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Memorandum

To: Karen Hadden, Executive Director, SEED Coalition
From: Arjun Makhijani
Subject: Proposed Rule that would allow low-level radioactive waste (LLRW) imports into the Texas-Vermont Compact
Date: January 15, 2010

You have asked me, as an expert on radioactive waste management issues[1], to provide you with my professional opinion judgment regarding the Texas Low-Level Radioactive Waste Disposal Compact Commission's Proposed Rule 675.2 dated December 11, 2009 (hereafter called the "Proposed Rule"). In particular, you have asked for my opinion about the following:

1. The adequacy of the Texas Low-Level Radioactive Waste Disposal Compact Commission's (hereafter "the Commission") Proposed Rule 675.2, dated December 11, 2009 ("Proposed Rule"), to fulfill the purposes of the Texas-Vermont LLRW Compact, and
2. The conclusion in the Proposed Rule that the rule is not a "major environmental rule."

As discussed below, I have significant concerns about both of these issues.

1. Purposes of the Compact

In my opinion, the Proposed Rule is not adequate to fulfill the purposes of the LLRW Disposal Compact between the States of Texas and Vermont. As described on lines 21-27 of the Proposed Rule, those purposes are four-fold:

- To "provide a framework for a cooperative effort to limit the number of facilities needed to effectively, efficiently, and economically manage low-level radioactive waste;"

- To "encourage the reduction of the generation" of LLRW;

[1] As you know, I have extensive professional experience on a variety of aspects relating to radioactive waste management, including on waste classification, environmental impacts of disposal, risks of radiation, regulatory matters relating to radioactive wastes and regulatory matters relating to radiation protection. I have a Ph.D. in Engineering from the University of California at Berkeley. I have testified as an expert on nuclear waste issues before the Nuclear Regulatory Commission. I have also done extensive analyses of radioactivity source terms in different contexts. A copy of my curriculum vita is attached.

- To "cooperate among the party states in the protection of the health, safety, and welfare of their citizens;" and

- To "distribute the costs, benefits, and obligations among the party states."

I do not believe that the Proposed Rule satisfies these goals in a number of respects. First, it does not contain any provision for the reduction of the generation of LLRW, or even address how that goal might be served. This goal could be very important, given the enormous volumes and amounts of radioactivity that could be imported into the Compact.

Second, it fails to provide a "framework" for a cooperative effort between Texas and Vermont to effectively, efficiently, and economically manage low-level radioactive waste. The Proposed Rule does not contain any kind of framework at all, but simply provides for ad hoc decisions to be made when a proposed export or import agreement is submitted. For instance, while the Proposed Rule requires the Compact Facility operator to provide to the Commission a recommended total annual volume to be imported for disposal and to certify that the disposal of imported waste will not reduce capacity for Party State generated waste, the triggering event for such a determination is the submittal of an import application (Lines 374-79). In my opinion, it would not be possible to manage LLRW effectively, efficiently, or economically unless the Commission used a far higher level of advance planning that gives detailed consideration to the large amount of waste that could potentially be imported into the Compact, especially since the imported waste could far outstrip the licensed capacity of the site in much less time than the 15-year license that has been granted.

The Commission's volume rule states:

> The Commission estimates that Texas will dispose of Five Million (5,000,000) Cubic Feet of Low Level Radioactive Waste at a Compact disposal site to be established in Texas during the period from 1995 – 2045.[2]

Vermont's disposal volume at the Compact facility is limited to 1,000,000 cubic feet of low-level radioactive waste.[3] The total estimated disposal quantity needed by both party states, Texas and Vermont, is therefore 6,000,000 cubic feet. This total is already in excess of the licensed capacity. Hence before the Commission considers importation of any amount of waste, the State of Texas should properly address whether a license for a larger amount of in-compact waste can be properly granted in view of potential environmental and health impacts. Unless such a proceeding has been completed, the Commission cannot provide a framework for imports that could be in excess of both the licensed capacity and the planned in-compact disposal volume.

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[2] Adopted Rules, 34 Texas Register 6315-6344, September 11, 2009 at 6341.

