A Host Region Perspective on the Second Wave of Nuclear Plant Decommissionings

Prepared for NADO Washington Policy Conference

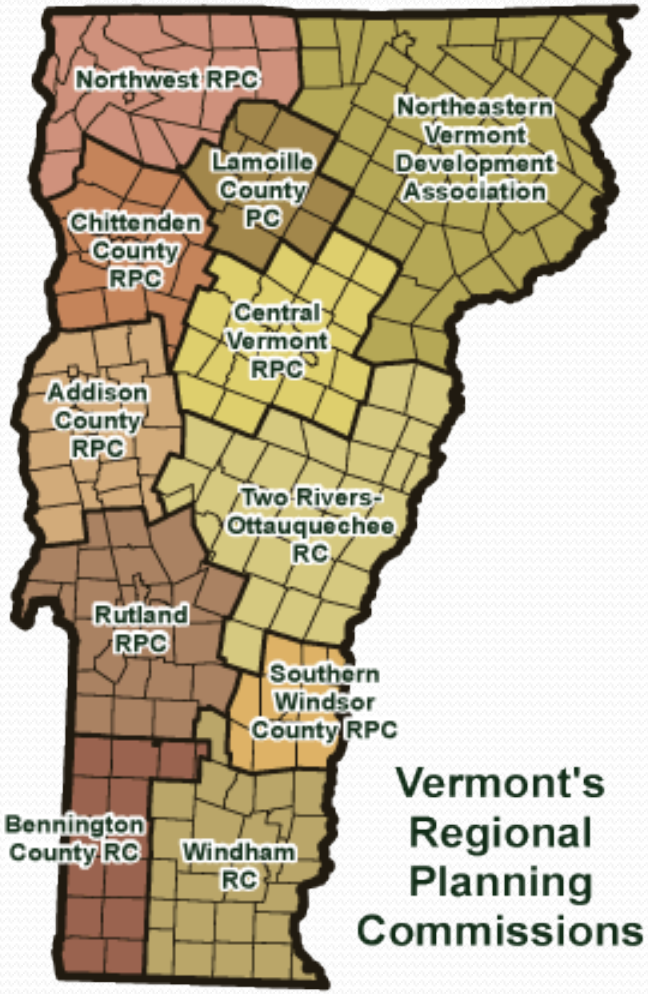
Shifts in Energy Policy and Regulations

Chris Campany, AICP Executive Director

April 5, 2016

WINDHAM REGIONAL COMMISSION

The Windham Regional Commission



- Established in 1965.
- Serves 27 towns in Windham, Bennington and Windsor counties over a 920 square mile area of southeastern Vermont.
- Our mission is to assist towns to provide effective local government and work cooperatively with them to address regional issues.
- In the absence of county government, we provide the essential link between local, state and federal government.

WRC Neutral on Vermont Yankee Operation

The plant has been a very controversial subject within the region and within the state.

The Commission has always taken a neutral position on whether or not the Vermont Yankee Nuclear Power Station should continue operation, and whether or not it should be issued a Certificate of Public Good by the Vermont Public Service Board.

This position was adopted in order to facilitate conversations among all parties on all sides of the issue.

SCIENCE

Vermont Yankee Plant to Close Next Year as the Nuclear Industry Retrenches

By MATTHEW L. WALD AUG. 27, 2013

The Vermont Yankee nuclear reactor, one of the oldest nuclear plants in the country and the subject of heated battles over the decades, will close late next year, the company that owns it announced on Tuesday, less than two weeks after winning a protracted legal f
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ENERGY & ENVIRONMENT

Nuclear Plants, Old and Uncompetitive, Are Closing Earlier Than Expected

By MATTHEW L. WALD JUNE 14, 2013

Zion Nuclear Power Station, which served Chicago and part of Illinois, was built in 1973.
Scott Olson/Getty Images

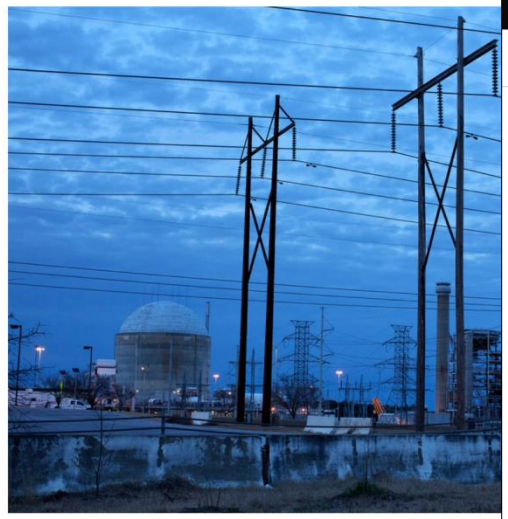
Washington — When does a nuclear plant become too old?

The nuclear industry is wrestling with that question as it tries to determine whether problems at reactors, all designed in the

SCIENCE

Amid a Graying Fleet of Nuclear Plants, a Hunt for Solutions

By HENRY FOUNTAIN MARCH 21, 2016



The H.B. Robinson nuclear power plant in South Carolina is one of the old
United States. Travis Dove for The New York Times

The H.B. Robinson nuclear power plant, abou
Columbia, S.C., has been producing electricit
interruptions since the Nixon administration

Sections The Washington Post

Can coal companies afford to clean up coal country?

