

Looking Backward, Moving Forward: Licensing New Reactors in the United States

*by Stephen G. Burns**

A resurgence of interest in new nuclear power generation as part of the energy mix has emerged around the world in the past few years. The reasons for this potential “nuclear renaissance” stem from a complex set of considerations, including the environmental benefits of no “greenhouse” gas emissions, the enhanced reliability of nuclear operations, advantageous fuel and operating costs and government incentives, among others. For the first time in a generation, electric generating companies are giving serious consideration to building new commercial nuclear power plants in the United States.

As the licensing and regulatory authority in the United States, the U.S. Nuclear Regulatory Commission (NRC or Commission) has received expressions of interest in the licensing of nearly 30 new nuclear power plants over the next decade, as well as in the certification of several new designs that would be used in many of these plants. In reviewing these new applications, the NRC will be implementing a licensing review process that is significantly different than the process used to licence the current fleet of 104 operating reactors in the United States. This process, codified in 10 C.F.R. Part 52 of the NRC’s regulations, is itself the product of regulatory reform efforts that culminated in the late 1980s in response to severe criticism of the agency’s original two-step licensing approach. In adopting a new framework in Part 52 to provide for early site permits and approval of standardised designs, both of which could then be referenced in an application for a combined licence to construct and operate a plant, the NRC intended to foster greater standardisation, encourage early resolution of safety issues, and improve the stability and predictability of the licensing process. The purpose of this article is to review the history of the adoption of Part 52, to review early experience with the process since it was originally adopted and to discuss some of the challenges that lie ahead as the NRC faces a potentially significant new workload of applications for new plant licences.

* Deputy General Counsel of the U.S. Nuclear Regulatory Commission since 1998. He joined the agency in 1978 as a staff attorney and has served in various positions including Executive and Legal Assistant to former Chairman Kenneth M. Carr. He received the Commission’s Distinguished Service Award in 2001. Mr. Burns received his law degree from the George Washington University and earned his B.A. in German from Colgate University in New York. The author alone is responsible for the facts and opinions expressed in this article. The views in this paper are his own and do not reflect the official position of the U.S. Nuclear Regulatory Commission. Questions or comments on this paper may be addressed to Mr. Burns at Stephen.Burns@nrc.gov.

Institutional framework

The NRC, established in 1975, is an independent federal regulatory agency within the Executive Branch of the U.S. Government. The NRC was one of two successor agencies to the U.S. Atomic Energy Commission (AEC) and carried forward the regulatory functions of the AEC over civilian uses of nuclear energy and material in commercial, academic, medical and research spheres.¹ The central legislative authority establishing the NRC's regulatory jurisdiction and powers is the Atomic Energy Act (AEA) of 1954, as amended, 42 U.S.C. §§ 2011 *et seq.* In broad terms, the NRC is authorised to

“establish by rule, regulation or order such standards and instructions to govern the possession and use of special nuclear material, source material, and by product material as the Commission may deem necessary or desirable to promote the common defence and security or to protect health or to minimize danger to life or property. [AEA § 161b., 42 U.S.C. § 2201(b)]”.²

In a well-worn phrase familiar to U.S. nuclear law practitioners, the authorities granted to the NRC under the AEA have been termed as virtually unique in the degree to which broad responsibility is reposed in the administering agency, free of close prescription in its charter as to how it shall proceed in achieving the statutory objectives.³

The NRC issues licences and exercises regulatory oversight of all commercial nuclear power reactors in the United States pursuant to authority conferred by the AEA and the Energy Reorganization Act of 1974.⁴ With respect to commercial power reactors, the NRC may issue licences to persons who agree to

“observe such safety standards to protect health and to minimize danger to life or property and who agree to make available to the Commission such technical information and data concerning activities under such licenses as the Commission may determine necessary to promote the common defence and security and to protect the health and safety of the public”.⁵

Until recently the Office of Nuclear Reactor Regulation (NRR)⁶ within the NRC was the lead office for review of initial applications for reactor construction permits and operating licences. In 2006, the Commission established an Office of New Reactors to be primarily responsible for the review and evaluation of new reactor designs and applications to site new reactors; NRR retained responsibility for ongoing oversight of operating reactors, including amendments to original licences.

-
1. The Energy Reorganization Act of 1974, 42 U.S.C. §§ 5801 *et seq.*, abolished the AEC and established the NRC and the Energy Research and Development Administration, which was later incorporated into a new Department of Energy.
 2. See also AEA §§ 161i. and o., 42 U.S.C. §§ 2201(b) and (o).
 3. *Siegel v AEC*, 400 F.2d 778, 783 (D.C. Cir. 1968), *cert. denied*, 439 U.S. 1046 (1968).
 4. The NRC does not licence nuclear facilities owned and operated by the U.S. Department of Energy, except for those facilities specifically enumerated in the Energy Reorganization Act of 1974. 42 U.S.C. § 5842. An explicit exclusion from NRC licensing of utilisation facilities of the Department of Defense is contained in 42 U.S.C. § 2140.
 5. See AEA § 103b., 42 U.S.C. § 2133(b). Commercial power reactors are “utilisation facilities” under the AEA for which “any person” must have a licence to possess or use such facility. AEA §§ 11cc. and 101, 42 U.S.C. §§ 2014(cc) and 2131.
 6. See 42 U.S.C. § 5843.

The two-step licensing process

All currently operating commercial nuclear power plants in the United States have been licensed under the two-step process which was originally implemented by the NRC or its predecessor, the AEC. Under authority conferred by the AEA, the AEC implemented a two-step process for licensing production and utilisation facilities which was modelled, at least in part, on the earlier Federal Communications Act of 1934 and its two phase process for construction and operation of radio transmission and broadcast facilities.⁷ In simple terms the AEC, and later the NRC, would first issue a construction permit, based on evaluation of preliminary safety and design information, to allow construction of a nuclear power plant and then issue an operating licence, upon completion of construction, based on evaluation of the final design and other operational considerations. The U.S. Supreme Court sustained the AEC's approach as a permissible, if not the only, means of implementing the AEA.⁸ The two-step approach to licensing plants is still available as an option for licensing a new plant and is reflected in the NRC's regulations contained in 10 C.F.R. Part 50.⁹

Construction permits and operating licences

The important statutory provisions framing the original process are found in Sections 182, 185, and 189 of the AEA.¹⁰ Under the original provisions of the AEA, still reflected in Section 185a. and the Commission's regulations in 10 C.F.R. Part 50, an applicant to construct and operate a nuclear power plant must initially obtain a construction permit. The application for a construction permit must include the principal design criteria for the proposed plant as well as other information bearing on the suitability of the site, the applicant's financial qualifications, and other information on its safety and physical protection characteristics.¹¹ Until enactment of the Energy Policy Act of 2005, licensing of commercial reactors also entailed an antitrust review pursuant to Section 105(c) of the AEA.¹² It should be emphasised, however, that the applicant was not required as part of its application or "preliminary safety analysis report" under Section 50.34(a) to submit a complete design at the

-
7. See *Texas Utilities Electric Co.* (Comanche Peak Steam Electric Station, Unit 1), CLI-86-4, 23 N.R.C. 113 (1986).
 8. See *Power Reactor Development Co. v Electricians*, 367 U.S. 376 (1961). Indeed, Section 161h. of the AEA, 42 U.S.C. § 2201(h), allowed for the consideration "in a single application one or more activities for which a license is required by this Act" and to "combine in a single license one or more of such activities". Part 52's combined licence provisions, when adopted in 1989, conformed to the existing statutory strictures on licensing. See *Nuclear Information and Resource Service v NRC*, 969 F.2d 1169 (D.C. Cir. 1992), reversing in part 918 F.2d 189 (1990).
 9. See 10 C.F.R. §§ 50.35 and 50.57. For example, the Tennessee Valley Authority has indicated that it will seek an operating licence for its Watts Bar Unit 2 facility under Part 50. The plant received a construction permit in 1973, but largely suspended work in the mid-1980s and put the plant in a lay-up condition.
 10. 42 U.S.C. §§ 2232, 2235 and 2239.
 11. See e.g. 10 C.F.R. §§ 2.101, 50.33 and 50.34(a). The NRC developed Regulatory Guide 1.70, *Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants*, which applicants could use to ensure their applications addressed the information necessary for the NRC to conduct its review.
 12. Pub. L. 109-58, 119 Stat. 784, amending 42 U.S.C. 2135(c). See *Alabama Power Co. v NRC*, 692 F.2d 1362, cert. denied, 464 U.S. 816 (1983) for a description of the earlier scheme for antitrust review. At the construction permit stage a separate hearing might be held on antitrust review issues. Applications for operating licences did not require formal antitrust review unless the Commission determined that "significant changes" in the applicant's activities had occurred since the earlier review of the construction permit application.

construction permit phase. The applicant would be required though to submit with the application an environmental report which addressed the anticipated environmental impacts of the project, which was used by the Commission staff in preparing a draft environmental impact statement (EIS), as described *infra*.

