



International Institute for
Applied Systems Analysis
www.iiasa.ac.at

Public Opinion Surveys in Spent Nuclear Fuel Management

Vasilieva, E.

**IIASA Interim Report
November 2002**



Vasilieva, E. (2002) Public Opinion Surveys in Spent Nuclear Fuel Management. IIASA Interim Report. IR-02-072
Copyright © 2002 by the author(s). <http://pure.iiasa.ac.at/6715/>

Interim Report on work of the International Institute for Applied Systems Analysis receive only limited review. Views or opinions expressed herein do not necessarily represent those of the Institute, its National Member Organizations, or other organizations supporting the work. All rights reserved. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage. All copies must bear this notice and the full citation on the first page. For other purposes, to republish, to post on servers or to redistribute to lists, permission must be sought by contacting repository@iiasa.ac.at

Interim Report

IR-02-072

Public Opinion Surveys in Spent Nuclear Fuel Management

Ekaterina Vasilieva (evasil@imm.uran.ru)

Approved by

Joanne Linnerooth-Bayer (bayer@iiasa.ac.at)
Project Leader, Risk, Modeling and Society

November 2002

Contents

1. Introduction.....	1
2. Theoretical background.....	2
3. SNF management in Russia.....	5
4. Case studies.....	11
4.1. Finland.....	11
4.2. Sweden.....	14
4.3. The USA.....	17
5. Discussion.....	21
6. References.....	22

Abstract

Russia's plans to import foreign SNF for storage and reprocessing meet serious public opposition. As a start of taking into account public concerns, programs of public involvement can be designed and implemented. In the paper, approaches to decision-making on spent nuclear fuel management that differ in their commitment to public participation are discussed. The review of public opinion surveys in Russia that investigated public attitudes to spent fuel is given. Finally, the experience of several countries that have made serious progress in spent fuel management is analyzed with particular attention paid to the programs of public involvement and public opinion surveys. The aim is to understand the role of public opinion surveys in decision-making in this field and to describe how the surveys can be designed and conducted. This information might be useful for designing the programs of public involvement in Russia.

Acknowledgments

The author would like to thank Joanne Linnerooth-Bayer and Keith Compton for fruitful discussions and help during the work on this paper, and Valeri Samosyuk for helpful consultations.

About the Author

Ekaterina Vasilieva is a research scholar at the Institute of Mathematics and Mechanics, UB RAS, Ekaterinburg, Russia. She was a participant of IIASA's Young Scientists Summer Program in 2002 with the Risk, Modeling and Society project.

Public Opinion Surveys in Spent Nuclear Fuel Management

Ekaterina Vasilieva (evasil@imm.uran.ru)

1. Introduction

Management of spent nuclear fuel (SNF) has a reputation as a highly controversial policy issue facing countries that use nuclear reactors for electric power generation. Each year the world's reactors produce around 12,000 tons of SNF, and more than 250,000 tons of SNF are now awaiting disposal or reprocessing¹. The problem is growing because interim near-reactor storage facilities are reaching their capacity. Even if all the world's reactors were to be closed, there would still be a need to find a method of disposing of those radioactive wastes that have already been created. Each country chooses its own strategy of SNF management. Such strategies could be an interim storage followed by direct disposal, a permanent monitored surface storage, or reprocessing.

Besides the technical aspects, the SNF issue has also a social aspect, which is very important because of differences in perceptions among experts and the public. Experts engaged in promoting nuclear power argue that associated risks are comparatively low and manageable while large sections of the population and many experts are deeply opposed to the proposals and view risks as unacceptably high and threatening. Efforts to manage spent fuel raise a lively debate, which may escalate into a powerful confrontation. For example, the U.S. Department of Energy's program to develop a national underground repository has been seriously delayed due to overwhelming political opposition fueled by perceptions of the public and many experts that the risks are immense and unacceptable. Also, the plans to build an international repository in Australia were rejected because of political and public opposition². There are other examples where public opposition was one of the factors that led to reconsidering programs of SNF management.

Russia's plans to import foreign SNF for storage and reprocessing are also meeting serious public opposition. In order to take public concerns into account, programs of public involvement can be designed and implemented. One of the elements of such programs is public surveys. In this paper, the experience of several countries that have made serious progress in incorporating public involvement into spent fuel management is analyzed. Attention is paid to how public participation was organized, and, in particular, to public opinion surveys. Conclusions are made on what is the role

¹ <http://aaa.lanl.gov/atw>

² <http://www.pangea-international.com>

of public surveys in decision-making on SNF management, how to design and conduct surveys, and how their results could be used. This information might be useful for designing public involvement programs in Russia.

2. Theoretical background

According to [1], there are two basic approaches to decision-making in controversial issues such as siting of hazardous waste storage or reprocessing facilities: the 'open' and 'closed' approaches. They differ in their commitment to public participation. An example of the 'closed' approach is the so-called DAD ("decide, announce and defend") policy. An example of the 'open' approach is a voluntary process. Of course, these two approaches represent extremes on a continuum of decision-making and a policy can exhibit characteristics of both open and closed approaches.

The closed approach is optimal from a narrowly technical perspective because decisions are based on the views of experts and no money or time is spent on public negotiations. But this approach is fraught with serious consequences such as escalation of public and political opposition, social unrest, and, eventually, loss of trust in state institutions. I.J. Duncan [2] notes that the so-called NIMBY ("not in my back-yard") position "could be the child of 'top down' siting decisions usually based upon DAD policy", and that "failures to obtain sites for investigation, let alone for a repository, have in part been due to technical failure, but more importantly due to industry and government failure to understand public concerns and attitudes". In the same work we find the following:

Recipe for Site Loss [2]

- To maximize the attraction of NIMBY, have the site decided behind closed doors and then announced and defended (DAD).
- Exclude local participation and be Foreign to the subject community. Be from another state, another country, be federal, be international. As our American friends would say, be from out of town!
- Trust only yourselves. Make sure that the oversight body is male dominated, industry loaded, with perhaps some token female and government presence.
- Rush the procedure, minimizing community involvement as much as possible.
- Pretend that the site selected will only be used for scientific evaluation, certainly not for final disposal.
- Distribute glossy brochures that depict the decay of radio toxicity in obscure units over time, both on a log/log scale, and hope that the lay population will each have degrees in physics, chemistry, mathematics and geology.
- Do not publicly discuss compensation with the community or the surrounding area for fear of introducing the prospect of a "bribe".

The basic principle of the voluntary approach is that only communities that volunteer to investigate a facility are considered as potential hosts. Instead of fighting with communities that do not want the facility, interested communities are supported. The focus is primarily on social and political rather than technical and engineering aspects. It is becoming increasingly clear that there are advantages to a process of formal and informal consultation, communication and local involvement when undertaking the development of any large and controversial project, such as the siting of a radioactive waste disposal facility. The advantages of this approach stem from the increased openness and transparency in the decision-making process. In some countries public involvement is legally required in environmental decision-making. For example, there is a general consensus among the responsible bodies of the European Union that the public should be involved principally at the local level in decisions on the siting and licensing of radioactive waste management and disposal facilities³.

In a typical consultation process on spent fuel management, draft proposals, which are sufficiently detailed to allow an informed opinion to be formed and a decision to be taken, are laid before the relevant public. This is done on the understanding that their concerns will be addressed and their expressed views fully taken into account. This may result in the modification or even abandoning of the proposals in their original form. The work [3] demonstrates the wide variation that exists from one national program to another in terms of the payments and benefits that have been, and are being, offered to encourage communities to take part in siting processes for nuclear waste facilities. The benefits may include direct payments, local tax reductions, employment guarantees, infrastructure improvements including highways, railroads, waterways, airports or other public projects, environmental improvements including the cleanup of existing air, water or waste problems, investments in public safety, education, public health.