A 529 Save My List

With some of the country's largest coal companies in bankruptcy, about 120,000 retired miners and their families in West Virginia could lose their pension and health care accounts. For many families in this region, this means losing their only regular source of income. (Jorge Ribas/The Washington Post)

By Steven Mufson and Joby Warrick April 2 at 9:58 AM Follow @StevenMufson Follow @jobywarrick

Orientation

Vermont Yankee

- 620 megawatt boiling water reactor.
- The Vermont Yankee Nuclear Power Station began commercial operations in March 1972. Vermont Yankee Nuclear Power Corporation, a public utility, sold the Station to Entergy Nuclear Vermont Yankee, LLC collectively with Entergy Nuclear Operations, Inc. on July 31, 2002, thereby becoming a “merchant plant.”
- Merchant plant - An electric generator not owned and operated by an electric utility and that sells its output to wholesale and/or retail customers.

Vermont Yankee Property (~148 acres)

Vermont Yankee Plant to Close Next Year as the Nuclear Industry Retrenches – New York Times, Matthew L. Wald, August 27, 2013,

"The Vermont Yankee nuclear reactor, one of the oldest nuclear plants in the country and the subject of heated battles over the decades, will close late next year, the company that owns it announced on Tuesday, less than two weeks after winning a protracted legal fight against the State of Vermont to keep it open."

"The company, Entergy, said a long depression in natural gas prices had pushed the wholesale price of electricity so low that it was losing money on the reactor, which is on the Connecticut River in Vernon just north of the Massachusetts border."

"So far this year, owners have announced the retirements of five reactors, with the low price of gas being cited as a factor in all of the cases. Three of the five have substantial mechanical problems."

VY's Closure Plan

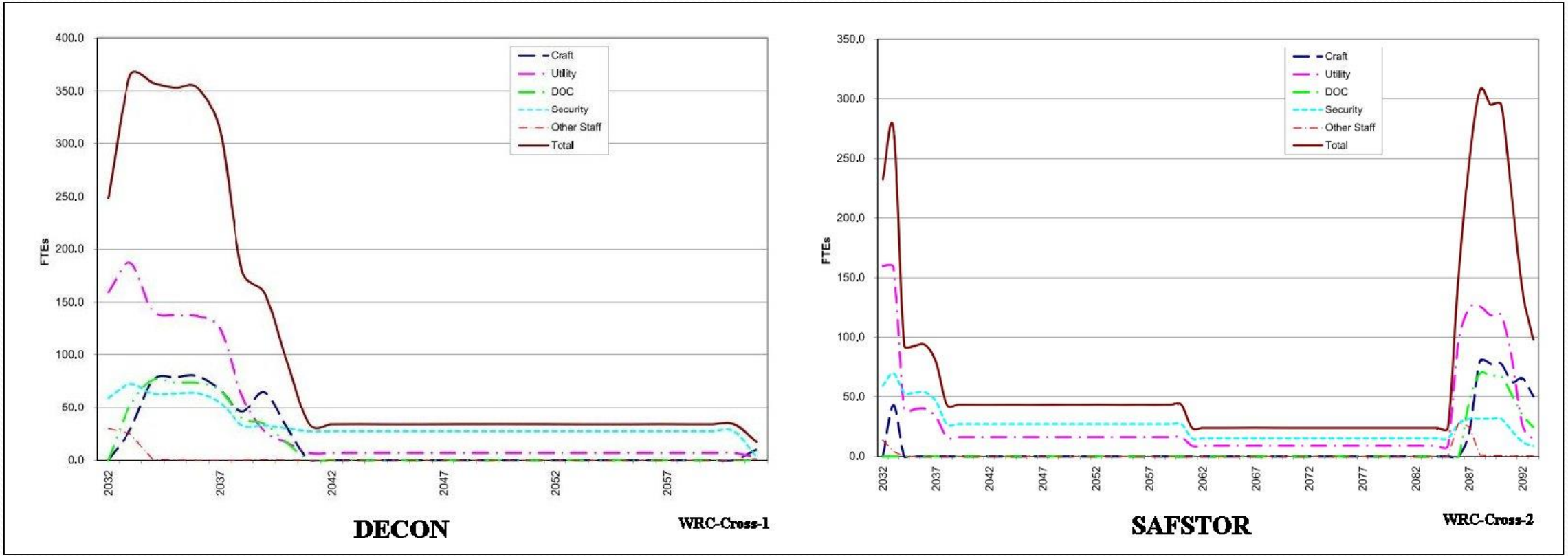
- Assumes 2015-2020 transition to SAFSTOR
- Assumes DOE Spent Fuel pick up by 2052.
- 2012-2075 Dormancy, Dismantlement & Decontamination and Site Restoration
- Updated Cost Estimate to decommission Vermont Yankee is $1.242 Billion in 2014 dollars for SAFSTOR.
  - Termination of the NRC Operating License - $817 Million
  - Site Restoration - $57 Million
  - Spent Fuel Management - $368 Million
- Nuclear Decommissioning Trust Fund was at $642.6 million as of 9/30/2014. $583.2 million as of 2/29/16.