[3] Health and Safety Code Chapter 403, Sec.3.04 (11) states: "The shipments of low-level radioactive waste from all nonhost party states shall not exceed 20 percent of the volume estimated to be disposed of by the host state during the 50-year period." In the Proposed Volume Rule at 34 Texas Register 4279, "Vermont indicated that its needs would probably meet or exceed 1,000,000 cubic feet of capacity based on observed experiences during decommissioning of the Maine Yankee generating facility. There are similar decommissioning requirements in Vermont that indicate the volume could be similar to that generated in the Maine decommissioning process."

It is possible to get an idea of potential import volumes by examining the last few years of low-level waste disposal data. Commercial low-level waste disposed of in the United States between January 1, 2006, and December 31, 2008, amounted to 8.76 million cubic feet containing 2.23 million curies of radioactivity.[4] The annual average values for volume and radioactivity in this three-year period are therefore 2.9 million cubic feet and 0.74 million curies, respectively (rounded). Almost all this waste is now generated in states that do not have an in-compact disposal facility.

The only facility open to non-compact commercial waste at present is the Clive, Utah facility, which is licensed for only Class A waste. All but about 20,000 cubic feet of the 8.52 million cubic feet of LLRW that were disposed of at Clive during 2006-2008 constituted Class A waste from outside the Northwest states' compacts. That is an average of over 2.8 million cubic feet of Class A waste per year. Under the Proposed Rule, much or most of those 2.8 million cubic feet of Class A waste per year could be diverted to Texas, depending on relative economics. It should be of concern to the Compact that the total *annual* volume of Class A waste that could come from outside the Compact to Texas is more than the licensed capacity of 2.31 million cubic feet of the WCS site for commercial LLRW.

Opening up the WCS site to waste imports could result in the importation of a significant amount of Class B and C waste as well. There is currently no site that is accepting out-of-compact Class B and C waste. Well over 90 percent of the approximately 2.2 million curies LLRW was generated in states that are out of the Northwest and Atlantic States compacts during 2006-2008 and the vast majority of this is Class B and C waste.[5] This is an out-of-compact average of about 700,000 curies per year. This waste would likely be disposed of in Texas. Yet the licensed capacity of the WCS facility is only 3.89 million curies. This capacity would be exceeded by out-of-compact waste in less than six years.

These figures can be illustrated in another way. The radioactivity from commercial wastes comes largely from nuclear power plants and therefore has a similar composition, concentration, and radioactivity amount per unit generation across the country. The environmental impact in terms of waste generation would therefore be roughly proportional to the power rating of the reactors (assuming comparable capacity factors). The Texas-Vermont Compact has only five operating nuclear reactors, with a total reactor capacity of 5,500 megawatts. The country has 104 reactors, with a total power rating of 106,000 megawatts.[6] Therefore, opening up the WCS site would increase the radioactivity in the waste that could be sent to the Texas facility by roughly 19 times.

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[4] Data cited here are from the DOE MIMS database unless otherwise stated. The various tallies are attached to this affidavit. All values are rounded to three significant figures. Waste data cited are attached.

[5] Total radioactivity in LLRW disposed of in 2006-2008 was 2.226 million curies. Of this about 13,000 curies was Class A waste disposed of at the Clive, Utah Site (which can only accept Class A waste). The MIMS database does not allow sorting of data by class of LLRW. But it reasonable to assume that almost all of the out-of compact waste not disposed of at the Clive facility is Class B and C waste since only Class A waste can be sent out of compact to Clive, but none of the other wastes can be sent out of compact. In-compact LLRW curie totals disposed of amounted to only about 114,000 curies (rounded).

[6] Reactor data are from *2009-2010 Information Digest*, U.S. Nuclear Regulatory Commission, Washington, D.C., August 2009, on the web at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1350/v21/sr1350v21.pdf.

2. Major Environmental Rule

According to the Proposed Rule, a "Major Environmental Rule" is, among other things one "that may adversely affect, in a material way… the environment or the public health and safety of the state or a sector of the state." If the Texas facility is opened to 19 times the total reactor capacity, the likely environmental impact can be expected to increase commensurately. Further, the Proposed Rule does not restrict potential waste imports to U.S.-origin wastes. Imports from foreign countries where the waste classification systems, waste compositions regulatory requirements, and other matters impacting the ability to handle and dispose of the waste in the U.S. safely, could be different would complicate matters even more. They could also greatly increase the environmental impact.

