CASTLETOWN LAW

SMRs: FUTURE REGULATION

PART II

“The next steps in SMR development, will require more extensive international collaboration and governmental support to build a global and robust SMR market.”

OECD, NEA 2021

Contents

Castletown Law is a specialist Energy and Infrastructure practice with a particular focus on the nuclear sector. The law practice is based in the UK but operates internationally, being designed to operate as a digital practice since it was first established. The ethos behind Castletown Law was to offer clients a dedicated service from senior lawyers in their field and to accompany the client along their own journey in the projects in which they chose to involve us.

We have been involved in large nuclear projects in the UK and internationally, in the regulatory and commercial areas. We have a deep understanding of the challenges faced by all involved in developing nuclear projects. We have been following the progress of Small Modular Reactor designs both in the UK and internationally and wherever possible making the case for their full support (politically, economically and from a regulatory standpoint). We are currently advising Small Modular Reactor Developers wishing to manufacture and deploy their technologies in the UK and internationally.

In the following pages in this Part II we will look at why regulation of the current process for nuclear is so entrenched, what can be done to resolve this issue, and what a new fit-for-purpose regulatory and licensing regime might look like.

We hope that by the end of this Part II readers will have come away with the understanding that a new look regulatory approach is warranted. This should ensure that SMRs achieve their full potential and take their rightful place in a decarbonised global power generation market for the benefit of all.

Specialists in Energy and Infrastructure

Andrew Renton
Principal

Simon Stuttaford
Principal

As we are writing this Foreword to Part II of our guide on SMRs, COP 26 is reaching its conclusion and the world is acutely aware of the need to meet the ambitious decarbonisation targets set for 2050. There also seems to be a broader realisation that these targets are only achievable with a major contribution from a secure, affordable and “firm” power source such as nuclear energy.

The objective behind the second part of this guide is to show that, if we are to see SMRs reach their full potential, a new approach to the application of regulatory consenting is required with buy-in and adoption at the international level.

We have suggested some core principles that need to be enshrined and have proposed some key features that we would wish to see included within Model Regulations. Overall we are not proposing a material change from the existing international nuclear regulatory framework but rather a revised approach and a decoupling of technical considerations from the regulatory/licensing process.

If the will is there, we are firmly of the view that SMRs can play a major role in the future energy mix."

Revised Regulatory Approach

The objective of Part II of our guide – SMRs: Future Regulation, is to explain and propose a revised regulatory approach.

To facilitate the use of SMRs, the goal for legal regulation must be to provide a clear structure which is capable of being applied generically in any jurisdiction. The research referenced in Part I indicates that integrating technical criteria into the legal regulatory structure does not aid clarity and therefore, in this Part II, we consider the regulatory approach from a non-technical perspective.

We also seek to remove the silo regulatory mind set which in our view seems to be based on historic considerations which no longer need to apply.

We fully support and endorse the previous work of the IAEA in setting the parameters for a legislative framework of nuclear law for states looking to develop their own national nuclear legal infrastructures. We see no deviation from the existing core principles of nuclear law. [1] We would however emphasise a change in approach in relation to the "responsibility principle" (see further below) and we would wish to see an even greater emphasis placed on the "international co-operation principle". Our proposed approach maintains the existing required liability management but with more flexibility, allowing for approvals between states and for the deployment of support among states.

In this regard it is helpful to look at the technical report of the Joint Research Centre (JRC) of the European Commission as well as the advisory reports of both the Scientific Committee on Health, Environmental and Emerging Risks (SCHEER) and the Group of Experts on radiation protection and waste management under Article 31 of the Euratom Treaty.

All reports broadly agree (albeit using bespoke language) that nuclear energy does not represent significant harm to human health or to the environment, or any of the Taxonomy objectives - provided that the associated industrial activities satisfy appropriate technical screening criteria and provided that sufficiently robust regulatory controls are in place.

The JRC went so far as to say that protection of the environment and human health are achieved if a licence has been issued by a regulatory authority. The language used by SCHEER was that nuclear energy "does less harm" in many respects than other energy technology and "does not represent unavertable harm".

Our view is that economic stability depends on energy driven economies being able to sustain a stable population growth and development. Deployment of nuclear power is recognised as essential and delaying unnecessarily may lead to a growth in civil unrest, continuing diplomatic and political tensions and strained relationships in many aspects of national and international relations. Finding a way to provide safe, secure and low carbon power generation on an interdependent mutual basis is likely to drive harmonisation and cooperation among those participating.

In Part I we looked at the background and current status of the licensing and consenting regimes. In our view, the logical conclusion is that the correct approach would allow for the acceleration of a regulatory structure within which governments, developers and vendors can achieve an acceptable degree of certainty for economic investment into SMRs as part of their decarbonisation objectives.

In this Part II we will look at why regulation of the process is so entrenched, what can be done to resolve this issue, and what features a new fit-for-purpose regulatory and licensing regime might contain.

We do recognise that there are some legitimate concerns that SMRs need to be able to answer, in much the same way that any potential new technology faces, albeit in the case of SMRs the "nuclear" angle is a differentiator. We will flag up those potential concerns and address them in the text that follows. We argue for a requirement for all states to sign up to the International Atomic Energy Agency (IAEA) standards and conventions and for a stronger enforcement role for the IAEA. We also draw on the work of the Organisation for Economic Co-Operation and Development (OECD)`s Nuclear Energy Agency (NEA) and its most recent report "Small Modular Reactors: Challenges and Opportunities" in 2021 in which they state that to see SMR development "…will require more extensive international collaboration and governmental support in all these interconnected dimensions to build a global and robust SMR market." It is also important to ensure that Countries of Origin are appropriately incentivised and compensated to share their know how and support.

[1] The safety principle; the security principle; the responsibility principle; the permission principle; the continuous control principle; the compensation principle; the sustainable development principle; the compliance principle; the independence principle; the transparency principle; the international co-operation principle.

REGULATORY & LICENSING PROCESS

National Jurisdiction Requirements

United Nations Headquarters in New York City

There are some basic premises we consider necessary to bring the regulatory and licensing process of SMRs to a more uniform and universal approach.

