomic Energy Agency (IAEA) and the World Nuclear Association (WNA). These contributors have been chosen so that the primary target audience – decision and policy makers in potential nuclear newcomer countries and their advisers – can be confident firstly, in their considerations of nuclear power as part of a sustainable energy mix and, secondly, if a decision in principle is taken, determine how to develop a nuclear power programme predictably and affordably in a way that meets multiple policy objectives.

## II. Rationale for preparing the report

3. The reason for undertaking this report now was the favourable response to the first substantive draft of the companion report “Redesigning the Uranium Resource Pathway - Application of the United Nations Framework Classification for Resources for Planning and Implementing Sustainable Uranium Projects”, currently under review and due for publication by the United Nations Economic Commission for Europe (ECE) later in 2019, received from countries developing their policies in respect of uranium resources and adoption of nuclear energy into their sustainable energy portfolios. In many cases, these countries have been part of the drafting and development process through related meetings, workshops and acting as reviewers. The first report examines new approaches to and reasons for uranium resource recovery and valorisation. This companion report is a natural sequel, focussing on how best to use that resource, whether within the context of a national nuclear energy programme, or perhaps as part of regional cooperation for balanced, sustainable energy provision, or within the context of international initiatives for sustainable development and climate action.

4. The emphasis of the new report is on meeting an unmet need expressed by decision and policy makers in a wide range of countries worldwide currently examining whether they should explore the potential for including nuclear power in the portfolio of options available to them as part of low-carbon energy mix and to support sustainable development. Why and how should they do this? Is there a predictable, affordable entry pathway which does not confront them with so many unknowns and uncertainties they cannot confidently proceed, or force them to become wholly dependent on third parties for turn-key solutions they do not understand?

5. UNRMS supports a refocus on the 2030 Agenda for Sustainable Development and action on climate change, notably Sustainable Development Goals (SDGs) 7 and 13, to put

natural resources on service for society<sup>1</sup>. Among these resources for some Member States are uranium deposits wholly within their own borders or in some cases deposits shared with one or more neighbours. Only when the case for recovering these stocks of uranium moves away from a commodity-based model towards an integrated system for utilization of resources locally or regionally to usher in good social and environmental outcomes does the context for decision making gain clarity. Moreover, that by no means predicated a predetermined decision to proceed down the uranium/nuclear pathway. It simply says that if such a decision is taken, this is a way to implement it in a well-accepted, sustainable way, in combination with all other energetic resources in the national portfolio.

6. The growing interest in nuclear energy is frequently mirrored by the national preference for, or even commitment to, sourcing the necessary uranium fuel from domestic uranium resources such as in Indonesia, Jordan, Nigeria, Philippines, Saudi Arabia and United Republic of Tanzania. Often uranium resources occupy a significant part of the available mineral energy sources (measured in exajoules (EJ)) in several countries. However, the case for uranium as an energetic material of critical value to future sustainable energy provision has not always been understood by policymakers and the public.

7. Greater policy and public support are achieved when connectivity is established between nuclear energy and sustainable development in meeting national socio-economic needs, notably jobs and higher value-added manufacturing and services. Also, when national resources and uranium recovery can be shown to further support nuclear energy development and facilitate economic growth.

### III. Factors to be addressed in the report

8. A number of factors of particular interest are:

#### 1. Technical factors

9. These include Small Modular Reactors (SMRs)<sup>2,3</sup>, especially those that can be:

- (a) designed on the basis of acceptable and well understood risks regarding safety and waste management;
- (b) built and commissioned on a “fast track”, progressive, modular basis (energy output range 25-300Mw);
- (c) integrated with complementary low-carbon energy sources, such as large nuclear power reactors and renewable energy as part of a “hybrid” solution, and;
- (d) capable of being sited on small decentralised energy networks and hence not requiring the very expensive investments in the transmission grid.

#### 2. Economic and financial factors

10. These include asset acquisition strategies and financing instruments that are:

- (a) affordable and appropriate to economies in transition;
- (b) inherently promote and strengthen localisation (e.g. semi-turnkey to enable knowledge and technology transfer as part of the supply contract), and;

<sup>1</sup> Sustainable Development Goals <https://sustainabledevelopment.un.org/sdgs>

<sup>2</sup> Small modular reactors <https://www.iaea.org/topics/small-modular-reactors>

<sup>3</sup> Small Nuclear Power Reactors <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx>

- (c) encourage transboundary cooperation.

### 3. Regulatory and legal factors

11. The regulatory and legal factors will include associated environmental, health, safety and waste management provisions. These factors play a role in establishing a set of entry-level procedures for newcomer countries to nuclear energy programme that are straightforward to implement while also building a robust base of public (stakeholder) trust and confidence.

### 4. Socio-economic development factors

12. These include the establishment of national, and where appropriate regional, nuclear energy competencies, through knowledge transfer, capacity building and context-sensitive policies for localisation. These factors can also include a range of intangible benefits, such as public education and science awareness. These underpin the essential “social licence to operate” (SLO) on which a successful entry programme will depend.