The Proposed Rule would also significantly increase the potential quantity of radioactivity imported to the Texas facility, on a scale of millions of additional curies of radioactivity *every year*. LLRW consists of fission products that are dangerous to human health if ingested or inhaled in amounts of a fraction of a curie. It is incorrect to conclude without analysis, as the Proposed Rule has done, that the transport, handling, storage, and disposal of millions of curies of radioactivity, some of which would be very long-lived, does not constitute a "Major Environmental Rule." A site-specific analysis is required to arrive at such a conclusion.

Considerations of health and environmental impacts are crucial to the operation of low-level waste disposal sites. Increasing potential volume and radioactivity by more than an order of magnitude over the presently licensed amounts (even before decommissioning wastes are included) without a detailed estimation of environmental impact would be unwise. The facts warrant a conclusion that the Proposed Rule should be considered a Major Environmental Rule until an impact assessment is completed. Such an assessment should include added radiation doses to the public and workers from transport, processing, handling, storage, and disposal of out-of-compact wastes in Texas. It should also include potential long-term environmental impacts of disposal of added amounts of waste at the site. Finally, it should include the added potential for accidents and other incidents that could cause environmental and health damage.

I am not arguing for or against import of LLRW at this time. Rather, in view of the above analysis, I strongly recommend that the State of Texas postpone consideration of import of wastes from outside the Compact until an evaluation along the lines described is completed and has been aired in public. A consideration of whether to allow imports can only properly be made in view of that analysis, given that public health and the environment must be central factors in any such decision.

Thank you for your consideration of my views.

Arjun Makhijani, Ph.D.
President, Institute for Energy and Environmental Research

Manifest Information Management System

Volume and Activity Summary

Search Criteria:

States: All states
Disposal Site: All disposal sites
Waste Type: LLW only
Date Range: January 1, 2006 through December 31, 2008

Click your browser's 'Back' button to generate the same report using different criteria.

Year Received	State	Volume (ft3)	Activity (curies)
2006	Alabama	31,254.33	13,927.28
2006	Arizona	31,660.45	177.31
2006	Arkansas	11,599.08	514.00
2006	Army Out U.S.	25.60	0.88
2006	California	452,430.69	1,182.49
2006	Colorado	393.68	0.76
2006	Connecticut	706,456.89	512.22
2006	Delaware	59.18	11.85
2006	Dist of Columbia	164.20	0.17
2006	Florida	32,397.16	249.51
2006	Georgia	15,643.45	1,188.63
2006	Hawaii	2,297.52	166.16
2006	Idaho	50.05	14.00
2006	Illinois	614,726.45	41,367.36
2006	Indiana	462.96	5.21
2006	Iowa	1,654.87	16,049.79
2006	Kansas	1,294.06	469.53
2006	Kentucky	38,609.69	131.89
2006	Louisiana	4,203.06	911.11
2006	Maine	3,977.30	8.60
2006	Maryland	48,131.84	60.10
2006	Massachusetts	746,514.86	15,740.02
2006	Michigan	448,943.91	1,217.17
2006	Minnesota	8,288.81	121.72
2006	Mississippi	3,886.43	4,243.81
2006	Missouri	3,442.15	923.40
2006	Montana	204.66	0.32
2006	Nebraska	7,452.51	467.19
2006	Nevada	99.07	0.71
2006	New Hampshire	1,889.15	226.17

2006	New Jersey	93,768.08	4,571.52
2006	New Mexico	206.95	0.03
2006	New York	45,878.96	3,175.67
2006	North Carolina	195,264.34	96,720.32
2006	North Dakota	22.50	0.00
2006	Ohio	39,091.27	2,510.02
2006	Oregon	575.25	0.07
2006	Pennsylvania	57,890.24	91,719.13
2006	Rhode Island	112.18	1.26
2006	South Carolina	45,761.25	1,736.36
2006	Tennessee	154,684.41	719.77
2006	Texas	15,161.09	773.97
2006	Utah	688.94	0.23
2006	Vermont	3,170.39	18,813.65
2006	Virginia	149,988.19	652.91
2006	Washington	21,658.13	1,604.68
2006	West Virginia	38.02	0.03
2006	Wisconsin	4,596.59	5,959.10
2006	Wyoming	22.90	0.07
2007	Alabama	60,194.81	110,324.62
2007	Alaska	2.81	0.05
2007	Arizona	28,766.29	763.69
2007	Arkansas	53,493.58	132.16
2007	California	926,604.27	2,794.88
2007	Colorado	395.89	405.18
2007	Connecticut	36,862.53	322.16
2007	Delaware	42.73	12.86
2007	Dist of Columbia	374.34	0.17
2007	Florida	57,391.64	1,351.44
2007	Georgia	9,408.46	33,604.72
2007	Hawaii	3,688.48	52.52
2007	Idaho	254.72	29.53
2007	Illinois	171,936.37	163,034.08
2007	Indiana	450.80	0.55
2007	Iowa	10,791.12	110.00
2007	Kansas	900.35	170.54
2007	Kentucky	107,097.85	25.16
2007	Louisiana	16,744.32	2,847.80
2007	Maine	176.84	39.76
2007	Maryland	21,016.06	25,304.54
2007	Massachusetts	132,458.82	184.97
2007	Michigan	87,137.07	1,416.85
2007	Minnesota	8,525.20	264.47
2007	Mississippi	9,972.76	58,122.21
2007	Missouri	13,406.41	166.51
2007	Nebraska	10,383.49	989.33

