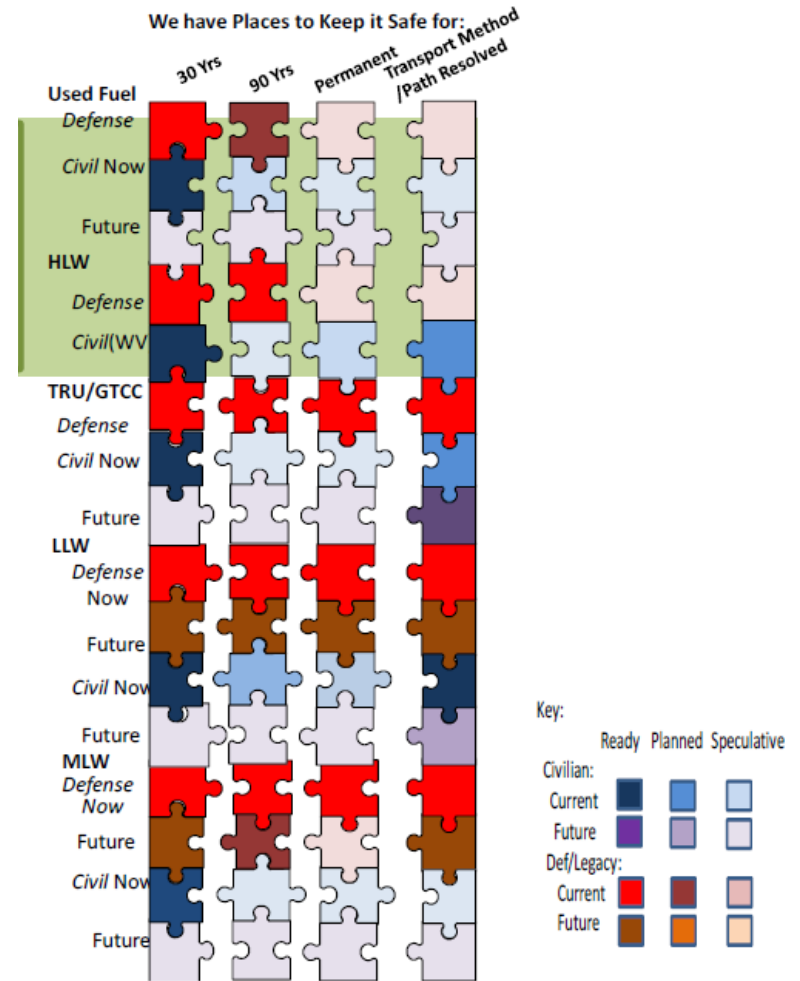


Siting Challenges in the Context of Integrated Nuclear Waste Management

**Presented to:
The Blue Ribbon Commission on Nuclear Waste
Charles W. Powers, Ph.D.
CRESP and Vanderbilt University**

Washington, D.C. September 21, 2010

**Nuclear Residuals Management Today:
Defense & Civilian, Using Existing Waste Classifications**

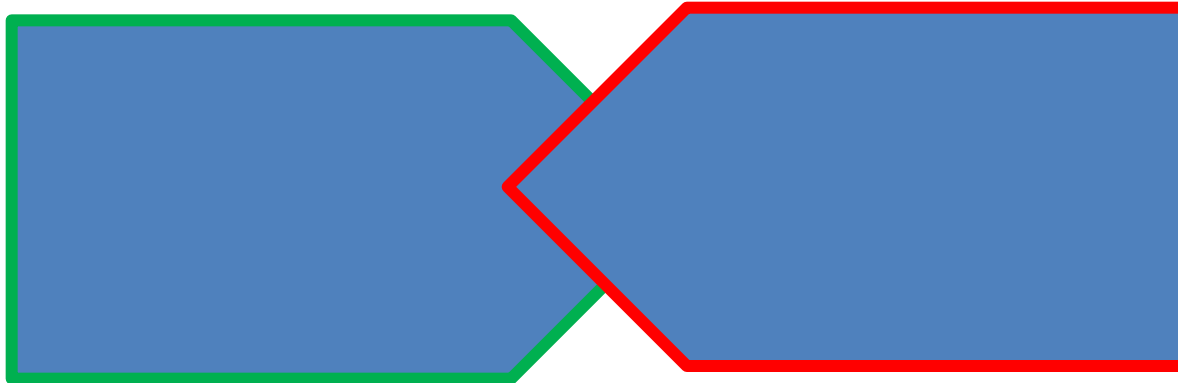


The Commission's Challenge:

