Consent-Based Siting:
What Have We Learned?

A consent-based policy for siting a deep geological repository straddles a fine line between outright federal preemption of any state role in siting a repository and an absolute state veto, exercised at one specific moment in time.

By Daniel Metlay

The president realized that the nation lacked a clear policy for developing a deep-mined geologic repository for high-level radioactive waste and spent nuclear fuel. New legislation would be required to chart a more promising path forward. The views of multiple parties had to be taken into account. He decided to create a high-level body to ventilate the issues involved and to make recommendations. He charged the group with holding public meetings and soliciting comments on draft documents to make the deliberations as transparent as possible.

Especially notable was the group's recommendation that the United States adopt a consent-based policy for siting a repository. Such a policy would walk a fine line between outright federal preemption of any state role in siting a repository and an absolute state veto, exercised at one specific moment in time.

The time: the late 1970s. The president: Jimmy Carter.

In February 1980, President Carter laid out the administration's views on how to manage high-level waste and spent nuclear fuel (SNF).[1] In particular, the president accepted the recommendation of the Interagency Review Group (IRG) to use "consultation and concurrence" to guide the siting process: "[A] state would be in agreement with each step of the [repository development] process before the next activity [would begin]."[2] Although most of the IRG's advice was incorporated into the 1982 Nuclear Waste Policy Act, Congress transformed "consultation and concurrence" into "consultation and cooperation."

Thus, this country's first venture into consent-based siting was sidetracked, and ultimately aborted, by the passage of the 1987 Nuclear Waste Policy Amendments Act (NWPAA), which limited, for all practical purposes, site selection for an HLW and spent fuel repository to Yucca Mountain in Nevada.

In many respects, this nation's second attempt at consent-based siting was equally disappointing. The NWPAA also established the Office of the Nuclear Waste Negotiator, who was given a mandate to forge agreements with states or Native American tribes to host either a deep-mined geologic repository or a centralized spent fuel storage facility. Congress abolished the office in 1995, just as negotiations with the Mescalero Apache Tribe in New Mexico were gaining traction.

Subsequently, private efforts to site a centralized spent fuel storage facility on the Goshute Reservation in Utah ran into determined political opposition at the state and local levels. This opposition prompted legislation and administrative actions at the national level that first placed the project into a prolonged state of limbo and then forced its cancellation.[3]

Notwithstanding this History . . .

The Blue Ribbon Commission on America's Nuclear Future (BRC), established by the direction of President Barack Obama to chart a new path forward in the wake of the canceled Yucca Mountain Project, made consent-based siting the centerpiece of its recommendations. The administration has, in very general terms, endorsed that key proposal—see, for example, the U.S. Department of Energy's recent "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," *Radwaste Solutions,* May–June 2013, pp. 34–46.

It remains to be seen, of course, whether this latest recommendation to adopt a consent-based siting approach will meet the same problematic fates as its predecessors. Certainly the BRC is well aware of this history. Its "Report to the Secretary of Energy" nicely documents and analyzes each of the three previous efforts to implement a consent-based siting strategy. The commissioners argue, however, that "based on a review of successful siting processes in the United States and abroad—including most notably the siting of a disposal facility for transuranic radioactive waste, the Waste Isolation Pilot Plant (WIPP) in New Mexico, and recent positive outcomes in Finland, France, Spain, and Sweden—we believe this type of approach can provide the flexibility and sustain the public trust and confidence needed to see controversial facilities through to completion."[4]

My take on the evidence supporting the claim that a consent-based siting strategy is a realistic and potentially effective approach in the U.S. context—as opposed to simply a normatively attractive idea—is somewhat different. Although I would not fully concur with the view of Ward Sproat, the former director of the Yucca Mountain Project, who termed the consent-based siting recommendation "idealistic" and observed that it failed to acknowledge the "elephant in the room—politics,"[5] I would agree with his contention that the evidentiary foundations of the advice are less clear and more ambiguous than the BRC maintains. I will start with the siting experiences in other countries. I then will examine the development of WIPP.