A similar distinction between different ways of decision-making is made in the work [4]. First, the author makes some comments on the nature of the problem of siting a potentially hazardous object: "The background to a conflict regarding siting is a clash of interests that in many cases emanates from the tension between the national and the local. From the national (and/or regional) perspective the installation is a necessity, whilst from the local perspective it is most often a disturbing nuisance. A siting conflict can also be based in a clash between different kinds of interest at the same geographical level." Then the author describes two possible extreme approaches to decision-making: autocracy and democracy. "...The response on how to tackle the ecological challenge can be placed on a continuum between autocracy and democracy. Those advocating autocracy assert that democracy is incapable to create sufficient and effective responses to the ecological challenge. The reason for this is that there are certain ecological principles that other values have to be subordinated to... The proposed solution is an ecologically enlightened and strong state that can exercise power on behalf of the collective interest. By force – centralized to the state – the citizenry and other actors in society should be compelled to make necessary changes... The other extreme point at the continuum is to be found within liberal democracy, which perceives democracy as a procedure for political decision-making. Similar to the case above, it states that ecology

³ <http://www.rwm-eu.org/en/index.asp>

and democracy can be in conflict with each other, but in contrast it asserts that in these cases democracy should have precedence.”

In the last decade, there is a tendency in the world’s practices of SNF management to change policies from closed to open approach. This is how the idea is described in the work [3]: “It has become widely accepted over the last several years that an evolution has been occurring worldwide in the methodologies being used to site hazardous waste facilities, away from the centralized, top-down processes of the past (often referred to as ‘Directed Siting’) and towards those in which the public is more involved... Previous work in this area⁴... described in particular the development of the ‘Volunteer Process’, in which siting studies are initially focused only on those communities expressing an interest in being considered, without obligation or commitment from either side. It also described other processes where some degree of pre-selection still takes place before volunteers are sought, referring to these as ‘Mixed-mode’, being as they are a combination of the ‘Volunteer’ and ‘Directed Siting’ processes. “

Preferences of the open approach and the need for open and public negotiations have been recognized by many authors, see, e.g., [2,5,6]. Most recent studies of policymaking in highly controversial, risk-plagued, and technical areas suggest that regulatory officials need to suspend the belief that the public is ‘irrational’ or unable to absorb complex debates. “People’s deep anxieties are linked to numerous realities, including the reality of radiation’s unique and powerful qualities, the reality of nuclear power’s links to nuclear proliferation and war, the reality of many serious examples of mismanagement... and the reality of extensive media coverage documenting major and minor problems and controversies involving nuclear technologies” [7]. Therefore public perceptions of the risks related to SNF reprocessing or disposal require careful assessment and explanation.

The need for public participation in a decision-making process is also recognized in the work [6]: “The limitation that is common to most of the existing decision-making processes is that public opinions have been ignored or partly considered only to a limited degree... The position is taken that the public have to be persuaded or convinced after the decision has been made by the decision-maker. Therefore, efforts are normally directed towards advertisement and education as a means of attempting to change public attitudes and beliefs. This process sometimes creates situations so confrontational between the public and the decision-maker that there is a danger of each side insisting on its own adversarial stance resulting in public distrust of the decision-maker. If this occurs, the public will not be willing to accept the decision.”

In the same work we find the following recommendations: “The importance of proper communication with the public has been recognized in the decision-making process. A comprehensive system of acquiring genuinely representative public opinions should be developed. To quantify public risk perception, a questionnaire is usually employed to take a public poll on the risk... The contents of the questionnaire should be simple and easy enough for the public to understand, but should be also soundly based, so that the public will be willing to participate in the poll. The use of a professional polling organization could improve the reliability and credibility of the results.”

⁴ Richardson, P.J., An overview of international siting programmes for radioactive waste disposal facilities: Possible lessons for Sweden. Published by Swedish Radiation Protection Institute (SSI-Rapport 94-15). 1994.

As we see here, one of the elements of the open approach is investigation of public attitudes to the proposal. T. Litmanen [5] notes that in the last decade there is a tendency to view public reactions as prudent instead of considering them irrational. “As the volume of empirical research grew, it became evident that the public cannot be regarded as ignorant... Instead of being skeptical towards public concerns, the researcher takes these concerns seriously and sees that residents can inform the planners about the social, sociological, ethical and political questions revolving around the siting process... By understanding the logic and meanings of resistance, support and neutrality, it would be easier to establish a dialogue between the parties.” [5]

It is important for federal and local authorities involved in SNF management to consider public concerns and perceptions when formulating policies and procedures. It is clear that a valid picture of public opinion can be obtained only if the questions posed to people are designed to give them a chance to freely express their opinions, without leading clues and other distortions. If policy-makers have a valid picture of public opinion, they can employ a range of techniques to raise public understanding, gain public confidence and trust, and to move towards the establishment of public acceptability of the proposals.

3. SNF management in Russia

According to the national policy of the Russian Federation, SNF is subject to reprocessing, which is chemical processing of spent fuel with the aim to separate out plutonium, uranium, and waste products. The plutonium and the uranium can then be used to produce fresh reactor fuel. Also, there is a plan designed by Minatom (Ministry of Atomic Energy of the Russian Federation) to import up to 20,000 tons of SNF for storage and reprocessing, thereby generating 20 billion dollars in total revenues. According to the Minatom’s plan, 7 billion dollars will be spent on state environmental programs. The imported SNF will be transported to the Krasnoyarsk region where it will be stored for 30-50 years. After the storage, when the radioactivity has decreased, a part of the foreign SNF will be returned to the countries of origin, and a part will be reprocessed and used in the nuclear cycle. In June 2001, the Russian parliament approved the necessary amendments to the laws. These amendments allow foreign SNF to be imported for storage and reprocessing. This is the first time in the history of SNF management that a large amount of foreign SNF is going to be brought into a country and stay there for a long time, possibly forever. At the official Minatom site we find the following details: “Reprocessing of foreign SNF will let Russia obtain the real source of financing not only for the construction of nuclear power plants that are more modern and safe, but also for realization of large-scale environment-oriented measures. If we import 20,000 tons of SNF, then only for its storage during 10 years we will get 20 billion dollars, and the amount of received foreign SNF in Russia will not exceed 50% of its own SNF.”⁵

⁵ www.minatom.ru

This proposal gave rise to a lot of discussions in the mass media and in many sections of the population. When considering the issue of import of foreign SNF into Russia, there arises in addition a moral problem of 'buying foreign risks'. Quite understandably, people oppose the plans because they believe that it is unfair to be subject to risks that originate in another country. This idea is found in many studies, e.g., in [8]: "People accept risks more readily if the risk distribution is perceived as fair". It is quite natural that moral issues are brought up in the debates, since risk debates are often about life and death. "Collectively shared interpretations of risks also contain moral judgments about what is acceptable and what is not. In the nuclear waste conflict this means that the risks, which are brought into the community from outside, offer a fertile ground for residents to discuss not only the construction project, but also more general social questions, such as what is important for them (e.g., their history or future), who they are (e.g., the question of identity) and what is their role in the wider society (e.g., questions about equity)" [5].

