# Considerations for Siting of a UNF Repository: *Public Acceptance*

Remarks prepared for the United States
Nuclear Waste Technical Review Board

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# Overview

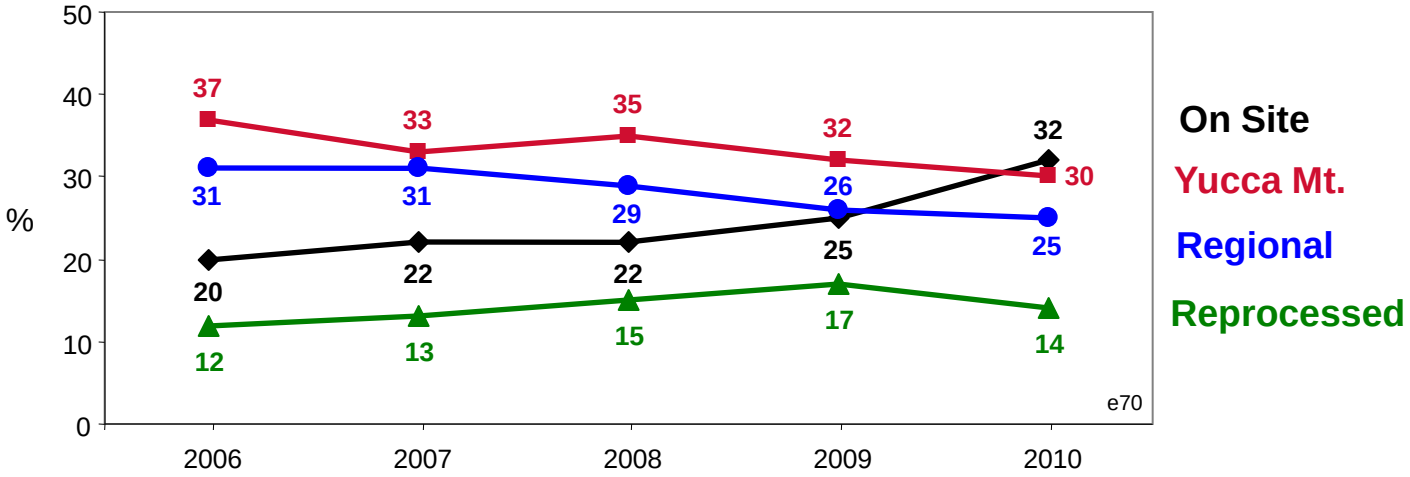
- Public Beliefs about UNF
- Preferences for Current and Alternative UNF Policy Options
- Policy Design Variations and Public Preferences for UNF
- UNF Disposal Facility Proximity and NIMBY

# Measuring Public Views on Complex Policy Issues

- Energy and Environment Survey Project
  - Nation-wide surveys annually, 2006 to present
  - May 2011 Focus on Nuclear Waste Views and Preferences
  - Research funded jointly by Sandia National Laboratories and the University of Oklahoma
- Mixed-mode survey collection required
  - Telephone (June 1 – July 5, 2010, n=529 interviews)
  - Internet (June 8-9 2010, n=1890 interviews)
- Representativeness and Reliability
  - Phone survey cooperation rate – 78%
  - Demographically and regionally balanced

# Awareness of Current Methods

**What currently is being done with most US spent nuclear fuel?**




(Currently, used nuclear fuel is being stored temporarily at > 100 sites in 39 states.)

**To the best of your knowledge, is spent nuclear fuel being stored above ground at any nuclear power plant within your state?**