Once the NRC staff accepted the application as complete, they undertook a safety and environmental review of the proposed design and site for the plant, using the NRC's Standard Review Plan and Regulatory Guides that addressed the acceptance criteria for approving various aspects of the application. The application was subject to a hearing, which may have been contested or uncontested as more fully described below. The application was also required to be reviewed by the Advisory Committee on Reactor Safeguards (ACRS), a statutory committee of outside experts established to advise the Commission on the hazards of proposed facilities and the adequacy of proposed safety standards.¹³ After meeting with the Commission staff and the applicant, the ACRS submitted a letter report to the NRC to present the results of its review and recommend whether a construction permit should be issued. Taking into account the ACRS review and determinations on technical or environmental matters raised during the hearing process described *infra*, the staff could then issue the construction permit. In this regard, it should again be emphasised that the NRC's findings were essentially based on a preliminary design which was sufficient to allow the agency to conclude that any remaining safety questions could be resolved by completion of construction and at the operating licence stage.¹⁴ Although site clearing, grading and construction of safety structures, systems and components could not commence until the construction permit was issued, the Commission allowed for some preliminary activities under a Limited Work Authorization.¹⁵

Before the scheduled completion of construction (typically when the plant was 50% constructed), the applicant would file an application for an operating licence. At this point the applicant would provide in a final safety analysis report the complete design bases and other information related to the safe operation of the plant, technical specifications for operation of the plant, and a description of operational programmes such as those for training, physical security and emergency planning.¹⁶ Updated environmental information would be provided to support the NRC's supplemental environmental review.

The purpose of the NRC review at this stage is to determine:

- Whether the nuclear power plant has been constructed in accordance with the construction permit, the application as amended and the Commission's regulations.

13. AEA §§ 29 and 182b., 42 U.S.C. §§ 2039 and 2232(b).

14. See 10 C.F.R. § 50.35(a).

15. The Commission could issue a Limited Work Authorization (LWA) in advance of the final decision on a construction permit if: (1) all environmental and site selection issues for a construction permit had been resolved, and (2) the presiding Licensing Board had concluded that there was reasonable assurance that the proposed site would be suitable from a radiological health and safety standpoint for a reactor generally equivalent to the size and type proposed in the application. The LWA could also authorise installation of the structural foundation. The NRC recently revised its LWA rule to re-define construction activities for which a LWA is required. Final Rule, *Limited Work Authorizations for Nuclear Power Plants*, 72 Fed. Reg. 57, 416 (9 October 2007).

16. See 10 C.F.R § 50.34(b)-(h).

- Whether there is reasonable assurance that the plant can be operated in compliance with the Commission’s regulations and without endangering the health and safety of the public or the common defence and security.
- Whether the applicant has the requisite technical and financial qualifications.¹⁷

The staff must also prepare a supplemental EIS to update the original EIS. The application is subject to a hearing if one is requested. The ACRS must again review the application and provide its opinion. Again, subject to the ACRS review and the outcome of any hearing, the staff could then issue the operating licence.

Assessment of environmental impacts at both stages

In carrying out its licensing process, the Commission must also adhere to the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321-4347. NEPA obligates federal agencies to evaluate the potential environmental impacts of federal actions and requires preparation of an environmental impact statement for “major” federal actions.¹⁸ Although the AEC initially resisted application of NEPA to facilities licensed under the AEA, the agency ultimately implemented NEPA’s environmental assessment provisions in the face of an adverse court decision.¹⁹ Current regulations governing the NEPA process at NRC may be found at 10 C.F.R. Part 51.

Because the issuance of a construction permit is considered a “major federal action” for NEPA purposes, the Commission was required under NEPA to prepare an EIS at the construction permit stage which evaluated the environmental impacts of constructing and operating the proposed plant as well as considered alternatives to the proposed facility. Although a supplemental EIS was required at the operating licence phase to consider environmental impacts of issuance of the operating licence, the review was limited to changes that had occurred since the EIS was issued in connection with the construction permit. No further consideration of alternative sites was necessary in this supplemental EIS. Under NEPA procedures, an agency first proposes and publishes a draft EIS for public comment, which is then followed by a final EIS that addresses the comments received. Although NEPA itself does not require public hearings, the Commission has permitted consideration of environmental issues in its hearing process (described *infra*) in the same manner as safety and security issues arising under the AEA.

Public hearings on construction permits and operating licences

In all proceedings to grant, suspend, revoke or amend a licence, or to issue or modify regulations, the AEA requires the Commission to grant a “hearing” upon the request of “any person whose interest

17. See 10 C.F.R. § 50.57(a); AEA §§ 182a. and 185a., 42 U.S.C. §§ 2232(a) and 2235(a).

18. NEPA is one of a number of environmental laws (e.g. Clean Air Act, Clean Water Act) that require the consideration of a wide range of environmental matters during the licensing process. Reviews under these statutes, require the involvement of numerous federal and state agencies. Although resolution of many of these issues must be taken into account during NRC’s licensing process, a company wishing to site a new nuclear – or indeed any kind of electric generating – plant will need multiple regulatory approvals from various federal, state and local agencies before the plant can be constructed.

19. See *Calvert Cliffs’ Coordinating Comm. v Atomic Energy Commission*, 449 F.2d 1109 (D.C. Cir. 1971).

may be affected” by the proposed action and to admit such persons as parties to the proceeding.²⁰ Under a 1957 amendment to the AEA, the Commission is required to hold a hearing on a construction permit, whether or not anyone has requested one.²¹ A public hearing on an operating licence application is not, however, mandatory, but may be conducted on request by an interested person or as a matter of discretion by the Commission.

In implementing its licensing and hearing processes, the Commission must follow the Administrative Procedure Act of 1946 (APA), 5 U.S.C. §§ 551-559 and 701-706. The APA codifies procedural requirements generally applicable to federal agency rulemaking, licensing and other proceedings.²² For agency rulemaking, the Commission has generally followed the informal rulemaking process permitted by the APA under which the agency must first publish a rule in the *Federal Register* and invite public comment and then follow with issuance of a final rule that takes into consideration any comments received.²³ During the first wave of nuclear power plant licensing, both the AEC and the NRC provided for formal, trial-type hearings in licensing proceedings to satisfy the hearing requirements under Section 189 of the AEA. Agency procedures allowed opportunities for discovery and cross-examination similar to the procedures established for trials in the federal courts under the Federal Rules of Civil Procedure. However, the NRC adopted comprehensive changes to its adjudicatory procedures in 2004 which, among other things, provided for the use of more informal procedures in reactor licensing hearings.²⁴ The revised procedures still provide for an oral hearing on material disputes of fact, discovery and the opportunity to request cross-examination in appropriate circumstances. Past and current hearing procedures are generally codified in 10 C.F.R. Part 2 of the Commission’s regulations.

A 1962 amendment of the AEA allowed the Commission to establish Atomic Safety and Licensing Boards composed of legal and technical experts to conduct licensing hearings.²⁵ The Boards generally were empowered to rule on the admission of parties and issues for litigation, oversee the

20. AEA § 189a.(1)(A), 42 U.S.C. § 2239(a)(1)(A).

21. AEA § 189a.(1)(A), 42 U.S.C. § 2239(a)(1)(A); see Pub. L. 85-256 § 7, 71 Stat. 576 (1957).

22. The APA is one of a group of federal “openness” laws that are designed to provide greater transparency in federal agency decision-making. See Fung, A., Graham, M. and Weil, D., *Full Disclosure* 25-28 (Cambridge University Press 2007). The APA applies to all NRC actions taken under the AEA, as provided by AEA 181, 42 U.S.C. 2231. The debate over the fairness and formality of the AEC or NRC’s hearing procedures – a subject beyond the scope of this article – has stretched across the history of both agencies, reaching at times the U.S. Supreme Court as well various courts of appeal. See e.g. *Vermont Yankee Nuclear Power Corp. v Natural Resources Defense Council*, 435 U.S. 519 (1978); *Citizens Awareness Network, Inc. v NRC*, 391 F 3d 338 (1st Cir. 2004).

23. *Siegel v AEC*, 400 F .2d 778, 783 (D.C. Cir. 1968), *cert. denied*, 439 U.S. 1046 (1968), established the principle that the notice and comment procedures were sufficient to satisfy the hearing requirement in Section 189 for rulemaking. During the 1970s, the AEC and NRC did conduct a few rulemakings using a more formal trial-like process; most notable was the rulemaking to establish emergency core cooling requirements for nuclear reactors. See Rulemaking Hearing on Acceptance Criteria For Emergency Core Cooling Systems For Light-Water-Cooled Nuclear Power Reactors, CLI-73-39, 6 A.E.C. 1085, 1973 WL 18177 (1973).