- Our suggested approach utilising the outline below is as follows: Each nation that wishes to participate in the use of nuclear power for electricity generation will retain the current UN liability as the host nation according to the UN Treaties and Conventions. This is in respect of power generation only. Other uses of nuclear materials, whether for medical, research, or scientific reasons are not covered in our proposed approach.
- Each nation may adopt an approach of cooperation under the relevant UN Treaties and Conventions, whereby the relevant signatories may agree a bilateral agreement for support in the development of nuclear power generation. This is a known process undertaken on a number of occasions, but we envisage that it expands beyond current "nuclear" nations to include aspiring nations.
- The relevant bilateral agreement should provide sufficient resource and competence to allow the host nations to meet the relevant criteria under the IAEA 19 milestone requirements. Subject to IAEA acceptance, the host nation may begin a process for development of nuclear power generation with a milestone achievement structure based on the bilateral treaty approval. The result being that within a specified time, from commencement of the physical development and operation of a nuclear power plant, the relevant IAEA requirements are met. The content of any bilateral treaty will depend on intergovernmental agreements, but it could extend to technical, commercial, educational, and financial support.
- The host nation must have its own independent regulatory body before commencement of construction of a nuclear power plant. This regulatory body should be staffed by competent and experienced resource, which may be provided under the bilateral agreement or contracted in. The importance of the independent regulatory body reflects the national liability criteria and the arrangement recognises the need to facilitate the roles where indigenous capability is not available and may take some years to develop.
- An independent national regulatory body may adopt such approvals, consents and licensing conditions applied in an already established "nuclear" country. Those countries should be listed in the schedule to the regulations. The Host Country will have no rights of claim against the "nuclear" country whose approvals and consents are adopted, unless a bilateral treaty provides for this, or the IAEA requires it as part of the national consenting process of the Host Country.
- In essence, the current international requirements for nuclear power generation development will remain, but with some additionality to enable adoption and reliance on a "nuclear" country's prior determinations, in compliance with IAEA standards. This is likely to be a critical feature of how SMR technology investment is looked at, as the ability to deploy internationally is a major factor.
- It is recognised that although in principle the existing conventions and treaties ought to apply to SMRs, that might not always be the case. All signatories will need to agree to effect any amendments to the existing UN Treaties and Conventions and to adopt those amendments into their own national legislation.

Obligations on Vendor Developers

The criteria which we suggest apply here are consistent with the requirements of the International Conventions and site operator liability regimes. This means that once approval of technology is achieved, and a selected site is approved within the IAEA requirements, then the risk for delivery, construction, operation and maintenance of the SMR sits with the developer.

A key aspect of the development cycle is the ability to fund the project. In addition, it is important that the Host Country (whether by government or industry) can give a satisfactory undertaking to purchase the power generated, aligned with export credit facilities and potential limited recourse finance alternatives. If that is the case, then there is reason to believe that the level of cost of a single SMR unit of say $5Bn, can be achieved and secured for a large majority of those countries which are interested. We also take into account that in some cases it may be part of a bilateral agreement for an intergovernmental loan facility under the Energy Charter Treaty.

We anticipate certain criteria being regulated in respect of vendor/developer participation in countries other than their country of domicile.

- The vendor/developer will be required by law to take responsibility for the operation, maintenance, management, and security of a facility. This liability may be capped and, based on the Paris/Brussels criteria (as amended), a minimum liability of €700,000,000 may apply. This may be an insurable risk as in other industries liabilities of this level are covered. There may be a joint, government/sponsor/developer and operator component to the insurance and all risks policies. See for example in this respect: for large cargo shipping the ability to cover through P&I Club and ITPOF type provisions; in air carriage, see the catastrophic event insurance provisions. In each case, these are at levels of more than $1Bn. We see the resolution of this position perhaps with Country of Origin (COO) state indemnity backing, as being a key step in making the proposed arrangements work.
- Developers and vendors may be asked to provide financial and performance bonds, which can be accommodated within the regulations. The suggestion is that these should be at levels commensurate to the risk of exposure to loss arising from non-performance rather than absolute default. These forms of security are not unusual in large projects, but we question in the current circumstances their usefulness. Our recommendation is for the regulations to specify the percentage which can be asked for as a performance bond in respect of delivery of the overall project.
- Developers and vendors or at least one of them must be sufficiently recognised and experienced in the nuclear sector and they must be experts in the design and operation of the proposed technology. This means in almost every case the developer/operator will in the first instance be an entity led by the technology provider. The criteria for the level of experience may be flexible, as will the relationship arrangements within the sponsor, but reliance on knowledge, expertise, capability and capacity are essential. Those criteria will be stated as mandatory minimum requirements in the regulations, to allow developers to operate in third party countries.
- As the concept of SMRs is to manufacture offsite and assemble onsite, the regulations will need three essential components. The first will be the manufacturing of the nuclear component of the power plant, its delivery, security, and protection. The second is the manufacture, delivery and assembly of the non-nuclear part of the power plant. The third component is the fuelling and refuelling cycles which we deal with below.
- Offsite modular manufacture is not a new concept but in nuclear power stations it brings particular challenges. Nuclear systems have extreme levels of detail in design and manufacture and precision manufacturing is measured in microns. The method and regulation of manufacture will be for the COO, but the vendor/developer must have a quality assurance programme in place. This would cover the transportation, delivery, assembly, testing and commissioning which has to meet the required standards under the licensed consents and specifications.
- Regulations will need to provide for COO regulation sign off on manufacture, transportation and post transportation inspection and checking. Other essential aspects to be regulated are onsite capability and competence during assembly. Pre-commissioning inspection and testing and inspection reporting are also essential. The requirements for these will be mandatory and sign off to a standard acceptable to the IAEA or their nominated inspection body, will be applied in all circumstances.
- Criteria for the inspection, assembly and commissioning testing regime will need to be developed and examples can be sought from other industries, such as shipping and aircraft.

Manufacturing of SMRs

1. Manufacturing facilities must meet the relevant safety and security requirements. This may not require consenting for nuclear materials. This is because, if the operational assemblies are within nuclear licensed sites (which would be recommended) the licensing of nuclear materials already in place will apply to those sites.
2. The manufacturing facilities will require very careful and specific design and specification input. The manufacturing tolerances will be measured in microns in some cases and the facilities must accommodate that manufacturing ability.
3. The manufacturing process will be open to inspection and certification. Third party oversight by competent independent inspectors will be required.
4. Pre-shipping inspection and certification and onsite inspection and verification will be part of the manufacturing process.

Not all designs will be appropriate for a unitised manufacturing process. Where the manufacturing and site assembly do not lend themselves to a modular manufacturing process, the question of whether the power plant is both small and modular should be assessed.