| Correct | Don't Know | Wrong |
|---|---|---|
| **12%** | **59%** | **29%** |

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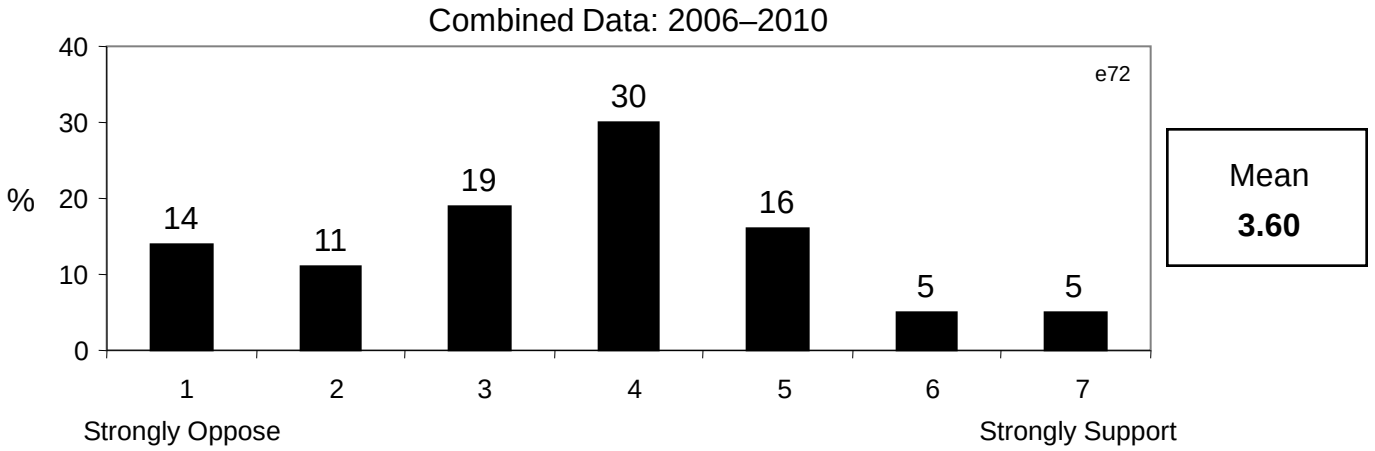
# Support for On-Site Storage for "the Foreseeable Future"

**(Random Order)**

"Opponents argue that some nuclear power plants where spent nuclear fuel is stored are near rivers, oceans, and large population centers. On rare occasions spent fuel has leaked radiation into the cooling pools. Moreover, the cooling pools and containers are located at ground level, and therefore might be vulnerable to terrorists. They note that these storage practices do not provide a permanent solution for managing spent nuclear fuel."

"Supporters argue that transporting spent nuclear fuel by train or truck to consolidated storage facilities is risky, that storing spent nuclear fuel at nuclear power plants is less expensive than consolidated storage, and that it buys time for finding future solutions. Moreover, storage at nuclear power plants has not caused any accidents that have exposed the public to radiation."

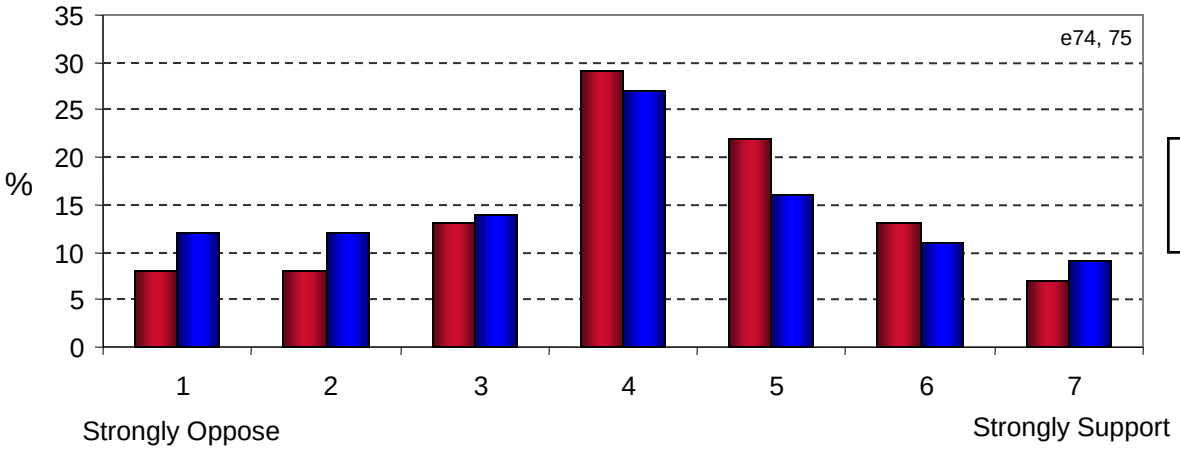


# Preferences for Number of Permanent Storage Sites

**(Random Order)**

- Construct **six to eight regional storage sites** that can be more easily secured and can provide longer-term storage. This option requires transporting spent nuclear fuel by train or truck over moderate distances and is likely to generate political and legal opposition

- Construct **two large centralized storage sites** (one in the west and one in the east) that can be most secure and provide permanent storage. This option requires transporting spent nuclear fuel by train or truck over longer distances and is likely to generate political and legal opposition.