53 Years after the NAS
recommendations
very little is resolved
- and siting is the major obstacle

The area of agreement among all those who have presented to the Commission:

**We know we need an
integrated “back-end strategy”
to move forward/break the impasse**

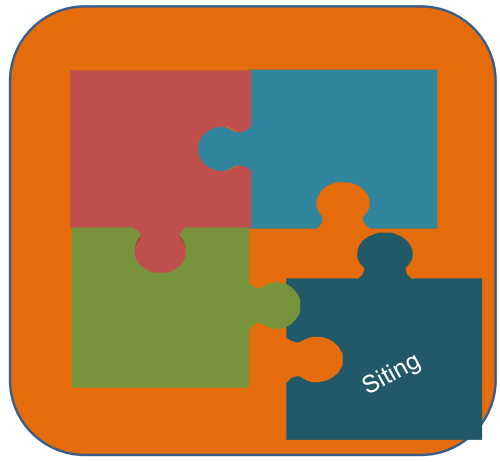


**We know we need to acknowledge
we do not yet know where the technology
will take us that might make some “waste”
a safe “resource” - and
We know that only phased, step-by-step
processes can win the assent
of the needed parties**

Options	Regulation/ Classification Waste/Resource	Institutional Management Pub/Priv./Mix	Siting Interim/Disposal facilities	Transportation
A				
B				
C				
D				
E				



Not only a list of “options” for
“Managing the back end of the fuel cycle”
BUT a “plan”



Commission’s Objectives and Scope of Activities
“..will make recommendations for a new plan.”

Objectives of this presentation: Siting in the Context of an Integrated System

- To place the challenge of nuclear waste facility siting in the context of what would create integrated nuclear waste management – including three guiding principles for such a plan: safety, informed consent and equity
- To define the importance of a very early Commission decision as to whether, and if so how, storage and disposal of defense and private nuclear waste should be governed by the same or separate policies and institutional management processes.
- To explore briefly how the presuppositions that governed in the late '70's early '80's helped lead to the current siting impasse and what concrete steps could be taken to make a new start successful – and to explore structural ways to address perhaps the major impediment: the perception that on nuclear waste the *government does not keep its promises*
- To propose a scenario where siting efforts would seek to elicit local and state proposals to serve as sites for regional interim storage and for developing fuel recycling options while simultaneously the waste streams and appropriate geological and geographical settings contexts for final geological disposition are defined and siting for them pursued.
- To draw on the work and experiences of the Consortium for Risk Evaluation with Stakeholder Participation and related work to explore the relationship between credible technical work and public acceptance when nuclear waste decisions are at issue
- To suggest the basic outlines of the authorities, foci and key practices of a successor Commission to this one that would have a operate for at least a decade to facilitate nuclear waste facility siting – and specifically what kind of authority and resources would be needed to allow it to address the local/state conundrum

Safe: What criteria would an interested community and state expect to be persuaded when considering hosting a site provide safety and responsibility, considering current & future knowledge and uncertainties?

Essential criteria include that the implemented system:

- Incorporates pre-emptive monitoring in-place and is designed to facilitate detection and correction needed to respond to unforeseen processes and events prior to the occurrence of unacceptable consequences.
- Provides for retrievability of nuclear materials/wastes for many generations to allow review and changes based on future resource needs, knowledge and values.
- Provides for technically safe permanent disposal if future generations chose that option, without placing unreasonable financial burdens on future generations.
- Allows no implementation of any facility or process whose implication and foreseeable adverse consequences for preventing proliferation have not been addressed
- Is developed and maintained by stable and credible institutions to ensure management - and resources - consistent with these criteria over the full-term of its operation the arrangement – and to lock in those assurances (trust funds, irrevocable agreements/leases/escalating liability provisions

Equity

Distributional values, which determine the fair allocation of costs, benefits and risks to stakeholders and society as a whole.

