Geschäftsstelle

Kommission
Lagerung hoch radioaktiver Abfallstoffe
gemäß § 3 Standortauswahlgesetz

Beratungsunterlage zu TOP 3 der 6. Sitzung

Zusammenfassung des Kurzvortrags
von Prof. Dr. Miranda Schreurs

Kommission
Lagerung hoch radioaktiver Abfallstoffe
K-Drs. 65

28. November 2014

Endlager-Governance im internationalen Vergleich

Vorgelegt bei der 6. Sitzung der „Kommission Lagerung radioaktiver Abfallstoffe“ zum Thema „Internationale Erfahrungen“, 5. Dezember 2014

Verfasst von: Prof. Miranda A. Schreurs, PD Dr. Achim Brunnengräber, Dr. Maria Rosaria Di Nucci und PD Dr. Lutz Mez (Forschungszentrum für Umweltpolitik, FFU)[1]

Inhalt

Vorbemerkung: Die nachfolgende Stellungnahme synthetisiert zum einen zwölf **fact sheets**, die am FFU im Rahmen der Forschungsplattform ENTRIA erstellt wurden. Zum anderen fasst sie die Ergebnisse der FFU-Publikation „**Nuclear Waste Governance: An International Comparison“** (im Erscheinen[2]) zusammen, in der die Suchprozesse zur Einlagerung[3] radioaktiver Reststoffe in zwölf Ländern eingehend analysiert werden. Die hier präsentierte Synthese basiert auf empirischen Beobachtungen, ist aber thesenhaft formuliert, weil der knappe Zeitrahmen für die Präsentation eine differenziertere Darlegung nicht zulässt. Ferner besteht die Notwendigkeit, die nachfolgend präsentierten Beobachtungen in der Endlager-Governance vertiefender politik- und sozialwissenschaftlich zu untersuchen.

1 Die Stellungnahme entstand im Rahmen des vom BMBF geförderten Projektes „Nukleare Entsorgung aus einer Multi Level Governance-Perspektive“ am Forschungszentrum für Umweltpolitik (FFU) der FU Berlin. Es ist ein Teilprojekt der Forschungsplattform „Entsorgungsoptionen für radioaktive Reststoffe: Interdisziplinäre Analysen und Entwicklung von Bewertungsgrundlagen“. Zu Governance-Aspekten bestehet in diesem Rahmen eine enge Kooperation mit dem in Karlsruhe ansässigen Institut für Technikfolgenabschätzung und Systemanalyse (ITAS) am KIT (für ausführliche Informationen siehe www.entria.de).

2 Achim Brunnengräber, Maria Rosaria Di Nucci, Ana María Isidoro Losada, Lutz Mez and Miranda Schreurs (Eds.) (2015): Nuclear Waste Governance. An International Comparison, Wiesbaden: Springer VS (im Erscheinen).

3 Auf die Begriffe Entsorgung und Endlagerung wird in dieser Stellungnahme nicht verzichtet, da beide in der öffentlichen wie in der wissenschaftlichen Debatte etabliert sind. Sie sind aber auch problembehaftet und werden entsprechend krtisiert. Wir möchten deshalb darauf hinweisen, dass nie eine risikofreie und nur eine möglichst sichere Einlagerung umsetzbar sein wird.

Ausgangssituation

Der Umgang mit hochradioaktiven, Wärme entwickelnden Reststoffen kann als *wicked problem* bezeichnet werden[4]. In allen Ländern, in denen diese Reststoffe anfallen, konnte bisher noch kein Endlager in Betrieb genommen werden. Die Abfallmenge nimmt derweilen stetig zu; ebenso das Risiko, dass radioaktive Isotope aus den Abfallbehältern und Lagern in die Umwelt gelangen, denn die genutzten Zwischenlager sind für die Langzeitaufbewahrung der Reststoffe nicht ausgelegt. Wie ist es möglich, dass die Abfälle der nuklearen Energiegewinnung nicht in einem eigens dafür gebauten Endlager bestmöglich eingelagert werden können, obgleich die Atomkraft schon über ein halbes Jahrhundert genutzt wird? Handelt es sich um Markt- oder um Staatsversagen? Ist es ein gesellschaftspolitisches, ein wissenschaftliches oder ein technisches Problem? Ist die Entsorgung zu teuer oder liegt es daran, dass sich die immanenten Folgewirkungen der spezifischen nuklearen Art Elektrizität zu produzieren und zu konsumieren gar nicht mehr vollständig und daher auch nicht erfolgreich wieder beheben lassen? Diese Fragen müssen beantwortet werden, weil das Problem nicht verschwindet. Einige nukleare Reststoffe stellen für den nach menschlichem Ermessen unüberschaubaren Zeitraum von 1 Million Jahren ein Risiko für die nachfolgenden Generationen sowie für die Umwelt dar.

Ausgangsfragen:

- Warum ist weltweit noch kein Endlager für hochradioaktive Abfälle in Betrieb?
- Warum stellt die Standortsuche in allen betroffenen Ländern eine erhebliche Herausforderung dar?
- Wie sehen die Governance-Prozesse in den einzelnen Ländern aus?
- Was lässt sich aus dem Ländervergleich lernen? Gibt es einen oder *den* geeigneten, gangbaren und praktikablen Weg zum Endlager?

1. Das Problem mit der Problemdefinition

Ein Grundproblem der internationalen sowie der nationalen Anstrengungen bei der Endlagerung radioaktiver Reststoffe liegt darin, dass kein einheitliches Problemverständnis vorliegt. Bereits die genauere stoffliche Bestimmung des Problems divergiert innerhalb als auch zwischen einigen Ländern. Radioaktive Reststoffe werden u.a. nach Aktivitätskonzentration, Wärmeentwicklung und Halbwertszeit klassifiziert. In vielen Ländern wird die direkte Einlagerung der abgebrannten Brennelemente verfolgt (u.a. in, Finnland, Schweden, Spanien, der Tschechischen Republik und den USA), in anderen Ländern die Einlagerung nach der Wiederaufarbeitung (Frankreich, Großbritannien, Japan) und in wieder anderen Länder eine Mischform (u.a. in Belgien, der Schweiz und Deutschland). Auch die Forschungsarbeiten – zum Teil in internationalen Verbünden – gestalten sich sehr unterschiedlich. Sie reichen von der Langzeitzwischenlagerung bis hin zur Endlagerung und der Transmutation.