**Means: 2010**

**Regional: 4.18**
**Centralized: 3.91**

$p < .0001$

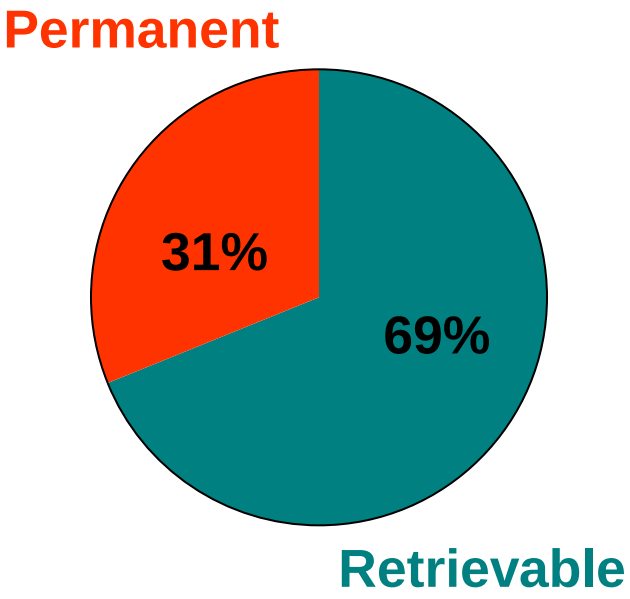
**When forced to rank these two options: Regional = 60% Centralized = 40%**

# Retrievable vs. Permanent

Should radioactive materials be managed in a way that allows authorized personnel to gain access to them and retrieve the materials in the future, or that seeks to permanently block assess to them?

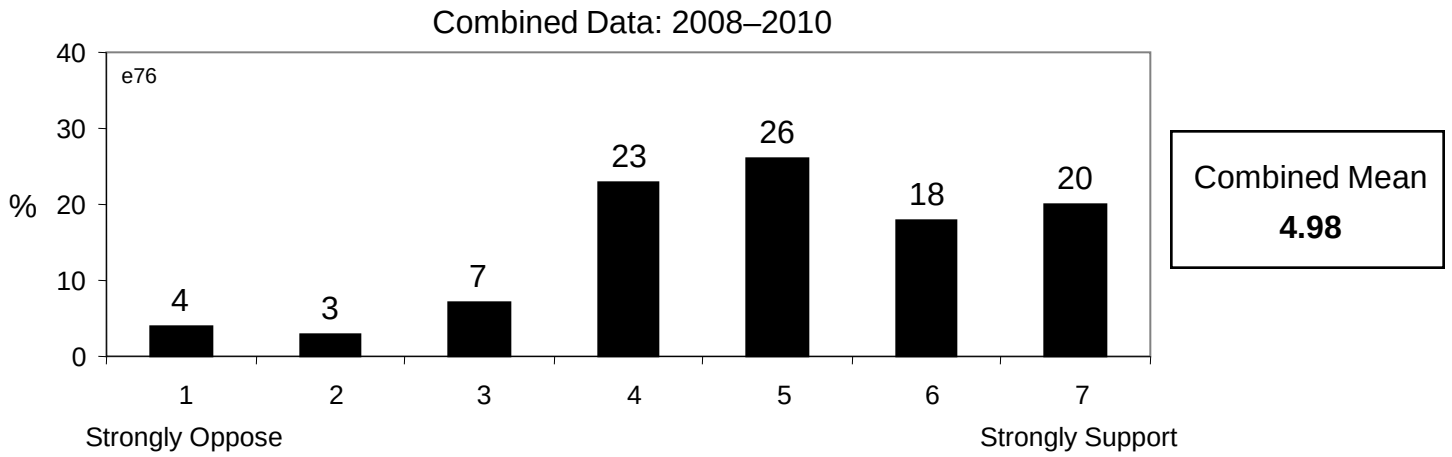
- "One option is to build facilities where the stored materials are continuously monitored and can be retrieved for reprocessing, or possibly to make them less dangerous using future technological developments. This option requires greater security efforts and may be more vulnerable to attack or theft."