Source: Entergy presentation to NDCAP 10/30/14 http://publicservice.vermont.gov/sites/psd/files/Entergy%20VY%20Site%20Assessment%20Study%20Presentation%20to%20NDCAP%20October%2030th%202014.pdf

DECON versus SAFSTOR

- Under DECON (immediate dismantling), soon after the nuclear facility closes, equipment, structures, and portions of the facility containing radioactive contaminants are removed or decontaminated to a level that permits release of the property and termination of the NRC license. (Minimum 10 years until site restored.)
- Under SAFSTOR, often considered "deferred dismantling," a nuclear facility is maintained and monitored in a condition that allows the radioactivity to decay; afterwards, the plant is dismantled and the property decontaminated. (Can remain in this condition for up to 60 years.)
- Decommissioning must be completed within 60 years of the plant ceasing operations. A time beyond that would be considered only when necessary to protect public health and safety in accordance with NRC regulations.

DECON versus SAFSTOR Employment Vermont Yankee example



Anticipated Economic Impacts

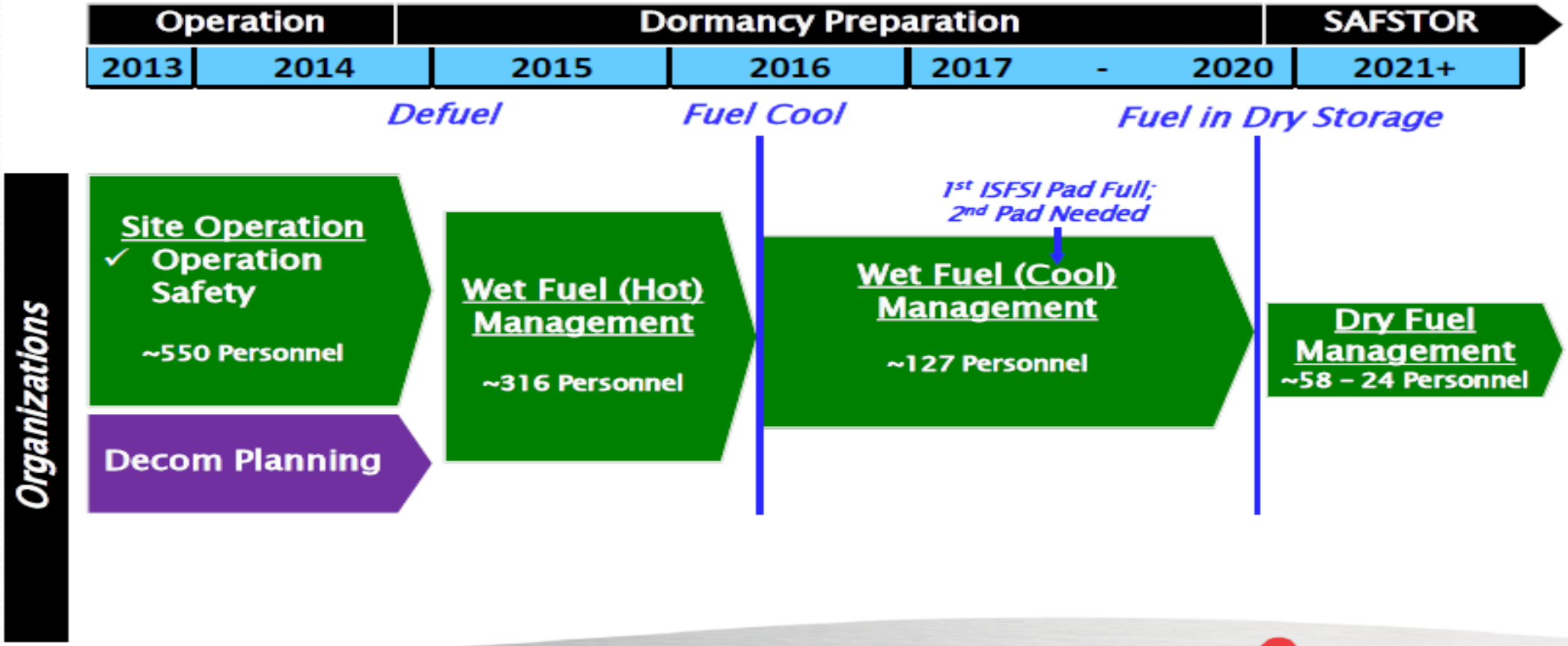
Umass Donohue Institute Study

Paid for by Franklin Regional Council of Governments. Completed December, 2015.

Employment impacts.

- Vermont Yankee employed roughly 620 workers in the tri-state area with a payroll of about $65.7 million.
- Accounted for approximately 2% of employment and 5% of compensation earned in Windham County.
- Contributed $300,000 to $400,000 in charitable contributions across approximately 100 organizations.
- Average employee annual income exceeded $100,000.
- Employee residence by state: Vermont – 238, New Hampshire 210, Massachusetts – 167.