Site-selection strategies for a deep-mined geologic repository necessarily involve passing candidates through what is, in effect, two distinctly different "filters."
On the one hand, detailed and quantitative technical requirements have to be met.
On the other hand, sites could be disqualified because of considerations such as "lack of social acceptance," "high population density," or "difficulty of access."

Thinking about Siting

The IRG observed that site-selection strategies for a deep-mined geologic repository necessarily involve passing candidates through what are, in effect, two distinctly different "filters." (It is arguable whether the two filters are truly independent of each other.) On the one hand, detailed and quantitative technical requirements have to be met. On the other hand, sites could be disqualified because of considerations such as "lack of social acceptance, high population density, difficulty of access." The technical and the nontechnical filters could be applied in any order. In the IRG's view at least, although the suite of sites eventually selected might be different, depending on the order in which the filters were applied, "equally suitable sites should emerge from either approach."[6]

Neither approach precludes a consent-based process. If, for example, detailed technical criteria are first used to evaluate potential sites, willingness to host a repository could become a deciding factor in the final choice. The risk here is that communities at all the potential sites might decline to host a repository or actively oppose their selection.

Conversely, a call could go out for volunteers at the start. Communities stepping forward would have to control real estate that satisfies very broad technical site-selection criteria to be considered further. [No sharp demarcation separates "detailed" criteria from "broad" ones. The difference between the two, however, can be understood by comparing the very detailed criteria used in the United States (*Code of Federal Regulations* Title 10, Part 960, "General Guidelines for the Preliminary Screening of Potential Sites for a Nuclear Waste Repository") with the broad guidelines used in the United Kingdom ("Managing Radioactive Waste Safely: White Paper by Defra, BERR, and the devolved administrations for Wales and Northern Ireland," Cm 7386, The Stationery Office, Norwich, England. Available at www.decc.gov.uk.)] Only later on would detailed site characterization winnow down the possible sites. The risk here is that no technically suitable site can be found in any of the communities. An additional risk arises if only one community volunteers. Then pressures of all sorts could result in design decisions that might compromise the long-term safety of the repository.

I suspect that countries, weighing these risks either implicitly or explicitly, have adopted site-selection processes to mitigate what they regard as the most critical ones.

Comparing National Approaches to Siting

Sweden

The disposal concept selected in Sweden, KBS-3, envisions spent fuel placed in copper canisters surrounded by bentonite clay and disposed of in the crystalline bedrock that covers most of the country. Thus, as a practical matter, a repository could be sited most anywhere.

In the early 1980s, nationwide test-drillings gave rise to widespread local protest. By the end of that decade, the implementer, nuclear industry–owned SKB, reformulated its siting strategy, recognizing that *under Swedish licensing legislation, communities held a near-absolute veto* over the development of a deep-mined geologic repository within their borders. In 1992, SKB sent a letter to all 286 Swedish municipalities, asking whether any of them would be interested allowing "feasibility studies" to be undertaken. Any expression of interest would be purely voluntary and could be withdrawn at any time.

Although two municipalities in northern Sweden expressed some initial interest, both asked SKB to withdraw once their citizens made plain their opposition in referenda. SKB then focused its attention first on four out of the five nuclear communities and ultimately on two of them: Oskarshamn and Östhammar. The company established a long-term local presence in each municipality, interacting with residents in what appears to be a sincere and

respectful manner. By all indications, solid bonds of trust were created. In 2009, SKB formally chose Östhammar largely on the basis of the soundness of the rock at that location.

Two years later, SKB submitted a license application to construct a deep-mined geologic repository in Östhammar and a facility for encapsulating SNF in Oskarshamn. The regulator, SSM, is reviewing these applications to determine whether they satisfy the requirements under the Swedish Nuclear Activities Act. On a parallel track, the Environmental Court is conducting a proceeding to determine whether the applications comply with the Swedish Environmental Code.