4 Der vom Designtheoretiker Horst Rittel in den 1970er Jahren geprägte Begriff „wicked problems“ bezeichnet eine Problemlage, für die es keine definitive und objektive Lösung gibt. Die Problematik wird themenbezogen erläutert in: Brunnengräber, A., Mez, L., Di Nucci, M. R., Schreurs M. (2012): Nukleare Entsorgung: Ein „wicked“ und höchst konfliktbehaftetes Gesellschaftsproblem, *Technikfolgenabschätzung – Theorie und Praxis*, 3/21, 59-65 sowie in Brunnengräber, A., Di Nucci, M.R., Häfner, D., Isidoro Losada A., (2014): Nuclear Waste Governance – ein wicked problem der Energiewende. In: Brunnergräber, A. & Di Nucci, M.R (eds.): Im Hürdenlauf zur Energiewende. Von Transformationen, Reformen und Innovationen. Springer Fachmedien Wiesbaden. 389-399. Siehe auch Bergmans, A. et al (2008): Wanting the Unwanted: Effects of Public and Stakeholder Involvement in the Long-Term Management of Radioactive Waste and the Siting of Repository Facilities (Final Report CARL-Project)

Ebenso sind die gesellschaftlichen Interessenlagen sehr unterschiedlich – und in den betrachteten Ländern die Ursache von ganz unterschiedlichen Konflikten. Für die Bevölkerung in der Region, in der ein Endlager entstehen soll, stehen die Gesundheit oder die Grundstückspreise als auch das Image einer Region im Vordergrund; für die Energieunternehmen die damit verbundenen Kosten und finanziellen Belastungen; für die Behörden und Ministerien die Verständigung auf politische Verfahren und Institutionen; für die Parteien die politische Lösung und die öffentliche Meinung. Aus philosophisch-ethischer Sicht sind darüber hinaus intra- wie intergenerationelle Fragen der Gerechtigkeit sowie die Hypothek, die wir künftigen Generationen übertragen, von Bedeutung.

Folgende **Problemdimensionen** greifen ineinander und führen zu dem, was wir als *wicked problem der Standortsuche* bezeichnen wollen:

(1) Die Akteursdimension: Unter den Akteuren bestehen Differenzen hinsichtlich der Interessen, Werte und Präferenzen, die sich über einen längeren Zeitraum verfestigt haben.

(2) Die Interdependenzdimension: Politische, soziale, ökologische, wissenschaftliche, wirtschaftliche und technische Aspekte sind eng miteinander verzahnt und bedingen einander oft.

(3) Die Mehrebenendimension: Es bestehen Wechselwirkungen zwischen internationalen, europäischen, nationalen und länderspezifischen bzw. lokalen Politiken.

(4) Die Zeitdimension: hier müssen intra- und intergenerationale Aspekte sowie ethische Fragen berücksichtigt werden.

2. Inter- und supranationaler Rahmen, aber nationale Kontextabhängigkeit

Von inter- und supranationaler Seite wird der Standortsuchprozess für ein Endlager nicht nur begleitet, sondern durch die Setzung von Standards und Richtlinien auch aktiv gestaltet. Die International Atomic Energy Agency (*IAEA*) oder die Nuclear Energy Agency (NEA) der OECD befassen sich mit radioaktiven Reststoffen und geben im Wesentlichen Handlungsempfehlungen, die sich auf Sicherheitsanforderungen, Organisationsstrukturen, technische Anforderungen, jedoch nur in geringem Umfang auf die Standortauswahl beziehen (siehe hierzu auch die Stellungnahme von Prof. Klaus-Jürgen Röhlig, TU Clausthal). Die EU hat darüber hinaus im Juli 2011 eine verbindliche Vorgabe gemacht. Entsprechend der EU-Richtlinie 2011/70/Euratom müssen die Mitgliedstaaten nationale Programme für die Entsorgung abgebrannter Brennelemente und radioaktiver Abfälle erstellen, durchführen und fortlaufend aktualisieren. Diese Programme müssen für alle Stufen der Entsorgung abgebrannter Brennelemente und radioaktiver Abfälle von der Entstehung bis zur Endlagerung gelten und regelmäßig überprüft sowie aktualisiert werden. Ferner müssen die Mitgliedstaaten der Kommission ihre nationalen Programme erstmals bis spätestens zum 23. August 2015 notifizieren.

Von der inter- und supranationalen Ebene kommen also Richtlinien und verpflichtende Vorschriften für die Endlagerung hochradioaktiver Reststoffe. Doch der *top down*-Ansatz, wie er globale Umweltregime auszeichnet, stößt immanent an Grenzen. Er kann der Aufgabe der national sehr spezifischen Standortsuche kaum gerecht werden. Den *einzigen* „richtigen“ Weg, das Modellprojekt zum Endlager, wird es daher nicht geben. Im Wesentlichen zeigt sich, dass die Standortsuche trotz aller internationalen Rahmensetzungen ein nationales Governance-Vorhaben darstellt, in dem eine Vielzahl von Akteuren mit unterschiedlichen Interessen starke Vetospieler sein können. Dabei besteht in vielen Ländern seitens der Öffentlichkeit nicht selten ein großes

Misstrauen gegenüber ExpertInnen, TechnokratInnen, staatlichen Instanzen und internationalen Organisationen, das u.a. von schlechten Erfahrungen herrührt. Informationen wurden nicht zur Verfügung gestellt, Entscheidungen in intransparenten Verfahren getroffen oder Beteiligungsmöglichkeiten verhindert. Vertrauen und Transparenz sind deshalb zentrale Begrifflichkeiten und Konzepte der Standortsuche.

3. Mehr *bottom up*-, weniger *top down*-Ansätze

Staatliche Steuerungsversuche nach dem D–A–D-Prinzip (Decide-Announce-Defend), wie sie in den 1980er Jahren noch die Vorstellungen des politisch-administrativen Systems prägten (also „government" im Unterschied zu „governance"), führten in den unterschiedlichen Projekten der Standortsuche nicht zum Erfolg. Vielmehr findet sich eine Bandbreite von gescheiterten Versuchen, neuen Anläufen sowie einerseits wenig ambitionierten und andererseits sehr elaborierten Entsorgungsplänen. Diese begonnenen Prozesse können zu jedem Zeitpunkt an bekannte oder ganz neue Hindernisse stoßen und wieder unterbrochen werden. Die Verschiebung von Zeitplänen, so lässt sich in vielen Ländern beobachten, ist daher der Normalfall. Mit der Einplanung von Monitoring und Fehlerkorrekturen kann dem begegnet werden.