Staffing Transition to Decommissioning



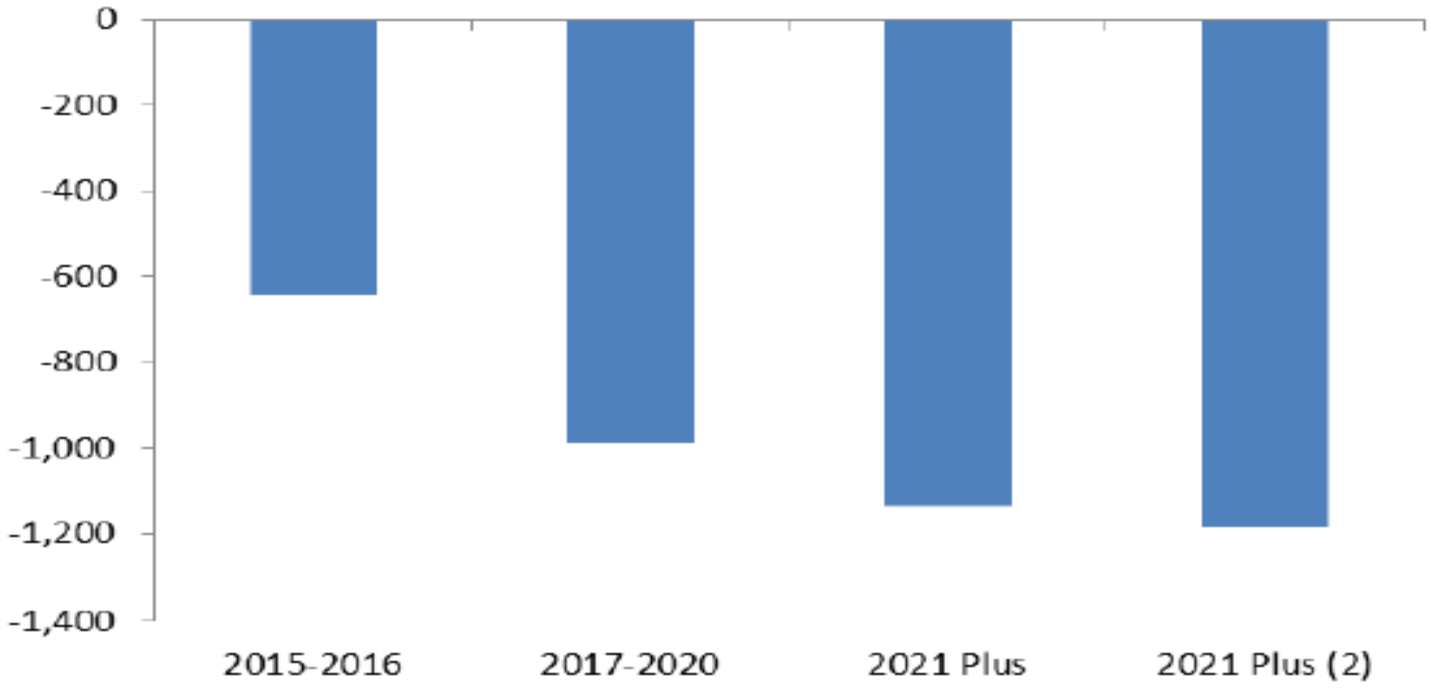
Economic Activity Levels of Vermont Yankee to the Tri-County Region Over Time

	Operational	2015-2016	2017-2020	2021 Plus	2021 Plus (2)
Direct					
Employment	550	318	126	58	24
Labor Income	$82,099,127	$38,564,486	$15,508,264	$2,675,750	$1,100,406
Value Added	$244,286,992	$66,121,377	$26,547,585	$7,849,919	$3,242,067
Output	$402,707,428	$81,769,337	$32,091,293	$10,573,188	$4,328,235
Indirect					
Employment	282	93	37	16	6
Labor Income	$10,425,325	$3,547,281	$1,426,498	$618,522	$246,311
Value Added	$31,131,267	$5,541,555	$2,224,922	$968,233	$386,153
Output	$47,691,302	$10,528,954	$4,227,352	$1,734,171	$692,314
Induced					
Employment	387	165	66	10	4
Labor Income	$14,377,220	$6,106,431	$2,455,631	$361,327	$148,855
Value Added	$26,575,152	$11,297,051	$4,535,741	$667,946	$275,168
Output	$43,008,077	$21,464,397	$8,617,908	$1,081,549	$445,562
Total*					
Employment	1,220	577	229	84	34
Labor Income	$106,901,672	$48,218,198	$19,390,393	$3,655,600	$1,495,572
Value Added	$301,993,411	$82,959,983	$33,308,248	$9,486,099	$3,903,388
Output	$493,406,806	$113,762,689	$44,936,552	$13,388,908	$5,466,111