- Which generation should make the decision and bear the burden?
- Who in the current generation should fairly bear the burden of having the waste nearby?
- Perceptions of benefits and risks (burdens)

Three Ethical Perspectives on Intergenerational responsibility

“...The generation of citizens which has enjoyed the benefits of nuclear energy has an obligation to responsibly dispose the waste in-perpetuity.”

“...Our obligation is to give them (succeeding generations) a real choice and the opportunity to shape their own decisions while at the same time not imposing a burden which future generations may not be able to manage.”
[paraphrased from Canadian Nuclear Waste Management Organization study & Tom Isaacs]

“...Our connection to 10 or 100 generations in the future is more remote than our sense of obligation to distant world events with which we do not engage. Therefore, our judgments of prudent use of current resources should be a balanced reflection of our values and immediate generations because many generations in the future will likely derive little benefit and have different norms and values.” [Milton Russell, 2008].

Informed Consent

The host community is fully familiar with the nuclear energy and or nuclear systems to be operated (informed) and knowledgeably agrees to their local siting and operation throughout the process of the facility development (consent).

➤ To explore briefly how the presuppositions that governed in the late '70's early '80's helped lead to the current siting impasse and what concrete steps could be taken to make a new start successful – and to explore structural ways to address perhaps the major impediment:
the perception that on nuclear waste the *government does not keep its promises*

Beginning in 1977, there were four basic choices that became a set of premises of almost all nuclear waste management action: 1) the nation would no longer recycle its used, but energy-rich, used (spent) nuclear fuel because, it was believed, that recycling process would promote proliferation of nuclear weapons; 2) management of used fuel would be restricted to burying it permanently and safely in deep geologic repositories – immediately - so that the burden of its management would not be passed on to future generations; and 3) the selection of the specific characteristics and location(s) of the repository(ies) would be based on technical factors and regional equity, not local public acceptance, since, it was believed, no community or state would ever voluntarily support the nearby siting of such facilities; 4) efficiency dictates that a single repository should host both the civilian and defense wastes, including both spent nuclear fuel and vitrified high level waste, that are to be sent to a geological repository.

In retrospect, alternative premises might have been both implementable and have better served the diverse public purposes that have emerged early in the 21st century. Those “alternative premises” can be simply stated: 1) If it can be done safely, economically and protect against proliferation, the nation should develop the capacity to retrieve the energy left in nuclear fuel after initial use; 2) this fuel should be stored for a significant period of time (at least 90 years) in intermediate surface storage facilities, both so that it “cools” and thus can be more efficiently stored permanently and be available should effective recycling technologies and systems evolve; 3) when good practices are employed in nuclear residuals management (whether in its transportation, storage, or permanent disposition) the risks are not greater than the risks from management of other hazardous materials; 4) nuclear materials management should take place in locations where the affected communities understand and want to host the nuclear facilities, when adequate financial and safety considerations are made.

Then

Now

A Paradigm Shift

Simply put, the Commission should commit to the following basic criteria to guide every aspect of the site selection process

Site Selection

1. Stable, credible and transparent process
2. State and local assent
3. Geographic equity (re-establish).
4. Appropriate geologic and geographic setting.
5. Comprehensive Safety Case established to address known and provide mechanism to address evolving issues.

Note: while these criteria seem self-evident it is arguable that only the 4th and possibly 5th have characterized our nuclear waste siting processes to-date

➤ To define the importance of a very early Commission decision as to whether, and if so how, storage and disposal of defense and private nuclear waste should be governed by the same or separate policies and institutional management processes.