If what is being offered is a small nuclear power plant built on site under similar propositions as currently apply to large nuclear power plants, then this will not be an SMR but rather just a small nuclear power plant. The efficiencies of scale and product line manufacturing will not apply and so this category must be distinguished.

In our view having a design which can be manufactured in modules and assembled on site within efficient time frames and with low workforce headcount (as compared to current approaches) will be a clear distinguishing feature of SMRs. Another key factor is the rigidity of the design which means that an SMR delivered to Site X will be identical to an SMR delivered to Site Y.

Site Assembly of SMRs

This is potentially a more challenging area. Firstly, with the growing and wider interest in SMRs it will be important to ensure that appropriate standards are maintained. In this respect our recommendation is that the IAEA standards and conventions are applied to ensure that before export is permitted (and separate from any regulatory approval process) any COO “sponsoring” export of an SMR product is able to fully comply with all relevant IAEA requirements and standards. The Host Country would then similarly be able to meet that standard so long as it has IAEA compliant legislation and standards.

In line with the manufacturing approach, a compliant modular design will minimise on site assembly, construction and engineering risks. It will cut down significantly on current construction times and result in major cost savings.

We see onsite assembly being the exclusive responsibility of the vendor/developer working with compliant local jurisdiction requirements but subject also to oversight by the COO regulatory and independent inspection regime.

This will ensure the quality and safety standards are maintained. Many of the current site selection criteria will be considered but for SMRs the site footprint will likely be much smaller, because of the failsafe design approaches inherent with SMRs, and hence the approach to site selection will be reduced in context, time and cost.

We see some primary requirements applying under a regulated regime which will enable the delivery both in the COO and internationally.

1. The site selection must be compliant with the appropriate standards and subject to independent third-party verification under IAEA auspices.
2. Licensing of the site for both construction and operation should be unified in one process. The Host Country should be able to adopt a protocol structure for this within its regulatory structure to enable control to be with the relevant licensed operator and site owner.
3. The vendor/developer must be able to have control of the site, the access to site, the security and delivery of the modular construction, all of which will be subject to independent verification and potentially COO cooperation with the Host Country regulator.
4. Post construction and commissioning processes should be subject to a verification audit and technical and legal opinions on the process. These will reference the application of the relevant regulatory requirements, the contractual compliance and the quality application and readiness for first fuelling and compliance with construction standards. In other words, a final review of readiness to accept fuel and begin start up.
5. First fuel and start up will progress on an incremental basis with the failsafe shut down mechanisms applying on the instruction of the appointed independent inspector, throughout and for a minimum of 1 year post start up.

Nuclear Material, Fuel and Waste

The key to the suggested approach here is a different way of achieving what is required for nuclear fuel and material management and transportation.

Based on the COO manufacturing approach for secure and highly controlled systems, nuclear regulatory requirements remain at the levels required. However, where demonstration plant and FOAK power plants are delivered in the COO, the engineering assembly of the plants can already be demonstrated in a secure and compliant way.

Management and transportation of nuclear fuel will be the same for all types of fuel. The method of installation of the fuel to the plant and the refuelling will be an essential feature of the safety case management for the fuel cycle.

As the nuclear obligations are based on sovereign undertakings and liability, this aspect of the overall regulation must adhere to the accepted and current regulatory approaches.

1. The nature and origin of the fuel must be clear and its stability for transportation assured. In some SMRs this is achieved by the canister or plug-in capsule approach.
2. The receiving site power station must be fully compliant and certified as ready for the stage of first fuel receipt before transportation of the fuel commences.
3. Cooperation between the COO regulators, the developer`s technical team, independent inspectors and Host Country regulatory bodies will be critical, and we see this as a primary area of focus in delivering a workable universal regime for SMR delivery.
4. Refuelling and repatriation of spent fuel to the COO will be an essential obligation here. This will be the default position unless a derogation acceptable to the international authorities is agreed.

Operation

We envisage normal operational standards of safety and security applying throughout the operating period. We envisage that aggregation of additional units on one site is achievable based on the pre-preparedness of the site in terms of serviced civil sites being completed before the intended final number of units. The subsequent modular construction should then be able to be progressed while prior units are in operation.

Control room of nuclear power plant

A FRAMEWORK FOR MODEL REGULATIONS

Objectives

What is suggested here is an outline for discussion on what may be achieved by cooperation among the multiple stakeholders and interested parties.

1. Retain no less than the current requirement for safety and security as directed by the IAEA.
2. Focus on efforts to improve opportunities for harmonisation at the pre-licensing stage and specifically design approval which in itself could assist in the down-selection process of SMR designs. (To note that the concept of standardised reactor designs does not mean that units have to be identical but all units should at least share the same architecture and specifications.)
3. Work towards efforts to achieve a greater harmonisation of licensing regimes, potentially by starting off with the harmonisation of specific categories of SMRs (starting with all LWR designs for example).
4. Decouple the process of regulation from the technical compliance issues which are dealt with in implementation of the regulations.
5. Simplify the structure, wording and regulatory approach so that it is understandable as being applicable in all jurisdictions.
6. Use a top down structure so all signatories at top level may adopt all the provisions below.
7. Ensure a capable and competent designer, operator and licence holder.
8. Ensure adequate public engagement via stakeholder forums.

Core Principles of the Proposed SMR Agreement

1. Ensuring compliance with appropriate IAEA standards for the safe management of SMRs.
2. A party to this agreement must also be a signatory party to the Convention on Nuclear Safety issued for signature on 20 September 1994 and adopted by the IAEA.
3. A party adopting the provisions of this agreement re-affirms and accepts the necessity for a high level of regulated safety and security for civil nuclear applications.
4. Recognising the need for an effective culture for nuclear safety at all levels.
5. Recognising the need for regulation of activity by government, industries and businesses to facilitate development of civil nuclear power generation.
6. Ensuring suitable public engagement.
7. Acknowledging that nuclear incidents and radiation leaks have the potential for transboundary impacts.
8. Acknowledging the need for an effective and internationally cooperative approach to nuclear waste management.