13. Each of the above aspects (and potentially other relevant issues) will be explored in its own right in the report, section by section, and illustrated and supported by decision-trees and checklists that will help to assess potential nuclear energy entry pathways and explain how they may be configured in a given country or region, for immediate benefit.

14. Following this, the entry pathway that leads to nuclear energy implementation, in a manner aligned to the delivery of both the SDGS and the goals of the Paris Agreement on Climate Change, is laid out end-to-end in a dedicated section on the role of nuclear energy in an integrated sustainable energy mix. Critical issues will be addressed, such as:

- (a) energy potential of local resources - biodiversity impacts and land use;
- (b) localisation and industrial development, and;
- (c) decarbonisation objectives.

15. It is anticipated that this entry pathway, based on the overarching UNRMS approach, will show a three-stage solution:

- (a) planning, design, technology selection and capability development for nuclear energy and any fuel cycle facilities.

- (b) low barrier, fast-track entry installation and commissioning of the first “nuclear asset” in the sustainable energy asset portfolio.

- (c) modular growth by:

- (i) extensification (more units of similar size at different locations mentored by the first asset crew) and;

- (ii) intensification (additional concatenated units and/or more substantial assets).

16. Creating value and benefit to the newcomer country, both within but also beyond the nuclear energy domain, will be a primary objective in each stage of development.

## IV. Context

17. The simultaneous adoption of the SDGs and the Paris Agreement on Climate Change in 2015 followed by successive and ever more urgent calls to action from the International Panel on Climate Change (IPCC) (see 2018 Report, Global warming of 1.5°C: An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate

poverty)<sup>4</sup> requires a ground-up review of all energetic resources and low-carbon production options critical for the successful delivery of the SDGs, notably SDGs 7 and 13.

18. Regarding the three essential precepts of the SDGs, People, Planet and Prosperity:

(a) “People”, the objective of this report is to provide decision-makers with the best technical advice on options for, and benefits of, using nuclear power as a critical component in the goal of 2° Celsius (or if possible 1.5° Celsius) low-carbon stabilization pathways. The decisions taken are not just concerned with meeting the immediate objectives of providing safe, affordable and accessible energy for all through the selection of a locally or nationally appropriate portfolio of energy sources and technologies. The decisions are also hinged on communicating the potential advantages. They should as well address the very significant challenges of including nuclear energy in that mix.

The nuclear contribution to de-carbonising energy production is of ever greater significance to public health and safety in urban communities, in which more than 50 per cent of the world's population now live, namely prioritising the urgent need to reduce or eliminate the dominant sources of urban air pollution among the factors in energy technology selection.

(b) Regarding “planet”, the objective is to align the purposes of taking this redesigned pathway to nuclear power as part of national and international contributions to this Agenda 2030:

“We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.”

The report will show how well-suited the combination of nuclear power coupled with uranium sourced locally/nationally is as part of a platform for innovative engagement with the challenge of integrating natural resource management with clean energy production and associated climate action.

(c) With regard to increased “prosperity”, much will depend in the coming few years on decision makers understanding better why nuclear power using uranium as a potentially indefinite fuel resource matters so much to the future prosperity and environmental health of the planet. The discourse needs to consider why there is so much to be gained from redesigning the nuclear power entry and the three-stage development pathway both in tangible and intangible terms.

## V. Selected Case Studies

19. Short case studies that document how countries are engaging with new pathways or are turning to SMRs as a means of complementing other investments in sustainable energy are integral to this report. These will set out lessons learned, methods of engaging with stakeholders and examples of how the SLO has been obtained and maintained, or perhaps re-negotiated according to changes in attitudes and perceptions.

20. An initial list of identified countries includes: Argentina, Canada, China, India, Indonesia, Jordan, Nigeria, Philippines, Russian Federation, Saudi Arabia, Tanzania, United Kingdom, United States of America and others as appropriate.

<sup>4</sup> IPCC Report 2018, [https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15\\_SPM\\_High\\_Res.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_High_Res.pdf)

## **VI. Timeline for drafting, review, public comment and publication**

21. The following drafting, review, public comment and publication timeline is foreseen. A number of steps have already been completed that have resulted in the development of this Concept Note:

(a) initial discussion between ECE, the International Atomic Energy Agency (IAEA) and the World Nuclear Association (WNA) at the Nuclear Energy for Sustainable Development Session at the Ninth International Forum on Energy for Sustainable Development, 12-15 November 2018, Kyiv, Ukraine;

(b) in principle discussion by ECE and WNA, 4 December 2018;

(c) development of meeting notes and Concept Paper by WNA, IAEA, ECE and Aleff Group at meeting on 22 January 2019. Drafting and review complete by 23 January 2019 for submission to ECE;

(d) development of a zero-draft report for review at the tenth session of the Expert Group on Resource Management, Geneva, Switzerland, 29 April – 3 May 2019;

(e) completion of a substantive draft for the proposed SMR Meeting, Arusha, Tanzania, June/July 2019;

(f) draft issued for public consultation by ECE: September – October 2019;

(g) workshop at the Tenth International Forum on Energy for Sustainable Development, Bangkok, Thailand, 7-8 October 2019;

(h) completion and publication: December 2019.

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