- the current confusion (separate but overlapping classification systems, authorities, managers and management systems, culminating in a common repository and some other facilities) leads to serious inefficiencies and only tentative and intermittent co-operation and/or separation and understandable public puzzlement.
 - Examples: separations expertise from legacy waste processing and related separations work informing new fuel cycles and their waste streams and management. Possible dual storage location uses. WIPP's siting example.
 - But on the other hand, does weapons legacy work “tarnish” nuclear energy and does the current overlap limit institutional innovation on the “private” side or confuse resolution of the distinguishable defense HLW disposition?
- every aspect of what the Commission decides about all key issues in the “plan” it has been charged with producing will flow from its decision on this defense/civilian issue – and nowhere more importantly than on the siting strategy it chooses. Are DOE sites in or out as potential interim facilities for civilian SNF, for example.

➤ To propose a scenario where siting efforts would seek to elicit local and state proposals to serve as sites for regional interim storage and for developing fuel recycling options while simultaneously the waste streams and appropriate geological and geographical settings contexts for final geological disposition are defined and siting for them pursued. Safety, Equity and Informed Consent

If the NRC says (9/15/2010) that when SNF is in cask storage, the Commission has the needed confidence in interim storage safety for 60 years after a reactor closes, then why move it from current reactors to centralized storage? And while it might make sense to move it when a reactor closes, why more than one such facility?

We simply need to take concrete steps to “normalize” the nuclear waste management and siting process – we need to show we know how to do it – that WIPP is not some exception but a model (modified as appropriate).

We need to be doing what we know we need to do and to be taking modest but sure steps to prove that we can both proceed but be continually adapting as we pursue the full plan including a repository

We need to help the public understand that the nuclear waste management issues are large and hard - yet tiny By comparison to what we expend, the risks we run and the property we sequester to generate other forms of power – and that will not happen until we demonstrate that a process that is actually working has been incorporated the fabric of economic and social life. Waiting to see what happens is not a “new plan”

Would also serve many of the international concerns that Mr. Timbie discussed.

To draw on the work and experiences of the Consortium for Risk Evaluation with Stakeholder Participation and related work to explore the relationship between credible technical work and public acceptance when nuclear waste decisions/siting are at issue



What and Who is CRESP?

The Consortium for Risk Evaluation with Stakeholder Participation III

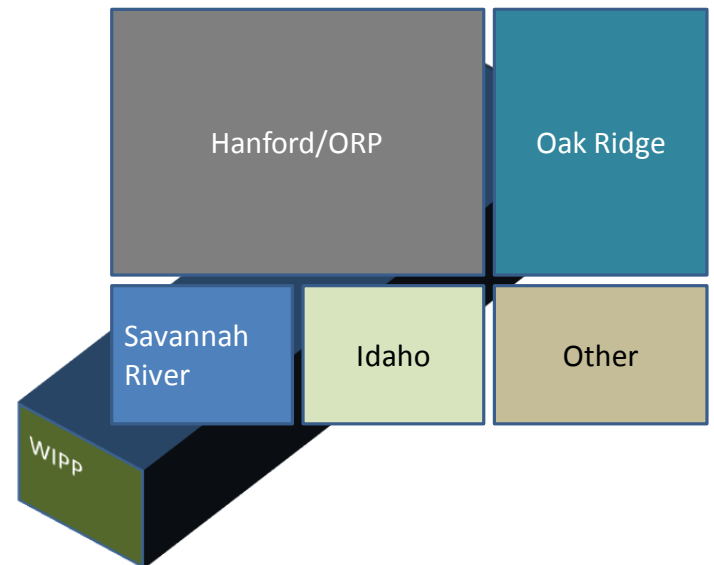
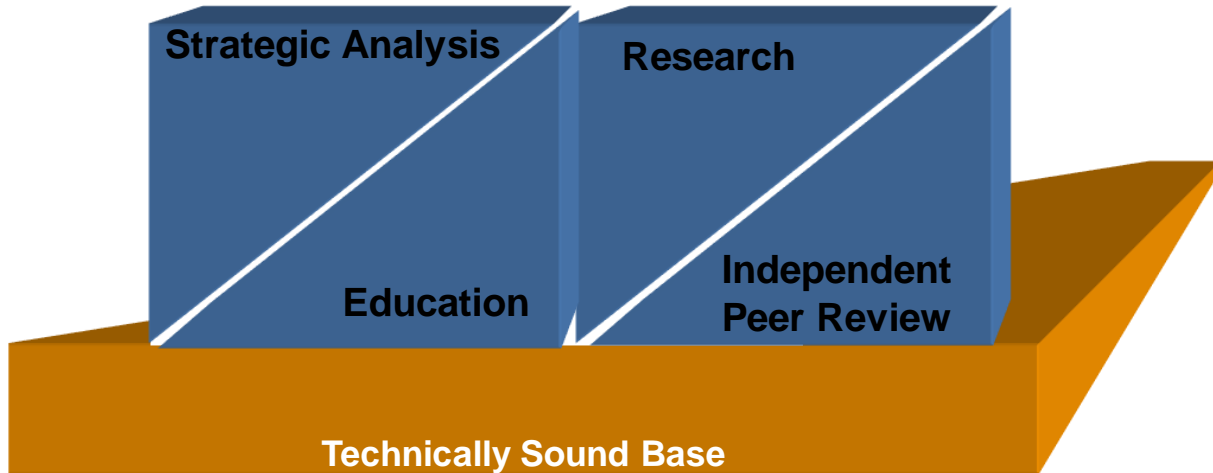
Mission: Support safe, effective, publicly-credible, risk informed management of existing and future nuclear waste from government and civilian sources through independent strategic analysis, review, applied research and education.