Implementation of Proposed Model Regulations

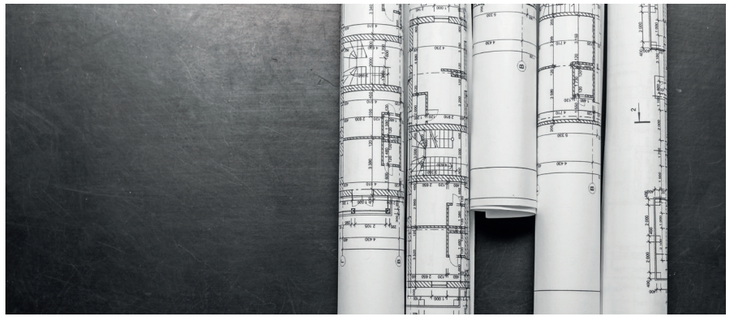
1. Adopting the proposed required Model Regulations into national law will facilitate cooperation in the delivery of new nuclear power generation in compliance with the existing laws, conventions and regulations.
2. Where an existing convention, law or regulation is in conflict with the required Model Regulations, the existing convention, law or regulation will require modification.
3. The required Model Regulations may be adopted by a Host Country as the minimum compliant regulatory standards to be applied.
4. The required Model Regulations will only be accepted as effective in legislation once they have passed all necessary regulatory implementation stages under existing state laws for public administration.
5. The legislation will provide effective means for control, implementation and enforcement of the Model Regulations. Such measures will be compliant with the obligation in the 1994 Convention to have an independent body entrusted with the control, implementation and enforcement of regulation.
6. Only when a Host Country has demonstrated the existence of such regulations, including relevant enforcement powers, via an IAEA inspection visit, will approval be granted for deployment and construction and operation in that country.
7. The legislation will provide that, only when a regulatory authority is satisfied that the operator of a proposed licensed nuclear site has the ability to comply with the required Model Regulations, will a licence be granted.
8. The legislation will provide that, financial resources are available for the delivery of the proposed development, its maintenance, operation, closure, decommissioning, deconstruction and for the storage of any resulting waste.

Key Features of Proposed Regulations

SITING

1. A proposed site for a nuclear power generation plant will only be permitted to be used for that purpose once a licence for that specific site and purpose has been granted by the established Host Country Regulator.
2. A licence to use a site for the purpose of nuclear power generation shall be evaluated and approved.
3. Approval of a site shall consider at least: safety; lifetime of plant; impacts on society and individuals; environment and ecology; geology and terrain.
4. Approval of a site shall specify any mandatory mitigations on impacts to the considerations in item 3 above.
5. Approval of a site may include any requirements for dealing with any radiological emergency arising from the presence of the nuclear power generation plant.
6. Approval/Granting of a site licence shall not be dependent on the approval of the technology to be deployed.
7. The approval process may require the applicant after approval in principle, to undertake community and stakeholder group reviews before completing any approval process.
8. Once approved, the site licence holder shall take all steps which may be reasonably necessary or stipulated in the licence to ensure the safety and security of the site and shall do so as soon as reasonably practicable after the date on which the licence is granted.

Key Features of Proposed Regulations



DESIGN

1. The design of any proposed nuclear power generation plant including SMRs must meet the requirement of defence in depth but with an emphasis on the "graded approach" against the risk of radiological incident. (The IAEA's SMR Regulators Forum concluded that the defence in depth concept is valid for SMRs).
2. Where a design has been approved for construction in a signatory country to the Convention on Nuclear Safety by an independent regulator established within the IAEA guidelines, another signatory party (the adopting party) may adopt the approval given, subject to any conditions which may be imposed at the discretion of the approving authority.
3. Where a design has not been approved in another signatory country, or the approval in a signatory country is considered by the proposed adopting country to be inadequate, the design must be approved by the relevant independent authority by reference to existing operation, testing, analysis, or relevant research and development.
4. In any case, the authority (ie the Host Country regulator) shall satisfy itself that the design is safe and incorporates all features required for stable, reliable and manageable operation of the nuclear power generation plant.
5. Approval of the design of the SMR will consider the suitability of the design for the location at which it is to be deployed.
6. Approval of the design of the SMR will not be dependent on considerations of construction or assembly of the nuclear power generation plant.

CONSTRUCTION

1. The licence to use the site as a licensed site for nuclear power generation shall contain relevant conditions which ensure the construction is carried out to required standards of quality and safety.
2. A continuing role for the vendor/developer on a contractual basis is expected.
3. All personnel engaged to carry out work, services, inspections or otherwise and who are involved in the construction of the plant will be suitably qualified in their field of skill or expertise.
4. The authority granting the licence for the site will issue a written consent to the site licence holder as soon as it is satisfied as to the safety, security, quality, project management, construction management and relevant oversight by independent inspectors is in place.
5. The authority granting approval of the design will be entitled to carry out periodic or permanent inspection of the site works being undertaken or instruct an independent inspector to carry out that role out on its behalf.
6. The authority granting approval of the design may require staged hold points in the construction to allow for any specified testing, inspection or other regulatory compliance steps to be undertaken.
7. The inspection by the authority approving the design will cover only those parts of the nuclear power generation plant which have nuclear material interface[1]. Where no nuclear interface applies industry standard construction requirements and quality will apply.
8. The authority granting the licence for the site and the authority granting the approval of the design, will satisfy themselves based on credible audited evidence supported by an independent report on capability, quality and capacity, as to the ability of the site licence holder or of those contracted to carry out any part of the construction.
9. The site licence holder will require and retain the personal details and professional qualifications of personnel working on the site, their relevant work credentials, education and of every person who is granted access to the site.
10. The site licence holder will ensure a record is kept of every worker's activities for every working day in not less than 15-minute segments for the duration of the work being carried out.
11. The site licence holder will obtain and retain the manufacturing origin, path and quality assurance records for every component included in the construction of the plant.
12. Before commencing construction, the site licence holder will put in place a means of satisfying the site licence authority that the plant being constructed can be decommissioned and deconstructed and the site remediated and returned to an approved use.