Finland

The Finns have adopted the Swedish disposal concept. Like its neighbor, most of Finland is covered by crystalline bedrock, thereby allowing considerable flexibility in choosing a site for a repository.

Site-selection criteria addressing fracturing and faulting patterns as well as population density were established by 1983. Siting investigations became increasingly focused by 2000, at which point four sites—Olkiluoto, Romuvaara, Kivetty, and Hästholmen—had been studied closely.[7]

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Under the Finnish Nuclear Energy Act, the implementer applies to the Ministry of Employment and the Economy to obtain a "decision-in-principle" from Government. The municipality plays a decisive role in relation to siting. The local council has an absolute right to veto the decision-in-principle; such an action cannot be overruled by Government.[8] The Decision-in-Principle on the repository was approved by Government in 2000 and ratified by the Parliament a year later. On December 28, 2012, precisely according to a schedule developed in the mid-1970s, Posiva submitted a license application to its regulator, STUK, to construct a deep-mined geologic repository.

France

Preliminary site screening began in France in the early 1980s. Intense public opposition arose, leading to massive demonstrations. In response, the French Parliament passed the 1991 Research on Radioactive Waste Management Act. That law required the implementer, government-owned, public service agency Andra, to characterize two sites for an underground research laboratory (URL), one in which the emplacement rock was clay, the other in which the emplacement rock was granite.

Ultimately, communities in the Meuse/Haute-Marne (clay) and Vienne (granite) Departments agreed to host an underground research laboratory, recognizing that if the sites proved to be suitable, a deep-mined geologic repository might be developed nearby. Andra prepared an extensive technical analysis, evaluating whether HLW could be emplaced in the Meuse/Haute-Marne clay.[9] In 2006, Parliament passed a second act, designating an area around Bure in Meuse/Haute Marne region as the repository site.

The successful siting of a facility in France seemingly supported the position of those, such as the BRC, who have argued in favor of volunteerism. But this example may, in fact, be a deviant case.

Although local officials in the Vienne Department were enthusiastic, the granite sites failed to pass through the technical filter, having been declared too difficult to evaluate by the French waste-management overseer, the National Evaluation Committee. Because the 1991 law appeared to require characterization of two sites, Government established the "Granite Mission of Concertation." The mission identified technically suitable granite sites in 16 Departments. However, the "mere announcement of the visit of emissaries from Government to the Departments selected for their quality of geological subsoil triggered a real outcry almost everywhere."[10] Consequently, to support the passage of the 1996 law, Andra was forced to compare a "real" clay site with an "abstract" granite one. (Andra sought to develop a deep-mined geologic repository for long-lived intermediate-level waste in the Meuse/Haute Marne region. To date, no volunteers have stepped forward.)

United Kingdom

After decades of temporizing and one aborted effort to site an intermediate-level radioactive waste repository, Government launched an ambitious course, Managing Radioactive Waste Safely (MRWS), and defined a multistage process. At its core was an initial commitment by the authorities to site a deep-mined, geologic repository only in communities that "voluntarily expressed an interest in taking part in the process that will ultimately provide a site for a geological disposal facility. . . . Participation up until late in the process, when underground operations and construction are due to begin, will be without commitment to further stages."[11]

Despite concerted efforts to encourage communities to volunteer, only one group of local authorities, in Cumbria County, expressed an interest in participating. (This expression of interest is particularly ironic because in 1994 the Cumbria County Council rejected an application to

investigate a site in West Cumbria to determine whether it was suitable for developing a repository for low- and intermediate-level waste. Whether the "rock" in West Cumbria is fundamentally unsuitable remains a highly contested issue.) An advisory partnership was established, bringing together 17 governmental and nongovernmental organizations. (See the West Cumbria MRWS Partnership website: www.westcumbriamwrs.org.uk. Importantly, three environmental advocacy groups refused to participate.) The British Geological Survey ruled out approximately 25 percent of West Cumbria but concluded that a potentially suitable site could be found on the remaining 1890 square kilometers of land.[12]