David S. Kosson and Charles W. Powers, Co-PI's

Institutions: Vanderbilt U. (lead), Rutgers U., Oregon State U., U. of Pittsburgh, New York U., Howard U., U. of Arizona, Robert Wood Johnson Medical School, U. of Washington

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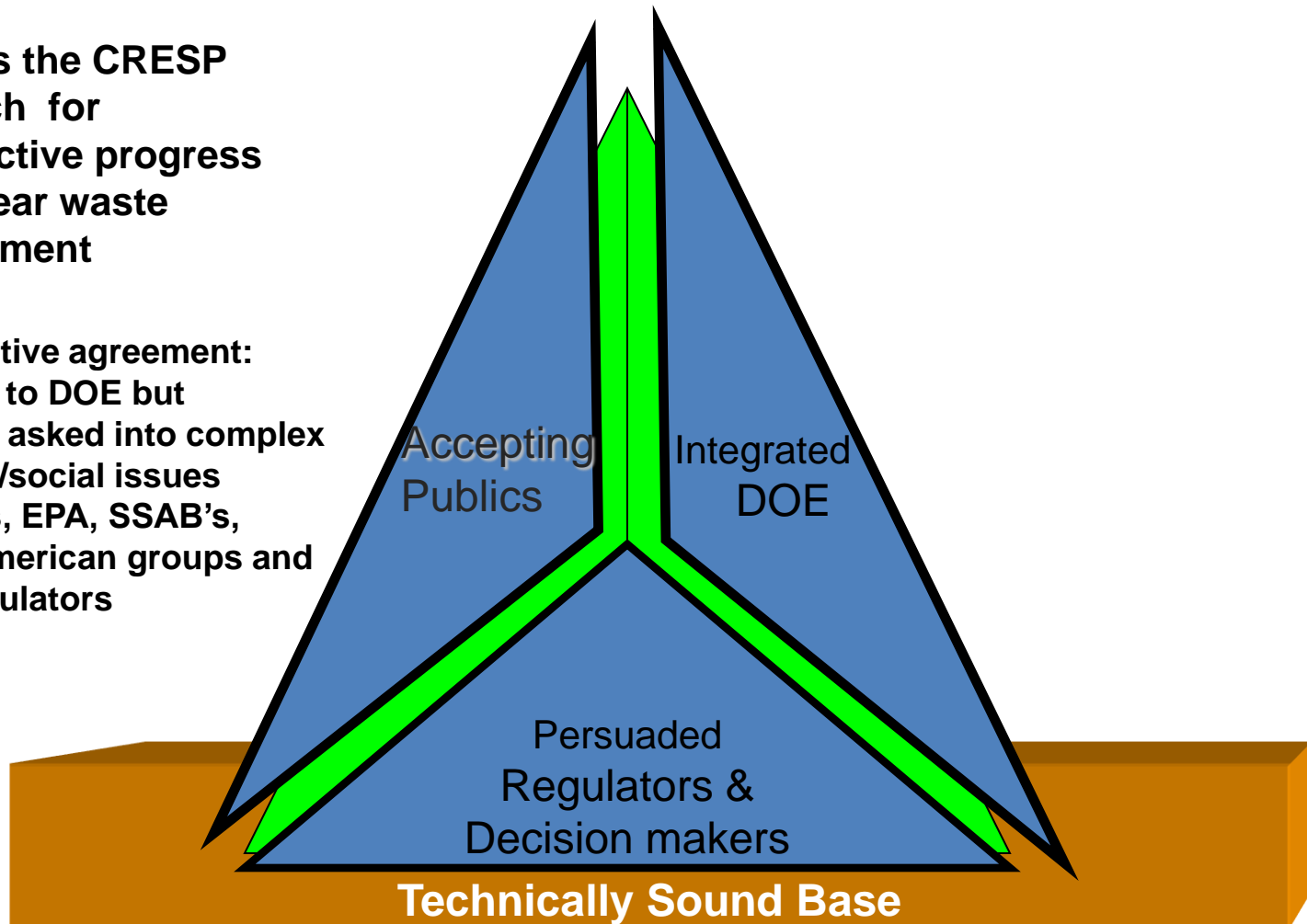
CRESP's Four Functional Modes pursued throughout the Legacy Site complex