24. Final Rule, *Changes to Adjudicatory Process*, 69 Fed. Reg. 2, 182 (14 January 2004). The rule changes were challenged as violating the APA, but were sustained by a federal court of appeals. See *Citizens Awareness Network, Inc. v NRC*, 391 F.3d 338 (1st Cir. 2004).

25. AEA § 191, 42 U.S.C. § 2241. This amendment essentially provided an exception to the usual principle under the Administrative Procedure Act that hearing examiners or administrative law judges be lawyers.

discovery process among the parties, conduct the hearing on contested issues and render a decision on the evidence before the Board. Besides the AEC or NRC staff and applicant, participation in such proceedings is granted to those persons who can establish “standing”, i.e. a specific cognizable interest that may be affected by the outcome of the proceeding and who proffer an admissible contention – or issue – for litigation.²⁶ Other parties to licensing proceedings might include state or local governments, advocacy groups or individuals.²⁷

Board decisions were subject to appeal within the agency. From 1969 until 1991, the Commission deferred most of the appellate review to an Atomic Safety and Licensing Appeal Board, which heard appeals from Licensing Board decisions but also conducted *sua sponte* review of unappealed final decisions in licensing cases. The Commission itself conducted much more limited appellate review of decisions in hearing cases, a practice which was roundly criticised by the major reviews of the agency in the wake of the Three Mile Island accident.²⁸ A final agency decision could then be appealed by an aggrieved party to a federal court of appeals in accordance with Section 189 of the AEA 42 U.S.C. § 2239(b).

As we shall see, the NRC has undertaken extensive efforts in the past 20 years to construct what it believes will be a more effective licensing process. Although one expects most new licensing to be conducted under the new process provided in 10 CFR Part 52, the NRC has not repealed the two-step process and it remains available as an option for licensing new reactors.

Re-making the licensing process

Although the history of the early licensing process carried out by the AEC and later the NRC reflects a near constant debate over the need for reform,²⁹ the purpose here is to provide an overview of the initiatives and efforts that led to the NRC’s adoption of the procedural mechanisms in 10 CFR Part 52. Instead of the two-phase process of construction permit and operating licence, Part 52 allows an applicant to seek a combined licence (COL) which authorises construction based on a complete design and provides conditional authority to operate the plant, subject to verification that the plant has been constructed in accordance with the licence, design and the Commission’s regulations. Part 52 also provides two other significant procedures: (1) review and approval of standardised designs through a design certification rulemaking and (2) review and approval of a site’s suitability, prior to a decision

26. 10 C.F.R. § 2.309(a), (d) and (f) (2007). The Commission generally follows judicial concepts of standing to determine whether someone should be properly admitted as a party to a proceeding, though it is not required to do so. See *Sequoyah Fuels Corp.*, CLI-01-2, 53 NRC 9, 14 (2001); *Envirocare of Utah, Inc. v NRC*, 194 F.3d 72, 75 (D.C. Cir 1999). To demonstrate “standing” in NRC proceedings, a petitioner must allege “(1) an actual or threatened, concrete and particularized injury, that (2) is fairly traceable to the challenged action, (3) falls among the general interests protected by the Atomic Energy Act (or other applicable statute, such as the National Environmental Policy Act) and (4) is likely to be redressed by a favourable decision”. *Sequoyah Fuels Corp.* at 13.

27. Many early proceedings were uncontested, and it was not until the late 1960s that significant intervention by advocacy organisations or individuals began to routinely occur in licensing proceedings. See NRC Special Inquiry Group, *Three Mile Island: A Report to the Commissioners and to the Public*, Vol. II at 3 (1980) (hereinafter Special Inquiry Group Rep’t); Green, H.P., *Public Participation in Nuclear Power Plant Licensing: The Great Delusion*, 15 Wm. and Mary L. Rev. 503, 512 (1974).

28. See *Report of the President’s Commission on the Accident at Three Mile Island*, at 51 (1979) (hereinafter Kemeny Commission Rep’t); Special Inquiry Group Rep’t, *supra* note 27, Vol. I at 140-41.

29. See generally Walker, Samuel J., *Containing the Atom* 37-56 (University of California 1992).

whether to build a particular plant, through an early site permit.³⁰ An applicant for a COL can reference either a design certification or an early site permit, or both. The design characteristics and site suitability determinations in the design certification or early site permit may not be reviewed again in the combined licence review except under limited circumstances.

As the NRC begins its review of the first COL applications under Part 52, it is worth recalling that the basic rule is itself now almost twenty years old. When the rule was proposed in 1988, the basic concepts – combined licences, certified designs and early site reviews – had been debated since at least the early 1970s. As we shall see, criticism of the two-step licensing process and the lack of any legislative consensus in the U.S. Congress on licensing reform legislation led the NRC to undertake administrative reform of the licensing process.

Criticism of the two-step process

When it published the proposed Part 52, the NRC stated its purpose was

to improve reactor safety and to streamline the licensing process by encouraging the use of standard designs and by permitting early resolution of environmental and safety issues related to the reactor site and design. As a result the scope of the combined license proceeding for a facility can be far more limited than the scope of the two-step licensing process currently in use. Similarly, after the combined licensing proceeding the regulatory matters which would remain for resolution before authorization to operate under the combined license, would be more limited and well-defined than are the issues which remain to be resolved in an operating license proceeding under the current practice.³¹

This statement of the objectives of re-tooling the licensing process reflects the frustration with the two-step process: a lack of standardisation and a “design as you go” approach to constructing the plant, deferred resolution of important safety issues until plant construction was well underway, changing regulatory requirements and a seemingly inefficient and duplicative review and hearing process.

Essentially, the deferral of design details until construction was authorised allowed the construction of commercial reactors with “an unusual degree of variability and diversity” – in sum, a set of custom-designed and custom-built plants.³² This lack of standardisation posed challenges to the NRC’s ability to adequately monitor the safety of plant operations as well as the industry’s ability to learn from operating experience.³³ From an economic standpoint, the variability in design implementation through the “design as you go” approach also contributed to the escalating cost and lead times, as long as 12 to 16 years, to bring a planned facility into operation. In this regard,

30. A combined licence may also reference a manufacturing licence or a final design approval. 10 C.F.R. § 52.73(a).

31. Proposed Rule, *Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Reactors*, 53 Fed. Reg. 32060, 32062 (23 August 1988).

32. U.S. Congress Office of Technology Assessment, *Nuclear Power Plant Standardisation*, at 6 (1981) (hereinafter OTA Report).

33. See *ibid* at 3, 12, 38, 55-57.

advocates of greater standardisation cited favourably foreign experience, such as in France, as providing a model for greater achievement of safety and efficiency through standardisation.³⁴

In the absence of a substantially complete design or resolution of pertinent safety issues, the two-stage process also opened the door to the consideration of new or changed regulatory requirements at the operating licence phase while construction was well underway. The “ratcheting” or “backfitting” of new requirements was viewed as undisciplined and accomplished without necessarily appreciating the overall safety impact of the new requirements. Although it is hard to imagine licensing of plants without the significant regulatory requirements adopted in the 1970s and 1980s – fire protection, environmental qualification of electrical equipment, security plans, emergency planning, post-Three Mile Island design and operational enhancements – these requirements were largely retrofitted on plants already well under construction or in operation. Perhaps the most dramatic examples of the consequences of deferred decisions on critical licensing or siting considerations were the Seabrook and Shoreham plants. Both plants, well under construction, were embroiled in divisive controversies over the ability to provide adequate emergency planning for their sites. The Seabrook plant eventually achieved full power operation, but the Shoreham plant never did. Although the utility initiated low power testing of the plant, New York State, which had challenged the efficacy of emergency planning at the site, effectively bought the utility out for the purpose of terminating operations and decommissioning the plant.³⁵

While critics disagreed on whether the NRC’s hearing process was detrimental to the overall licensing scheme,³⁶ there was general agreement that the two-stage process fostered the perception, if not the reality, that a favourable licensing decision was inevitable at the operating licence phase in the face of the significant investment of the applicant into a plant substantially constructed at the time the operating licence review was undertaken.³⁷ Ironically, this echoes the argument rejected by the U.S. Supreme Court in an early case under the AEA in which the Court sustained the Commission’s approach to issuing construction permits based on only preliminary design information.³⁸ Nonetheless, the consensus of agency critics was that the NRC should move to a one-stage licensing process in lieu