After nearly three years of intensive and highly transparent effort, the partnership presented a final report to the Cumbria local authorities. It observed: "The Partnership agrees that it is inherently uncertain at this stage whether a suitable site can be found, that more geological work is therefore required, and that it should be done as soon as possible. However, there is a difference of view in the Partnership about whether this further geological work should be done *before* or *after* a decision about [further] participation [emphasis in the original]."[13]

In January 2013, the local authorities voted on whether to proceed to the next stage in the MRWS process: authorizing desk-based studies to identify potential sites. Although the Borough Councils in Copeland and Allerdale voted overwhelming to move forward, the Cumbria County Council rejected the proposal. Among the reasons suggested for the denial were the lack of specifically identifiable potential sites, concerns about whether Government would allow communities to withdraw from the MRWS process as it continued, and the tension between the economic benefits of the proposed repository for industrial West Cumbria and the tourist interest in East Cumbria. (See, for example, the December 11, 2012, letter from the Department of Energy and Climate Change [DECC] to Bill Jefferson, Chairman, Lake District National Parks Authority. Available on the partnership website.) The DECC announced immediately after the county council vote that it was halting all activity in Cumbria. Government has since launched a review of what transpired in Cumbria with an eye to making revisions to the MRWS process.

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Canada

In a report to Government, the so-called Seaborn Panel concluded that the disposal concept advanced by Atomic Energy of Canada Ltd. (AECL) had failed to secure public acceptance.[14] In response, the Canadian Parliament passed the 2002 Nuclear Fuel Waste Act, authorizing the establishment of the nuclear industry–owned Nuclear Waste Management Organization (NWMO). The NWMO was required to develop collaboratively with Canadians "a management approach for the long-term care of Canada's used nuclear fuel." In what probably remains the "gold standard" today, NWMO initiated an extraordinary effort to interact with all sectors of the nation, especially Aboriginal Groups. It commissioned surveys and focus groups, it met with individuals throughout the country, and it sponsored topic-specific dialogues. Its report to the government recommended a siting process, Adaptive Phased Management, which combines specific institutional designs and behaviors with a technical concept that relies on multiple barriers and defense-in-depth.[15] Two years later, Government approved the approach.

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In May 2009, NWMO published for public comment a proposed process for selecting a repository site. In many respects, the plan contained elements of the MRWS program. The plan specified general criteria that might disqualify potential sites, sought voluntary expressions of interest from communities, and provided guarantees about the ability to withdraw from the process.[16]

Beginning the following year, NWMO began receiving expressions of interest from what turned out to be 21 communities. Contractors conducted initial screenings. Some areas, such as Red Rock, Ontario, were deemed unsuitable. Most, however, passed the initial screening, and many of those have decided to move to the next step in the process: more detailed preliminary assessment studies. So successful has the implementation of Adaptive Phased Manage-

ment been that in September 2012, NWMO announced a suspension of additional expressions of interest.[17]

Japan

The Japanese Diet passed the Specified Radioactive Waste Final Disposal Act, which came into force in 2000. The law established the nuclear-industry-owned nonprofit Nuclear Waste Management Organization of Japan (NUMO) as the implementer. It also mandated a voluntary, stepwise siting process and created a system for financing the development of a deep-mined geologic repository for HLW, transuranic-contaminated (TRU) waste, and long-lived low-level waste requiring geologic disposal.

In December, 2002, NUMO announced an open solicitation to all 3239 municipalities. The communities would have only to agree to a literature search to determine whether they might contain potentially suitable sites. Among the disqualifying criteria were the following:

- Clearly identified active faults.
- Regions with a 15-km radius of Quaternary volcanoes.
- Uplift of greater than 300 meters during the last 100 000 years.
- Unconsolidated Quaternary deposits.
- Economically valuable mineral deposits.