Although the issue of SNF import is very controversial and may affect people's interests, there are no plans to hold a referendum, despite the continuing requests. For example, in the beginning of 1997, green movement activists collected 98,255 signatures in the Krasnoyarsk region in a petition for a local referendum against the ongoing construction of the RT-2 plant. The plant is intended for storage and reprocessing of spent nuclear fuel. Its construction was authorized in 1977, although actual construction was not started until 1984. In 1989 the construction was halted due both to a lack of funding and strong opposition against the facility on the local level. The first referendum in Krasnoyarsk region was held in the early nineties and resulted in a lack of support for the construction of the plant. A second referendum was requested in 1997, but at the Region Council hearings on April 18 the initiative was rejected by a majority of the deputies. The council referred to the RT-2 being subject to supervision by Federal authorities in Moscow, leaving regional authorities powerless in the matter⁶.

In autumn 2000, Russian environmental groups collected around 2.5 million signatures in support of a national referendum to restore state environmental agencies and to ban nuclear waste/material import into the country. The Russian Central Electoral Committee rejected around 600,000 signatures and declared that the required 2 million criterion for starting the vote was short by 127,000 signatures⁷.

The next attempt to request a referendum in Krasnoyarsk region took place in February 2002 when activists submitted more than 40,000 signatures on a demand of a regional referendum on the issue of managing SNF in Krasnoyarsk region. The regional election commission disqualified around 90% of the signatures, thereby rejecting the referendum. In April, the initiative group filed an appeal against this decision. The court declared the decision unlawful, but also rejected the referendum saying that the storage and disposition of nuclear waste was the prerogative of the federal government.⁸

In the last few years several opinion polls that addressed the issue of SNF management have been held in Russia. Most of them were conducted at the time when the bills allowing import of SNF into Russia were being discussed in the Parliament. Below is a review of the polls.

⁶ Bellona News, www.bellona.no/imaker?sub=1&id=8396

⁷ Bellona News, www.bellona.no/en/international/russia/nuke_industry/waste_imports/18705.html

⁸ www.greenpeace.ru/gpeace/refKrasnoyarsk

In April-October 2000 a series of opinion polls was conducted in several Russian cities: Chelyabinsk⁹ (25.04 - 05.05), Novosibirsk¹⁰ (14.08 - 20.08), Tomsk¹¹ (21.08 – 20.08), Ekaterinburg¹² (17.09 – 22.09), and Ozersk¹³ (25.09 – 01.10). They were organized by a sociologist, Nadezhda Kutepova, who is a post-graduate student at the Ural State University and a green activist. More than 4000 people participated in telephone interviews on ecological issues. In this survey, some of the questions were apparently designed to change people’s attitudes. For example, Chelyabinsk citizens were asked the following question: “Do you know that the Chelyabinsk region is considered to be the most radioactively-contaminated in the world?” without mentioning by whom it is considered such.

In each of the cities two questions addressed SNF management in Russia. These questions are given below together with the results.

The first question: “*The Ministry of Atomic Energy of Russia is going to bring for storage to the Russian territory 20 thousand tons of foreign spent nuclear fuel. Do you know about it?*” (In Chelyabinsk: “*The Ministry of Atomic Energy is going to bring for storage to the territory of the Chelyabinsk region tons of foreign spent nuclear fuel. Do you know about it?*” Note that the questionnaire presents Chelyabinsk, not Krasnoyarsk, as the destination of imported SNF.)

	Yes, I know	No, I don’t know	Hard to answer
Chelyabinsk	45,2%	49,6%	5,2%
Novosibirsk	51,9%	45,2%	2,8%
Tomsk	57,3%	41,3%	1,4%
Ekaterinburg	53,0%	47,0%	0,0%
Ozersk	63,0%	34,2%	2,8%

The second question: “*Do you think that it is acceptable to import foreign spent nuclear fuel to the territory of Russia?*” (In Chelyabinsk: “*In your opinion, is it acceptable to import foreign spent nuclear fuel for storage to the territory of the Chelyabinsk region?*”)

	Yes, acceptable	No, unacceptable	Hard to answer
Chelyabinsk	3,5%	93,3%	3,2%
Novosibirsk	5,7%	87,6%	6,7%
Tomsk	7,7%	87,9%	4,4%
Ekaterinburg	3,7%	92,7%	3,7%
Ozersk	30,1%	58,2%	11,7%

As we see, the overwhelming majority of the people answered “No” to the second question. It is remarkable that results of the poll in Ozersk differ considerably from the results in the other cities. This can be explained by the fact that Ozersk is a closed city

⁹ www.ecoline.ru/news/JUN00/00060201.TXT

¹⁰ http://cci.glasnet.ru/antinuclear/rus/expert/oom_nsk.htm

¹¹ www.index.org.ru/eco/165.html

¹² http://cci.glasnet.ru/antinuclear/rus/expert/oom_eburg.htm

¹³ <http://cci.glasnet.ru/antinuclear/rus/aap/aap286.htm>

where Mayak Production Association is located, and Mayak operates a spent fuel reprocessing facility RT-1.

In September 2000, the research group ROMIR at the request of Greenpeace conducted a survey poll using a representative all-Russian urban sample¹⁴. 1111 respondents were asked the following question: “*What is your attitude to the import to the Russian territory from other countries of radioactive materials for storage, disposal, or reprocessing?*” The poll gave the following distribution of the answers.

Definitely negative	81.5%
Rather negative	12.0%
Neutral	3.9%
Rather positive	0.4%
Definitely positive	0.4%
Hard to answer \ Refuse to answer	1.4%

In April 2001, VCIOM (All-Russian Center of Public Opinion Investigation) conducted a national public opinion survey¹⁵. 1600 respondents were asked among others the question: “*On the whole, do you support the idea of reprocessing and storage of spent nuclear fuel from other countries?*” The results were as follows:

Support	11%
Do not support	82%
Hard to answer	7%

In May 2001, before the Parliament vote on the amendments allowing import of SNF, the research group ROMIR conducted a research poll asking people the following questions¹⁶.

“*Will you support a representative of your region at the following parliament elections if he or she votes for the bills allowing import of radioactive materials for reprocessing, storage, and disposal?*”

Definitely yes	1.0%
Rather yes	2.4%
Rather no	12.4%
Definitely no	78.9%
Hard to answer \ Refuse to answer	5.3%

“*Will you support a party / movement / block at the following parliament elections if the fraction of this party / movement / block votes for the bills allowing import of radioactive materials for reprocessing, storage, and disposal?*”

Definitely yes	0.9%
Rather yes	2.4%

¹⁴ www.greenpeace.ru/pictures/336/1romir.rtf

¹⁵ www.vciom.ru/vciom/new/press/bottom2000.asp?id=120425

¹⁶ www.greenpeace.ru/gpeace/282

Rather no	12.0%
Definitely no	79.6%
Hard to answer \ Refuse to answer	5.0%

In June 2001, after the Duma had approved the bills allowing import of foreign SNF, the research group ROMIR conducted telephone interviews with 500 Muscovites asking them “Who will benefit from passing of the bills?” The results were the following¹⁷.

Foreign suppliers of SNF	28.0%
Minatom	19.6%
Russian Government	17.8%
Deputies of the Duma	9.2%
All Russian population	4.1%
Other	6.1%
Nobody	6.3%
Hard to answer	8.9%

In July 2001, “The public Opinion Foundation” conducted a nation-wide survey, asking 1500 respondents and, in addition, 500 muscovites, the following questions:¹⁸

“Do you know, have you heard something, or is it the first time you have heard that ‘Yabloko’ leader Grigory Yavlinsky has called for a referendum on the import of spent nuclear fuel into Russia?”