The Eternal Triangle

Explains the CRESP approach for constructive progress on nuclear waste management

Co-operative agreement: Advisory to DOE but has been asked into complex technical/social issues by States, EPA, SSAB's, Native American groups and other regulators



What CRESA has learned about Nuclear Waste Facility Siting and Public Perceptions

The general Public knows very little about nuclear waste, even as to where it is currently located – major demographic-specific differences

The American mind appears to close when it hears the word “nuclear”, but not yet well-understood/studied is the extent to which that is currently changing and whether there are emerging major “age-specific” differences in perception about all matters nuclear.

The FACA’s at DOE’s Nuclear Waste Facility Sites play a major role in providing what appears to be the most effective way yet devised for promoting an effective mechanism of broader public understanding linked to the technical and public policy challenges nuclear waste managers face

The publics nearest both DOE and non-DOE nuclear facilities are generally both more knowledgeable and receptive to additional nuclear facilities – but there are major differences among those sites and the presence of facilities is a very poor predictor of state policies and receptiveness (see Seth Kirshenberg’s ECA testimony – and your own visit to Hanford)

Concern about Promise-keeping is the most common concern

How does trust on technical issues evolve?

- National scientific institutions (eg., NAS) – broad agenda
- Transparent management/contractor processes
- Some capacity to address and track local technical challenges (universities – labs – other created state units?)
- Locally-recruited – federally funded – technical advisors to stakeholder groups

The central role of local FACA's or their equivalent – with sustained support and stable institutional governance – in questioning/ translating key issues*

Is CRESP an aberration or a model?

- But as the commission has seen, those most knowledgeable are often the most concerned with promises not kept

A theme constantly reiterated to the Commission: “this is not primarily a technical problem”

Three key elements:

- Education (elementary, lay and professional) – what can be said impartially and credibly, what is the curriculum? where is it taught?
- Independent legal-policy research – what is the law, where are the segues?
- Social scientific work – what does the public understand/reckon and why?

All are missing from most of the current research processes

CRESP’s work is not enough:

but for example:

FUEL CYCLE TO NOWHERE? FAILURE AND
SUCCESS IN U.S. NUCLEAR LAW AND POLICY,
Richard Burleson Stewart, Jane Bloom Stewart (in
press, Vanderbilt University)

Table 1. Public Knowledge of Disposition of Used/Spent Commercial Nuclear Fuel in the United States, % 2008

Source	Answers, Total sample	Six nuclear waste/or lab	Five nuclear power plant	National sample
Stored at nuclear power plants above ground	9.6	11.6	9.0	7.0
Stored at Yucca Mountain underground	22.8*	25.2*	22.3*	19.5*
Reprocessed and used as new fuel	1.7	na	na	na
Dumped in the ocean	1.3	na	na	na
Reprocessed into weapons grade materials	0.5	na	na	na
No answer	64.1	59.0	64.8	70.8

na=no answer because of small numbers. Aggregate of three for six nuclear waste/labs was 4.2%, 3.9% for nuclear power plant sites; and 2.7% for national sample

*Stored at Yucca is significantly higher than other choices at $P < .001$ in all four comparisons.