-
34. See *ibid* at 46-48; Testimony of Philip Bray, A., *Hearings before the Subcomm. on Energy and the Environment, House Comm. on Interior and Insular Affairs on Nuclear Licensing Reform*, 98th Cong., 1st Sess., at 254 (1983) (noting construction of two General Electric reactors in Taiwan in 5 years time). On this point, I would like to share a personal anecdote: When I visited the Paluel plant, a four-unit site on the Normandy coast in 1987, my French hosts proudly noted that it had taken them half the time – about six years – to build the units than it had taken its sister plant, the South Texas Project on the Texas coast, to be constructed.
 35. For a flavour of the controversy in these cases, see *Massachusetts v NRC*, 924 F.2d 311 (D.C. Cir. 1991); *Seacoast Anti-Pollution League v NRC*, 690 F.2d 1025 (D.C. Cir. 1982); *Long Island Lighting Co.* (Shoreham Nuclear Plant, Unit 1), CLI-89-2, 29 NRC 211 (1989).
 36. Compare Testimony of Bart, Z. Cowan and Testimony of Bradford, Peter A., *Hearings before the Subcomm. on Nuclear Regulation of the Senate Comm. on Environment and Public Works on S.893 and S.894*, 98th Cong., 1st Sess., at 226 and 239 and 477 and 567 (1983).
 37. See e.g. Kemeny Commission Report, *supra* note 28, at 52; NRC’s Notice of Request for Comments on Proposed Legislation; Nuclear Standardisation Act of 1982, 47 Fed. Reg. 24044, 24045 (2 June 1982); Testimony of Gellhorn, Ernest, F., *Hearing before the Subcomm. on Energy and Power of the House Comm. on Energy and Commerce on Nuclear Licensing Reform*, 100th Cong., 2nd Sess., at 36 (1988).
 38. See *Power Reactor Development Co. v Electricians*, 367 U.S. 376 (1961). The Court stated: “We cannot assume that the Commission will exceed its powers, or that these many safeguards to protect the public interest will not be fully effective”. *Op.cit.* at 415-16.

of a system in which “one lengthy safety review is conducted too early to be useful, and the other is too late to be fully effective”.³⁹

Early attempts at licensing reform

Even in the early 1970s, the AEC moved to encourage greater standardisation in plant designs. Although the assertion seems remarkable now, knowing the changes and challenges to come to a then-nascent industry, the AEC encouraged standardisation through the issuance of policy statements in 1972 and 1973.⁴⁰ The AEC also proposed legislation that reflects early conceptual approaches to the key components of the current Part 52 – provision for combined licences, approval of generic designs by rulemaking and approval of sites before a specific application for a plant is submitted.⁴¹ In the 1973 policy statement the AEC identified three standardisation approaches: *reference systems*, by which significant portions of a plant design would be standardised and could be referenced once approved by the agency; *duplicate plants*, by which the design would undergo a single review and then could be applied to identical plants; and *manufacturing licences* for facilities that would be built and then installed at separately approved sites. The AEC later adopted these concepts in its regulations, which were continued in the original Part 52 and still are reflected in the recent updating of the rule.⁴² The AEC would later add a fourth option, *replication*, by which approved designs could be used and only the site itself, or changes to the approved design would undergo agency review.

Although the AEC’s efforts bore some fruit in its last years and in the early years of the NRC, the NRC recognised in its 1978 policy statement that the depressed market for new nuclear plant orders reduced the likelihood of extensive use of standard designs at that time.⁴³ Nonetheless, the NRC provided in the policy statement additional guidance on implementation of the standardisation options in addition to assurance, based on consultation with U.S. Department of Justice, that pursuit of standardisation would not *per force* raise concerns about anti-competitive behaviour under federal antitrust laws. A number of preliminary design approvals were granted under the reference plant concept but they subsequently expired, and no design was adopted through the rulemaking option provided in 10 C.F.R. Part 50, Appendix O. Only one manufacturing licence was issued for the Offshore Power Systems design, but it was never built.⁴⁴ Although about 20 applications were

39. Special Inquiry Group Rep’t, *supra* note 27, Vol. I at 139; see *op.cit.* at 141; Kemeny Commission Report, *supra* note 28, at 65.

40. Policy Statement on Standardisation of Nuclear Power Plants (28 April 1972).

41. *Hearings before the Joint Comm. on Atomic Energy on Nuclear Powerplant Siting and Licensing*, 93rd Cong. 2nd Sess., Vol. 2, 985-1005 (1974) (AEC bill H.R. 13484). See Shapar, H., and Malsch, M., *Proposed Changes in the Nuclear Power Plant Licensing Process: The Choice of Putting a Finger in the Dike or Building a New Dike*, 15 Wm and Mary L. Rev. 539, 549-50 (1974). The legislation also would have eliminated the mandatory construction permit hearing and ACRS review, at 545-46.

42. The manufacturing license concept was adopted as Appendix M to 10 C.F.R. Part 50 at *Standardisation of Design; Licenses to Manufacture Nuclear Power Reactors*, 38 Fed. Reg. 302151 (2 November 1973); Appendices N and O to Part 50 were adopted to reflect the duplicate plant and reference system concepts, respectively, at *Licensing of Duplicate Nuclear Power Plants; Review of Standard Nuclear Power Plant Designs*, 40 Fed. Reg. 2974 (17 January 1975). The three approaches are substantially included in the recent updating to Part 52. See 10 C.F.R. Part 52, Subparts E, F, and Appendix N, at 72 Fed. Reg. 49, 352, 49, 538-44, 49, 559 (28 August 2007).

43. 43 Fed. Reg. 38, 954, 38, 955 (31 August 1978).

44. See *Offshore Power Systems*, LBP-82-49, 15 NRC 1658 (1982), *aff’d* ALAB-718, 17 N.R.C. 384 (1983).

submitted under the duplicate plant or replication concepts, only a few units, including the Callaway and Wolf Creek plants under the Standardised Nuclear Unit Power Plant System (SNUPPS) consortium and Commonwealth Edison's four Byron and Braidwood units, were licensed to operate.⁴⁵

With utilities shedding construction plans in the late 1970s and with attention directed to reforms needed in the NRC and the industry in the wake of the Three Mile Island accident,⁴⁶ there was little resolve to pursue licensing reform and standardisation until the 1980s. As noted before, the two major studies of the Three Mile Island accident severely criticised the NRC's approach to plant licensing and recommended a greater encouragement of, if not mandatory, standardisation and a change to one-step licensing of any new plants. The Congressional Office of Technology Assessment issued a 1981 report on standardisation in response to House and Senate committee requests.⁴⁷ Chairman Nunzio Palladino, newly appointed to the Commission by President Reagan, established a Regulatory Reform Task Force in late 1981 to explore legislative and internal reforms of NRC's licensing process.

The NRC task force produced a legislative proposal that was published for public comment in the *Federal Register* prior to its submission by the Commission to the Congress.⁴⁸ The Department of Energy submitted its own legislative proposal on behalf of the Reagan Administration. Both bills contained the major aspects of the licensing process embodied in Part 52: combined licences, certified designs and site permits. Although hearings were held on this legislation, the bills never passed the Congress. The experience would repeat itself in 1985 and 1987.⁴⁹ Reform legislation was introduced, hearings were held, but no serious effort to enact the legislation gained ground.

By 1987, the NRC decided that it would pursue both a legislative and an administrative approach to encouraging standardisation and reforming its licensing process. While it continued to believe that legislation should be enacted, the Commission stated in a revised Policy Statement on standardisation that much of its legislative proposal could be accomplished under the NRC's existing statutory authority and that it would develop proposed regulations to address licensing reform and

45. For a synopsis of early experience under the standardisation programme, see SECY-85-382, Memorandum from Dircks, W., Executive Director for Operations (EDO), to Commission, Standardisation Policy Statement, Enclosure 2 (4 December 1985). This document is available in NRC's Agency wide Documents Access and Management System (ADAMS) under Accession No. ML8512120471, www.nrc.gov/reactors/new-licensing/related-documents.html#history.

46. See generally Walker, Samuel J., *Three Mile Island* 209-25 (University of California 2004).

47. OTA Report, *supra* note 32.

48. Notice of Request for Comments on Proposed Legislation; Nuclear Standardisation Act of 1982, 47 Fed. Reg. 24044 (2 June 1982).

49. See *Hearings before the Subcomm. on Nuclear Regulation of the Senate Comm. on Environment and Public Works on Nuclear Licensing Reform: S.893 and S.894*, 98th Cong., 1st Sess. (1983); *Hearings before the Subcomm. on Energy and the Environment, House Comm. on Interior and Insular Affairs on Nuclear Licensing Reform: H.R. 2511 and 2512*, 98th Cong., 1st Sess., at 3 and 33 (1983) (NRC and DOE bills); *Hearing before the Subcomm. on Nuclear Regulation of the Senate Comm. on Environment and Public Works on Nuclear Regulatory Reform*, 99th Cong., 1st Sess. (1985); *Hearings before the Subcomm. on Energy and the Environment, House Comm. on Interior and Insular Affairs on Nuclear Licensing and Regulatory Reform Legislation*, 99th Cong., 2nd Sess., at 19 (1986) (NRC bill H.R. 1447); *Hearing before the Senate Comm. on Energy and Natural Resources on Nuclear Facility Standardisation Act of 1986*, S. 2073, 99th Cong., 2nd Sess. (1986).

standardisation.⁵⁰ The 1987 Policy Statement focused on the approval through rulemaking of the reference design concept in Appendix O to 10 C.F.R. Part 50 as the framework under which to encourage standardisation and thereby increase the efficiency of the review process and improve safety performance of future plants.