	Total Russia	Total Moscow
I know about it	17%	31%
I've heard about it	37%	38%
This is the first time I've heard about it	41%	30%
Hard to answer	5%	1%

“Do you support the idea of holding a referendum on the import of spent nuclear fuel into Russia, or not?”

¹⁷ www.romir.ru/socpolit/actual/06_2001/nuclear-wastes.htm

¹⁸ <http://english.fom.ru/reports/frames/short/etb012607.html>

	Total Russia	Total Moscow
Support	70%	70%
Don't support	19%	21%
Hard to answer	11%	9%

“If a referendum on the import of spent nuclear fuel into Russia were held, would you vote in this referendum, or not?”

	Total Russia	Total Moscow
Yes	73%	77%
No	17%	16%
Hard to answer	9%	7%

“Would you vote for or against importing spent nuclear fuel into Russia?” (Responses of those saying they would vote in the referendum).

	Total Russia	Total Moscow
For	8%	9%
Against	62%	63%
Hard to answer	4%	5%

Finally, the Russian Internet site “Glas Runeta” (www.voxru.net) is holding an on-line opinion poll “Nuclear fuel”¹⁹. This poll has started on September 7, 2001 and it has 8 questions. There are at the moment as much as 7534 answers to one of the questions. It should be noted that an Internet vote might be highly biased. Nevertheless, below the distribution of the answers to one of the questions is cited.

The question: *“What is your attitude to import to the Russian territory from other countries of spent nuclear fuel for reprocessing, storage and/or disposal?”*

Definitely negative	48.1%
Rather negative	21.6%
Neutral	10.6%
Rather positive	9.5%
Definitely positive	7.5%
Hard to answer	2.7%

¹⁹ www.voxru.net/arc/ecology/yadro.html

There is a considerable difference between these results and the results of the survey poll held in September 2000 by ROMIR. It is not clear if this difference can be explained by different attitudes of Internet users, by inaccuracies in Internet polling, or by other reasons.

If we compare Russia with other nuclear countries, such as the USA, Canada, Sweden, we find that the amount of public opinion surveys on people's attitudes to SNF management is comparatively low. Moreover, there were no surveys designed to find the reasons behind people's attitudes. Minatom's efforts to convince people that the import of foreign SNF is a necessity concentrate on educating with no serious programs of public involvement. Minatom appears to have chosen the closed approach, which has its disadvantages. The case studies show that the countries that made some progress in spent fuel management have moved their policies towards more open approach during their attempts to solve the problem. This transition will be shown in the next section for several countries.

4. Case studies

In this section three countries are considered. In each case the policy of the country on SNF management and the history of attempts to solve the problem is described. Particular attention is paid to the programs of public involvement and to organization and results of opinion polls.

4.1. Finland²⁰

At present, Finland has two nuclear plants situated in Loviisa and Olkiluoto. Each of the plants operates two nuclear reactors. The two Finnish nuclear power plants produce a total of some 70 tons of spent fuel every year. Also, on 24 May 2002, the Finnish Parliament ratified the decision on the construction of the fifth nuclear reactor. There are no plans for reprocessing of the produced SNF. Therefore, it is classified as nuclear waste. Finnish nuclear waste management is guided by the Nuclear Energy Act and Decree (1988). In 1994 the Nuclear Energy Act was amended so that all nuclear waste produced in Finland must be disposed of in Finland. Until the end of 1996, all nuclear waste generated at Loviisa was transported to a Russian reprocessing plant. The Nuclear Energy Act also prohibits the import of nuclear waste.

The basic principle of nuclear waste management in Finland is that each producer is responsible for the safe management and disposal of the waste as well as for the financing of these operations. In 1995 the waste management divisions of the both nuclear power plants united to form a new company, Posiva, which is responsible for the research, development and planning work of final disposal of SNF. It is planned that

²⁰ http://www.stuk.fi/english/nuclear_materials/final_disposal.html

the spent fuel will be encapsulated and disposed of in bedrock at a depth of about half a kilometer. Final disposal site investigations have been done on four localities. They were Kuhmo, Äänekoski, Olkiluoto, and Häshtolmen at Loviisa. After the preliminary investigations, Posiva has proposed that Olkiluoto be chosen for the final disposal site. This proposal was approved by the Decision in Principle ratified by the Parliament on 18th May 2001. The construction of the final disposal facility is scheduled to start in the 2010s. The facility should be operational after 2020. At the earliest, all nuclear waste will be disposed of in the middle of the 2100s. The tunnels will be filled and the encapsulation plant decommissioned. It is remarkable that at the moment Finland is the only country in the world to have set a program for SNF disposal that has not been delayed by any process or event.²¹

The decision to set up a separate company responsible for SNF management was one of the measures the companies believe was important for building public confidence in the program. Another element in building public confidence has been to ensure that the finance is available to carry out the program, which will continue for many decades.

Posiva is responsible not only for completing research, development, and site investigations, but also for ensuring local and political acceptance at each step of the program. One of the tasks is to dispel public disquiet about the repository. The Nuclear Energy Act and Decree implies that the local municipality and the Finnish Center for Radiation and Nuclear Safety (STUK) have first to approve the siting and development of a waste disposal facility before the government and the parliament can provide the final authorization. The proposed host municipality, therefore, has the right of veto, and this fact has helped local populations to accept the site investigations.

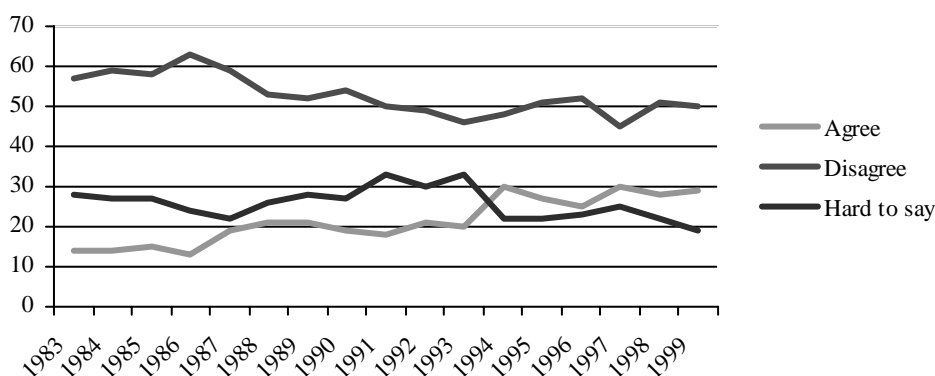
Numerous public surveys were conducted in Finland to assess public attitudes to SNF management. Some of them were national, and some of them were conducted in the municipalities that were considered to be potential hosts. Also, Finland participated in two EU surveys on the attitudes to radioactive waste management. The latest of them, "Europeans and radioactive waste"²², was carried out in Autumn 2001 at the request of the European Commission's Directorate-General Energy & Transport. The survey covered the population of the European Union aged 15 and over; in total, some 16,000 interviews were conducted. All interviews were face-to face in respondents' homes and conducted in the appropriate national language. The survey investigated how well people are informed about radioactive waste and which sources of information they trust; reactions to such issues as national versus regional disposal sites, reasons for the present impasse in developing geological repositories, people's concerns about such sites and other related issues.