Michael Greenberg, Heather Truelove

[“Right answers and right-wrong answers: Sources of information influencing knowledge of nuclear-related information”](#)

Socio-Economic Planning Sciences, Volume 44, Issue 3 Pages 130-140

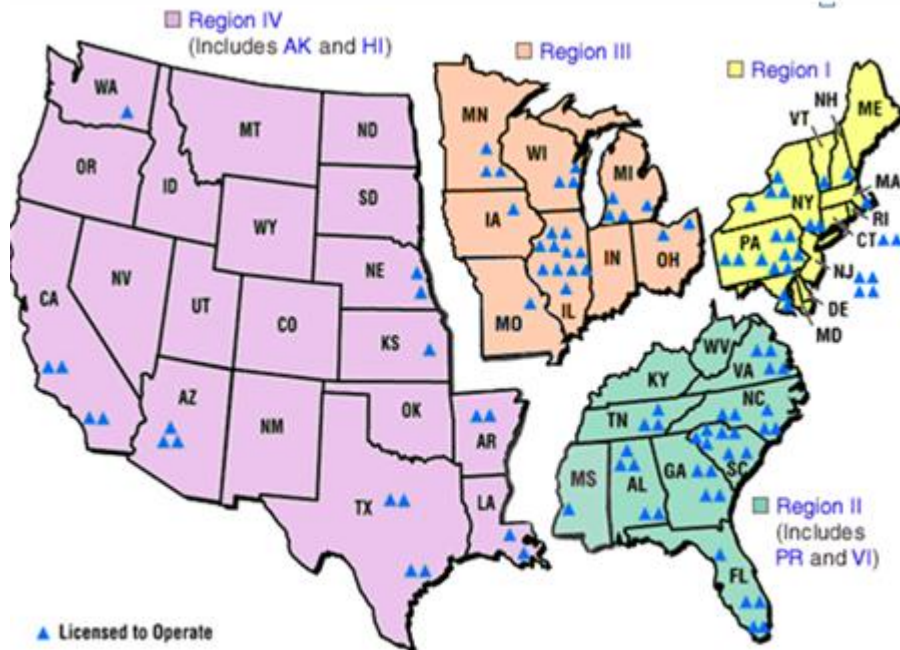
Also; Greenberg, Michael R, NIMBY, CLAMP, and the Location of New Nuclear-Related Facilities: U.S. National and 11 Site-Specific Surveys *Risk Analysis*, Vol. 29, No. 9, 2009, pp 1242-54.

The Reporter’s Handbook on Nuclear Materials, Energy and Waste Management, Greenberg, Michael R. et. al., Nashville, 2009, Vanderbilt University Press

When is it that communities want to host nuclear materials and waste management facilities?

Communities appear to want to host one or more nuclear materials and waste management facilities when:

- The affected parties and communities are all part of an equitable distribution of the benefits of the facility. That distribution to include both “company of others” [others doing the same equitable thing] and pilot status for most of the approval/start-up process
- The affected parties and communities are assured of a long-term commitment to diverse and evolving patterns of economic support and development that is responsive to the community’s and state’s needs.
 - Infrastructure, educational opportunity, economic development that is synergistic with the facility’s mission so that the selection continues its benefits. (Trusts, iron-clad agreements, owner-lease arrangements, accelerating and well-defined penalties when waste movement is promised
 - Direct benefits (jobs, property subsidies, etc.).

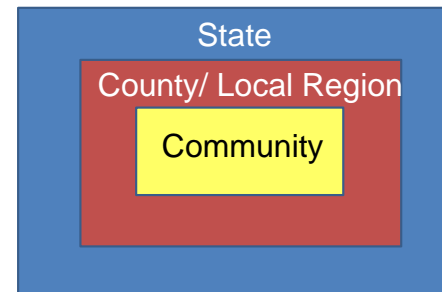


▲ Licensed to Operate

Note: There are no commercial reactors in Alaska or Hawaii.