NRC fulfilled its commitment in the Policy Statement to develop its own regulations by publishing the proposed 10 C.F.R. Part 52 for public comment in August 1988.⁵¹ The final rule was issued in April 1989.⁵² Several advocacy groups challenged the final rule in a federal court of appeals. Although it sustained significant portions of the NRC's approach under Part 52, the three member panel that originally heard the appeal struck down the NRC's approach to hearings for combined licences. On *en banc* review, the entire court, however, reversed this initial determination and sustained the NRC's rule outright.⁵³

Key features of and early experience with Part 52

In providing an overview of the key features and initial experience with the licensing process established under Part 52, the important aspects of the final rule and any significant changes since the rule's original adoption in 1989 have been identified. Although the principal approaches are the same, some features have been modified either to reflect the provisions of the Energy Policy Act of 1992, which codified significant aspects of Part 52, or as part of the significant updating of the rule that the Commission accomplished in 2007 to clarify the rule and to build on the initial experience with reviewing design certifications and early site permits.⁵⁴ The 2007 Rule was intended in part to bring greater clarity to the interrelationship among design certifications, early site permits and combined licences as well as to the relationship between the technical criteria and requirements in 10 C.F.R. Part 50 applicable to nuclear plants and the procedural requirements in Part 52. The revised rule was also intended to lay out in greater detail the licensing and hearing process associated with NRC findings on inspections, tests, analyses and acceptance criteria (ITAAC). These changes were directed at ensuring that the NRC's adjudication of contentions on ITAAC findings would not unnecessarily delay the licensee's scheduled plans for fuel loading and operation.

It should also be noted that the changes effected by the adoption of Part 52 focused primarily on the encouragement of greater standardisation and streamlining the licensing process but did not focus particularly on the procedures by which hearings would be conducted.⁵⁵ Although dissatisfaction with

50. Policy Statement, *Nuclear Power Plant Standardisation*, 52 Fed. Reg. 34884 (15 September 1987). NRC General Counsel William C. Parler testified to such effect in 1988. See *Hearing before the Subcomm. on Energy and Power of the House Comm. on Energy and Commerce on Nuclear Licensing Reform*, 100th Cong., 2nd Sess., at 5-20 (1988).

51. Proposed Rule, *Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Reactors*, 53 Fed. Reg. 32,060 (23 August 1988).

52. Final Rule, 54 Fed. Reg. 15,372 (18 April 1989).

53. *Nuclear Information and Resource Service v NRC*, 969 F.2d 1169 (D.C. Cir. 1992), reversing in part, 918 F.2d 189 (1990).

54. See Energy Policy Act of 1992, Pub. L. 102-486, 106 Stat. 2776, conforming changes adopted at 57 Fed. Reg. 60,975 (23 December 1992); Final Rule, *Licenses, Certifications, and Approvals for Nuclear Power Plants*, 72 Fed. Reg. 49,352 (28 August 2007).

55. See 54 Fed. Reg. at 15,373 (18 April 1989).

of AEC and NRC's hearing procedures surfaced as part of the overall critique of the licensing process, the question of how to conduct the hearing was largely left to other rulemaking efforts.⁵⁶

Below is a description of the chief features of the licensing process established under Part 52: early site permits, standard design certifications, manufacturing licences and combined licences. Except as otherwise noted, the references to particular provisions of Part 52 are to the final rule published in August 2007.⁵⁷

Early Site Permits (10 CFR Part 52, Subpart A)

An early site permit (ESP) is, in effect, a partial construction permit under the AEA which allows an applicant to resolve site suitability issues from a radiological safety and a security standpoint, environmental issues including the evaluation of environmentally superior sites and emergency preparedness issues. If granted, an ESP may be referenced in later applications for a construction permit and operating licence under Part 50 or a combined licence under Part 52.⁵⁸ An ESP may be granted for a period of 10 to 20 years and may be renewed for a similar period.⁵⁹

To seek an ESP, the applicant must provide, among other things, a final safety analysis report that describes the number, type and thermal power level of the plants which may be built on the site, information about the site characteristics to allow evaluation of site suitability under the relevant requirements of 10 CFR Parts 50 and 100, an environmental report, and emergency preparedness information that can range from identifying major impediments to emergency planning to consideration of complete, detailed plans themselves.⁶⁰ The applicant does not need to specify the particular design being used, but may use a "plant parameter envelope", that set of values of plant design parameters that the applicant believes bounds the actual design characteristics of a plant which it might build at the site in the future. The applicant may also request authorisation to conduct limited construction activities prior to issuance of the ESP under a Limited Work Authorization (LWA), provided the necessary safety and environmental information is provided and a site redress plan is prepared should the applicant terminate activities under the LWA or be denied a construction permit or combined licence.⁶¹

To aid in the review of ESP applications, the NRC staff has issued a review standard.⁶² In addition to conducting its review under applicable siting and safety criteria, the NRC must prepare an EIS in accordance with its regulations implementing NEPA in 10 C.F.R. Part 51. A hearing is required on the application under Section 189 of the AEA because an ESP is a partial construction permit.⁶³

56. See e.g. Final Rule, *Changes to Adjudicatory Process*, 69 Fed. Reg. 2, 182 (14 January 2004), *aff'd*, *Citizens Awareness Network, Inc. v NRC*, 391 F.3d 338 (1st Cir. 2004); *Procedural Changes in the Hearing Process*, 54 Fed. Reg. 33, 168 (11 August 1989), *aff'd*, *Union of Concerned Scientists v NRC*, 920 F.2d 50 (D.C. Cir. 1989).

57. 72 Fed. Reg. 49, 352 (28 August 2007).

58. See 10 C.F.R. §§ 52.13 and 52.73(a).

59. 10 C.F.R. §§ 52.26 and 52.33.

60. 10 C.F.R. § 52.17.

61. 10 C.F.R. §§ 50.10(c), 52.17(c), published at 72 Fed. Reg. 57, 416, 57, 442 and 57, 447 (9 October 2007).

62. RS-002, *Processing Applications for Early Site Permits* (2004) (ADAMS No. ML040700099).

63. 10 C.F.R. § 52.21.

The ACRS must also review the application.⁶⁴ Assuming the requisite safety and environmental findings can be made as prescribed in 10 C.F.R. § 52.24, the NRC may issue the ESP. In this regard, the NRC must find that the proposed inspections, tests, analyses and acceptance criteria (ITAAC), if any, including those for emergency planning, are “necessary and sufficient” to determine whether the plant has been constructed and will be operated in conformity with the licence, the NRC’s regulations and the AEA. The ESP must also identify appropriate site characteristics, design parameters and other terms which, under the finality provisions of 10 C.F.R. § 52.39(a), the NRC generally may not change except to bring into compliance with NRC requirements existing at the time that the ESP is issued or are necessary to meet the fundamental “adequate protection” standard under the AEA.

In any subsequent proceeding on an application for a construction permit and operating licence under Part 50 or combined licence under Part 52 that references an Early Site Permit, those matters resolved in the ESP proceeding are deemed resolved and are not re-visited in subsequent hearings.⁶⁵ Under the 2007 revisions to Part 52, applicants for a combined licence which reference an ESP must identify, however, any new and significant information for issues resolved in the ESP proceeding and a description of the methodology for identifying such information.⁶⁶ This requirement may affect the efficacy of an ESP for early resolution of site issues.

Three ESP’s have been issued to date for the North Anna, Grand Gulf and Clinton sites, all of which have existing reactor facilities located on them.⁶⁷ An additional ESP application for the Vogtle site is under review. A combined licence application has now been filed for the North Anna site which will incorporate the ESP by reference. The NRC does not expect to receive many ESP applications in the foreseeable future primarily because the applicants who have expressed interest in new plants are likely to apply directly for combined licences by which site suitability can be determined.

In some respects, the ESP reviews (which received some support from the U.S. Department of Energy) have been used as a test bed for the licensing process under Part 52, with an eye toward future combined licence reviews and hearings. Of the three ESP’s issued, only the North Anna and Clinton proceedings involved contested issues raised by third party intervenors. The issues in both cases were resolved on the filings and did not go to trial. For the mandatory hearing required under Section 189, the Commission provided guidance on the conduct of the uncontested portions of the hearings and the role of the presiding Atomic Safety and Licensing Boards in conducting such hearings,⁶⁸ although the Commission has since indicated that it plans to conduct most mandatory hearings itself.⁶⁹

Standard design certifications (10 CFR Part 52, Subpart B)

Design certification by rulemaking is the cornerstone of Part 52’s provisions to enhance standardisation in a new generation of nuclear plants. Indeed, design certification rules were the first actions to be issued using Part 52 in the 1990s. To date, the NRC has issued four design certifications

64. 10 C.F.R. § 52.23.