- "Another option is to attempt to seal off storage sites in such a way that people cannot readily gain access to the materials in the future. This option is more secure, but does not allow reprocessing or treatment by future technological advancements."



# Reprocessing

"Reprocessing involves the chemical separation of radioactive materials in spent nuclear fuel. After reprocessing, most of the uranium and plutonium can be captured and reused to generate electricity, reducing the amount of uranium that must be mined in the US or purchased from other countries. Remaining materials are radioactive and must be safe-guarded and isolated from the environment. However, reprocessing may also separate the plutonium which, like uranium, could be used to make nuclear weapons."

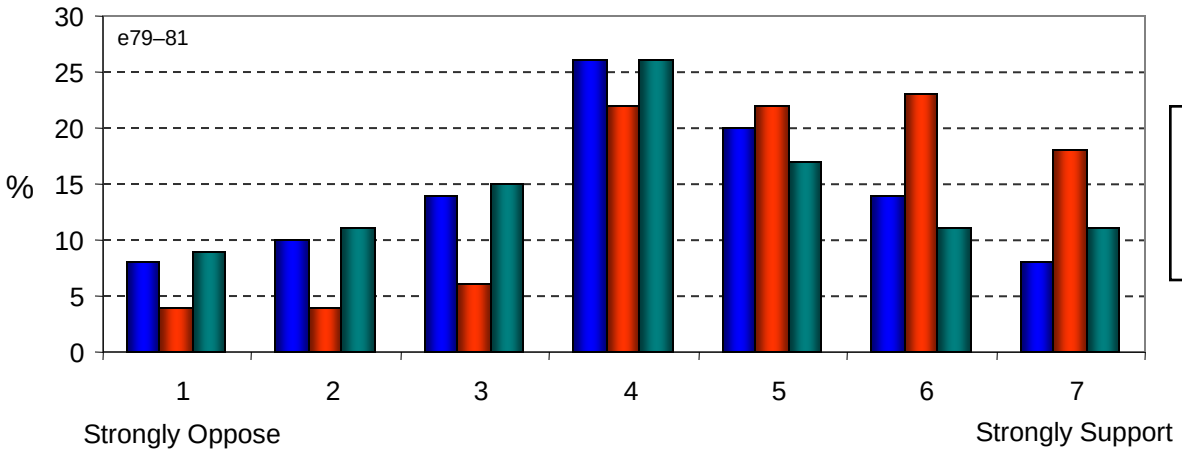



**Oppose: 14%** **Undecided: 23%** **Support: 64%**

# Storage Depth

**(Random Order)**

- Construct storage facilities at or near the surface of the earth that are less permanent but allow retrieval for reprocessing, research, or other treatments.
- Construct storage facilities underground that are like mines that could be either permanently sealed or could allow materials to be retrieved.
- Construct very deep boreholes that afford permanent and safe disposal, but would make materials extremely difficult to be retrieved.




**Means: 2010**

| | |
|---|---|
| **Surface:** | **4.16** |
| **Mines:** | **4.92** |
| **Boreholes:** | **4.08** |