In Finland, a follow-up study called "Energy attitudes of the Finns" has been investigating attitudes towards questions concerning energy policy for seventeen years (1983-1999).²³ In the time series concerning the entire follow-up period, the total number of participants is 25,077. The study series makes it possible to trace how people's attitudes have been changing through the years. For example, as seen from the graph below, the percentage of people who considers that the disposal of nuclear waste in the Finnish bedrock is safe has grown from 14% to 29%.

²¹ High-level waste and spent-fuel disposal research strategy. Task 1.2: International programme analysis. Report to DETR. QuantiSci. 1998.

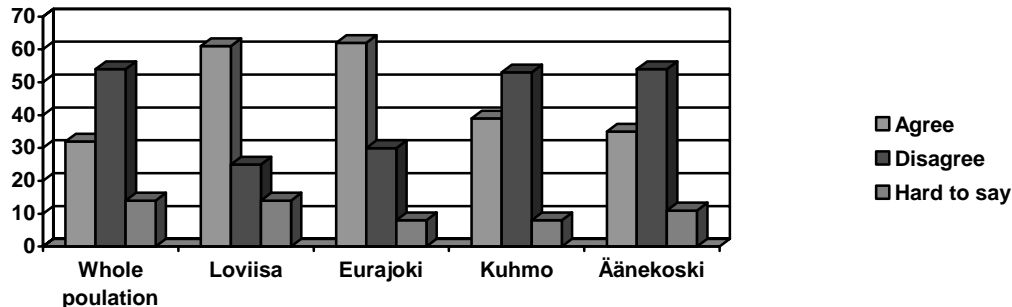
²² http://europa.eu.int/comm/energy/nuclear/pdf/eb56_radwaste_en.pdf

²³ <http://www.sci.fi/~pena/eas99eng/eng-eas99.htm>



Distributions of the answers to the question
“It is safe to dispose of nuclear waste in the Finnish bedrock?”
 National surveys, 1983-1999

In 1999, the study included also answers of the people who represented the population of Loviisa, Eurajoki, Kuhmo and Äänekoski, i.e. the municipalities that were being investigated as potential hosts of a repository. It is remarkable that the majority of the people living in Loviisa and Eurajoki (61% and 62%) accept the location of the repository in their municipalities. One of the reasons for accepting could be that these two municipalities are already familiar with nuclear technologies as they host the two Finnish nuclear power plants.



Distributions of the answers to the question
“Do you agree with the statement ‘If research showed that my municipality of residence is a safe place for the final disposal of Finnish nuclear waste, I would accept the disposal of Finnish nuclear waste in the area of my municipality?’”

The position of people in Eurajoki on the final disposal project was also studied in February 2000. The study showed that a clear majority of them (78%)²⁴ were willing to accept the building of the final disposal facility in Olkiluoto, provided the safety of the project is verified through research and an official safety assessment. In logical consequence of this, the Municipal Council of Eurajoki decided in January 2000 to

²⁴ <http://www.world-nuclear.org/waste/report2000/chapter6.htm>

support the construction of the final disposal facility in Olkiluoto as proposed in the application for the policy decision.

In January 2000, a nationwide poll was also conducted, asking Finnish people whether nuclear waste generated in Finland should also be disposed of in Finland, and what their feelings were about continuing the project after STUK had decided in favor of the final disposal facility.²⁵ As many as 92% of Finnish adults supported the disposal of nuclear waste in Finland. 78% of the people also felt that research and preparations for the final disposal in Eurajoki should be continued in compliance with the application for the policy decision.

Another example of the serious study on people's attitudes to siting a repository is the article [5], in which results of the surveys conducted in Eurajoki, Äänekoski, and Kuhmo were analyzed with the aim to explain differences of attitudes in these municipalities. The thesis of the paper is that in order to understand different opinions about a facility, one must understand the cultural logic of risk perception, because social background is connected with attitudes towards the siting of nuclear waste. The author provides some conclusions for the policy-makers: "An interesting result was the notion that the supporters of the project have more knowledge about the siting of nuclear waste than its opponents. From this the nuclear industry usually draws the conclusion that more information has to be given to the opponents so that their views would change. The conclusion is too hasty from the viewpoint of the cultural approach; the results do not necessarily indicate ignorance on the part of the opponents. The opponents may be unwilling to receive information about the project because they do not regard it as acceptable. Instead of spending resources to the education of strong opponents, it would be more important to study the cultural basis of the resistance. By understanding the logic and meaning of resistance, support and neutrality, it would be easier to establish a dialogue between the parties."

Decision-making on nuclear waste management in Finland certainly has features of the open approach. To this testifies the fact that municipalities have the right to veto the decision on the siting of a repository. It is not very clear if the awareness of this right increases the percentage of supporters, but it is a rare case that a community is willing to accept a radioactive waste repository on its territory. Also, numerous public surveys helped to take into account people's concerns about safety, thereby increasing the chances of acceptance. Finland is, at present, one of the most successful countries in SNF management.

4.2. Sweden²⁶

According to the Swedish law, the companies that own nuclear power plants are responsible for the handling and final disposal of nuclear waste. The nuclear companies have formed a joint company, the Swedish Nuclear Fuel and Waste Management Co. (SKB), to fulfill this requirement. Currently, the spent nuclear fuel is stored one year at the reactor pool, and then transported to the Central Storage for Spent Fuel (CLAB) situated near to the Oskarshamn Nuclear Power Plant. No repository has yet been constructed for spent nuclear fuel. Work within the industry focuses on final disposal in

²⁵ <http://www.posiva.fi/englanti> (Finland's commitments / Policy decision)

²⁶ http://www.ski.se/se/index_nuclear_uk.html

the bedrock. However, the method has not yet received final approval. Furthermore, a site has not yet been selected to host the repository. The siting process is in progress and a number of municipalities are currently participating in investigations. The nuclear industry hopes that construction of a repository can start by 2008.

In the search for a suitable site for the repository, SKB has been conducting studies of geologic suitability in the country since the mid-1970s. Between 1977 and 1985, test drillings were made at about 10 sites. The first drillings faced protests by local authorities and demonstrators. Protestors held many actions in the effort to stop testing²⁷. For example, in one of the municipalities, the tests faced demonstrators blocking the road to the test site for three days in February 1981. In another municipality, in 1983 local groups and politicians asked for adequate information and that an independent geologist could take part in analyzing the results. However, SKB refused the request of an independent geologist, as he "would merely be in the way". In June 1984, some 40 meters of drill cores were stolen from a container. In an anonymous reaction to a newspaper, a geologist report said the drill cores showed the unsuitability of the bedrock for waste disposal. People criticized the lack of information. In a newspaper SKB said: "We do not have the time to sit in on a series of showy meetings. We consider that the meetings cried for by the public have nothing to do with public information." A blockade was organized on the road to the test site and was cleared by the police. Finally, the energy and environment minister reprimanded SKB for its lack of information dissemination. SKB had to change its policy. The concept of voluntariness was the centerpiece of their new strategy. There is a comment on this policy change in the work [3]: "SKB's siting activities also show the now typical evolution away from a 'Directed Siting' process to one involving the use of volunteerism. Investigations by SKB began in the late 1970's, designed initially to demonstrate the existence of potentially suitable geological formations. These included detailed work at as many as 11 sites up until 1985, some of which was terminated because of intense local opposition, after which SKB concentrated its siting work on desk-studies. From 1992 onwards the siting process became 'Mixed-mode', with SKB inviting any *kommun* interested in the possibility of being examined as to its suitability, to volunteer for an initial desk-based feasibility study."