65. See 10 C.F.R. § 52.39(c).

66. 10 C.F.R. § 51.50(c)(1); see 72 Fed. Reg. at 49431.

67. Dominion Nuclear North Anna, LLC (North Anna ESP), CLI-07-27, 66 NRC 215 (November 2007); Exelon Generation Co., LLC, (Clinton ESP), CLI-07-12, 65 NRC 203 (March 2007); System Energy Resources, Inc. (Grand Gulf ESP), CLI-07-14, 65 NRC 216 (March 2007).

68. *Exelon Generation Co., LLC, et al.*, CLI-05-17, 62 NRC 134 (2005).

69. See note 103 *infra*.

for the U.S. Advanced Boiling Water Reactor, the System 80+, the AP-600 and AP-1000 designs.⁷⁰ Part 52 allows any person to seek a certification of evolutionary light water reactor or advanced reactor designs, although advanced designs may require prototype testing.⁷¹ The certification may be issued for a term of 15 years and may be renewed.⁷² A certified design may be referenced in applications to construct or operate a plant under Part 50 or in a COL application under Part 52. Issues concerning the adequacy of a design which were resolved during the course of the design certification rulemaking are not reconsidered in a combined licence proceeding.⁷³

The contents of the application are specified in 10 C.F.R. § 52.47 and must provide the essential information necessary to demonstrate that the design will comply with the NRC's radiological safety, environmental and security standards.⁷⁴ Among other things, the application must address relevant post-Three Mile Island technical requirements, information to close out generic and unresolved safety issues and severe accidents. The applicant must also provide a probabilistic risk assessment and identify the necessary inspections, tests, analyses and acceptance criteria (ITAAC) to verify proper installation of key design features. The NRC recently published for comment a proposed rule that would require applicants for design certification to assess the level of protection built into the design to avoid or mitigate the effects of a large commercial aircraft impact.⁷⁵ A final decision on the rule is expected in 2009.

Procedurally, design certifications are adopted through notice and comment rulemaking, although the Commission may, at its discretion, hold a legislative-style hearing on comments received on the proposed certification.⁷⁶ From the agency's standpoint, the rulemaking process, which is generally used to adopt generic standards and requirements, gives the NRC greater flexibility than adjudicatory procedures. Unlike agency adjudications which require demonstration of a person's particular interest affected by the proceeding and the specification of admissible issues for litigation, any person may comment on any aspect of the proposed design certification rule. The ACRS also reviews design certifications and reports on their safety aspects.⁷⁷ Although applicants were originally required to obtain a final design approval under the former Appendix O to Part 52, the requirement to

70. See 10 C.F.R. Part 52, Appendices A through D.

71. Prototypes could be required for non-light water reactors or light water reactors with unique features or relying on untested principles. 10 C.F.R. § 52.41 and § 52.47(c) (2) [referencing § 50.43(e)].

72. 10 C.F.R. §§ 52.55 and 52.57.

73. 10 C.F.R. §§ 52.63 and 52.98.

74. See 10 C.F.R. § 52.48.

75. Proposed Rule, *Consideration of Aircraft Impacts for New Nuclear Power Reactor Designs*, 72 Fed. Reg. 56,287 (3 October 2007). The rule would require an applicant to describe and evaluate "design features, functional capabilities, and strategies to avoid or mitigate the effects of the aircraft impact ... objective of this rule is to require nuclear power plant designers to perform a rigorous assessment of design features that could provide additional inherent protection to avoid or mitigate, to the extent practicable, the effects of an aircraft impact, with reduced reliance on operator actions".

76. 10 C.F.R. § 52.51. Under the original 1989 rule, the Commission provided for an informal adjudicatory hearing before a Licensing Board which could request authorisation to employ more formal procedures such as cross-examination. The revised Part 52 provides that the Commission may in its discretion hold a legislative style hearing under 10 C.F.R. Part 2, Subpart O. Final Rule, *Changes to Adjudicatory Process*, 69 Fed. Reg. 2,182 (14 January 2004).

77. 10 C.F.R. § 52.53.

do so was abolished in the 2007 updating of the rule.⁷⁸ After resolution of public comment and the ACRS report, the NRC will adopt a final design certification rule and publish it in the Code of Federal Regulations as an Appendix to Part 52. The rule incorporates by reference the applicant's detailed Design Control Document (DCD).

The issue of the sufficiency of the design information arose early after the promulgation of Part 52 in 1989, as the industry moved toward the development of the first proposed certified designs. Commission and industry viewpoints were often far apart on the level of design detail for a complete design— an issue that was at the very heart of the quest for standardisation and finality that had eluded the first generation of reactors. Although the full history of the debate over the level of detail design cannot be recounted here, eventually the NRC accepted several compromises on the level and importance of detailed design in the certifications. The NRC allowed a distinction between the essential information considered part of the certified design (“Tier 1”) and other information (“Tier 2”) approved in the rule but not “certified”.⁷⁹ Tier 2 must be followed and might demonstrate, for example, how the Tier 1 requirements were met but is not subject to the same change and control requirements.⁸⁰ The NRC also reached a compromise on the level of detail by adopting a policy that permitted reliance on “Design Acceptance Criteria” (DAC) in lieu of detailed design information in some design areas in order to reach final conclusions on the safety questions required by 10 C.F.R. § 52.47.⁸¹ The primary reasons offered by vendors for relying on DAC in lieu of detailed information involved

“(1) technologies that are changing so rapidly that it would be unwise for the NRC to freeze the details of the design many years before an actual plant is ready to be constructed, and (2) design areas such as pipe stress and support analyses, where vendors do not have sufficient as-built, or as-procured information to complete the final design”.⁸²

The applicant must still develop ITAAC for the DAC to ensure verification that the as-built plant conforms to the certified design. The NRC encourages the development, to the extent practicable, of ITAAC that are objective and non-discretionary in order to maximise regulatory

-
78. See 72 Fed. Reg. at 49442. The NRC still provides for issuance of Final Design Approvals in accordance with Subpart E to Part 52, although design certification is believed to be the preferred approach to obtaining early resolution of design issues. 72 Fed. Reg. at 49, 391. A Final Design Approval does not have the same binding effect as a design certification rule. 10 C.F.R. § 52.145.
 79. See e.g. Notice, *Rulemakings to Grant Standard Design Certifications for Evolutionary Light Water Reactor Designs*, 58 Fed. Reg. 58, 664 (3 November 1993) (using Tier 1 and 2 definitions). See also SECY-90-377, Memorandum from Taylor, J., EDO, to Commission, Requirements for Design Certification under 10 CFR Part 52 (8 November 1990), available in NRC's Agencywide Documents Access and Management System (ADAMS) under Accession No. ML003707889, www.nrc.gov/reactors/new-licensing/related-documents.html#history and; Staff Requirements Memorandum from Chilk, S., Secretary, to Taylor, J., on SECY 90-377 (ADAMS No. ML003707892).
 80. See e.g. 10 C.F.R. Part 52, Appendix D, § II.D and E (definitions in AP1000 certification).
 81. See NRC Reg. Guide 1.206, *Combined License Applications for Nuclear Power Plants*, § C.III.5 (June 2007).
 82. See SECY-92-053, Memorandum from Taylor, J., EDO, to Commission, *Use of Design Acceptance Criteria During 10 CFR Part 52 Design Certification Reviews* (19 February 1992) (ADAMS No. ML003707942).

stability and predictability and to enhance the possible replication of the “inspections and tests” exception to the conduct of hearings in the Administrative Procedure Act.⁸³

Once a design certification is approved, the original Part 52 provided that no change would be made to a certification during its term unless the change is necessary for compliance with NRC requirements in effect at the time the certification was issued or to meet the statutory adequate protection standard.⁸⁴ This effectively enforced a higher degree of standardisation, but prevented the original design certification applicant from proposing design improvements to enhance safety or for other reasons or to complete detail previously left to DAC. In addition to the compliance and adequate protection criteria, the 2007 revisions to the rule adopted a broader standard for revision of a design certification by allowing any person, not only the design vendor, to request changes that would reduce unnecessary regulatory burden, provide necessary design detail to remove selected DAC, correct errors, substantially increase on a cost benefit basis overall safety, reliability or security, or contribute to increased standardisation.⁸⁵ To the extent that such changes are adopted by the NRC through a rulemaking to amend the certification, the changes are imposed on all plants referencing the design.⁸⁶ Westinghouse Electric Company has recently filed such an amendment application for the AP-1000.⁸⁷ The NRC is also reviewing three other designs for certification: the Areva U.S. EPR, the General Electric ESBWR and the Mitsubishi US-APWR.⁸⁸

Manufacturing licences (10 CFR Part 52, Subpart F)

Although NRC has not issued a manufacturing licence since adopting Part 52 (and only one was issued under the original rule adopted in 1974), the Commission has continued to make this approach to standardisation available through its regulations. The manufacturing licence essentially allows a person to apply to fabricate a nuclear power plant at a location other than the one where it is to be installed and operated.⁸⁹ The manufacturing licence may be a useful option for the fabrication of small modular reactors under development. The primary change to the manufacturing licence concept is that a final design equivalent to that required for design certification or an operating licence under Part 50 must be submitted in order to receive approval of the licence.⁹⁰ The applicant must include ITAAC and an environmental report.⁹¹

A manufacturing licence application is subject to an adjudicatory hearing if requested by an interested person; an environmental assessment is prepared and the application is reviewed by the

83. 5 U.S.C. § 554(a)(2).