2007	Nevada	125.07	0.16
2007	New Hampshire	3,211.48	43.56
2007	New Jersey	47,136.13	51,747.98
2007	New Mexico	112.36	0.06
2007	New York	46,352.61	50,963.09
2007	North Carolina	81,700.94	48,141.43
2007	North Dakota	15.55	0.00
2007	Ohio	21,309.73	39,997.38
2007	Oklahoma	5.60	0.64
2007	Oregon	608.56	6.95
2007	Pennsylvania	78,454.53	492,579.18
2007	Rhode Island	10.02	1.22
2007	South Carolina	84,019.10	1,307.36
2007	South Dakota	196.13	0.00
2007	Tennessee	259,112.38	1,100.74
2007	Texas	69,758.55	1,068.83
2007	Utah	541.36	0.33
2007	Vermont	8,692.10	642.73
2007	Virginia	45,911.74	578.67
2007	Washington	94,027.71	13,211.60
2007	West Virginia	48.69	0.14
2007	Wisconsin	17,302.73	9,958.02
2008	Alabama	34,964.36	2,232.20
2008	Arizona	53,204.45	189.58
2008	Arkansas	14,996.34	13.06
2008	California	549,679.44	2,892.41
2008	Colorado	1,444.46	0.40
2008	Connecticut	30,582.09	282.54
2008	Delaware	414.79	12.23
2008	Dist of Columbia	111.29	0.21
2008	Florida	58,284.78	1,478.48
2008	Georgia	30,189.12	1,307.95
2008	Hawaii	3,633.42	27.08
2008	Idaho	112.50	15.16
2008	Illinois	137,468.50	207,637.70
2008	Indiana	1,154.48	1.31
2008	Iowa	4,434.47	137.35
2008	Kansas	5,661.89	179.66
2008	Kentucky	101,519.54	11.99
2008	Louisiana	17,420.49	882.17
2008	Maine	114.68	18.76
2008	Maryland	6,702.48	2,181.52
2008	Massachusetts	176,546.53	33,537.44
2008	Michigan	31,136.17	27,539.85
2008	Minnesota	5,443.38	28,729.45
2008	Mississippi	4,978.59	777.09

2008	Missouri	110,156.79	616.19
2008	Nebraska	19,136.25	1,573.24
2008	Nevada	208.08	0.06
2008	New Hampshire	5,977.84	439.52
2008	New Jersey	33,740.88	20,806.73
2008	New Mexico	186.70	1.38
2008	New York	32,388.59	92,977.73
2008	North Carolina	61,186.39	46,071.16
2008	North Dakota	6.00	0.00
2008	Ohio	71,863.74	6,082.15
2008	Oklahoma	13.10	1.53
2008	Oregon	85.41	3.04
2008	Pennsylvania	113,607.00	283,329.29
2008	Puerto Rico	15.10	0.00
2008	Rhode Island	9.09	1.79
2008	South Carolina	90,035.22	1,576.88
2008	South Dakota	0.67	0.00
2008	Tennessee	150,572.39	827.52
2008	Texas	34,261.58	1,200.58
2008	Unknown	28.80	0.08
2008	Utah	88.63	0.12
2008	Vermont	6,678.31	465.69
2008	Virginia	43,516.15	531.75
2008	Washington	35,505.62	16,413.97
2008	West Virginia	132.15	0.13
2008	Wisconsin	5,766.94	158.15
	Total:	**8,759,290.48**	**2,225,833.24**

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Manifest Information Management System

Volume and Activity Summary

Search Criteria:

States: All states
Disposal Site: Clive
Waste Type: LLW only
Date Range: January 1, 2006 through December 31, 2008

Click your browser's 'Back' button to generate the same report using different criteria.