Immer zeigen sich dabei herrschaftsförmige Prozesse. Den Bewegungsspielraum legen vor allem jene Akteure fest, die in den wichtigen Institutionen vertreten sind und über die entsprechenden Ressourcen verfügen. Vor allem diejenigen Akteure, die politisch und aufgrund ihrer Ressourcen in der Lage sind, Einfluss auf das Standortauswahlverfahren, die Konzeptentwicklung sowie die Errichtung eines Endlagers zu nehmen, sind aber nicht unbedingt durchsetzungsfähig. Sie stehen zwar bei der Festlegung des Verfahrens und der zentralen Handlungsbereiche sowie der politischen Regulierung im Vordergrund. Doch zivilgesellschaftliche Akteure wie Bürgerinitiativen, NGOs oder auch Kommunen haben eine erhebliche Blockademacht; und zwar sowohl im Standortsuchprozess als auch in der Bauphase. Deren Präferenzen, Interessen und Handlungen stehen nur in wenigen Fällen mit denjenigen der institutionellen Akteure im Einklang. Darin liegt ein weiteres, zentrales Problem in der Standortsuche, das gelöst werden muss.

4. Partizipation und Freiwilligkeit als Königsweg?

Die Belange der Bevölkerung, die von der Standortsuche oder dem Endlager betroffen sind, und insbesondere deren politischer Wunsch nach Teilhabe, wurden lange nicht ausreichend berücksichtigt. Mit Kompensationen, dem Aufruf an Kommunen, sich freiwillig zu melden, oder erweiterten Beteiligungsmaßnahmen werden die Prozesse der Standortsuche nun anders ausgestaltet. Dabei wurden ganz unterschiedliche Erfahrungen gesammelt, die ausgewertet werden müssen, um sie produktiv nutzen zu können:

Frankreich

In Frankreich wurde das Endlagerkonzept nach einer kontroversen öffentlichen Konsultation, die durch eine Nationale Kommission organisiert wurde, im Zeitraum von 2005-2006 gebilligt. Gegen dieses Verfahren protestierten Umweltgruppen und Bürgerinitiativen und wiesen darauf hin, dass die Positionen gegen die Endlagerstätte nicht ausreichend berücksichtigt wurden. Bei der öffentlichen Debatte im Mai 2013 rief die Bürgerinitiative BURESTOP 55 für einen Boykott des

Verfahrens auf. Die vielfältig geäußerte Kritik an dem Projekt und dem Verfahren hat schließlich dazu geführt, die für 2025 geplante Inbetriebnahme zu verschieben. Nun soll bis 2017 ein neues Endlagerkonzept vorgelegt werden, über das bis 2020 entschieden werden soll. Um den Ergebnissen der Öffentlichkeitsbeteiligung zu entsprechen, ist außerdem eine fünfjährige Pilotphase mit Dummies vorgesehen.

Großbritannien

In Großbritannien wurde von der Regierung seit 2008 auf Freiwilligkeit gesetzt: Potentielle Standort-Gemeinden hatten das Recht, sich vom Prozess bis zu einem vorgegebenen Zeitpunkt zurückzuziehen. Dialoge wurden mit der Planungsbehörde, den Gemeinden, anderen interessierten Stakeholdern und der allgemeinen Öffentlichkeit geführt. Schließlich erklärte die örtliche Verwaltung in West-Cumbria ihr Interesse an einem Standort für ein Tiefenlager, der Rat der Grafschaft stimmte aber schließlich gegen weitere Erkundungen. Nach dieser Entscheidung setzte die Regierung weiterhin auf Freiwilligkeit, allerdings erklärte keine Gemeinde ihr Interesse als Standort zu fungieren, so dass die Regierung nun nach Auswegen aus dieser Situation sucht.

Schweden

In Schweden sind Transparenz und öffentliche Teilnahme Schlüsselelemente im Endlagersuchverfahren. Das Verfahren verlangt die formelle Konsultation einer großen Bandbreite von Stakeholdern bevor ein Genehmigungsantrag gestellt werden kann. Der Entscheidung für Forsmark in der Stadtgemeinde von Östhammar, die 2009 getroffen wurde, ist ein langer Prozess vorausgegangen. Auch hier stießen die landesweiten Bohrungen und Erkundungen an verschiedenen Standorten in den 1980er Jahren auf weitverbreiteten lokalen Protest und Widerstand. Dies führte zu der Alternative, sich auf einen freiwilligen Prozess zu konzentrieren, in dem Standortgemeinden ihr Interesse bekunden konnten. Letztendlich konkurrierten zwei Gemeinden, Oskarshamn und Östhammar (beide bereits AKW-Standorte und somit „Nukleargemeinden"), als potenzielle Standorte. Interessant am schwedischen Verfahren ist vor allem, dass aus dem Entsorgungsfonds Mittel für Umweltgruppen und andere NGOs zur Verfügung gestellt wurden, damit diese an den öffentlichen Debatten und Prüfungen des schwedischen Entsorgungskonzeptes teilnehmen konnten.

Finnland

Finnland wird gerne als ein gelungenes Beispiel für die Standortsuche dargestellt, das jedoch vor dem Hintergrund einer eher „konfliktscheuen" Gesellschaft so gesehen werden sollte. Der Standortauswahlprozess folgte dort einem Mix aus Voluntarismus und *top down*-Entscheidung. Der Standort Onkalo wurde in einem Verfahren ausgewählt, das zunächst nicht durch eine öffentliche Debatte begleitet wurde. Ein wichtiger Faktor spielte jedoch die sog. „im Prinzip Entscheidung", d.h. die Möglichkeit für die betroffene Gemeinde, ein Vetorecht auszuüben. Dies führte zu einem beinahe konfliktfreien Verfahren. Auch die obligatorische Umweltverträglichkeitsprüfung stellte einen sehr wichtigen und unterstützenden Schritt dar, u.a. auch für das Partizipationsverfahren. So wurde die lokale Akzeptanz mit einem *top down*-Ansatz

verknüpft. Letztendlich wurde die Entscheidung für Olkiluoto von einer Gruppe von ExpertInnen und BeamtInnen in den zuständigen Ministerien getroffen.

Spanien

In Spanien wählte Ende 2011 die Regierung die Stadt Villar de Cañas (Castilla la Mancha), eine Gemeinde mit 455 BewohnerInnen, für ein Oberflächenlager aus. Villar de Cañas war eine von den 14 Städten, die sich freiwillig als Standort für die Lagerungsstätte anboten. Es gab zwar Proteste und Klagen von autonomen Gemeinden über intransparente und nicht-inklusive Verfahren. Trotz dieses Protestes soll mit dem Bau der Lagerungsstätte 2016 begonnen werden, wobei sich die Konstruktion am Oberflächenlager HABOG in den Niederlanden orientieren wird.