The expectation was that several municipalities would come forward to be designated "Preliminary Investigation Areas." Those localities passing additional muster would be designated "Detailed Investigation Areas." The repository site would then be chosen based on comprehensive surface investigations as well as measurements and tests in a URL.[18]

The mayor of Toyo township in the Kochi Prefecture southwest of Tokyo announced that he would respond positively to NUMO's open solicitation. Opposition arose immediately within the local community and from governors of nearby prefectures. Ultimately the mayor was soundly defeated in an election that served as a referendum on participation in the site-selection process. No other community has stepped forward since. From time to time, the Japanese government has suggested that alternatives to a voluntary approach may have to be considered.

The tsunami-caused accident at the Fukushima Daiichi nuclear power plant is likely to dampen further any voluntary impulse at least in the near-term.

Switzerland

In 1994, GNW, a subsidiary of Nagra, the implementing cooperative of radioactive waste producers and the Swiss Confederation, applied to construct a deep-mined geologic repository for LLW in the Wellenberg region of the Nidwalden Canton. Although the local authorities supported the application, a year later a *cantonal* referendum rejected GNW's bid. GNW submitted a modified application in 2001. This one met the same fate: local governmental approval but denial in a vote by the public.[19]

This experience led to the formation of an expert advisory group, which developed the notion of "controlled geological disposal."[20] The group's recommendations were largely adopted with the passage of the 2002 Swiss Nuclear Energy Law. The legislation requires a feasibility demonstration of safe and permanent disposal of HLW and SNF. This requirement was fulfilled when Government approved Nagra's safety assessment of a repository hosted in opalinus clay.[21]

Four years later, Government promulgated the Sectoral Plan, which defines the criteria for the siting process and the choice of potential host regions and sites. It also specified the process that would lead to the approval of a candidate site.[22] The Sectoral Plan calls for a three-stage process:

- Suitable siting regions are identified for each repository type, based on safety criteria defined by the regulatory authority.
- Potential repository sites are defined in the previously proposed siting regions and compared on the basis of provisional safety assessments. Socio-economic factors are also taken into account at this stage.
- Detailed investigation of at least two sites for each repository type. Such investigation includes a full safety assessment for each selected site. Based on the results of this process, a repository site will be selected for each repository type.

Stage 1 was completed when the Federal Council accepted Nagra's identification of six potentially suitable siting areas.[23] Nagra is now moving forward to identify specific sites within the accepted regions. As it does so, it is engaging local communities to determine informally whether they would support or oppose the siting of a repository.

However, voluntarism is not envisioned. The Sectoral Plan does require several rounds of more formal public consultations. Communities will be asked their views, but they have not been given any legal right to object. Ultimately, the Federal Council will select the repository site. That decision will be subject to a *national,* not a *cantonal,* referendum. In many respects, then, the Swiss siting process concentrates decision-making power in the hands of technical and national political elites.

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Germany

More than 35 years ago, a salt site was identified near the town of Gorleben in the state of Lower Saxony that might be suitable for development as a deep-mined geologic repository. The German government had, in fact, chosen the location based on a four-step siting process that considered a large variety of geologic, demographic, and op-

erational criteria. Contentious hearings were conducted in Lower Saxony on the advisability of developing a National Waste Management Center, which would include not only the repository, but also a sizable reprocessing plant. The Federal Government accepted the hearings' conclusion that the Gorleben salt site could be developed into a repository for HLW. (No explanation or rationale for the decision that emerged from the hearings was ever made public.)

Beginning in 1979 and lasting until 2000, surface and underground experiments were conducted and seemed, in the view of the proponents, to support the view that high-activity waste could be isolated and contained there for millennia. Throughout that period, opponents at the national level maintained that the process for selecting the site had been flawed and that in any case, a disinterested evaluation of the technical work would clearly demonstrate that the site was unsuitable.[24]

An agreement between the "Red/Green" German Government and the nuclear utilities was reached in 2001 and provided, among other things, for a three- to ten-year moratorium on investigations at Gorleben. Ten years later, the Christian Democratic government ended the moratorium, only to reinstate it in December 2012 after the tsunami that damaged the Fukushima reactors. The new moratorium will last until the next federal election, which is anticipated in September 2013.