Year Received	State	Volume (ft3)	Activity (curies)
2006	Alabama	25,537.10	31.41
2006	Arizona	31,262.69	11.83
2006	Arkansas	11,407.76	3.57
2006	California	451,070.98	185.93
2006	Colorado	180.34	0.12
2006	Connecticut	703,039.68	55.03
2006	Delaware	51.68	0.31
2006	Dist of Columbia	151.22	0.06
2006	Florida	32,103.77	30.64
2006	Georgia	14,920.05	181.94
2006	Idaho	26.23	0.00
2006	Illinois	611,912.69	1,521.60
2006	Indiana	462.96	5.21
2006	Iowa	1,472.72	70.18
2006	Kansas	1,147.09	1.61
2006	Kentucky	38,535.24	2.93
2006	Louisiana	3,870.36	54.78
2006	Maine	3,452.96	0.11
2006	Maryland	47,830.52	4.06
2006	Massachusetts	745,916.36	295.94
2006	Michigan	448,018.71	44.98
2006	Minnesota	8,253.52	54.25
2006	Mississippi	3,439.31	458.45
2006	Missouri	3,273.16	4.49
2006	Nebraska	7,299.44	73.22
2006	Nevada	69.07	0.11
2006	New Hampshire	642.79	14.84
2006	New Jersey	89,982.30	56.54
2006	New Mexico	206.95	0.03
2006	New York	44,584.33	151.86

2006	North Carolina	194,524.77	164.41
2006	North Dakota	22.50	0.00
2006	Ohio	38,517.41	22.52
2006	Pennsylvania	55,909.19	777.52
2006	Rhode Island	112.18	1.26
2006	South Carolina	43,190.66	79.82
2006	Tennessee	153,397.66	183.36
2006	Texas	14,907.50	6.23
2006	Utah	586.50	0.11
2006	Vermont	2,706.10	9.70
2006	Virginia	145,081.45	8.32
2006	Washington	202.50	0.04
2006	West Virginia	38.02	0.03
2006	Wisconsin	4,481.79	1.12
2007	Alabama	55,799.48	28.45
2007	Arizona	28,222.09	4.95
2007	Arkansas	53,373.47	4.79
2007	California	925,691.03	148.65
2007	Colorado	168.35	0.23
2007	Connecticut	34,567.45	83.05
2007	Delaware	35.23	0.08
2007	Dist of Columbia	374.32	0.06
2007	Florida	56,994.26	18.98
2007	Georgia	8,564.62	46.10
2007	Idaho	15.00	0.00
2007	Illinois	167,899.03	624.70
2007	Indiana	449.01	0.04
2007	Iowa	10,790.92	110.00
2007	Kansas	860.69	4.41
2007	Kentucky	107,097.45	25.04
2007	Louisiana	15,901.80	100.25
2007	Maine	2.60	0.01
2007	Maryland	20,736.16	9.37
2007	Massachusetts	132,268.41	62.22
2007	Michigan	86,427.10	27.12
2007	Minnesota	8,466.76	204.98
2007	Mississippi	8,888.32	32.17
2007	Missouri	13,315.47	45.96
2007	Nebraska	10,199.90	197.21
2007	Nevada	40.07	0.10
2007	New Hampshire	2,663.07	2.33
2007	New Jersey	46,670.91	32.48
2007	New Mexico	102.06	0.03
2007	New York	44,905.12	93.54
2007	North Carolina	81,154.44	106.27
2007	North Dakota	15.55	0.00