5. „Mut“ zum Oberflächenlager oder Zauderstrategie?

Einige EU-Staaten bauen in ihrem Entsorgungskonzept auf eine längerfristige Zwischenlösung. Zunächst soll eine oberflächennahe Lagerungsstätte die hochradioaktiven, Wärme entwickelnden Reststoffe aufnehmen. Gleichzeitig wird in die Forschung investiert, oft im Rahmen von internationalen Projekten, um Möglichkeiten für den endgültigen Verbleib der hochradioaktiven Stoffe zu entwickeln. Dieser Weg nimmt den Ländern den Handlungsdruck und gewährt eine gewisse Flexibilität im Umgang mit den radioaktiven Reststoffen. In der EU verfolgen die Niederlande und inzwischen auch Italien und – wie oben schon erwähnt wurde – Spanien diese Strategie.

In den Niederlanden ist das Volumen nuklearer Reststoffe relativ klein. Dennoch hat es einen starken örtlichen Widerstand gegen ein tiefengeologisches Endlager mit der Option der Rückholbarkeit gegeben. Schließlich wurde das Zwischenlager in Vlissingen nahe dem AKW-Standort Borssele realisiert, das 2003 seinen Betrieb aufgenommen hat. Das Gebäude soll wenigstens 100 Jahre bestehen.

Die spanische Regierung hat in der Hoffnung, dass in der Zukunft angemessenere technische Lösungen entwickelt werden, die Entscheidung über ein tiefengeologisches Endlager vertagt. Eine Entscheidung über eine Tieflagerung wird nun nicht vor 2050 erwartet.

Auch in Italien wurden Ambitionen für eine tiefengeologische Lagerung aufgegeben, nachdem die Pläne der damaligen Berlusconi Regierung, in 700 Metern Tiefe in der südlichen Region Basilikata ein Endlager zu errichten, durch starke Proteste im Jahre 2003 und eine Anzahl von Klagen blockiert wurden. Das neue Vorhaben sieht, ähnlich wie in den Niederlanden und Spanien, ein Oberflächenlager vor, das in einem Wissenschafts- und Technologie-Park errichtet werden soll. Die Suche nach einem geeigneten Standort für den Bau dieses Technologieparks ist noch nicht weit fortgeschritten und könnte nach allen bisherigen Erfahrungen noch von heftigem gesellschaftlichem Widerstand begleitet werden.

6. Trend zur Rückholbarkeit

Insbesondere nach den Problemen im Versuchsbergwerk Asse 2 gewann in Deutschland die Diskussion über die Rückholbarkeit von Abfällen an Bedeutung. Dahinter steht die grundsätzliche Frage, ob und wie lange Abfälle zugänglich und rückholbar gelagert werden. Die Schweiz

beantwortet diese Frage für die Betriebsphase eindeutig: Rückholung soll möglich sein. In den untersuchten Ländern werden dieser Frage jedoch unterschiedliche Bedeutungen zugeschrieben. In Spanien ist die Frage offiziell noch nicht beantwortet, wenngleich die Position verhandelt wird, die Rückholbarkeit für die ersten 100 Jahre zu ermöglichen. In den Niederlanden wurde entschieden, die hochradioaktiven Reststoffe bis 2130 oberflächennah und anschließend in tiefengeologischen Formationen zu lagern. Die Rückholbarkeit soll möglich sein, bis eine Entscheidung zum Verschluss der Anlage gefällt worden ist.

7. Unsichere oder unzureichende Finanzierung

Zwar existieren in fast allen Ländern Mechanismen zur Finanzierung der Endlagerung, die weitgehend dem *polluter pays*-Prinzip (Verursacherprinzip) folgen, doch ein genauerer Blick zeigt eine große Bandbreite an Finanzierungskonzepten, die von Fonds und Rückstellungen bei den EVU bis hin zu staatlich verwalteten Rückstellungen und Fonds sowie Zwischenstufen reichen. Mit erheblichen Problemen haben alle Konzepte zu kämpfen. In Frankreich müssen die Rückstellungen sicher angelegt werden und werden vom Staat kontrolliert, in Deutschland werden die Rückstellungen von den Energieversorgungsunternehmen (EVU) in Eigenregie verwaltet und in Spanien werden die Rückstellungen bzw. die Steuer, die auf den Atomstrom erhoben wird, an eine staatliche Einrichtung transferiert. Es ist fraglich, ob die Rückstellungen der EVU ausreichend sein werden. Diese Frage gewinnt an Bedeutung, wenn aufwändige unterirdische Erkundungen notwendig werden, die Baukosten unerwartet steigen oder Konzeptänderungen im Auswahlverfahren erforderlich werden. In Schweden ist das vorgesehene Finanzierungsmodell stark unter Druck geraten. Der sog. „Radioaktiver Abfall-Fonds" scheint nicht zu reichen. Es wird empfohlen, das Finanzierungssystem zu revidieren, um zu vermeiden, dass zukünftige Generationen die Kosten tragen müssen. In den Niederlanden werden während der hundertjährigen Lagerungszeit Geldmittel in einen Kapital-Wachstums-Fonds investiert, der gewährleisten soll, dass auch die kommenden Generationen den Betrieb des Langzeit-Zwischenlagers und die Endlagerungspläne mittragen können.

8. Neue Annäherungen an die Problemlösung

Weltweit ist ein hoch politisierter Diskurs über die Frage der Endlagerung entstanden. In den allermeisten Ländern zeigt sich, dass rein technologisch gedachte Lösungsansätze zu kurz greifen und die erforderliche gesellschaftliche Akzeptanz für ein Endlager als breites Gesellschaftsprojekt verstanden werden muss. Die meisten neueren Versuche der Problembearbeitung sind mit erheblichen technisch-wissenschaftlichen Herausforderungen konfrontiert und mit einem Akteursumfeld, das durch Konflikte geprägt ist. Die Konsequenz daraus: die Standortsuche wird als mehr oder weniger anspruchsvoller Prozess der gesellschaftlichen Teilhabe verstanden. Das Spektrum reicht von einfachen bi-direktionalen Informations- und Kommunikationsstrategien bis zu Partizipationsmöglichkeiten, die einen deliberativ-demokratischen Anspruch haben (etwa in der Schweiz) oder mit direkten Gestaltungsmöglichkeiten und Vetorechten ausgestattet sind. Vielen NGOs und Anti-Atom-Initiativen gehen die derzeitigen Partizipations-Schritte ihrer Regierungen oder ihrer Parlamente aber noch nicht weit genug.