[1]A nuclear interface is where the design is for containment of nuclear material or where it has a nuclear material control function

Key Features of Proposed Regulations

COMMISSIONING OF SMRS

1. The person holding the licence for the site will be responsible for the operation of the nuclear power generation plant on the site.
2. As part of the commissioning process each functional part of the safety and security system will be tested alongside each operational function of the plant independently and jointly.
3. The commissioning process will include failsafe steps for immediate safe and secure shut down if required during commissioning tests.
4. The authority approving the design will ensure that such tests are carried out before and after importation of nuclear material to the nuclear power generation plant.
5. The tests to be carried out will be specified by the site licence holder and approved by the relevant authorities for site licence and design.
6. The tests may be carried out by an independent inspector on behalf of the authorities and any relevant authority including the authority granting approval to the design which has been adopted. Any other nuclear authority including the IAEA may have inspectors attend the commissioning.
7. The authority granting the approval which is adopted and the IAEA may attend on site at any time during construction, commissioning or operating to verify the compliant operation of the plant.
8. A party attending the commissioning tests will be entitled to receive a full set of documentation relating to the commissioning and the operation of the plant. That documentation will set out the proposed operation, maintenance, inspection testing and systems management procedures for the plant. It will also include all relevant safety, emergency procedure and security information relating to the plant.
9. Any inspection by or on behalf of a third party will not relieve the licensed site operator of responsibility for compliance with all required construction and commissioning requirements and quality standards.
10. Each party attending the commissioning of the plant in whole or in part will prepare a written report on the relevant part of the commissioning which they attended, inspected or visited. A verified copy of that written report will be given to each of the site licence authority, the design approval authority and if requested to the authority granting first design and approval and the IAEA.
11. The design approval authority, in consultation with the site licence authority, will seek any inputs from other agencies or authorities as it deems appropriate in relation to the commissioning undertaken.
12. Once satisfied that the commissioning has been carried out correctly and that the plant may begin operations safely and securely the design approval authority will issue a certificate of approved commissioning.

OPERATION OF SMRs

1. The site licence holder shall not allow any operation of the nuclear power generation plant on the licensed site except as may be approved in a commissioning plan before the certificate of approved commissioning has been issued by the design approval authority.
2. Prior to commencing any operation, the site licence holder will establish a safety committee of relevantly qualified and experienced independent individuals to act as an advisory and oversight board to the site licence holder and any operator of the plant.
3. On receipt of the certificate of approved commissioning, the site licence holder will issue notices to the site licence authority, and the design approval authority of the date on which the operational start-up of the plant is to commence.
4. Start-up operation will commence on the notified date. and the site licence holder (or its operator) will demonstrate the operation of the plant within the operational limits and conditions of the design of the plant or any modification made to those in the certificate of approved commissioning.
5. The site licence holder will ensure a record is maintained of all non-standard operational occurrences or incidents. Such records will be submitted to the design approval authority on at least a weekly basis.
6. The site licence holder will maintain a record at all times of the support available in the plant relating to health, safety and security.
7. Operational analysis programmes will be run in the control/instrumentation system on a constant watch basis to alert any non-standard performance in the plant.
8. All non-standard alert notifications will be analysed and dealt with, by adopting appropriate modifications subject to the approval of such modifications by the design approval authority.

Key Features of Proposed Regulations

Nuclear Fuel Cask in Transportation

TRANSPORTATION AND MANAGEMENT OF NUCLEAR MATERIAL

1. Transportation of nuclear material to and from the licensed site will be carried out under contracts issued by the site licence holder to an authorised and licensed carrier of nuclear material.
2. Handling and control of nuclear material being moved within the licensed site will only be done by experienced personnel with training in the safety and security required in handling nuclear material.
3. The site licence holder will in its contract with the supplier or handler or transporter of nuclear materials, ensure that such person is authorised to carry out the required activity in the country where the material is coming from and in all countries through which the material might pass and in the country of the location of the licensed site.
4. The site licence holder will satisfy itself before concluding a contract for transportation of nuclear material that the transporter carries the correct level of licence to handle the material and the level of insurance which may be required during the in-transit period of the transport.
5. The supplier of the nuclear material or their transport contractor will retain joint risk and liability with the consigning site licence holder in the transported material until it is accepted by the site licence holder at the recipient licensed site.

Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982

Article 4

In the case of carriage of nuclear substances, including storage incidental thereto, without prejudice to Article 2:

(a) The operator of a nuclear installation shall be liable, in accordance with this Convention, for damage upon proof that it was caused by a nuclear incident outside that installation and involving nuclear substances in the course of carriage therefrom, only if the incident occurs:

(i) before liability with regard to nuclear incidents involving the nuclear substances has been assumed, pursuant to the express terms of a contract in writing, by the operator of another nuclear installation;

(ii) in the absence of such express terms, before the operator of another nuclear installation has taken charge of the nuclear substances; or

(iii) where the nuclear substances are intended to be used in a reactor comprised in a means of transport, before the person duly authorized to operate that reactor has taken charge of the nuclear substances; but

(iv) where the nuclear substances have been sent to a person within the territory of a non-Contracting State, before they have been unloaded from the means of transport by which they have arrived in the territory of that non-Contracting State.

(b) The operator of a nuclear installation shall be liable, in accordance with this Convention, for damage upon proof that it was caused by a nuclear incident outside that installation and involving nuclear substances in the course of carriage thereto, only if the incident occurs:

(i) after liability with regard to nuclear incidents involving the nuclear substances has been assumed by him, pursuant to the express terms of a contract in writing, from the operator of another nuclear installation;

(ii) in the absence of such express terms, after he has taken charge of the nuclear substances; or

(iii) after he has taken charge of the nuclear substances from a person operating a reactor comprised in a means of transport; but

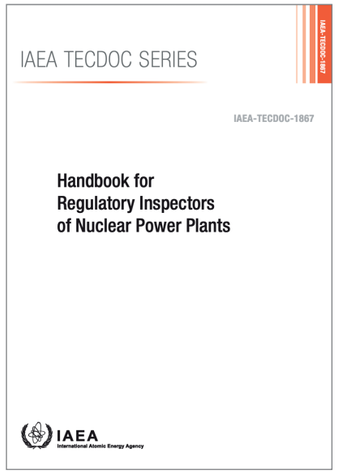
(iv) where the nuclear substances have, with the written consent of the operator, been sent from a person within the territory of a non-Contracting State, after they have been loaded on the means of transport by which they are to be carried from the territory of that State.

(c) ...

(d) A Contracting Party may provide by legislation that, under such terms as may be contained therein and upon fulfilment of the requirements of Article 10(a), a carrier may, at his request and with the consent of an operator of a nuclear installation situated in its territory, by decision of the competent public authority, be liable in accordance with this Convention in place of that operator. In such case for all the purposes of this Convention the carrier shall be considered, in respect of nuclear incidents occurring in the course of carriage of nuclear substances, as an operator of a nuclear installation on the territory of the Contracting Party whose legislation so provides.