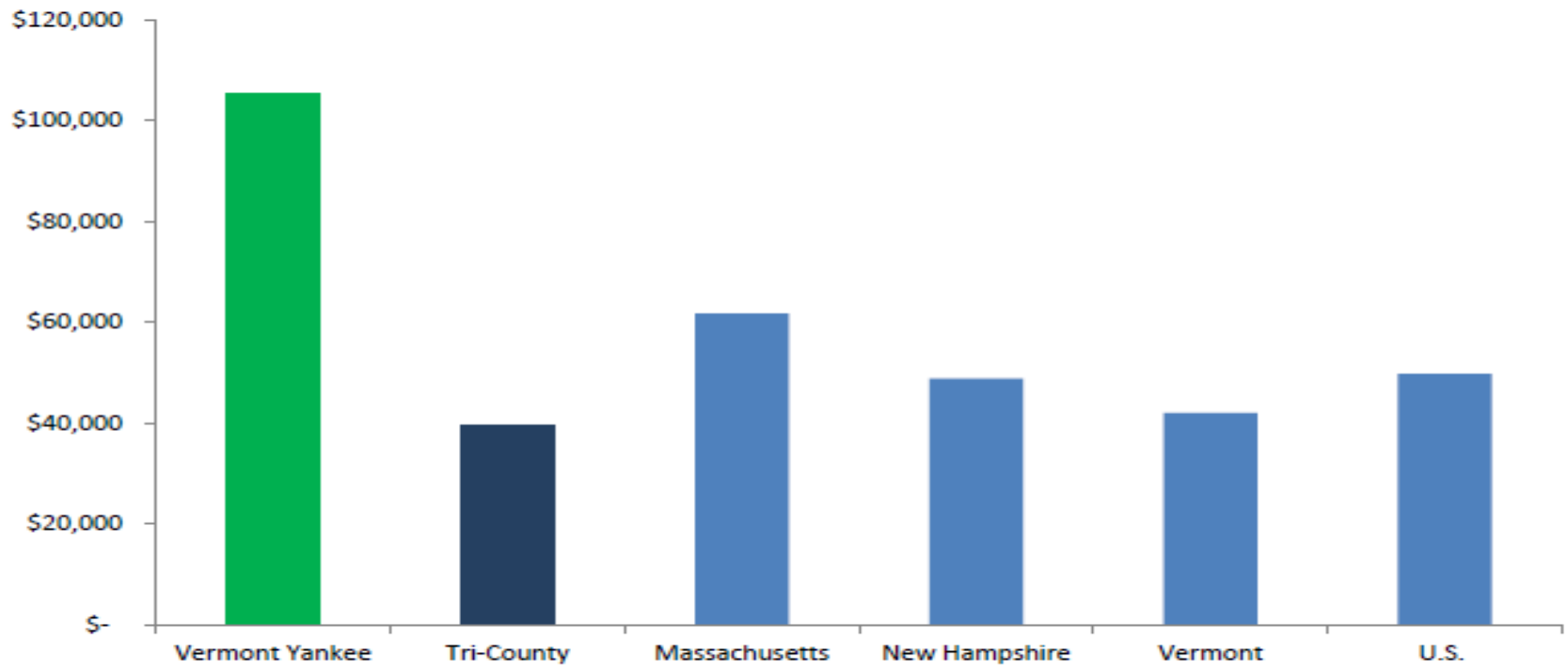
Source: Results are from IMPLAN

Total Job Impacts of the Vermont Yankee Decommissioning in the Tri-County Region

Net Loss In Jobs Compared to an Operational Vermont Yankee



Average Wage Per Employee, Vermont Yankee Compared to Region, States, and U.S.



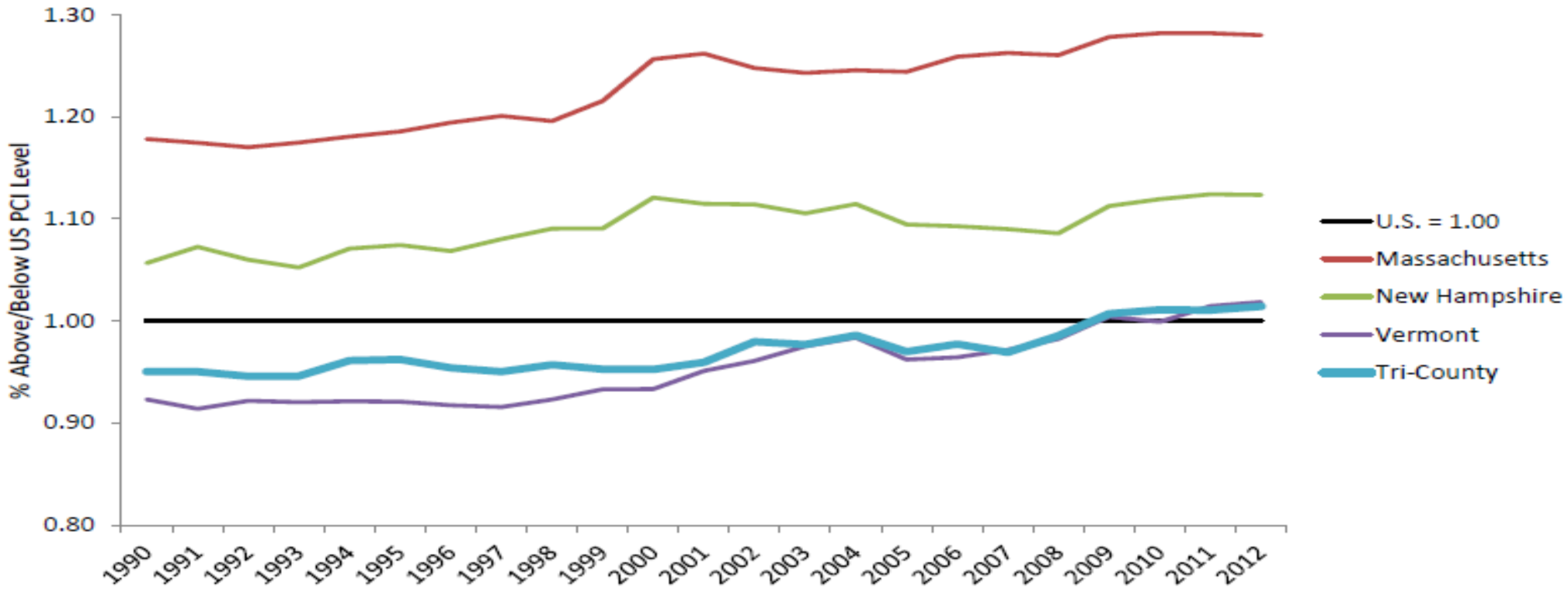
Source: Vermont Yankee (2011); Bureau of Labor Statistics QCEW (2013)

Jobs Growth Index (2003=1.00), Tri-County Region Compared to States and U.S.

Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW)

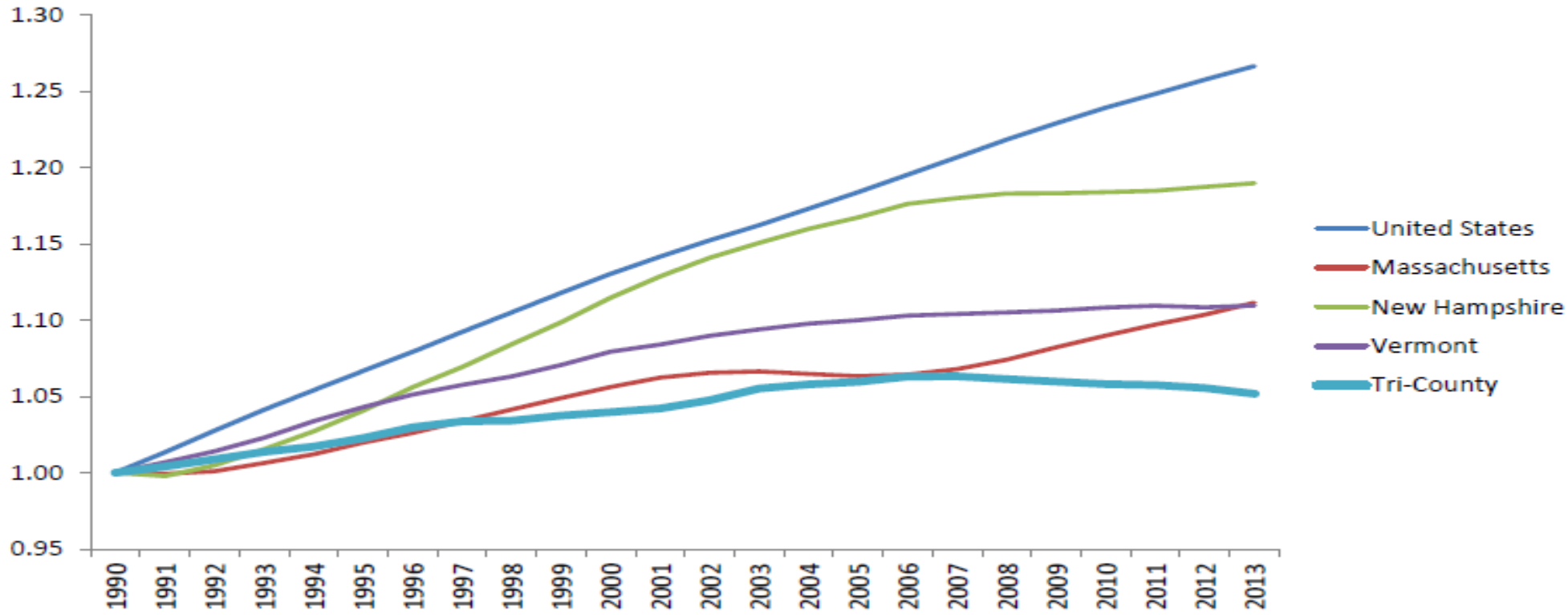
Per Capita Income Relative to U.S. for Tri-County Region and States, 1990-2012

Per Capita Income Growth Index, U.S. = 1.00



Source: Bureau of Economic Analysis (BEA)

Population Growth Index (1990=1.00), Tri-County Region Compared to States and U.S.



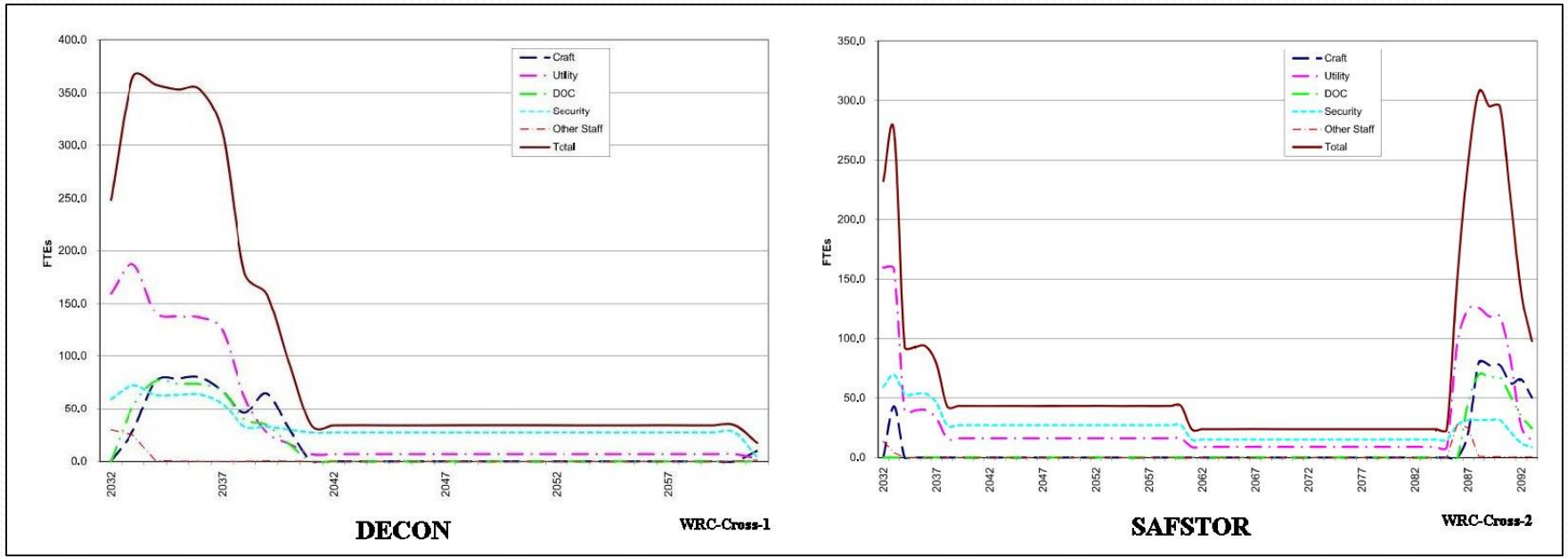
Source: U.S. Census Bureau

WRC Positions

Basis for WRC positions.