Eine Fundamentalopposition zur Endlagerung ist aber nicht möglich – und deshalb bringen sich die verschiedenen Organisationen und zivilstaatlichen Akteure in unterschiedlichem Maße in die

Endlagersuchprozesse ein. Selbst wenn dies nicht im formalen Rahmen erfolgt, so wird durch die außerparlamentarische Kritik der Diskurs um die Endlagerung dennoch bereichert. Da der zeitliche Rahmen einzelner Legislaturperioden für eine adäquate Problembearbeitung nicht ausreicht, bedarf es langfristiger, robuster Governance-Formen, damit das Problem nicht immer wieder vertagt werden kann. Außerdem wird es darauf ankommen, den gesellschaftlichen Prozess möglichst partizipativ und integrativ zu gestalten. In der Bundesrepublik Deutschland hat sich durch den Atomausstieg ein Gelegenheitsfenster eröffnet, das Problem der „Endlagerung“ anzugehen. Expertenkommissionen sind ein wichtiger Schritt auf dem Weg zu mehr Teilhabe und Transparenz, sie können den breiteren gesellschaftlichen Dialog aber nicht ersetzen. Gesellschaftliche Mitsprache und Einflussnahme sind für einen Erfolg essenziell.

9. Anlagen

9.1 Inhaltsverzeichnis zum Buch „Nuclear Waste Governance“ (im Erscheinen)

Nuclear Waste Governance: An International Comparison

Achim Brunnengräber, Maria Rosaria Di Nucci, Ana María Isidoro Losada, Lutz Mez and Miranda Schreurs (Eds.)

2015, Wiesbaden: Springer VS, c. 350 pp (forthcoming)

Contents

9.2 Ländervergleich Frankreich, Schweden und Finnland (wiss. Aufsatz)

Vortrag auf der internationalen Konferenz „Key Topics in Deep Geological Disposal“ der Deutschen Arbeitsgemeinschaft Endlagerforschung, Köln 24.-26. September 2014

Same, Same but Different

A Comparative Perspective on Participation and Acceptance in Siting Procedures for HLW repositories in France, Sweden and Finland

MARIA ROSARIA DI NUCCI[1], ANA MARIA ISIDORO LOSADA[2], ACHIM BRUNNENGRÄBER[3]

[123]Environmental Policy Research Centre, Freie Universität Berlin, Ihnestr.22, 14197 Berlin, Germany,

[1]dinucci@zedat.fu-berlin.de; [2]isidoro.losada@fu-berlin.de; [3] achim.brunnengraeber@fu-berlin.de

Abstract

This paper compares national approaches in Finland, Sweden, and France. These three EURATOM Member States are in an advanced stage of siting deep geological disposal (DGD) facilities. The procedures in these countries are largely based on voluntarism, but differ in their approach to public consultation as they were based on the so-called staged volunteer process leading to working partnership arrangements between the operator and the hosting communities and veto rights (Sweden), decisions with strong local community support and veto rights for municipalities until the final decision (Finland), and final top-down decision making after consultative processes (débat public) with the affected communities without veto rights (France). This presentation focuses on participation and acceptance issues; it analyses the different modes of governance with diverse conditions regarding transparency, trust, communication, and participation that have been at work. Moving beyondthe fact that variance exists with regard to the relevant national institutional, legal, cultural, industrial, and energy frameworks, the authors take evidence from national case studies and look for common patterns.

1 Introduction

Deep Geologic Disposal (DGD) has been indicated for a long time by a large majority of scientific and technical experts — and endorsed by national governments — as the most adequate way of disposing highly radioactive waste (HLW). However, the paradigm of DGD has started to erode. The ENEF-Working Group "Risks” (2009:3) claimed that “[..] it is nevertheless recognized that there are diverging views in some groups and that there are remaining concerns in the public about geological repositories”. Although the advocates of permanent closure of wastes in DGD continue to be numerous, reversibility and retrievability (R&R) is now seen as a more “prudent approach” (NEA/OECD 2012:3). Nowadays, the R&R option is included in several national waste disposal concepts as a possible way to adjust to progress in science and technology and to respond to societal pressures.

People, regardless of their views of nuclear power, realise that radioactive waste needs to be disposed of. In most countries, the debate on siting criteria is no longer confined to the

scientific and techno-political spheres, but involves stakeholders, including civil society. However, nuclear waste governance varies from country to country. Various actors and factors, such as the nature of the political and legal systems, formal and informal rules and procedures, political constraints, geographical conditions, technical skills, the stock of knowledge, degrees of public acceptance, and a country's nuclear history can shape siting processes. The way in which competing information and knowledge is processed and put to use by different actors and in different political and cultural contexts plays also an important role. Certainly without knowledge about geological formations and their corresponding morphologies and hydrological conditions no siting selection would be possible. But the process that leads to a selection of clay, salt or granite as host-rock for DGD is hardly only technical and we witness a shift from "geology" to "political geography".

Under the Directive 2011/70/Euratom, Member States are required to establish, implement, and keep updated "national programmes" for the management of spent nuclear fuel (SNF) and HLW waste by 2015. The state of implementation of the EURATOM directive at the national level varies considerably. In most Member States legal and institutional frameworks are now in place. Licensing requirements and procedures for site selection and safety criteria have been established, and the responsibilities of stakeholders defined. The major actors involved are: waste producers, waste management organisations, regulatory authorities, civil society, and policy makers at the national, regional, and local levels. Amongst the EURATOM countries, only Sweden, Finland, and France are in an advanced stage of planning and/or implementation of a DGD facility. These are the cases analysed in the following sections.

2 Common patterns and diversities

The management and governance of spent fuel and radioactive waste in Finland, Sweden and France present a number of similarities, but also marked differences. All three countries have nuclear programmes. In Sweden ten reactors are presently in operation, providing about 40% of the nation's electricity. In Finland, there are four reactors which make up approximately 30% of its domestic electricity. Olkiluoto 3 (European Pressurised Reactor-EPR) has been under construction since 2005 and two new reactors were approved by parliament in 2010. France counts 58 nuclear reactors, which provide approximately 75% of its domestic electricity. Moreover a new reactor, Flamanville 3 (EPR type), has been under construction since 2007 and another reactor (Penly) has been approved.

Amongst the three countries there are some similarities in the subdivision of responsibilities between waste producer and the waste management organisation. There is also a common functional separation between "operators" and "regulators" in charge of overseeing safety requirements and standards. Differences are most prominent with respect to the ownerhip structure of the implementing organisations, which are state agencies (France) or in private hands (Finland, Sweden). There are also differences in the host rocks chosen for the geological disposal, i.e. crystalline rock in Finland and Sweden and clay in France. For the system of financing, the 'polluter pays' principle is usually applied. All three countries can count on specific disposal funds which cover the financing of a wide spectrum of tasks, ranging from feasibility studies to decommissioning and to operating costs.