84. See 10 C.F.R. § 52.68, 54 Fed. Reg. at 54, 392 (1989).

85. 10 C.F.R. § 52.63.

86. 10 C.F.R. § 52.63(a)(3).

87. See Notice, *Acceptance for Docketing of a Design Certification Rule Amendment Request for the AP1000 Design*, 73 Fed. Reg. 4, 926 (28 January 2008).

88. Information on the status of these reviews and combined license reviews and other information on the NRC’s new reactor activities may be accessed at NRC’s website at www.nrc.gov/reactors/new-reactor-licensing.html.

89. 10 C.F.R. § 52.153.

90. 72 Fed. Reg. at 49, 392; see 10 C.F.R. § 52.157. The applicant can reference a standard design certification. 10 C.F.R. § 52.158.

91. 10 C.F.R. § 52.158.

ACRS.⁹² If the appropriate findings to support it can be made, the manufacturing licence may be issued for a term of 5 to 15 years.⁹³ The manufacturing licence has stricter provisions on finality as compared to a design certification. The NRC may not impose changes or modifications except to ensure adequate protection of public health and safety or to ensure compliance with the NRC requirements in effect at the time of licensing, and the licence holder may not make changes except by applying for a licence amendment.⁹⁴

Combined licences (10 CFR Part 52, Subpart C)

A combined licence (COL) under Part 52 provides an authorisation to construct a nuclear power plant and a conditional operating licence. To date, no COL has been issued, but the NRC had received through, April 2008, applications for 15 new units. As noted above, a combined licence application may, but is not required to reference an ESP, a design certification, design approval or a manufacturing licence issued under Part 52.⁹⁵ To the extent it does so, the prior decisions made, for example, in the ESP, manufacturing licence, or design certification are not re-determined when reviewing the COL application. The applicant must show however, that the actual design of the facility falls within the site characteristics and design parameters specified in the ESP or the design certification.

As provided in 10 C.F.R. § 52.79, the applicant must provide all of the information necessary to support the findings that the facility can be constructed and operated in conformance with public health and safety and the common defence and security. The applicant must also provide ITAAC, described below, to verify the facility has been constructed in accordance with its design.⁹⁶ In addition, emergency plans meeting the NRC's emergency planning requirements must be submitted.⁹⁷ An environmental report is also required and must include information to address environmental issues not considered in a previous proceeding on the site or design, as well as significant new information pertaining to previously considered environmental impacts.⁹⁸ As noted for the ESP, the applicant may also seek a Limited Work Authorization which allows some construction activities to occur before the combined licence is issued.⁹⁹

The ACRS must also perform a review of the application,¹⁰⁰ and the NRC must comply with its NEPA obligations in 10 C.F.R. Part 51 by preparing a draft Environmental Impact Statement (EIS) for public comment that addresses both construction and operational impacts and evaluates alternatives to

92. 10 C.F.R. §§ 51.54, 52.163 and 52.165.

93. 10 C.F.R. §§ 52.167 and 52.173.

94. 10 C.F.R. §§ 52.171. See 72 Fed. Reg. at 49, 392-93.

95. 10 C.F.R. § 52.73.

96. 10 C.F.R. § 52.80(a).

97. 10 C.F.R. § 52.79 (a)(21) and (25).

98. 10 C.F.R. § 52.80(b). NRC had previously issued draft guidance for preparing the environmental report, which may be subject to change to account for recent changes to the LWA rule. See NUREG-1555, Standard Review Plans for Environmental Reviews for Nuclear Power Plants (2000 and 2007 rev.).

99. 10 C.F.R. §§ 50.10(d)-(f) and 52.91, as revised in Final Rule, *Limited Work Authorizations for Nuclear Power Plants*, 72 Fed. Reg. 57, 416 (9 October 2007). The revised LWA rule excludes certain preparatory activities from the definition of construction within NRC's jurisdiction to regulate.

100. 10 C.F.R. § 52.87.

the project. Environmental issues may be raised in the hearing on the COL, except to the extent that the COL application references an ESP for which the EIS remains valid. A final EIS is prepared that addresses the comments received. Under Section 657 of the Energy Policy Act of 2005, the NRC must consult with the U.S. Department of Homeland Security prior to issuing a licence for purposes of identifying vulnerabilities of the proposed location of the facility to a terrorist attack.¹⁰¹

The important distinction between the two-stage licensing approach and the COL is that *all* issues are to be decided up front, before construction begins, which begs the fundamental question as to whether or not compliance with the acceptance criteria (including what they should be) in the COL will provide reasonable assurance that the facility has been constructed and will operate in accordance with the Commission's requirements.

As with a construction permit under the two-stage process, a hearing is required before issuance of a COL under Section 189a. of the AEA. The hearing may be contested, if interested persons request a hearing, or uncontested. With respect to the hearing process, two recent developments are worth noting. First, the Commission has issued a policy statement providing additional guidance on the hearing process.¹⁰² Among other things, the policy statement encourages consolidated consideration of cross-cutting generic issues in licence proceedings. The Commission also provides guidance on integrating combined licence hearings for applications that rely on a standardised design which is still undergoing review. Second, the Commission has recently indicated that it plans to hold uncontested hearings itself, rather than delegating them to a Licensing Board as has been the practice in the past.¹⁰³

Two important aspects of the COL process have been shaped by specific legislation: the specification of acceptance criteria (ITAAC) in the COL and the procedural steps necessary for operation to commence under the COL. Previous discussion of ESP's and design certifications has alluded to the incorporation of ITAAC as acceptance criteria in those regulatory approvals. For the COL, a favourable decision on compliance with ITAAC is critical in order for the plant to begin operation. The ITAAC that are approved as part of the ESP or design certification are incorporated into the COL that relies on an ESP or design certification.

ITAAC and the nature of the post-construction hearing were addressed in the 1989 Rule. NRC had developed the ITAAC concept to answer the criticism lodged against the two-step process to the effect that operational decisions under it were undisciplined and subject to malleable acceptance criteria. In contrast to the old process, the NRC would approve a set of ITAAC at the time of initial licensing, which was intended to provide greater stability and predictability in making the decision whether the plant conformed to the accepted design and could commence operation. Thereafter, at periodic intervals during construction, the NRC staff would publish notices of the successful completion of ITAAC in the *Federal Register*.¹⁰⁴ In addition, the NRC, seeing no clear way under the existing terms of Section 189a. to wholly eliminate a second hearing *prior* to plant operation,

101. Pub. L. 109-58, 119 Stat 814; *Memorandum of Understanding between NRC and the Department of Homeland Security Regarding Consultation Concerning Potential Vulnerabilities of the Location of Proposed New Utilisation Facilities*, 72 Fed. Reg. 9959 (6 March 2007).

102. *Conduct of New Reactor Licensing Proceedings*; Final Policy Statement, 73 Fed. Reg. 20, 963 (17 April 2008).

103. Staff Requirements Memorandum, Vietti-Cook, A., Secretary to Reyes, L., EDO, *et al.*, COMDEK-07-0001/COMJSM-07-0001 – Report of the Combined License Review Task Force (22 June 2007) (ADAMS No. ML071930224).