- Seek to mitigate, to the greatest extent possible, the economic, employment, cultural and social impacts of the closure on the region.
- Rate of change.
- Outcomes that will support the fiscal well-being of our towns, and which will lead to the restoration of the Vermont Yankee site to “greenfield” status as soon as possible so that it may be reused.
- Intergenerational responsibility.

We want an approach to decommissioning that produces a more gradual slope rather than a precipitous drop.



Source: Docket 7862, A.WRC:EN.1-27.1 and A.WRC:EN.1-27.2, graphics provided by Entergy

Prefer DECON over SAFSTOR

Prompt Decommissioning (DECON) should be required rather than an extended period of SAFSTOR. Prompt Decommissioning:

- Provides greater certainty, both technically and financially.
- Provides a better economic and workforce profile and is necessary for the orderly development of the region.
- Provides access to a workforce with critical legacy knowledge because no one knows the plant better than those who work there at present.
- Is less expensive.
- Produces less radiological waste, or an equal volume of waste, and there is greater assurance of the availability of appropriate waste disposal and transportation infrastructure.
- Reduces regulatory costs.

Decommissioning Trust

- The fund must grow faster than inflation, and when in SAFSTOR it must grow faster than inflation plus the cost of site maintenance.
- Prompt decommissioning reduces market uncertainties associated with the Decommissioning Trust Fund, and the risk of inflation.
- The decommissioning trust fund has performed well in real terms and relative to inflation, but it may never be sufficient to fully restore the site.
- Unless additional funding sources are secured, any additional costs charged to the decommissioning fund will delay the point at which the site can be decommissioned and restored.

Merchant plant.

- **Cannot shift cost burden to rate payers.**
- Whatever comes out of that fund is not available for decommissioning costs, or reinvestment to further build the fund.
  - Spent fuel management?
  - Taxes?
  - Economic impact mitigation?
  - Monitoring?
  - Public engagement?
  - Emergency planning?

Range of Site Restoration Cost Estimates

$47.8 million –Entergy estimate, 2011 dollars

Source: 2012 TLG Decommissioning Cost Analysis, DECON scenario 3&4

$57.4 million –VYNPC estimate,1998

Source: 1998 TLG Simplified Shutdown Cost Assessment

$82.2 million –VYNPC estimate in 2013 dollars

Source: Federal Reserve Bank of Minneapolis calculator

$94-$125 million –Vermont DPS estimate

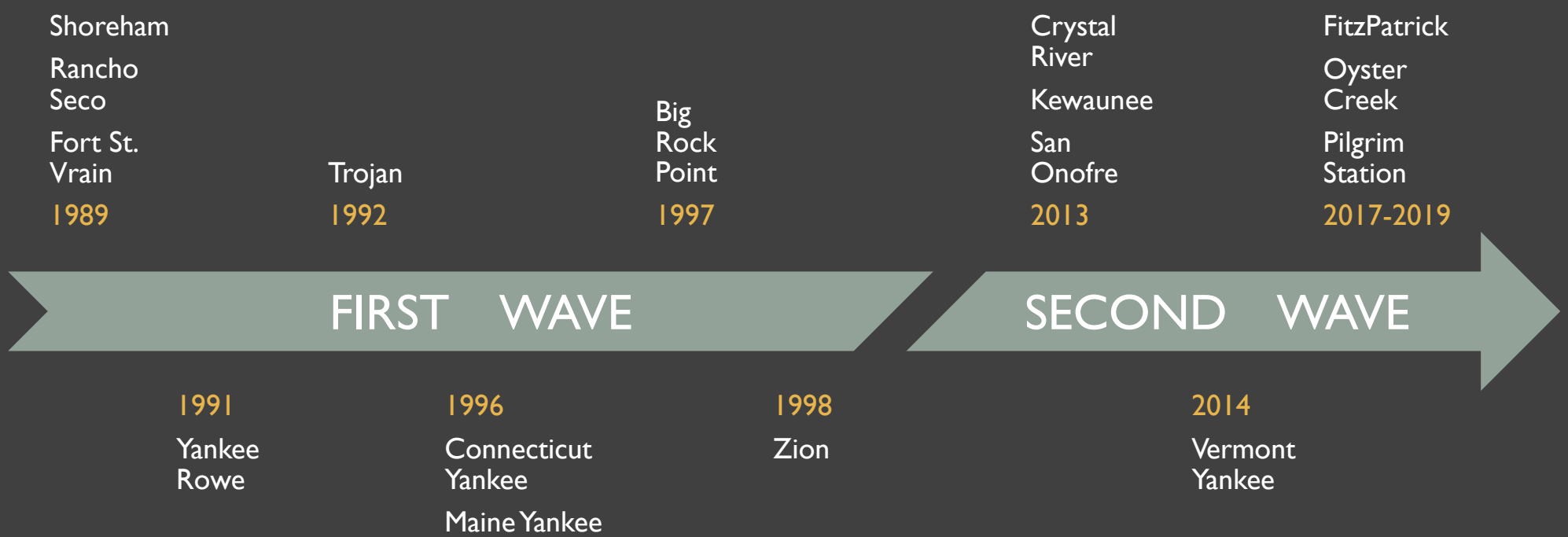
Source: Department of Public Service filings, docket 7862

$194 to $225 million –DPS estimate plus inclusion of the removal of all structures.