2007	Ohio	20,189.89	32.01
2007	Oklahoma	4.77	0.01
2007	Pennsylvania	76,381.10	1,251.63
2007	Rhode Island	9.42	1.13
2007	South Carolina	79,989.39	64.84
2007	South Dakota	196.13	0.00
2007	Tennessee	258,248.91	497.12
2007	Texas	69,395.13	5.38
2007	Utah	384.00	0.02
2007	Vermont	8,429.14	3.74
2007	Virginia	40,143.97	8.56
2007	Washington	2,311.90	0.12
2007	West Virginia	41.77	0.01
2007	Wisconsin	13,999.54	22.60
2008	Alabama	33,734.27	99.32
2008	Arizona	52,662.23	1.90
2008	Arkansas	14,992.26	11.37
2008	California	548,739.99	118.73
2008	Colorado	1,413.46	0.24
2008	Connecticut	30,259.79	31.21
2008	Delaware	396.20	0.85
2008	Dist of Columbia	110.72	0.19
2008	Florida	57,749.36	49.42
2008	Georgia	29,733.64	99.72
2008	Idaho	97.50	0.09
2008	Illinois	134,761.56	1,356.06
2008	Indiana	1,149.91	0.42
2008	Iowa	4,432.47	133.68
2008	Kansas	5,645.32	3.58
2008	Kentucky	101,515.42	11.28
2008	Louisiana	17,226.44	161.61
2008	Maine	28.25	0.00
2008	Maryland	6,541.60	10.61
2008	Massachusetts	176,033.02	121.75
2008	Michigan	30,577.51	119.10
2008	Minnesota	5,012.40	46.66
2008	Mississippi	4,846.90	224.09
2008	Missouri	110,006.41	18.74
2008	Nebraska	18,969.59	74.93
2008	Nevada	140.23	0.03
2008	New Hampshire	5,361.70	8.03
2008	New Jersey	31,354.83	7.49
2008	New Mexico	176.17	0.96
2008	New York	31,420.11	307.09
2008	North Carolina	60,607.17	109.92
2008	North Dakota	6.00	0.00

2008	Ohio	71,460.00	591.72
2008	Oklahoma	8.40	0.00
2008	Pennsylvania	111,508.05	586.32
2008	Puerto Rico	15.10	0.00
2008	Rhode Island	7.44	1.50
2008	South Carolina	87,506.97	19.67
2008	South Dakota	0.67	0.00
2008	Tennessee	149,804.80	102.45
2008	Texas	33,998.71	51.60
2008	Unknown	28.80	0.08
2008	Vermont	6,583.87	98.88
2008	Virginia	41,541.25	101.34
2008	Washington	16,614.66	4.11
2008	West Virginia	132.15	0.13
2008	Wisconsin	5,383.14	7.40
	Total:	**8,516,481.86**	**13,165.47**

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Manifest Information Management System

Volume and Activity Summary

Search Criteria:

Compacts: Northwest
Disposal Site: Clive
Waste Type: LLW only
Date Range: January 1, 2006 through December 31, 2008

Click your browser's 'Back' button to generate the same report using different criteria.

Year Received	State	Volume (ft3)	Activity (curies)
2006	Idaho	26.23	0.00
2006	Utah	586.50	0.11
2006	Washington	202.50	0.04
2007	Idaho	15.00	0.00
2007	Utah	384.00	0.02
2007	Washington	2,311.90	0.12
2008	Idaho	97.50	0.09
2008	Washington	16,614.66	4.11
	Total:	**20,238.29**	**4.49**

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Manifest Information Management System

Volume and Activity Summary

Search Criteria:

Compacts: Northwest
Disposal Site: Richland
Waste Type: LLW only
Date Range: January 1, 2006 through December 31, 2008

Click your browser's 'Back' button to generate the same report using different criteria.

Year Received	State	Volume (ft3)	Activity (curies)
2006	Hawaii	2,289.68	166.13
2006	Idaho	23.82	14.00
2006	Montana	204.66	0.32
2006	Oregon	575.25	0.07
2006	Utah	102.44	0.12
2006	Washington	21,402.21	1,604.56
2006	Wyoming	22.90	0.07
2007	Alaska	2.31	0.02
2007	Hawaii	3,632.28	52.52
2007	Idaho	239.72	29.53
2007	Oregon	608.56	6.95
2007	Utah	157.36	0.31
2007	Washington	91,715.81	13,211.48
2008	Hawaii	3,605.82	26.85
2008	Idaho	15.00	15.07
2008	Oregon	84.71	0.04
2008	Utah	88.63	0.12
2008	Washington	18,890.96	16,409.85
	Total:	**143,662.12**	**31,538.01**

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Manifest Information Management System

Volume and Activity Summary

Search Criteria:

Compacts: Atlantic
Disposal Site: Barnwell
Waste Type: LLW only
Date Range: January 1, 2006 through December 31, 2008

Click your browser's 'Back' button to generate the same report using different criteria.