The siting procedures, mostly based on volunteer processes, had unique outcomes in each country: partnership arrangements between the operator SKB and the hosting communities and

veto rights (Sweden); decisions with strong local community support and veto rights for municipalities till the final decision (Finland); and final top down decision making after some consultative processes (débat public) with the affected communities (France) without veto rights. In France, the final decision on site selection is subject to the outcome of a public debate; however, it is not binding and has been boycotted by opponents. The sites in Sweden and Finland are "nuclearised," as nuclear facilities exist within the municipality or in the neighborhood, whereas in France the designated site already hosts an underground research laboratory (URL). Moving beyond the fact that variance exists with regards to the relevant national institutional, legal, cultural, industrial, and energy frameworks, we take evidence from national case studies (Brunnengräber et al. 2015) and further analyse it to reveal common patterns and differences.

2.1 Finland

Finland has attracted worldwide attention, as it has already started building a DGD. The construction of the Onkalo nuclear waste repository at Olkiluoto started in 2004 and the HLW disposal facility is scheduled to begin operations by 2020.

Onkalo construction is proceeding with very little public debate; the influence of non-governmental organisations has been limited (Lehtonen 2010). In fact, the siting process in Finland has been based on voluntarism. In 1983, a list of 101 potential sites for a repository was prepared and a consultation process with the affected communities was started. This resulted in the identification of five potential sites that "volunteered" to accept more detailed investigations; these were subsequently carried out in three sites. The respective interim reports were released in 1996. Six areas were analysed for their suitability and a list of four candidate regions were selected. The EIA (environment impact assessment) regulations represented a very important step preceding the licensing process and can be seen as a major driver for initiating participatory planning processes. The need to ensure local acceptance was the major motive for the operator POSIVA's adoption of a more dialogue-oriented strategy (Lehtonen 2010; Kojo et al. 2012).

Finland made use of the so-called Decision in Principle (DiP) process in which municipalities have veto rights. A positive decision by the local municipality and a preliminary safety appraisal of the disposal concept by the regulator STUK were required before the government decided on whether to build the repository (NEA 2010). Cooperation took place between the operator Posiva and the local councils with whom the negotiations were carried out. The final positive decision by the municipal council was taken after the submission of the EIA report by Posiva and the application for the DiP process to the government.

2.2 Sweden

Like Finland, Sweden has gained international attention for having found a solution for the disposal of radioactive waste. Its approach to the governance and management of radioactive waste and the legislation governing it is often seen as a model for other countries. The Swedish state takes the ultimate responsibility for the management of radioactive wastes. However, differently from many Euratom countries, the state has somehow shifted responsibility to the industry. This applies to management and final disposal, but also to the financing of all related activities and regulation. The Swedish concept for RWG thus places the whole responsibility on the owners and operators of the nuclear power plants (Kåberger and Swahn 2014). The nuclear industry has

transferred this responsibility to their co-owned radioactive waste company SKB, which is in charge of RWM and the decommissioning of nuclear facilities.

Transparency and public participation are regarded as key elements of the safety of all nuclear facilities (IAEA 2006). The Nuclear Activities Act requests formal consultations with a broad range of stakeholders before a licence application can be submitted. Sweden has already implemented Article 10 (on transparency and public participation) of the 2011/70/Euratom Directive and the regulator takes care of consulting stakeholders including environmental organisations while developing the programme.

The current status is the outcome of a long process, one which started with nationwide test-drillings in the 1980s that resulted in widespread local protests. Original opposition led to a decision to turn towards a voluntary siting process in which all municipalities in Sweden were invited to host initial 'feasibility studies'. After local referenda blocked potential sites in northern Sweden, the focus shifted to communities already housing nuclear waste facilities. Two municipalities, Oskarshamn and Östhammar, both hosting NPPs, expressed interest and competed with each other to be the preferred site. As stipulated by environmental law since 2004, resources have been made available from the Nuclear Waste Fund to enable environmental groups and other NGOs to participate in the evaluation and public examination of Swedish RWM policy. The SKB decision for Forsmark in the municipality of Östhammar was made in 2009.

2.3 France

In France, the search for a site to host a nuclear waste repository started in the late 1970s. Site investigations conducted in the late 1980s generated intense local opposition, prompting the government to declare a one-year moratorium on the search for a site in 1990. After extensive consultation, the parliament adopted the country's first nuclear law in 1991 (Bataille Law), which reopened the search for a waste solution. The law also marked the beginnings of a more participatory approach to waste management policy. French legislation requires both retrievability of the waste packages and the reversibility of decisions concerning the project. In 1998, the village of Bure (89 inhabitants), situated in the Northeast of the country was first chosen as the site for an underground research laboratory (URL) for deep geological disposal; subsequently it was designated to host the final disposal facility.

The focus of the French participation procedures is on consultative instruments and – as in any infrastructure process – they include an "enquête publique" and a "débat public". The first has an administrative character; the second is considered as more important, but its results are non-binding. The disposal concept was confirmed after a controversial public consultation process organised by the National Commission of Public Debate in 2005-2006. Environmental and citizens groups contended that the law passed in 2006 on the basis of the public debate ignored the fact that a portion of the citizens in the public debate in 2005 were against the DGD facility. In the case of the second *débat public* in May 2013, a grouping of citizens´ initiatives, BURESTOP 55, called for a boycott. Consequently, the debate was continued on the web and comments could only be provided online. Three members of the commission disassociated themselves before the end report of the commission was completed. In Bure there is a Committee (*Comité local d'information et de suivi* (CLIS)), which consists of 90 members (state, regional, district & local governments, MPs, NGOs, environmental groups, Trade Unions, ANDRA, etc.) who work in several commissions, but its influence is limited.

The Cigéo repository remains a controversial project, which on the one hand captivates an economically declining region with potential socio-economic benefits, but on the other hand also generates many doubts and concerns, especially regarding possible negative impacts on local image and economic development (Lettonen 2014). Upon approval from the government and the nuclear safety authority ASN, the waste management operator ANDRA will start constructing Cigéo in 2017.