Source: Docket 7862 testimony

The Host Region Engagement Challenge

Closure Timeline: 1989 – 2019



Closure Motives

FIRST WAVE

YEAR	PLANT	AGE	MOTIVE
1989	Fort St. Vrain	10	Maintenance
	Rancho Seco	14	Public Process
	Shoreham	3	Public Process
1991	Yankee Rowe	30	Maintenance
1992	Trojan	16	Structural
1996	Conn. Yankee	28	Competition
	Maine Yankee	25	Maintenance
1997	Big Rock Point	34	Competition
1998	Zion	25	Maintenance

SECOND WAVE

YEAR	PLANT	AGE	MOTIVE
2013	Crystal River	36	Maintenance
	Kewaunee	39	Competition
	San Onofre	29	Structural
2014	Vermont Yankee	42	Competition
	FitzPatrick	42	Competition
2017-2019	Oyster Creek	50	Public Process
	Pilgrim Station	47	Competition

Closure Methods

FIRST WAVE

YEAR	PLANT	AGE	METHOD
1989	Fort St. Vrain	10	DECON
	Rancho Seco	14	MIX
	Shoreham	3	DECON
1991	Yankee Rowe	30	DECON
1992	Trojan	16	DECON
1996	Conn. Yankee	28	DECON
	Maine Yankee	25	DECON
1997	Big Rock Point	34	DECON
1998	Zion	25	MIX

SECOND WAVE

YEAR	PLANT	AGE	METHOD
2013	Crystal River	36	SAFSTOR
	Kewaunee	39	SAFSTOR
	San Onofre	29	DECON
2014	Vermont Yankee	42	SAFSTOR
	FitzPatrick	42	TBD
2017-2019	Oyster Creek	50	TBD
	Pilgrim Station	47	TBD

Socioeconomic Impacts

Need to improve conditions for host communities to achieve successful post-closure outcomes

There are no dedicated programs or resources to help communities navigate closure, or to assess & mitigate socioeconomic losses

- Host communities need to initiate assessment and planning independently
- Several examples of mitigation funding negotiated with plant owner
- Seek existing economic development resources aggressively
- Rulemaking = start of a conversation about ensuring targeted assistance for growing wave of nuclear closures

Closure is a challenge to local & regional 'bandwidth'

- Processes are entirely oriented to safety and environmental
- Closure is complex and demanding - tracking site activity, public hearings &education, coordinating changes as many more state and federal agencies get involved
- Activities drain resources that might be directed to socioeconomic response

NRC position: socioeconomic impacts are outside that agency's scope

- No targeted programs to help plan and respond to socioeconomic losses
- Adopting practices from other federal programs (brownfields & base closure) could better support host communities

Currently options to control or mitigate economic changes are very limited

- Communities have no influence over timing – job reductions, closure, or decommissioning activity
- Many options communities would like to pursue – deriving income from spent fuel or repurposing the site – are constrained
- Merchant sites = private land, often with public utility transmission infrastructure
- Cleanup standards geared to high level of safety, not economic activity or site reuse

Socioeconomic Impacts

NRC rulemaking and improving outcomes

This NRC rulemaking provides an *opportunity* to

- Make decommissioning processes easier to navigate
- Give host communities a seat at the table
- Reduce practices that impede socioeconomic recovery
- Leverage points of control to facilitate economic recovery
- Draw attention to the need for greater resources to help host communities plan for and mitigate losses from NPP closure to improve socioeconomic outcomes
- NRC Rulemaking Docket: NRC-2015-0070

https://www.regulations.gov/#!docketDetail;rpp=100;so=DESC;sb=docId;po=0;D=NRC-2015-0070

Thank you to the Institute for Nuclear Host Communities for their contribution to this presentation.

MISSION

To provide the communities that host nuclear power plants with the knowledge and tools they need to shape their post-nuclear futures

Jeff Lewis - Windham County Post VY Impact Study
http://seveds.com/wp-content/uploads/2012/03/PostVY.pdf

Dr John Mullin UMass Amherst - Yankee Rowe Closure Study

http://scholarworks.umass.edu/larp_faculty_pubs/25/

Dr Paul Kostecki – Conferences & Publications

http://www.aehsfoundation.org/east-coast-conference.aspx

Jonathan Cooper – Plymouth Power Station Study

http://works.bepress.com/jonathan_cooper/4/

Resources

- Windham Regional Commission
  - www.windhamregional.org
- NRC Decommissioning of Nuclear Facilities
  - http://www.nrc.gov/waste/decommissioning.html
  - http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html
- NRC Storage of Spent Fuel/Waste Confidence Rule
  - http://www.nrc.gov/waste/spent-fuel-storage/wcd.html
- GAO Report on NRC Oversight of Decommissioning Funds
  - http://www.gao.gov/products/GAO-12-258