The new basic rule for locating a repository is that the local community, or rather their elected representatives, needs to accept the facility. The government can overrule a local veto, but would then be required to demonstrate that there is no more suitable place for the repository and that would be hard to prove. SKB has decided, furthermore, that they will only apply for repository development at a volunteer community and, in addition, it is hard to see sufficient political will in the government to go against a local community on this issue. Consequently, local communities have to all practical purposes a full veto²⁸. One of the fundamental requirements for site selection is that the process is conducted on democratic grounds and that the people who live in the municipality have confidence in the facility. This means that the municipalities concerned, with the insight and involvement of their communities, should give their consent to each stage of SKB's site investigation program.

²⁷ <http://www.laka.org/teksten/afval/2-discussions-00/7-sweden.htm>

²⁸ High-level waste and spent-fuel disposal research strategy. Task 1.2: International programme analysis. Report to DETR. QuantiSci. 1998.

In accordance with these principles, in October 1992 SKB sent out an inquiry to all rural districts (*kommun*) in the country and asked them if they wanted more information about the handling of radioactive waste and if they were interested in further examination of the possibilities of locating a disposal site in their area. The *kommuns* have been told that a number of social benefits are likely should a facility eventually be sited. These would include such things as improved infrastructure, enhanced local employment opportunities etc. Between 1993 and 2000, SKB has conducted feasibility studies in eight municipalities that volunteered to be investigated, namely Storuman, Malå, Östhammar, Nyköping, Oskarshamn, Tierp, Älvkarleby and Hultsfred. The feasibility studies considered a wide spectrum of aspects concerning the feasibility of a repository in the community (including social and economic issues). In 2002, after the feasibility studies, SKB started more detailed site investigations at Oskarshamn and Östhammar.

Swedish attitudes on nuclear disposal have been studied by seven national polls at 6-month intervals from June 1992 to December 1995²⁹ conducted by the Swedish polling firm SIFO on behalf of SKB. As an example, 1023 persons aged between 16 and 74, were interviewed between November 29 and December 12, 1995. The results show no significant variation over time. A majority of 69±2% felt doubt or uncertainty regarding safety in disposal, but 87±1% accepted disposal in Sweden. An impressive majority of 80±3% said they would accept inclusion of their home municipality in studies regarding disposal, and 55±3% were even prepared to accept disposal there, if that would offer the best site.

The SIFO data have been widely quoted as supporting the thesis that Swedes were ready to accept nuclear waste. However, the results of two later local referenda stood in sharp contrast with SIFO data. The first of these referenda was conducted in September 1995 in the municipality of Storuman. The feasibility study report in Storuman was positive to continuing the investigations, but strong local opinion demanded a local referendum. The question put to the local public was whether or not SKB should be allowed to continue the search for a location for a final repository in Storuman or not. The outcome was an overwhelming "no" (70.5%). This is how the story was covered in the news:

“The nuclear industry and the Swedish Nuclear Fuel and Waste Management Company (SKB) had thought that Storuman would be a suitable place for the disposal facility, since unemployment is very high in that area (14%), and the population very small. The SKB promised 700 temporary jobs for the 10-year construction period and 200 permanent jobs for the next 50 years. The mayor of the city and district council agreed to the project. The resistance of the local population however was greater than expected. The SKB launched a massive campaign for a ‘Yes’ vote, but a poster produced by a local activist group, ‘Action group against radwaste in Storuman’, which showed a dead elk and carried the text ‘0 to 240,000 years’, made a stronger impression on the people. The rejection of the Storuman facility is a very big snag for the Swedish nuclear industry. The licenses for nuclear power plants in Sweden depend on a convincing radioactive waste disposal concept. As the planned facility in Storuman has fallen through, the SKB is now stumped with the problem of finding a new site.”³⁰

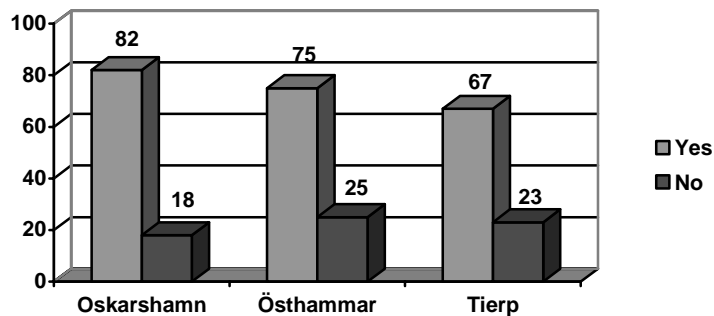
²⁹ SIFO (The National Institute for Consumer Research). Report 3251930. SIFO AB, Stockholm (1995).

³⁰ <http://www.antenna.nl/wise/441/4347.html>

The second local referendum, held in the municipality of Malå 1997, also led to stopping of further investigations. The citizens voted against further examinations in the area: 54 percent no and 44 percent yes.

The contrast between the results of the national polls and of the local referenda led several researches to investigate the issue. For example, the work [9] argues that SIFO has chosen the wrong methodology. The authors conducted several research polls and compared their results with SIFO's results. The aim was to investigate the influence of question formulation and of the method of interviewing on the results. The conclusion is that "if the purpose of the SIFO poll was to get a true picture of public opinion, it failed". The authors believe that "the reason why SIFO obtained much higher acceptance rates seems to reside in the face-to-face interaction process of their in-home interviews. Another reason was the use of subtle leading cues, assuming that the 'best' siting has been found, or lack of an explicit reminder about a policy being pertinent for the respondent's own community."

An extensive research poll on the socio-psychological effects of the repository was carried out recently in the municipalities that were investigated as potential hosts.³¹ A variety of questions on people's attitudes to nuclear power, nuclear waste, and the siting process were asked. It is remarkable, that, according to the results, population of the communities that already have nuclear objects on their territory (Oskarshamn and Östhammar) is more willing to accept a repository on their territory. As an example, here is the distributions of the answers to the question: "Do you think that SKB should be allowed to conduct a site investigation, i.e. carry out test drilling, for a repository for spent nuclear fuel in your municipality?"



In the case of Sweden we can observe the transition towards the open approach and that one has to be careful when using results of opinion polls because they can be misleading.

4.3. The USA^{32, 33}

The Nuclear Waste Policy Act of 1982 requires the U.S. Department of Energy (DOE) to locate, build and operate a deep geologic repository for the permanent disposal of high-level nuclear waste. Originally, DOE selected nine locations in six

³¹ http://hades.sckcen.be/conf/td22012002/roland_johansson.pdf

³² <http://www.nei.org/doc.asp?catnum=2&catid=63>

³³ <http://environment.about.com/library/weekly/blrwaste2.htm>

states that met its criteria for consideration as potential repository sites. Following preliminary technical studies and environmental assessments of five sites, DOE chose three sites in 1986 for intensive scientific study: Yucca Mountain, Nevada; Deaf Smith County, Texas; and Hanford, Washington. After extensive environmental assessments of all three sites, Congress, in its 1987 amendments to the Nuclear Waste Policy Act, eliminated two of the three sites from further consideration and designated Yucca Mountain as the site to be studied. DOE was obliged to start removing SNF to the repository in 1998. However, in 1987, DOE announced a five-year delay in the opening date for a centralized repository, from 1998 to 2003. One of the reasons for the delay was that the effort to study and confirm a site's suitability proved more time-consuming and costly than the Congress and DOE expected. Another reason was political and public opposition. In particular, the state of Nevada has been fighting DOE's program on the grounds that the site is unsafe, pointing to potential volcanic activity, earthquakes, water infiltration, underground flooding, nuclear chain reactions, and fossil fuel and mineral deposits that might encourage future human intrusion. The history of this fighting can be found, for example, in [10]. Two years later, DOE announced a further delay, until 2010. At present, the repository is at least 12 years behind schedule, and no site has been selected for an interim storage facility. The nation's spent fuel, which amounts to 40,000 tons, is stored at 131 sites in 39 states, primarily at reactor storage facilities. These facilities are now almost full, because storage space at reactors was deliberately limited in the expectation that spent fuel would be shipped to a more permanent storage facility.