Continental US divided by Nuclear Regulatory Commission Regions – and identifying locations of nuclear power reactors

But States are the lynchpins to the siting process



In the US, failure to achieve the assent and active participation **of the host state** in the decision to site a nuclear waste facility will simply not work

Why do states consistently resist the suggestion that communities or regions within the state host nuclear waste management facilities?

And those who have resisted are many and quite geographically diverse

States have not been persuaded that permitting one of its communities to host waste management facilities when:

- The states appear to believe there is scant evidence that when taken as a whole there will actually be an equitable distribution of the benefits of the facility to the full state.
- States are dubious that they can guarantee a long-term commitment from the federal government that it will provide patterns of economic support and development that can be spread broadly within the state – and state governments have witnessed no upwelling of public support
- Popular fears of transportation of waste to those facilities remain very high
- States see no evidence that federal government has established law or practice that indicates it will provide equity at a national level to those regions that both benefit from nuclear energy and accept responsibility for managing used fuel and wastes.

Experience with Promise-keeping!

But isn't the siting of WIPP in New Mexico a contrary example?

Be very careful to sort out the real experience of WIPP from the simple anecdotes:

WIPP was and today remains “a pilot project” over which the local community had the right until it opened to say “stop”

Additionally, the state demanded and received a major new road and \$300M unrestricted federal dollars in the final negotiation

New Mexico – supported by congressional jurisdictional factors – was able to limit the waste it received to defense waste – and controls the characteristics of the TRU it receives (RCRA)

New Mexico fought hard to ensure government guarantees regarding WIPP would be binding - in site-specific federal law and made judicially enforceable

Joseph Canepa, an attorney in the New Mexico Attorney General's office from 1978 through 1982 while WIPP was in development, reflected:

“A state must impose a phased decision-making process in order to have any type of meaningful role in, and effective control over, such projects.

The state must avoid at all cost being put into the position of making a one-time decision which gives the "green light" to the project forevermore”.

- To suggest the basic outlines of the authorities, foci and key practices of a successor Commission to this one that would operate for at least a decade specifically to facilitate nuclear waste facility siting – and to assure it had the authority and resources needed to allow it to address the local/state conundrum

Siting of nuclear waste is a very long term process and especially since the technical issues involved are evolving. To hand oversight of the issue to any “typical” bureaucracy, and/or to the same institutions who actually manage existing facilities or to those who will regulate the facilities is to create role confusion. If safety, informed consent and equity are the triangle of principles, the institution which implements them must in everything it does exhibit them and create no confusion as to what its mission is.

Similarly, we have seen that the formation of an Office of Waste Negotiator, not operating in the context of an otherwise viable program, and being given both a short lease on time and limited resources, could not (at least in the early ‘90’s environment succeed. Whereas a Commission of the requisite quality could not easily be dismissed

If, as is suggested above, the major obstacle to siting of nuclear waste facilities has been and will continue to be the host states, a weighty commission properly composed and with the resources and authority, is the only mechanism likely to be effective in achieving whatever the Commission recommends on siting

Recommendations

- Establish ca. 90 years from removal from reactor as reference aging interval prior to long-term disposition.
 - Safe and acceptable dry cask storage.
 - Provides for initial decay to reduce heat generation and shielding requirements.
 - Allows time to explore next generation fuel cycles.
 - Allows time to establish and pilot geologic repository.

Recommendations

- Establish multiple regional interim storage locations.
 - Provide geographic equity.
 - Process should include informed consent and multiple forms of on-going stakeholder engagement.
 - Process should include compensation and opportunity development.
 - Existing Federal Facilities may be attractive.

This advice is the same advice I gave to EPRI in 1991. Many in this room agreed then whether quietly or openly. It is my own personal hope that the Commission's plan can incorporate these principles, recommend these practices – in the context of the integrated nuclear waste system what facilitates a new culture needed.