During the past decade, several initiatives have been launched to develop a consensual siting process. For example, a Committee on Site Selection Procedure for Repository Sites issued a report calling for a criteria-based approach that would take into account long-term safety, regional development interests, and the willingness of the local population to participate in the process.[25] Draft legislation was presented in 2005 by the Ministry of Environment to create a staged site-selection process.

Beginning in November 2012, discussions were held among the major political parties to establish a common position on a new site-selection process. In May 2013, the German Parliament began debating a consensus approach, which called for the formation of a broadly based commission to develop detailed site-suitability criteria.

The Case of WIPP

The sole operating deep-mined geologic repository for radioactive waste is WIPP, in New Mexico. The history of its siting may inform efforts to institute a consent-based process in the United States.

A National Academy of Sciences (NAS) committee identified disposal in salt formations by as the "most promising method for the long-term management of HLW."[26] The Atomic Energy Commission (AEC) concluded that the Permian Basin in southeastern New Mexico was a potentially suitable location for a repository. Beginning in the early 1970s, municipal leaders in Carlsbad, faced with a sharp decline in the local potash mining industry, began to advocate strongly for the AEC to choose their community.

Based on the recommendations of the IRG, President Carter decided that a separate repository for defense-generated TRU radioactive waste was not needed and sought to eliminate WIPP's funding. But, supported by a sophisticated political campaign undertaken by Carlsbad's leaders, Congress for the first time authorized the development of WIPP and instructed the DOE to enter into a "consultation and cooperation" agreement with the state of New Mexico.[27]

As momentum for the WIPP project built, officials in New Mexico created the EEG to advise the state on the health and safety impacts of the proposed repository. Fiercely independent, yet bolstered by the support of powerful individuals, such as Sen. Pete Domenici, the EEG helped to ensure that technical issues would be addressed in a rigorous fashion.

As momentum for the WIPP project built, officials in New Mexico created the Environmental Evaluation Group (EEG) to advise the state on the health and safety impacts of the proposed repository. Fiercely independent, yet bolstered by the support of powerful individuals, such as Sen. Pete Domenici, the EEG helped to ensure that technical issues would be addressed in a rigorous fashion. As one commentator noted: "In general, the group supported the purpose of WIPP but consistently took a more cautious approach than the Department of Energy in urging further study of potential problems. Despite its inability to enforce its recommendations, it did prompt the department to change its plans."[28]

Nonetheless, the decision by the DOE to construct WIPP did not go unchallenged, either by the state or by nongovernmental organizations. Among other events, in 1981, those plaintiffs filed a lawsuit claiming that the land withdrawal needed to develop WIPP was contrary to law, that the DOE had failed to negotiate and sign the consultation and concurrence agreement, and that the DOE's emergency response plan was inadequate.

Although some of the issues raised in these lawsuits were soon settled, the state of New Mexico and the EEG continued to scrutinize closely the DOE's actions as work continued at WIPP. For example, the U.S. Department of Interior decision to withdraw land permanently for the repository, the DOE's plan to receive mixed radioactive and hazardous waste, and the DOE's proposal to emplace waste for experimental purposes all prompted new lawsuits by the state and several intervening organizations.[29]

The passage of the WIPP Land Withdrawal Act in 1992 resolved many of these conflicts.[30] A second NAS study concluded that unless the site is breached by humans sometime in the future, there is no credible, probable mechanism for release of radioactive material into the surrounding environment.[31] In May 1998, the U.S. Environmental Protection Agency (EPA) certified WIPP's compliance with the relevant radiation standards.[32] WIPP began receiving waste from Los Alamos National Laboratory on March 26, 1999.

Although the state of New Mexico has been zealous in safeguarding its rights and responsibilities, it has never unconditionally opposed the development of WIPP. Its acquiescence has depended, at least up until now, on preventing the disposal of HLW and spent fuel at the facility or near the site. Despite informal understandings with the DOE, the state insisted that the 1992 Land Withdrawal Act include a provision that limited WIPP's mission to the disposal of defense-generated TRU waste.