On February 15, 2002, the President approved the Secretary of Energy's recommendation of Yucca Mountain as the site for a national used nuclear fuel repository. In his letter of recommendation to the President, Secretary of Energy Spencer Abraham said: "After months of study based on scientific and technical research unique in its scope and depth, and after reviewing the result of a public review process that went well beyond the requirements of law, I reached the conclusions that technically and scientifically the Yucca Mountain site is fully suitable; that development of a repository serves the national interests in numerous and important ways; and that the arguments against its designation do not rise to a level that would outweigh the case for going forward."³⁴ In April 2002, Nevada objected to the President's recommendation, but these objections were over-ruled when the House of Representatives and the Senate endorsed the President's approval in May 2002, and in July 2002, respectively. DOE must now file a license application with the Nuclear Regulatory Commission before it can build and operate the repository.

The decision to consider Yucca Mountain as a repository site has led to an intense debate regarding the economic, social and political impacts of the repository. One of the problems with the assessment of related risks is that scientific confidence about the concept of deep geologic disposal has turned out to be difficult to apply to specific sites. Every high-level waste site that has been proposed by DOE and its predecessor agencies has faced allegations or discovery of unacceptable flaws, such as groundwater flow or earthquake vulnerability, that could release radioactivity into the environment. Much of the problem results from the inherent uncertainty involved in predicting waste site performance for the 10,000-year period (or longer) that nuclear waste is to be isolated.

³⁴ http://www.ymp.gov/new/sr_release.pdf

Most of the opposition to the Yucca Mountain project comes from the state of Nevada. Not only are most Nevadans opposed to the repository, their opposition is shared by the state's political leadership. In fact, when Congress singled out Yucca Mountain as the only site for detailed study in 1987, the state's political leaders reacted by establishing a firm policy opposing the project. Today that policy remains as the state's official position.

Public participation in the decision-making process was organized through the system of public hearings and comments³⁵. The three primary involved federal agencies - DOE, Nuclear Regulatory Commission (NRC), and Environmental Protection Agency (EPA) – have sought public participation through public meetings, hearings, comment periods, and other mechanisms. For example, DOE satisfied legal requirements for public participation by conducting more than 100 public hearings to discuss the Draft Environmental Impact Statement, siting characterization work, and other public and technical issues. Most of the hearings were held in Nevada. Also, DOE received written public comments for about 200 days and citizens also could share their comments and concerns at DOE's Yucca Mountain Web site. EPA held public hearings on its proposed standards for Yucca Mountain in October 1999 and received about 800 comments during the 90-day public comment period.

There were many efforts to make information about the project publicly available. For example, in November 2001, DOE held an 'open house' at the Yucca Mountain for those citizens wishing to visit the facility and to speak with project scientists and engineers about the ongoing work at the site. Secretary of Energy Spencer Abraham said on this occasion: "I have previously indicated that I would review suggestions about additional public involvement. One important way we can increase the quality and scope of information available to the public is to allow those citizens who wish to see the site for themselves to do so at an 'open house.' The 'open house' will provide citizens with an important opportunity to learn more about the science and engineering work being conducted at the Yucca Mountain site. In addition, citizens will be able to ask our scientist and engineers questions regarding the project"³⁶.

There were a huge amount of surveys conducted in the USA in order to assess public attitudes and opinions regarding the management of SNF. A report titled "Public opinion polling and the Yucca Mountain controversy: a seven year inventory"³⁷ published in 1993 presents an inventory of public opinion polling activities related to the Yucca Mountain project and held between December 1986 and June 1993. This inventory contains 56 public opinion polls discussed in terms of sponsor intentions/objectives, populations polled, survey design/implementation characteristics, and media attention to key factors. Of these 56 polls, 43 were held in Nevada. There was a particularly wide variety of poll questions on whether Nevadans support or oppose the repository (with around 70% Nevadans stating their opposition in the most of the surveys), other questions addressed the issues of whether the state government should do everything possible to prevent building the repository, what expectation Nevadans held as to the inevitability of the repository, what levels of trust people had in repository-related officials, whether people were willing to make a compensatory deal for the repository, and others.

³⁵ www.nsc.org/public/ehc/yucca/chap3.pdf

³⁶ <http://www.ymp.gov/new/openhousepr.htm>

³⁷ www.lincolncountyonline.com/reports/seven.pdf

One of the latest public opinion surveys was conducted between June 6th and June 19th, 2002 by Northwest Survey & Data Services based in Eugene, Oregon and affiliated with the University of Oregon³⁸. In this survey, 406 Nevadans gave complete telephone interviews, each answering 23 questions, of which 15 addressed issues related to Yucca Mountain project. The survey found that after all DOE's efforts to convince people that the repository is safe, over 76% of Nevadans oppose the project and would vote against it if given the opportunity. Only slightly more than 20% support the project. Analysis of the results of past surveys conducted since 1989 shows that the level of opposition to the Yucca Mountain project has remained consistently high for the past 13 years. Nevadans also remain opposed to the state abandoning the fight to stop the Yucca Mountain project. 65% of the respondents favored continuing state opposition, even if that meant turning down benefits, while just under 31% favored making a deal. These survey findings were remarkably consistent with the results for the same question from past surveys. The survey also asked a number of other questions regarding Nevadans' perceptions of risks associated with various aspects of the Yucca Mountain project, the transportation of spent nuclear fuel and high-level radioactive waste, and actions the state might take in an effort to oppose the project.

In the survey³⁹ conducted in 1998 by the University of Nevada, 1200 respondents were asked to answer 50 questions. Four of the questions related to the Yucca Mountain project. Here is the distribution of the answers to the question: *“How do you stand on the plan to permanently store high-level nuclear waste at Yucca Mountain in Southern Nevada?”*

Strongly oppose	57%
Oppose	18%
Neutral	11%
Support	8%
Strongly support	2%
Don't know	4%

Here 75% oppose the repository, which is consistent with other Nevada surveys.

While a majority of Nevadans oppose the repository, all-American surveys show support for the project. In the poll held May 31 to June 2, 2002 by Bisconti Research, Inc., telephone interviews were conducted with a nationally representative sample of 1000 U.S. adults.⁴⁰ According to the results, 92% of the American public believes it is extremely or very important to have a clear plan of action for handling the high-level radioactive waste from nuclear power plants. Answering the question *“Which way of handling high-level radioactive waste do you think is more helpful to our environment in the long run?”*, 57% of the respondents have chosen a permanent underground waste disposal facility and 19% have chosen to leave the waste above ground at the plant sites. Also, a November 2000 survey⁴¹ of 500 college graduates who are registered to vote found a strong support for presidential approval to move forward with the project. 70% of respondents believe that the President should give his approval for the NRC to

³⁸ <http://www.state.nv.us/nucwaste/news2002/nn11765.pdf>

³⁹ http://www.unlv.edu/Research_Centers/ccsr/nevada_poll_1998_questions.htm

⁴⁰ http://www.nei.org/documents/PublicOpinion_02-06.pdf

⁴¹ http://www.nei.org/documents/PublicOpinion_00-12.pdf

proceed with a licensing review if the site is considered geologically suitable. These results are consistent with the findings of previous (September 2000, 1995, 1994) surveys.