3 Participation and acceptance in comparison

Looking for a suitable framework to embed the three different cases in and compare them, we make use of the so-called “ladder of participation” (Arnstein 1969), as well as subsequent adaptations. In spite of being almost 45 years old and not immune from criticism, Arnstein´s ladder — once developed to frame citizen involvement in planning processes in the USA — still represents an adequate heuristic tool. Its charm resides mostly in its simplicity. The eight types of participation are grouped under: non-participation (step 1-2); tokenism (step 3-5); and citizen power (step 6-8). The lower rungs are non-participatory and include (1) manipulation and (2) therapy, and are characterised by plans to achieve public support by “public relations approaches”. The next step, (3), includes participation, but the information provided is unidirectional and no feedback is envisaged. Consultation (4) follows on the ladder and, in this step, instruments such as surveys, neighbourhood meetings, and enquiries are used. This step is considered by Arnstein to be “window dressing”. In rung 5 (placation), citizens advise or plan, but decision makers ultimately decide whether or not to accept their input. It is only in the next stage (6), characterised by partnership, where negotiations are possible and decision-making responsibilities are shared, for example in committees. The next stages, 7 and 8, include delegated power, citizen control and opportunities for power sharing and (co-) governance, but are hardly realistic in the case of RWG.

M. Wiedemann and S. Femers (1993) built upon Arnstein's ladder and considered public participation in risk-related decision-making. Their ladder goes from (a) public right to know, (b) informing the public, (c) public right to object and determine the agenda, (d) public participation in defining interests and recommending solutions, and (e) public partnership in the final decision.

In the EURATOM countries, most of the participation procedures are limited to rung 4 (consultation) or are even at an inferior level of Arnstein´s ladder. Consultative participation processes are the most frequently used instruments; there are hearings where mostly experts, politicians, and NGOs take part and advisory committess where NGOs and other stakeholders have an important role. Amongst the countries analysed, Sweden could be placed on scales 6 (Arnstein´s ladder) and e) (in the Wiedemann & Femers ladder) as it adopted a partnering approach. The procedure in France could be classified between steps 4 and 5 (Arnstein´s ladder) and between b) and c) on the expanded ladder. Finland has been often considered an example of a good balance between the requirements of fair representation and competent participation. NEA (2004) considers this to be one of the underlying elements of the partnership approach, which is linked to helping to achieve a combination of licensable site and management concepts with host community support and a balance between compensation, local control, and development opportunities. However, it has been observed that in Finland, there is no tradition of radical NGOs and there is a strong trust in local and official experts and a preparedeness to let them negotiate agreements in their interest (Kojo et al. 2012, Litmanen 2009, Lehtonen 2010). Moreover, demand

for participation appears to be limited. Against this background Finland could be placed between rungs 5 and 6 on Arnstein's Ladder and between b) and c) in Wiedemann & Femers ladder.

We can speak of real, active participation starting from rung 6 of the the Arnstein ladder and c)-e) of the Wiedmann & Femers ladder. In order for the public to participate and exert influence, additional criteria need to be fulfilled. NEA (2010) puts forward criteria that emphasises the importantance of considering local interests, i.e. voluntarism and veto rights, and speaks of local partnerships. These approaches have the potential to increase local acceptance and and build trust. Moreover, the stakeholders must be involved at the very beginning of the process; if a participatory process starts late, than these criteria cannot be fulfilled.

Transparency and access to information are a prerequisite in participatory siting processes that are on the higher rungs of the ladder, but the affected stakeholders should also be endowed with sufficient resources. This is the case in Sweden, where since 2005 some environmental organisations have received support from the nuclear waste fund. In France, the CLIS has a budget of 300,000 Euro per year for commissioning independent reviews of the programme and hiring experts (NEA 2010). In contrast, in Finland only once, in 1999, have NGOs been financed by the Ministry of Trade and Industry.

According to the Nuclear Energy Agency, key elements of the partnership approach are — apart from voluntarism and right of veto — cooperation with local stakeholders in facility design and implementation and the provision of community benefits (NEA 2010). The provision of community benefits or compensations can manifest in several ways. It provides financial backing for the affected stakeholders to empower the generation of knowledge and expertise (capacity building) and allow citizens to participate. However, it can also hide forms of bribery and in a way, serve as a subtle manipulation (which would bring the process back to the initial rungs of the ladder). For this reason, it is important that compensation is settled only after important aspects, such as safety and security issues, have been sufficiently discussed, and not earlier. All three countries provide compensation and socio-economic benefits to the affected communities.

4 Summary – Lessons learnt

In the case of complex political issues such as RWG, the classical transmission mechanisms between politics and civil society are not enough; citizens want to influence political decisions. The processes leading to a site selection are unforeseeable and conflict ridden; they cannot be encompassed by a narrowly defined planning approach in which problems are defined, analysed, and solved in consecutive steps. Especially because of changing requirements that are difficult to identify or anticipate and because of the many interdependencies at play, efforts to solve one aspect of the problem (whether societal, technical, or political) may end up creating new problems. Key conditions for an inclusive approach are access to information, early involvement of the affected population and stakeholders, openness for unforeseen results, inclusiveness of the process and compensation. In voluntary approaches, negotiated mechanisms to compensate the affected communities have played an important role. Proper provision of resources for local capacity building, including support for NGOs, is a factor which enhances engagement, increases public confidence, and possibly helps the quality of decision-making. The support of potential host communities, however, cannot be exclusively rely compensation which is expected to be commensurate to offset the potential detriments of the project. Another key element is trust in the institutions and preparedeness to delegate negotiation agreements to them, as this is perceived to

be in the community´s interest. However, this also implies that local authorities are capable of negotiation in this circumstance, and this depends on the capacity building support that they received in the process. Moreover, this is a not only a political factor, but also an especially influential cultural factor. In France, the population is said to mistrust the political elite; in Sweden and Finland there is a consensual approach.

Although participations strategies are not completely replicable in other countries, lessons learnt from these contexts can help us avoid underestimating the influence of the participatory factor in the siting process. This is of critical importance, as such an underestimation could result in the further hardening of attitudes and lead to deadlock situations.

Acknowledgements

This article is part of the work of the FFU / FU Berlin within the ENTRIA project funded by the German Federal Ministry of Education and Research (BMBF/ 02S9082B) (www.entria.de).

References

Arnstein, S. R. , 1969. A Ladder of Citizen Participation. Journal of the American Institute of Planners, 35(4), pp. 216-224.

Auffermann, B. et al., 2014. A Final Solution for a Big Challenge. The Governance of Nuclear Waste Disposal in Finland, in: Brunnengräber et al. (2015) (Eds), Nuclear Waste Governance: An international Comparison, Springer VS (forthcoming).