Current plans for WIPP's operation project that most of the TRU waste will be disposed of in the next decade or so. Carlsbad's leaders have made clear that they wish to expand the facility's mission to include the disposal of HLW and SNF. Officials from the state of New Mexico have been circumspect about its position on this possibility but have not foreclosed it.

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What Does It All Mean?

As policy-makers in the United States consider whether to adopt a consent-based approach to siting a deep-mined geologic repository for HLW and spent fuel, what lessons can they draw from the past, both at home and abroad?

Experience over the last nearly half century strongly suggests that any siting process that ignores the views, values, and preferences of a potential host community is unlikely to succeed. Technocratic and elitist approaches, such as many advanced in the past, are, in fact, creatures of the past.

Nonetheless, this examination of the full range of "data" strongly suggests that consent-based processes, which include but are not limited to voluntarism, will not necessarily culminate in a durable selection of a site. What then are the design conditions that may increase the likelihood of such an outcome?

- *Advancing a persuasive and technically defensible case for the safety of a country's disposal concept* ***prior*** *to seeking a community's consent seems to increase the chances of its being gained.*

The Swedish concept for disposing of spent fuel in crystalline rock, KBS-3, and, by extension, the Finnish one, enjoys strong technical support, including rigorous international peer reviews.[33] Although the AECL had not made a persuasive argument to demonstrate the social acceptability of its concept, even the Seaborn Panel recognized the strength of the technical argument, which parallels the approach adopted by the two Nordic nations. The French concept for disposing of HLW in argillite rests as well on a firm scientific foundation. Similarly, the Swiss have subjected their concept of disposing of HLW and SNF in opalinus clay to international scrutiny.

The salt disposal concept adopted at WIPP and, at least for now, by the Germans, traces its technical roots to the 1957 NAS report. Whereas the WIPP project was extensively reviewed by the EEG, NAS, and EPA, a full-fledged safety case for implementing this concept to dispose of spent fuel at Gorleben has not yet been developed—and thus has not yet been closely examined by the technical community. That circumstance probably has exacerbated the conflict over the Gorleben site, although it is by no means the sole contributor.

Finally, the Japanese and the British have advanced generic safety cases for at least two disposal concepts. The Japanese have conducted a comprehensive performance assessment for theirs. Nonetheless, the technical assessments in either country do not seem to enjoy the same international acceptance as, for example, KBS-3. (I am not suggesting that there are no residual uncertainties associated with the KBS-3 concept. For many, the issues of copper corrosion and bentonite behavior remain open.)

Certainly, the recent decision in Cumbria not to proceed with the MRWS process was influenced by the ambiguity of what disposal concept might be adopted. The general disqualifying criteria established at the start of the MRWS process focus predominately on rock type and resource conflicts and say little about hydrogeology and deep flow and transport, issues central to the performance of any deep-mined geologic repository. But again, the uncertainty surrounding the disposal concept is probably not the sole determining factor in Cumbria's decision to discontinue its involvement.

- *Institutional continuity and culture likely affect whether bonds of trust are formed between waste managers and potential host communities.*

The proposition that trust is a *sine qua non* for obtaining the consent of a potential host community has become today's conventional wisdom. (See, for instance, Ref. 34, where it first was suggested, and Ref. 35, where it is argued fully.) Certainly, the close relations established between SKB and both Oskarshamn and Östhammar confirm the thesis. Andra with Bure and the DOE with Carlsbad provide additional support.

As suggested earlier, NWMO offers an extraordinary model. Its deliberative process—steady, thoughtful, and sensitive—transformed a contentious issue into a largely consensual one. And along the way, it convinced an unprecedented number of local communities to express an interest in possibly hosting a deep-mined geologic repository for spent fuel.