Year Received	State	Volume (ft3)	Activity (curies)
2006	Connecticut	3,417.21	457.18
2006	New Jersey	3,785.78	4,514.98
2006	South Carolina	2,570.59	1,656.53
2007	Connecticut	2,295.08	239.11
2007	New Jersey	465.22	51,715.49
2007	South Carolina	4,029.70	1,242.52
2008	Connecticut	322.30	251.33
2008	New Jersey	2,386.05	20,799.24
2008	South Carolina	2,528.25	1,557.21
	Total:	**21,800.18**	**82,433.60**

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Curriculum Vita of Arjun Makhijani

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A recognized authority on energy issues, Dr. Makhijani is the author and co-author of numerous reports and books on energy and environment related issues, including two published by MIT Press. He was the principal author of the first study of the energy efficiency potential of the US economy published in 1971. He is the author of *Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy* (2007).

In 2007, he was elected Fellow of the American Physical Society. He was named a Ploughshares Hero, by the Ploughshares Fund (2006); was awarded the Jane Bagley Lehman Award of the Tides Foundation in 2008 and the Josephine Butler Nuclear Free Future Award in 2001; and in 1989 he received The John Bartlow Martin Award for Public Interest Magazine Journalism of the Medill School of Journalism, Northwestern University, with Robert Alvarez. He has many published articles in journals and magazines as varied as *The Bulletin of the Atomic Scientists, Environment, The Physics of Fluids, The Journal of the American Medical Association,* and *The Progressive*, as well as in newspapers, including the *Washington Post*.

Dr. Makhijani has testified before Congress, and has appeared on ABC World News Tonight, the CBS Evening News, CBS 60 Minutes, NPR, CNN, and BBC, among others. He has served as a consultant on energy issues to utilities, including the Tennessee Valley Authority, the Edison Electric Institute, the Lawrence Berkeley Laboratory, and several agencies of the United Nations.

Education:

- Ph.D. University of California, Berkeley, 1972, from the Department of Electrical Engineering. Area of specialization: plasma physics as applied to controlled nuclear fusion. Dissertation topic: multiple mirror confinement of plasmas. Minor fields of doctoral study: statistics and physics.
- M.S. (Electrical Engineering) Washington State University, Pullman, Washington, 1967. Thesis topic: electromagnetic wave propagation in the ionosphere.
- Bachelor of Engineering (Electrical), University of Bombay, Bombay, India, 1965.

Current Employment:

- 1987-present: President and Senior Engineer, Institute for Energy and Environmental Research, Takoma Park, Maryland. (part-time in 1987).
- February 3, 2004-present, Associate, SC&A, Inc., one of the principal investigators in the audit of the reconstruction of worker radiation doses under the Energy Employees Occupational Illness Compensation Program Act under contract to the Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.

Other Long-term Employment

- 1984-88: Associate Professor, Capitol College, Laurel, Maryland (part-time in 1988).
- 1983-84: Assistant Professor, Capitol College, Laurel, Maryland.
- 1977-79: Visiting Professor, National Institute of Bank Management, Bombay, India. Principal responsibility: evaluation of the Institute's extensive pilot rural development program.
- 1975-87: Independent consultant (see page 2 for details)
- 1972-74: Project Specialist, Ford Foundation Energy Policy Project. Responsibilities included research and writing on the technical and economic aspects of energy conservation and supply in the U.S.; analysis of Third World rural energy problems; preparation of requests for proposals; evaluation of proposals; and the management of grants made by the Project to other institutions.
- 1969-70: Assistant Electrical Engineer, Kaiser Engineers, Oakland California. Responsibilities included the design and checking of the electrical aspects of mineral industries such as cement plants, and plants for processing mineral ores such as lead and uranium ores. Pioneered the use of the desk-top computer at Kaiser Engineers for performing electrical design calculations.

Professional Societies:

- Institute of Electrical and Electronics Engineers and its Power Engineering Society
- American Physical Society (Fellow)
- Health Physics Society
- American Association for the Advancement of Science

Awards and Honors:

- The John Bartlow Martin Award for Public Interest Magazine Journalism of the Medill School of Journalism, Northwestern University, 1989, with Robert Alvarez
- The Josephine Butler Nuclear Free Future Award, 2001
- Ploughshares Hero, Ploughshares Fund, 2006
- Elected a Fellow of the American Physical Society, 2007, *"For his tireless efforts to provide the public with accurate and understandable information on energy and environmental issues"*
- Jane Bagley Lehman Award of the Tides Foundation, 2007/2008

Invited Faculty Member, Center for Health and the Global Environment, Harvard Medical School: Annual Congressional Course, *Environmental Change: The Science and Human Health Impacts*, April 18-19, 2006, Lecture Topic: An Update on Nuclear Power - Is it Safe?