There were many articles published in journals and books that discuss policy issues related to the Yucca Mountain project and analyze methodology and results of public opinion polls, see [10-13] and references in them. In the articles, attention is paid to possible reasons behind citizen's perceptions of the associated risks.

As a conclusion, we may note that decision-making on SNF in the USA has features of the both closed and open approaches. In the last few years, federal agencies tried to pay more attention to public involvement. But in spite of the policy of openness and the program of public hearings and comments, Nevadans remain strongly opposed to Yucca Mountain project. They feel that their participation in public hearings and their comments cannot change decisions taken by federal authorities. Due to the numerous public surveys, policy-makers have a full picture of public attitudes, but efforts to change these attitudes through educating and public involvement are mostly ineffective.

5. Discussion

The issue of spent nuclear fuel management has proven to be quite controversial. After several decades of struggle, there are countries that are on the way to find solution to the problem. In all the cases public acceptance is crucial for the success of the siting projects. Public opinion surveys are the instruments to measure acceptance and to find motives for people's attitudes to the issues related to nuclear waste management.

The Finnish program of SNF disposal has been quite successful so far. Currently, the investigations are going on in Olkiluoto, which is considered to be the final disposal site. According to the results of public opinion polls, the population of Eurajoki, which is the host municipality, is willing to accept the facility by a large margin. The acceptance is crucial to the project, because, according to the state policy, municipalities have the right to veto the decision on the siting of a repository. The Finnish case is also an example of siting a repository in the region that already has a nuclear installation, namely, a nuclear power plant.

In Sweden, the site for a final high-level waste repository has not yet been selected, but the site selection program is being implemented according to schedule. The first, 'direct siting', stage of site selection (1977-1985) was characterized by protests from the population and local authorities. After the period of desk-studies, a new strategy, which used the concept of voluntariness, was introduced in 1992. According to this strategy, the local communities should give their consent to each stage of the site investigation program. Feasibility studies were conducted only in communities that volunteered to be investigated. At the moment, detailed site investigations are being conducted in two municipalities that are considered to be potential hosts. According to polls, the population of the both municipalities accepts a repository. In Sweden we have a remarkable example of how results of public opinion polls can be misleading: after six national opinion polls had shown acceptance of site investigations, two local referenda rejected continuation of the research in the municipalities.

In the USA, the Yucca Mountain has recently been approved as the site for a national SNF repository. However, the local government, many experts and a majority of Nevadans have opposed the program, which has led to serious delays. The protests continue despite a recent wide-scale public participation program that has included numerous public hearings, admission of comments and the general policy of openness. This may be because public involvement programs that only seek to change public attitudes will be resisted. Public involvement may require a real chance for the public to affect the outcome, not merely agree to it.

The analysis of spent fuel management programs in Sweden, Finland and the USA shows examples of policies that have been changing towards a more open approach. Having analyzed the experience of these countries, we may note the following features of the site selection processes. First, communities that already have nuclear objects on their territories may be more willing to accept a facility than those that do not have nuclear industries. Second, the citizens' awareness that they have a right of veto makes them more willing to accept a facility. On the contrary, when people feel that the decision will be taken regardless of their attitudes, they are more likely to oppose it.

For successful public participation in a nuclear-related decision-making process, some basic conditions should be satisfied. The information about the problem and possible ways of its solution should be available to people early before plans and positions are fixed. Decision-making should be organized in such a way that the population could affect decisions from the very beginning. Transparency should be assured not only to the information but also to the process of decision-making. Consultation and participation should be seen to be fair and contain possibilities of selecting among options or getting changes made.

In the process of decision-making on SNF management, attention should be paid to public concerns. When designing public surveys, the following aspects should be taken into account. The contents of the questionnaire should be simple and easy enough for public to understand, but should be also soundly based, so that the public will be willing to participate in the poll. Before answering the questions about the attitude to a proposal, people should get full and objective information about expected benefits and disadvantages. It is important to include issues of compensation, trusted institutions, trusted sources of information, and desirable means of public involvement in the questionnaire. The use of a professional polling organization in both design and administration of the poll could improve the reliability and credibility of the results of the poll. Attention must be paid to the method of polling because it can influence the results. Serious analysis and use of the results are essential for developing a policy of SNF management. Neglecting public concerns may lead not only to project failure, but also to the loss of trust in the authorities.

6. References

1. Kemp, R., *The politics of radioactive waste disposal*. Manchester Univ. Press. 1992.
2. Duncan, I.J., *Some aspects of the relationship between society and the disposal of radioactive waste*, The 24-th Annual International Symposium 1999, The Uranium Institute. Available at <http://www.world-nuclear.org/sym/1999/duncan.htm>

3. Richardson, P.J., A review of benefits offered to volunteer communities for siting nuclear waste facilities. <http://www.radgiv-karnavf.gov.se/publikat/incitame.htm>
4. Lidskog, R., Siting conflicts – democratic perspectives and political implications. Presented at the conference “New Perspectives on Siting Controversy”, Glumslöv 17-20 May 2001. Preliminary version available at <http://www.cefos.gu.se/sitingconf/lidskog2.pdf>
5. Litmanen, T., Cultural approach to the perception of risk: analysing concern about the siting of a high-level nuclear waste facility in Finland, *Waste Management and Research* 17, 1999, 212-219.
6. Sohn, K.Y., Yang J.W., and Kang, C.S., Assimilation of public opinions in nuclear decision-making using risk perception, *Annals of Nuclear Energy* 28, 2001, 553-563.
7. Slovic, P. et al, “Perceived risk, stigma, and potential economic impacts of a high-level nuclear waste repository in Nevada, *Risk Analysis* 11, 1991, 683-696.
8. Keller, L.R. and Sarin, R.K., Equity in social risk: some empirical observations, *Risk Analysis* 8, 135-146.
9. Sjoberg, L. and Drottz-Sjoberg, B.-M., Fairness, risk and risk tolerance in the siting of a nuclear waste repository, *Journal of Risk Research*, 4, no.1, 2001, pp. 75-101.
10. Slovic, P., Flynn, J, and Layman, M., Perceived risk, trust and the politics of nuclear waste. *The Perception of Risk*. Edited by P. Slovic. Risk, society and policy series. 2000.
11. MacGregor, D., Slovic, P., Mason, R.G., Detweiler, J., Binney, S.E., and Dodd, B., Perceived risks of radioactive waste transport through Oregon: results of a statewide survey, *Risk Analysis*, 14, no.1, 1994, pp.5-14.
12. McBeth, M.K., Oakes, A.S., Citizen perceptions of risks associated with moving radiological waste, *Risk Analysis*, 16, no.3, 1996.
13. Bassett Jr., G.W., Jenkins-Smith, H.C., and Silva, C., On-site storage of high-level nuclear waste: attitudes and perceptions of local residents, *Risk Analysis*, 16, no.3, 1996, pp. 309-319.