6. Waste nuclear material of any kind to be stored on site must have its category clearly identified and it is to be stored in approved storage facilities.
7. Spent fuel being removed from the licensed site must be returned to the fuel provider for reprocessing or treatment.
8. Waste movements and waste storage are to be fully identified according to an Inventory, subject to inspection by the regulatory authority and also by the IAEA.

Key Features of Proposed Regulations



SAFETY INSPECTIONS AND RECORDS

1. Any relevant authority may, when accompanied by the design approval authority or in pre-commissioning the site licence authority, attend at site on giving no less than 24 hours' notice and carry out a periodic or ad hoc inspection of any part of the nuclear power generation plant and the licensed site.
2. Introduce a mechanism whereby local communities have the right to request a relevant authority to carry out an inspection on presentation of reasonable grounds.
3. A person carrying out such an inspection will prepare a written report on the inspection. Once prepared, the report will be shared as a proposed final report with the site licence holder and the operator. Each party has the right to make any comments on the report within 5 working days. The author of the report will give reasonable and balanced consideration to any points made by the site licence holder or the operator and revise the report accordingly.
4. Once the report is finalised, the author will provide a copy to the relevant authorities and any other authority or regulatory body to whom it considers appropriate to receive the report. A copy will also be given to the site licence holder as soon as practicable after the report is finalised.
5. The site licence holder will maintain detailed and accurate records of all aspects of the operation of the plant. These records will include revisions to operation or management of the plant and will be maintained on a real time basis.
6. All safety information, including all incident of any materiality will be logged on a real time basis on a digital format.
7. Records of all persons entering and leaving the plant and all equipment brought into or out of the plant will be logged and where appropriate, photographs will be taken and kept.
8. All records relating to the plant will be maintained in a secure format for the lifetime of the plant and on decommissioning deposited in a secure and safe storage facility, with access being granted to the relevant site licence and design approval authorities.

EMERGENCY PLANNING

1. A site licence holder must have in place on-site and off-site emergency plans (in conjunction with the relevant state or local authorities) that cover the actions to be taken in the event of an emergency, in accordance with both the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.
2. Emergency plans must be prepared and approved for any facility that could give rise to a need for emergency intervention.
3. Emergency intervention organisations need to be involved in the preparation of emergency plans.
4. Emergency plans must take into account the results of any accident analyses and any lessons learned from operating experience and accidents that have occurred in connection with similar activities.
5. Emergency plans have to be periodically reviewed and updated.
6. Suitable training must be put in place for personnel involved in implementing emergency plans and those plans must be tested regularly.
7. Prior information must be made available to the public who could reasonably be expected to be affected by an accident.
8. There must be an appropriate allocation of responsibilities for the notification of relevant authorities and for initiating intervention.
9. There must be suitable identification of operating and other conditions that could lead to a need for intervention.
10. There must be stated intervention levels for protective actions.
11. Procedures must be in place including communication arrangements, for contacting emergency intervention organisations and for obtaining assistance from fire-fighting, medical, police and other services etc.
12. There must be a suitable description of the methodology and instrumentation for assessing the accident and its consequences on and off site.
13. There must be suitable public information arrangements in place in the event of an accident including the criteria for terminating such protective action.

Key Features of Proposed Regulations

REGISTRATION AND REPORTING OF OCCURENCES

1. A party will require any site licence holder to put in place and maintain such training and awareness sessions for all persons who may enter the licensed site and will ensure that such persons are aware of the required safety and security procedures applicable at the plant.
2. All persons who receive such training will register their attendance by giving a written acknowledgment of having attended and understood the training given.
3. The training given will include awareness of the requirements of the 1986 Convention on the early Reporting of a Nuclear accident including: - the legal requirement for reporting of any incident or accident from which a release of radioactive material occurs and such persons will be required to report any incident or accident – whether or not such release may result in an international transboundary release.
4. The site licence holder will ensure that all such reports are maintained and notified with the requisite degree of urgency to the relevant site licence authority and the design approval authority.

DECOMMSSIONING AND DECONSTRUCTION

1. Not less than 12 calendar months before the site licence holder intends to cease power production operations at the plant, it will notify the site licence authority and the design approval authority of the date when it is intended to cease operations.
2. Within 10 working days of the date on which the intention to cease operations is notified, the site licence holder will provide to each of the site licence authority, the design approval authority and any party who was a consultee in the site licensing approval process or the design approval process, a revised plan for cessation of operations and decommissioning of the plant.
3. Within 3 calendar months of the date on which the revised decommissioning plan is submitted, the design approval authority will collate the relevant authorities' responses on the revised decommissioning plan and will respond to the site licence holder with any reasonably required amendments to the revised decommissioning plan.
4. Within 1 calendar month of the site licence holder receiving the comments from the relevant authorities, being at least the design approval authority and the site licence authority, and any authority whose response is subject to comment by the site licence holder, all parties will meet and resolve the final version of the revised decommissioning plan.
5. In the event that an agreement cannot be reached, the design approval authority will in its absolute discretion decide on the reasonable and necessary amendments to the decommissioning plan.
6. The decommissioning plan will then be issued by the site licence holder to all relevant parties as the final approved decommissioning plan.
7. The site licence holder will then implement the decommissioning plan from the date stated for commencement in the decommissioning plan.
8. The decommissioning plan will include the necessary provisions for defueling the plant and the management and transportation of any fuel or waste fuel.
9. The decommissioning plan will identify within the plant all material which may have been exposed to irradiation and will classify all such material in accordance with the prevailing waste categorisation at the time.
10. The decommissioning plan will provide for the scoping and implementation of such downsizing or deconstruction of the plant as may be required in the approved decommissioning plan.
11. The site licence holder will provide satisfactory evidence to the site licence authority that all irradiated material removed from the site will be handled by an approved person under the relevant international convention.
12. The site licence holder will implement the decommissioning plan within the timeline specified.
13. Once decommissioning is completed, the site licence authority will instruct an independent inspection of the site for verification of the completion of the decommissioning and deconstruction works in accordance with the approved decommissioning plan. The independent inspector will issue a certificate of verification to the site licence authority, the design approval authority and the site licence holder.
14. On completion of decommissioning and deconstruction any security held by the site licence authority, in security for satisfaction of the decommissioning and deconstruction obligations, may be released.