104. 10 C.F.R. § 52.99(e).

structured the second hearing to focus on the licensee's compliance with the ITAAC in the combined licence.¹⁰⁵

The NRC's approach to the post-construction hearing became the focal point of the most serious challenge on judicial review of Part 52. As noted above, the panel of the federal appeals court that originally heard the appeal of NRC's rule held that the NRC could not limit its pre-operational hearing to questions of conformance with ITAAC.¹⁰⁶ Although the entire court sitting *en banc* reversed this initial determination and sustained the NRC's approach, legislation was enacted that codified in significant respects the NRC approach. Thus, the provisions on ITAAC and post-construction hearing are now guided by the provisions of Section 185b., a paragraph added by the Energy Policy Act of 1992:

[A]fter holding a public hearing under Section 189a.(1)(A), the Commission shall issue to the applicant a combined construction and operating license if the application contains sufficient information to support the issuance of a combined license and the Commission determines that there is reasonable assurance that the facility will be constructed and will operate in conformity with the license, the provisions of this Act, and the Commission's rules and regulations. The Commission shall identify within the combined license the inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of this Act, and the Commission's rules and regulations. Following issuance of the combined license, the Commission shall ensure that the prescribed inspections, test, and analyses are performed and, prior to operation of the facility, shall find that the prescribed acceptance criteria are met. Any finding made under this subsection shall not require a hearing except as provided in Section 189a (1)(B).¹⁰⁷

In amendments to Section 189a. of the AEA, the Energy Policy Act of 1992 focuses the post-construction hearing on the ITAAC.¹⁰⁸ Under the amended Section 189a., the NRC is required, at least 180 days prior to anticipated fuel-loading of the reactor, to publish a notice of opportunity for hearing "on whether the facility as constructed complies, or on completion will comply, with the acceptance criteria of the license".¹⁰⁹ To be granted, a request for hearing must "show, *prima facie*, that one or more of the acceptance criteria in the combined license have not been, or will not be met, and the specific operational consequences of non-conformance that would be contrary to providing reasonable assurance of adequate protection of the public health and safety". If this is granted, then

the Commission shall determine, after considering petitioners' *prima facie* showing and any answers thereto, whether during a period of interim operation, there will be reasonable assurance of adequate protection of the public health and safety. If the Commission determines

105. See 54 Fed. Reg. at 15,380-15, 381.

106. *Nuclear Information and Resource Service v NRC*, 918 F.2d 189, 194-196 (D.C. Cir. 1990), *rev'd in part*, 969 F.2d 1169 (1992).

107. AEA § 185b., 42 U.S.C. § 2235(b) (added by Energy Policy Act of 1992 § 2801, 106 Stat 3120).

108. 42 U.S.C. § 2239 (a)(1)(B), (added by Energy Policy Act of 1992 § 2801, 106 Stat. 3120-21).

109. 42 U.S.C. § 2239 (a)(1)(B)(i).

that there is such reasonable assurance, it shall allow operation during an interim period under the combined license.¹¹⁰

The Commission has discretion to adopt formal or informal procedures to govern the hearing and is directed, to the maximum extent possible, to render a decision within 180 days of the hearing notice or the anticipated date of fuel loading, whichever is later.¹¹¹ The statutory provisions on the post-construction hearing before operation under a COL are now reflected in 10 C.F.R. §52.103. The NRC also provides an opportunity for petitioners to seek modification of the terms of the COL, but such requests do not require a hearing on their merits and, even if granted, do not necessarily prevent operation or other activities pending their resolution.¹¹²

In preparing for the possibility of combined licence applications, the NRC has been faced with questions about the depth and extent of the ITAAC that will need to be developed to support a licence. Some of that discussion continues today, but one important issue resolved in recent years is the extent to which so called programmatic ITAAC are required for licensing. Although the need for acceptance criteria for construction of safety structures and installation of hardware was clear, there was no consensus on the need for such criteria to apply to programmes to cover radiological safety, quality assurance, operator training, physical security and the like. The Energy Policy Act of 1992 required ITAAC for emergency planning, but was otherwise silent. The Commission directed that the matter be put out for public comment and finally determined, contrary to the NRC staff's recommendation, that programmatic ITAAC would not be required for programmes other than emergency planning.¹¹³ In the Commission's view, most operational areas could be resolved prior to issuance of the combined licence, but the Commission left open the possibility that programmatic ITAAC might be necessary in some limited areas.

A few final notes should be made on the combined licence provisions in Part 52. The term of the COL is 40 years from the time the NRC determines the acceptance criteria have been met or the period of interim operation begins in the event that an ITAAC hearing is commenced.¹¹⁴ Like ESP's and design certifications, the terms of the combined licence are subject to the strictures of the backfit rule.¹¹⁵ To the extent that amendments are made to the COL, the amendments may be made immediately effective pending the outcome of any hearing, similar to the procedures applicable to amendments to other reactor licences.¹¹⁶ Like final NRC decisions on issuing construction permits and operating licences, issuance of a COL is subject to judicial review in a federal court of appeals.

110. 42 U.S.C. § 2239 (a)(1)(B)(iii).

111. 42 U.S.C. § 2239 (a)(1)(B)(v).

112. 10 C.F.R. § 52. 103(f).

113. Notice, *Public Comment on Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)*, 66 FR 33718 (25 June 2001). For a discussion of the history of ITAAC and this issue, see SECY-02-0067, Memorandum from Travers, W., EDO, to Commission, *Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) for Operational Programs (Programmatic ITAAC)* (15 April 2002) (ADAMS No. ML020700641). Staff Requirements Memorandum, Vietti-Cook, A., Secretary, to Travers, W., EDO (11 September 2002) (ADAMS No. ML022540755).

114. 10 C.F.R. § 52.104.

115. 10 C.F.R. § 52.98.

116. 10 C.F.R. § 52.98(e); see AEA § 189a.(2)(B), 42 U.S.C. § 2239(A)(2)(B).

Ready for new build in the United States

The previous discussion has outlined the development and early experience with the NRC's revised licensing process for construction and operation of commercial power reactors. As noted, the NRC has under consideration several applications for new or amended design certifications as well as 15 combined licence applications with possibly that many more expected in the next few years. Most of these proposed plants are located in the south-eastern United States, along a crescent that stretches from North Carolina to Texas. The need for greater electric generating capacity in the region has certainly spurred interest in potential new nuclear construction. The Energy Policy Act of 2005 also provided incentives to new nuclear construction. This legislation extended the Price-Anderson Act, the comprehensive indemnification and liability scheme for nuclear incidents in the United States, through 2025.¹¹⁷ The 2005 Act also provides for risk insurance for up to six reactors for costs in the event of delays in NRC's licensing process and for loan guarantees for nuclear and other projects using "innovative technologies".¹¹⁸

For the NRC, preparation for the expected new licensing work has required a focus on staffing and enhancing the regulatory infrastructure. The NRC gained over 200 additional employees last year. As experienced employees who were the technical reviewers, inspectors and lawyers during the wave of nuclear licensing in the 1970s and 1980s retire, the transfer of knowledge and experience has become an agency priority.

The NRC has also continued to work on the agency's readiness to handle new licensing. The NRC staff have revised key guidance documents, such as standard review plans and regulatory guides that are used to assess the adequacy of an application against the agency's regulations and standards.¹¹⁹ The NRC also expects to adopt final rules in early 2009 which will update its security and physical protection requirements to reflect changes and enhancements made in response to the 11 September 2001 terrorist attacks in the United States.¹²⁰ The NRC staff are implementing a "design-centered approach" to reviewing applications by focusing technical reviews around the primary reactor designs and reaching decisions that can be applied across the COL applications referencing the particular design. The NRC hopes this approach will not only leverage its resources to carry out its licensing responsibility, but will also contribute to achieving standardisation and regulatory consistency. The NRC is also looking to gain insights from the Multinational Design Evaluation Programme (MDEP), which NRC established with its regulatory counterparts in France and Finland in 2005, as a way for national regulators to enhance co-operation, share experience and

117. AEA § 170c., 42 U.S.C. § 2210(c), as modified by Pub. L. 109-58 § 602(b), 119 Stat. 779 (2005).

118. Pub. L. 109-58 § 638 and Title XVII, 119 Stat. 791, 1117 (2005). The U.S. Department of Energy has implemented these provisions through rulemaking. See Final Rule, *Standby Support for Certain Nuclear Power Plant Delays*, 71 Fed. Reg. 46, 306 (11 August 2006); Final Rule, *Loan Guarantees for Projects that Employ Innovative Technologies*, 72 Fed. Reg. 60, 116 (23 October 2007).

119. Regulatory Guide 1.206, *Combined License Applications for Nuclear Power Plants* (2007); NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants* (2007); NUREG-1555, *Standard Review Plan for Environmental Reviews for Nuclear Power Plants* (2000 and 2007 draft rev.).

120. A proposed rule was published for comment. *Power Reactor Security Requirements*, 71 Fed. Reg. 62, 664 (26 October 2006). The NRC issued a revised design basis threat rule which informs security requirements in 2007. Final Rule, *Design Basis Threat*, 72 Fed. Reg. 12, 705 (18 March 2007).

research, and strive for convergence on acceptable technical requirements and reciprocity on oversight and other activities among participant countries that are undertaking or considering new reactors.¹²¹

The NRC has been engaged in earnest for more than 20 years in building a licensing framework to achieve the goals of greater standardisation and a more effective and stable decision-making process. The development of the new framework has come from a continuing dialogue over the years with various stakeholders, not all of whom are wholly satisfied, as the NRC developed the new process and tested it. Much has been achieved and new insights have come from the early experience with the new process. The most challenging test of whether the goals will be fully realised still awaits us as the NRC begins reviewing new plant applications.

121. The construction of the Olkiluoto plant in Finland, which uses the French Areva design that is being considered for design certification in the United States provided the impetus for MDEP. The OECD Nuclear Energy Agency (NEA) is now acting as the secretariat for MDEP, NEA (2006), NEA News, No. 24.2, OECD, Paris.