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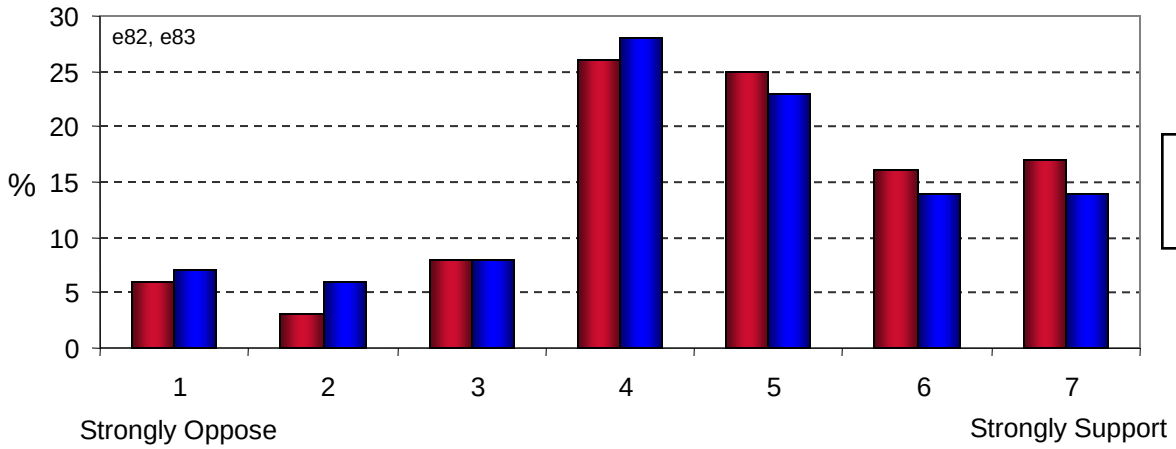
# Experiments in "Bundling" UNF Facility Attributes

- The YMP Bundle: Once-through waste, permanent disposal-only, no other functions.
- Other facility attributes might include:
  - Research/Laboratory functions to learn from the repository and the UNF
  - Potential future resource value of the "waste" in retaining the option of reprocessing at the site
  - Source of long-term revenue and jobs for the host state and community
- Survey experiment measured the effect of these options on policy support for two different kinds of "base" disposal facilities

# Experimental Base Case: Split Survey Design

**Mines Option:** 2 underground mine-like repositories several thousand feet deep; one in east and one in west; secure surface storage buildings; option for retrieval or permanent storage; meets all technical and safety requirements of federal and state regulatory agencies

**Boreholes Option:** 7 regional sites, each with multiple boreholes up to 3 miles deep into bed-rock; radioactive materials isolated permanently from people and environment; meets all technical and safety requirements of federal and state regulatory agencies




**Means: 2010**

| | |
|---|---|
| **Mines:** | **4.77** |
| **Boreholes:** | **4.51** |

# Implications of Design Options

## Co-locating Research Laboratory with Repository

| | 2 Mine-Like Geologic Repositories (%) | | | 7 Deep Borehole Repositories (%) | | |
|---|---|---|---|---|---|---|
| Initial Preference | Support 58 | Neutral 26 | Oppose 16 | Support 51 | Neutral 28 | Oppose 21 |
| Support Increased | **70** | **55** | **48** | **72** | **61** | **50** |
| Support Unchanged | 20 | 37 | 21 | 19 | 33 | 23 |
| Support Decreased | 10 | 8 | 31 | 9 | 6 | 26 |

## Co-locating Reprocessing Facility with Repository

| | 2 Mine-Like Geologic Repositories (%) | | | 7 Deep Borehole Repositories (%) | | |
|---|---|---|---|---|---|---|
| Initial Preference | Support 58 | Neutral 26 | Oppose 16 | Support 51 | Neutral 28 | Oppose 21 |
| Support Increased | **66** | **47** | **48** | **66** | **56** | **50** |
| Support Unchanged | 21 | 43 | 16 | 21 | 35 | 25 |
| Support Decreased | 13 | 10 | 36 | 12 | 9 | 26 |

# Robust Effects of Design Options

## 1995 Survey Respondents' Reactions to Co-locating Research Laboratory with Repository

| | Nevada | | Nuclear Counties | | Other US Counties | |
|---|---|---|---|---|---|---|
| Initial Preference | On-Site 77% | YMP 23% | On-Site 46% | YMP 54% | On-Site 54% | YMP 46% |
| YMP Support Increased | **48** | **63** | **70** | **74** | **68** | **65** |
| Support Unchanged | 45 | 33 | 21 | 22 | 29 | 30 |
| YMP Support Decreased | 7 | 4 | 9 | 4 | 3 | 5 |