Consulting Experience, 1975-1987
Consultant on a wide variety of issues relating to technical and economic analyses of alternative energy sources; electric utility rates and investment planning; energy conservation; analysis of energy use in agriculture; US energy policy; energy policy for the Third World; evaluations of portions of the nuclear fuel cycle.

Partial list of institutions to which I was a consultant in the 1975-87 period:

- Tennessee Valley Authority
- Lower Colorado River Authority
- Federation of Rocky Mountain States
- Environmental Policy Institute
- Lawrence Berkeley Laboratory
- Food and Agriculture Organization of the United Nations
- International Labour Office of the United Nations
- United Nations Environment Programme
- United Nations Center on Transnational Corporations
- The Ford Foundation
- Economic and Social Commission for Asia and the Pacific
- United Nations Development Programme

Languages: English, French, Hindi, Sindhi, and Marathi.

Reports, Books, and Articles (Partial list)

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A Time to Choose: America's Energy Future, final report of the Ford Foundation Energy Policy Project, Ballinger, Cambridge, 1974. One of many co-authors.

Makhijani, A., and A. Poole, *Energy and Agriculture in the Third World*, Ballinger, Cambridge, 1975.

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Kahn, E., M. Davidson, A. Makhijani, P. Caeser, and S. Berman, *Investment Planning in the Energy Sector*, Lawrence Berkeley Laboratory, Berkeley, 1976.

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Makhijani, A., *Energy Use in the Post-Harvest Component of the Food Systems in Ivory Coast and Nicaragua*, Food and Agriculture Organization of the United Nations, Rome, 1982.

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Makhijani, A., *Experimental Irradiation of Air Force Personnel During Operation Redwing - 1956*, Environmental Policy Institute, Washington, D.C., 1985.

Makhijani, A., and R.S. Browne, "Restructuring the International Monetary System," *World Policy Journal*, New York, Winter, 1985-86.

Makhijani, A., R. Alvarez, and B. Blackwelder, *Deadly Crop in the Tank Farm: An Assessment of Management of High-Level Radioactive Wastes in the Savannah River Plant Tank Farm*, Environmental Policy Institute, Washington, D.C., 1986.

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Makhijani, A., *An Assessment of the Energy Recovery Aspect of the Proposed Mass Burn Facility at Preston, Connecticut*, Institute for Energy and Environmental Research, Takoma Park, 1987.

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Franke, B. and A. Makhijani, *Avoidable Death: A Review of the Selection and Characterization of a Radioactive Waste Repository in West Germany*, Health & Energy Institute, Washington, DC; Institute for Energy and Environmental Research, Takoma Park, November 1987.

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Makhijani, A., and Brice Smith, *The Role of E.I. du Pont de Nemours and Company (Du Pont) and the General Electric Company in Plutonium Production and the Associated I-131 Emissions from the Hanford Works*, Institute for Energy and Environmental Research, Takoma Park. Maryland, March 30, 2004.

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Institute for Energy and Environmental Research, *Lower Bound for Cesium-137 Releases from the Sodium Burn Pit at the Santa Susana Field Laboratory*, IEER, Takoma Park, Maryland, January 13, 2005. (Authored by A. Makhijani and Brice Smith.)

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Makhijani, Annie, and A. Makhijani. *Shifting Radioactivity Risks: A Case Study of the K-65 Silos and Silo 3 Remediation and Waste Management at the Fernald Nuclear Weapons Site*, Institute for Energy and Environmental Research, Takoma Park, Maryland, August 2006.

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Makhijani, A., *Comments of the Institute for Energy and Environmental Research on the U.S. Nuclear Regulatory Commission's Proposed Waste Confidence Rule Update and Proposed Rule Regarding Environmental Impacts of Temporary Spent Fuel Storage,* Institute for Energy and Environmental Research, Takoma Park, Maryland, February 6, 2009.

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CV updated January 15, 2010