Decommissioning Flask – NDA

Key Features of Proposed Regulations

RISK, LIABILITY AND INSURANCE

1. A party seeking to provide a nuclear licensed site through their appointed independent authority and approval of technology to be located, and operated on the licensed site, will be a signatory to either the OECD`s Paris/ Brussels regime or the IAEA`s Vienna Convention on nuclear liability (or potentially the Convention on Supplementary Compensation for Nuclear Damage (CSC)).
2. A party will implement legislation which requires any site licence holder to be liable for any accident or occurrence on the licensed site resulting or probably likely to result in loss, injury or damage to any party who is not the site licence holder.
3. The liability of the site licence holder will be applied in a party's legislation without proof of fault.
4. The liability of the site licence holder will be applied at the levels envisaged in Paris/Brussels once the 2004 Amending Protocols have come into force.
5. There will be scope for SMRs to be considered as "low-risk" installations if the installation states' applicable convention and national law allow it.
6. The liability of the site licence holder will be exclusive liability under the legislation created.
7. The legislation may also provide for strict liability of the site licence holder for any loss, injury or damage resulting from accidents during transport of nuclear material to or from the licensed site, although if applicable joint liability with a licensed carrier may be included.
8. The site licence holder will be required to have in place through insurance or other means, financial security equivalent to its level of liability under the legislation which will be a level commensurate with the level of liability stated in the relevant conventions.
9. In addition to the existing heads of damage (loss of life or personal injury and loss of or damage to property) the following categories of nuclear damage (as per Paris/Brussels once the 2004 Amending Protocols have come into force) are allowed for:

    (a) economic loss arising from personal injury or damage to property;

    (b) costs of measures of reinstatement of the impaired environment, unless such impairment is insignificant;

    (c) loss of income deriving from a direct economic interest in any use or enjoyment of the environment, incurred as a result of significant impairment of that environment; and;

    (d) costs of preventive measures and further loss or damage caused by such measures.

PROTOCOL TO AMEND THE CONVENTION ON THIRD PARTY LIABILITY IN THE FIELD OF NUCLEAR ENERGY OF 29 JULY 1960, AS AMENDED BY THE ADDITIONAL PROTOCOL OF 28 JANUARY 1964 AND BY THE PROTOCOL OF 16 NOVEMBER 1982

Article 1

B. Four new sub-paragraphs (vii), (viii), (ix) and (x), shall be added to paragraph (a) of Article 1 as follows:

vii) "Nuclear damage" means, 1. loss of life or personal injury; 2. loss of or damage to property; and each of the following to the extent determined by the law of the competent court, 3. economic loss arising from loss or damage referred to in sub-paragraph 1 or 2 above insofar as not included in those sub-paragraphs, if incurred by a person entitled to claim in respect of such loss or damage; 4. the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in sub-paragraph 2 above; 5. loss of income deriving from a direct economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in sub-paragraph 2 above; 6. the costs of preventive measures, and further loss or damage caused by such measures, in the case of sub-paragraphs 1 to 5 above, to the extent that the loss or damage arises out of or results from ionising radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear substances coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.

viii) "Measures of reinstatement" means any reasonable measures which have been approved by the competent authorities of the State where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment. The legislation of the State where the nuclear damage is suffered shall determine who is entitled to take such measures.

ix) "Preventive measures" means any reasonable measures taken by any person after a nuclear incident or an event creating a grave and imminent threat of nuclear damage has occurred, to prevent or minimise nuclear damage referred to in sub-paragraphs (a)(vii) 1 to 5, subject to any approval of the competent authorities required by the law of the State where the measures were taken.

x) "Reasonable measures" means measures which are found under the law of the competent court to be appropriate and proportionate, having regard to all the circumstances, for example: 1. the nature and extent of the nuclear damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage; 2. the extent to which, at the time they are taken, such measures are likely to be effective; and 3. relevant scientific and technical expertise.

Key Features of Proposed Regulations

10. A party will provide in legislation for any claim made within 30 years (in compliance with Amended Paris/Brussels Conventions) of a licensed site event causing loss, injury and damage to be assessed. All other claims to be brought within 10 years from the date of the incident. Assessment will be carried out by an independent panel of three recognised experts selected in respect of each incident from a schedule of approved representative bodies experienced in the assessment and determination of value of claims.
11. The site licence holder will have the right to make representation on any claim made and the representations will be considered by the assessment panel.
12. Once determined the claim amount will be notified to the site licence authority, who shall serve notice of a requirement on the site licence holder to pay the amount of the claim on a specified date or dates.
13. A party will provide in legislation for the notice served by the site licence authority to be registered as an award under the legislation and enforceable as a judgement of a court in the jurisdiction of a party or any other jurisdiction.
14. Although the legislation will provide for exclusive liability of the site licence holder under statutory provisions to pay any amount assessed as resulting from an accident on the licensed site, the site licence holder may contract for insurance against such risks and indemnities from other parties and contractors carrying out works or performing services on the licensed site.
15. Where a third party indemnity is available to the site licence holder, the site licence holder may apply to the assessment panel appointed in respect of any claim, to have the assessment panel determine the amount of the liability determined by the assessment panel to be borne by any third party against whom indemnity is claimed including any insurer.
16. Any third party against which a request for assessment of liability is made will have the right to make representations to the assessment panel and the representations will eb considered by the assessment panel.
17. A determination of the liability of any third party liability will be issued by the assessment panel to the site licence holder and the any third party.
18. A party will provide in legislation for the determination of the liability of any third party to be registered under the legislation and enforceable as a judgement of a court in any relevant jurisdiction.
19. The site licence holder will maintain a register of all claims and determinations and make that register available to any authorised party or inspector of the facilities on the licensed site.
20. A party will provide that where the design approval authority relies on or adopts the certification or approval of technology granted by another party's design approval authority, that other design approval authority will have no liability to the adopting authority or another party in respect of the certification or approval adopted.

EDUCATION TRAINING AND SKILLS

1. After a site licence is granted, the site licence holder will provide to the site licence authority within 12 calendar months, a comprehensive programme for provision and development of the skills and training required to develop, construct, commission, operate and decommission the proposed plant.
2. The site licence authority will after consultation with all relevant authorities and stakeholders including the site licence holder, within 6 calendar months of receipt of the proposed programme, reply to the site licence holder with all revisions required to the proposed programme.
3. The site licence holder will implement the programme for skills and training in accordance with the timeline stipulated in the programme.

CONCLUSION

“Governments can support FOAK demonstration projects in many forms, ranging from specific longterm power purchase agreements to cost-sharing mechanisms that can minimise construction risks so as to attract more investors. Supporting regulators’ efforts to develop the necessary licensing regimes and capabilities is also essential.”