# Implications of Compensation

## Compensating State(s) for Hosting Repository

| | 2 Mine-Like Geologic Repositories (%) | | | 7 Deep Borehole Repositories (%) | | |
|---|---|---|---|---|---|---|
| Initial Preference | Support 58 | Neutral 26 | Oppose 16 | Support 51 | Neutral 28 | Oppose 21 |
| Support Increased | **62** | **42** | **39** | **59** | **53** | **41** |
| Support Unchanged | 20 | 43 | 23 | 24 | 30 | 22 |
| Support Decreased | 18 | 15 | 37 | 17 | 18 | 37 |

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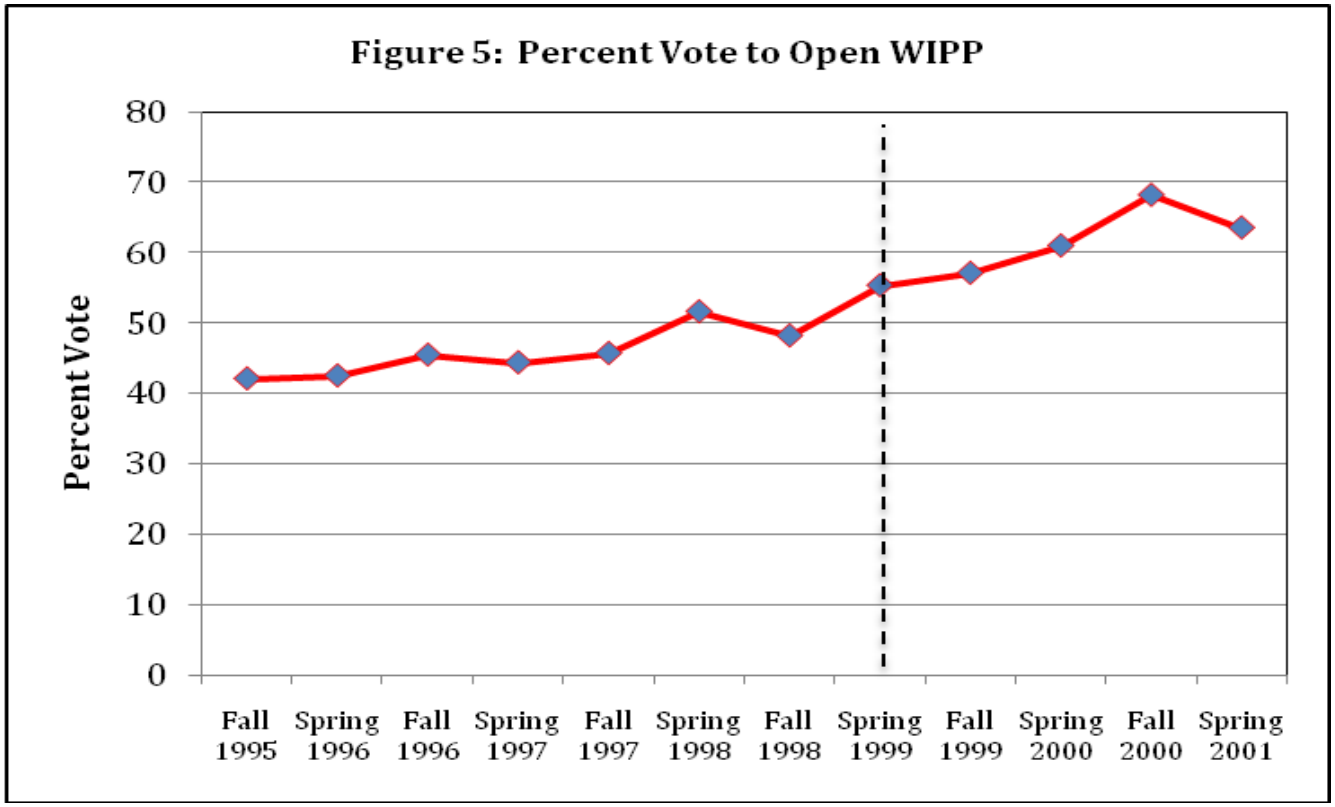
# Implications of Proximity