What distinguishes the situation in Canada from the situation in both the United Kingdom and the United States, for example, is that NWMO created Adaptive Phased Management from scratch *and then* was given the responsibility for implementing it. This continuity, I believe, has proven to be a valuable asset.

In contrast, the MRWS approach in Britain was first ad-

vanced by the Committee on Radioactive Waste Management (CoRWM I). Subsequently, it has been overseen by the Department for Food and Rural Affairs and then by the DECC. The presumed implementer, an off-shoot of the Nuclear Decommissioning Authority, has been interacting with the West Cumbria Partnership but only as an observer and not in the role of a central player. One wonders whether the outcome in Cumbria might have been different if the U.K. government had decided to have the implementer, not a surrogate, engage the communities.

In the United States, the BRC has been disbanded now for more than a year. Its former members continue to contribute to the national debate, and its ideas still provide an important focus for discussion. How Congress will respond is still quite uncertain. Nor is it clear how a consent-based siting process will be designed to reflect the unique American experience.

Finally, the behavior of the regulator seems to be as important as the behavior of the implementer. In Sweden, SSM and its predecessors and, in Finland, STUK, have well-established reputations for being trustworthy and representing the interests of communities. The U.S. Nuclear Regulatory Commission in the United States interacted visibly with the state of Nevada, but their relationship has not been unblemished over the years.

- *Any consent-based process will likely struggle with the issue of how power is distributed among the central government on the one hand and regional/state/local governments on the other.*

Historically, municipalities in Sweden and Finland have possessed definitive power in determining the course of development within their communities. This tradition was accepted when legislation setting up the siting process for a repository was passed. Swedish municipalities enjoy, for all practical purposes, a veto, and Finnish communities retain an absolute one.

Countries committed to voluntarism, such as Canada, Japan, and the United Kingdom, have made the political decision to cede near absolute power over siting to localities. (It should be noted that the Japanese and British commitment to voluntarism is not as unambiguous as the Canadian one. The recent events in Cumbria also suggest that even at the local level, different communities might view the development of a deep-mined geologic repository as affecting their immediate interests in opposite ways.) France discovered the limits of voluntarism when no community sitting upon granitic formations was willing to volunteer once the rock around Vienne was deemed unsuitable.

For countries with strong federal structures, like Switzerland, Japan, Germany, and the United States, the issue is much more complicated. The plan to construct a low- and intermediate-level waste repository at Wellenberg was defeated in a local popular referendum, notwithstanding support from the local authorities. With the Sectoral Plan, the federal government withdrew that power from the cantons and transferred it to the population of the country as a whole, a seemingly preemptive response.

The efficacy of consent-based siting in Japan had been called into question even before the tsunami struck the Fukushima power plants.

Over the years, the state of Lower Saxony has waxed and waned in its enthusiasm for hosting a repository at Gorleben. As noted earlier, the political process to create a new siting process is still under way. However, it appears quite possible that there will be a strong application of the technical filter at the start, with nontechnical considerations having a less than decisive influence at the end.

The BRC has not prescribed what a consent-based process ought to look like, arguing that it is up to the parties themselves to negotiate the modalities and to reach an enforceable agreement. In some respects, that approach is prudent and justifiable. But, as the Obama Administration response to the BRC indicates, it is quite possible to endorse what appears to be a normatively attractive idea and yet avoid committing to any specific institutional design.

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The experience in the United States will continue to frame expectations for the BRC's recommendation to adopt a consent-based siting process. Congress has had three opportunities to endorse such an approach in the past but has declined to do so. Early indications suggest that the path leading to a replacement for the Nuclear Waste Policy Act is likely to be circuitous and littered with obstacles, not the least of which is the continuing debate over the future of the proposed repository at Yucca Mountain.

Thus, it is hard to be sanguine over what, if anything, will transpire to push forward, at least in the near term, the quest for a repository in the United States. But then, working in the nuclear waste disposal business here has always been a vocation that has attracted optimists and visionaries, even if they are too often disappointed.

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