OECD, NEA, 2021

A Major Role for SMRs

As with all new technologies, there are areas to be addressed including over export and supervision but in our view a modified regulatory approach is warranted which should be more tailored to SMRs. We have suggested some core principles that need to be enshrined and have proposed some Model Regulations. We are not proposing a material change from the existing international nuclear regulatory framework (although in some areas, for example nuclear materials transport we have proposed a shift in approach). What we are proposing is a revised approach and a decoupling of technical considerations from the regulatory/licensing process.

As with the helpful work done in mid-2021 by the OECD and NEA, the objective of providing a model for international harmonisation of regulation while maintaining the current levels of safety and security should now be a major focus. The suggested approach of bi-lateral or multi-lateral cooperation is now gaining a lot of traction and is seen as the optimal method of securing a robust approach to development of harmonised international standards.

Our analysis in Part I and our suggestions in Part II recognise the need to maintain the high level of confidence in nuclear safety that is currently available.

Our view that the current regime of treaties and conventions may need to be reviewed to make them more specifically applicable to an enabled SMR regulatory process is now being reflected in other papers and publications. In our view there is insufficient time to have another five year or longer round of discussion and negotiation on the regulatory structures and the applicable conventions and treaties, before the need to have SMR's deployed nationally and internationally. Required approaches must be applied in parallel and in cooperation. Our proposed structure put forward in the model regulatory approach does not require material change to treaties or conventions and arguably could be applied within the existing conventions, but for clarity of purpose and policy some small changes would be a useful component to make the overall approach cohesive.

Our objective in producing these guides in two parts was to identify the huge amount of work by others which has gone into the process of ensuring the civil nuclear industry is able to deliver and operate nuclear power generation in an entirely safe and secure way. To then recognise the world is rapidly moving towards a different place from where it has been in recent history and into a new low carbon era. The recognition of nuclear power generation as an essential element in achieving the low carbon targets embraced by the IPCC and others suggest SMRs will be a significant and long-term component in allowing national governments to determine their energy policy and to enable economies to have secure long-term predictable cost of energy.

The piece we identified as missing is the international cooperative approach to utilising specialist regulatory and technical capacity to enable sharing of approvals and certificated compliance where that is appropriate and able to be done within the existing conventions.

Our model approach makes a good start on facilitating the internationalisation with only small changes to some existing structures.

If this can be applied and followed, we see no reason why SMRs, cannot play a major role in the decarbonised global power generation market.

APPENDICES

APPENDIX 1
Bibliography

1. Convention on Nuclear Safety (CNS)
2. Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency
3. Convention on the Physical Protection of Nuclear Material (CPPNM)
4. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
5. Code of Conduct on the Safety and Security of Radioactive Sources
6. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
7. Convention on Environmental Impact Assessment in a Transboundary Context
8. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters
9. Protocol on Strategic Environmental Assessment to the Espoo Convention
10. Paris Convention on Nuclear Third Party Liability
11. Brussels Supplementary Convention on Third Party Liability in the Field of Nuclear Energy
12. Vienna Convention on Civil Liability for Nuclear Damage
13. Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention
14. Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage
15. Convention on Supplementary Compensation for Nuclear Damage
16. Protocol to Amend the Paris Convention on Nuclear Third Party Liability (not yet in force)
17. Protocol to Amend the Brussels Supplementary Convention on Third Party Liability in the Field of Nuclear Energy (not yet in force)
18. Joint Convention requiring States to establish and maintain a legislative and regulatory framework
19. IAEA Handbook on Nuclear LAW, 2003
20. IAEA TECDOC Series, “Experiences of Member States in Building a Regulatory Framework for the Oversight of New Nuclear Power Plants: Country Case Studies”, 2021
21. IAEA Handbook on Nuclear Law: Implementing Legislation, STI/PUB/1456 ¦ 978-92-0-103910-1, 2010
22. Joint Research Centre (JRC) technical report on nuclear energy with respect to the Do no significant harm criteria (DNSH) of the Taxonomy regulation, March 2021.
23. SCHEER review of the JRC report on Technical assessment of nuclear energy with respect to the ‘do no significant harm’ criteria of Regulation (EU) 2020/852 (‘Taxonomy Regulation’), adopted on 29 June 2021
24. Opinion of the Group of Experts referred to in Article 31 of the Euratom Treaty on the Joint Research Centre’s Report Technical assessment of nuclear energy with respect to the ‘do no significant harm’ criteria of Regulation (EU) 2020/852 (‘Taxonomy Regulation’), adopted on 28 June 2021
25. OECD NEA report “Small Modular Reactors: Challenges and Opportunities”, 2021
26. IAEA SMR Regulators’ Forum Pilot Project Report: Report from Working Group on Graded Approach, January 2018
27. IAEA SMR Regulators’ Forum Pilot Project Report: Report from Working Group on Defence-In-Depth, January 2018
28. Handbook for Regulatory Inspectors of Nuclear Power Plants IAEA-TECDOC-1867 ¦ 978-92-0-101519-8, 2019

APPENDIX 2
IAEA Compliance Standards

IAEA General Safety Guide: Functions and Processes of the Regulatory Body for Safety
IAEA Safety Standards Series No. GSG-13, STI/PUB/1804 ¦ 978-92-0-100718-6, 2018

Governmental, Legal and Regulatory Framework for Safety
IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), STI/PUB/1713 ¦ 978-92-0-108815-4, 2016

Licensing Process for Nuclear Installations
IAEA Safety Standards Series No. SSG-12, STI/PUB/1468 ¦ 978-92-0-107510-9, 2010

Fundamental Safety Principles
IAEA Safety Standards Series No. SF-1, STI/PUB/1273 ¦ 92-0-110706-4, 2006

Technology Roadmap for Small Modular Reactor Deployment
IAEA Nuclear Energy Series: NR-T- STI/PUB/1944 ¦ 978-92-0-110021-4, 2021

Milestones in the Development of a National Infrastructure for Nuclear Power
IAEA Nuclear Energy Series NG-G-3.1 (Rev. 1), STI/PUB/1704 ¦ 978-92-0-104715-1, 2015

“If countries are to meet Paris Agreement objectives to reduce greenhouse gas emissions, nuclear power will need to make a significant and indispensable contribution to the overall energy mix.”

OECD, NEA 2021

CASTLETOWN LAW

www.castletownlaw.com