## Change in Support by Proximity to Repository

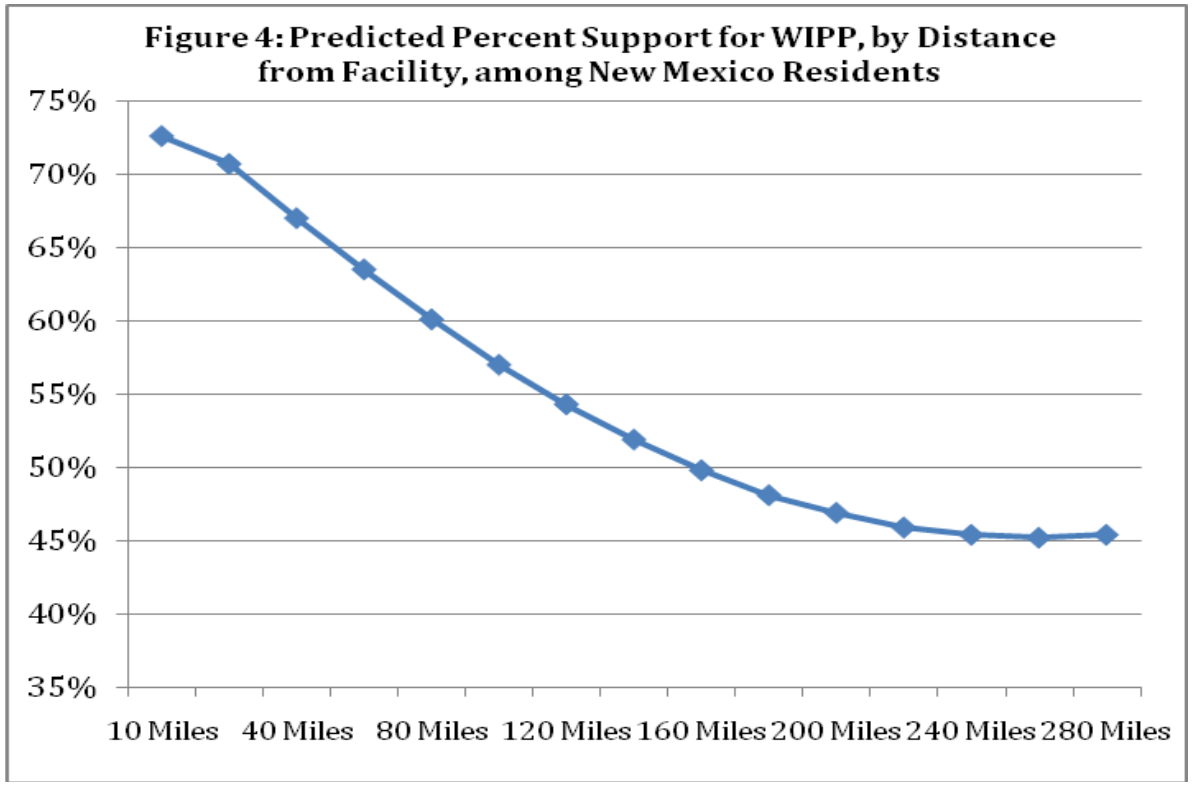
| | 2 Mine-Like Geologic Repositories (%) | | | 7 Deep Borehole Repositories (%) | | |
|---|---|---|---|---|---|---|
| Repository within… | Increased Support | No Change | Increased Opposition | Increased Support | No Change | Increased Opposition |
| Respondent's State | **44** | **30** | **26** | **45** | **27** | **28** |
| 300 Miles of Home | 42 | 27 | 31 | 40 | 27 | 33 |
| 50 Miles of Home | 30 | 31 | 39 | 40 | 20 | 40 |

# Percent Vote to Open WIPP

State-Wide New Mexico Surveys 1995-2001



# Support for WIPP by Proximity



# Conclusions in Brief

- Public understanding of UNF and current UNF policies is not well developed, but beliefs are integrated
- There is no public consensus on a preferred UNF option
  - Retrievability and Reprocessing are favored by robust majorities
- “Bundles” of attributes of a UNF storage/disposal facility matter
  - The YMP attributes minimized support
  - Lab option addresses underlying basis for opposition
  - State-level funding generates mixed reactions
- Proximity reduces – but does not eliminate – public support
  - Siting dynamics typically result in a opposition away from site

- Contact Information:

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