Brunnengräber, Achim; Di Nucci, Maria Rosaria; Isidoro Losada, Ana María; Mez, Lutz and Schreurs, Miranda (Eds.) (2015): Nuclear Waste Governance. An International Comparison, Wiesbaden: Springer VS (forthcoming)

Litmanen T. 2009. The temporary nature of societal risk evaluation: understanding the Finnish nuclear decisions. In: Kojo M, Litmanen T, (Eds). The renewal of nuclear power in Finland. Basingstoke: Palgrave Macmillan. 192–217.

Litmanen, T., Kojo, M., Kari, M.,2010. The rationality of acceptance in a nuclear community. Int J Nucl Govern Econ Ecol. 3(1):42–58.

Lehtonen, M., 2014. Megaproject Underway. Governance of Nuclear Waste Management in France, in: Brunnengräber et al. (2015) (Eds), Nuclear Waste Governance: An international Comparison, Springer VS (forthcoming).

Lehttonen, M., 2010. Deliberative decision-making on radioactive waste management in Finland, France and the UK: influence of mixed forms of deliberation in the macro discursive context. Journal of Integrative Environmental Sciences. 7: 3, 175 — 196

Kåberger, T., Swahn, J., 2014. Model or Muddle? Governance and Management of Radioactive Waste in Sweden, in: Brunnengräber et al. (2015) (Eds), Nuclear Waste Governance: An international Comparison, Springer VS (forthcoming).

Kojo M, Kari M., Litmanen T., 2012. Nuclear community considering threats and benefits of final disposal. Local opinions regarding the spent nuclear fuel repository in Finland. Int. J. Environmental Technology and Management, Vol. 15, No. 2, 2012.

Nuclear Energy Agency (NEA), 2004. Learning and Adapting to Societal Requirements for Radioactive Waste Management – Key Findings and Experience of the Forum of Stakeholder Confidence, OECD, Paris, France.

Nuclear Energy Agency (NEA), 2007. Fostering a Durable Relationship Between a Waste Management Facility and its Host Community. Adding Value Through Design and Process. NEA No. 6176. OECD, Paris.

Nuclear Energy Agency (NEA), 2008. Moving forwards with geological disposal. OECD, Paris, France http://www.oecd-nea.org/rwm/ reports/2008/nea6433-statement.pdf

Nuclear Energy Agency (NEA), 2010. Partnering for Long-term Management of Radioactive Waste. Evolution and Current Practice in Thirteen Countries. OECD, Paris.

Nuclear Energy Agency (NEA), 2012. Reversibility and Retrievability in Planning for Geological Disposal of Radioactive Waste. Proceedings of the “R&R” International Conference and Dialogue. 14-17 December 2010, Reims, France.

Wiedemann, P., Femers, S., 1993. Public participation in waste management decision making: Analysis and management of conflicts. Journal of Hazardous Materials, 33 (1993) 355-368.

9.3 Fact Sheet (France)

Fact Sheet - France

Last updated: November 2014[5]

Number of NPPs	58 nuclear power plants
Installed capacity	***63,130 net MWe.***
Enrichment and reprocessing facilities	One spent fuel reprocessing facility in La Hague, La Manche. Enrichment work and other activities take place at the Tricastin Nuclear Power Centre, and MOX fabrication at the Mélox plant in Marcoule, Gard
Volume of waste (low level- LLW, intermediate- ILW high level - HLW)	HLW: 2,700m^3 Short-lived ILW (tritiated waste): 4,500 m^3 Long-lived ILW: 40,000 m^3 (All LILW and VLL: 1,317,000 m^3 Non-classified waste: 3,600 m^3) (figures at end 2010) This inventory does not include 11% of the radioactive waste which originates from military installations and which is subject to military secrecy.
Perspectives for nuclear power in the country	• N-power generates ~75% of the produced electricity in France. • ~17% of France's electricity is from recycled nuclear fuel • The lifetime of the 900MWe reactors has been extended by ten years in 2002, after their second 10-yearly review. • Reprocessed and recoverable materials (uranium and plutonium) are considered as resources and are not included in the waste inventory.

10. Short description of the present national waste management plans/practice

Waste classification considers four categories according to activity level, i.e. VLLW, LLW, ILW and HLW. For each category, a further distinction is made between waste containing radionuclides with a very short (<100 days), short (≤31 years) and long (>31 years) half-life. From 1967 to 1969 France dumped LLW and ILW waste in the sea.

The National Radioactive Waste Management Agency (Agence Nationale pour la gestion des Déchets Radioactifs - ANDRA) operates three storage sites for short-lived low- and intermediate level waste, two in the department Aube and one in Digulleville, La Manche. Since 1992, ANDRA operates a storage facility for low-level and short-lived intermediate-level wastes at Soulaines-Dhuys in the department of Aube. It comprises waste conditioning facilities and a disposal area covering about 30 ha. Some 90% of the volume of VLLW, LLW, ILW is stored in interim storage facilities in the department of Aube. The storage facility is expected to meet France's needs until at least 2030. The La Manche facility was closed down in 1994 and accommodated 527,000m^3 of ILW from 1969 to 1994. It was covered with a multi-layer, engineered cap and was actively monitored until 2003, when the facility as entered a post-closure monitoring period that will extend over several centuries.

[5] We would like to thank Markku Lehtonen for his valuable comments on a previous draft of this fact sheet.

In 2003, a separate surface repository was commissioned for VLLW: the CIRES at Morvilliers. The repository is expected to remain operational for 30 years.

In 1999 ANDRA was authorised to build an underground research laboratory (URL) for HLW and long-lived ILW, and an exhibition centre in Bure. The construction started in 2000. In 2005 ANDRA stated that the clay formations at Bure were perfectly suitable for hosting the deep geological repository for HLW and long-lived ILW. In 2010, ANDRA publicised its project for the construction of a disposal facility, Cigéo. Currently the non-recoverable high-level radioactive wastes are stored in dedicated facilities at the production sites at La Hague, Marcoule and Cadarache, where they will remain for a few decades, until their final disposal.

Depleted uranium from reprocessing is sent to Russia for (re-)enrichment. The contracts ended in 2010 and depleted uranium from re-enrichment remains in Russia (WNA 2014).

11. Financing

Following the "polluter pays" principle, waste producers are obligated to provide funds to cover the total costs of radioactive waste storage and disposal, as well as the management and the dismantling of their facilities. The Ministry of Energy fixes the respective payments required from waste producers; specified in relation to the amount of produced waste. The revenues are placed in secure financial assets, controlled by the state. The cost estimate is updated periodically every three years.

In addition, a tax on nuclear facilities and plants is allocated to a specific for R&D on geological disposal, managed by ANDRA. Similar taxes are levied on waste producers to finance the economic support measures aimed at the communities near the URL and later the possible geological disposal (see compensation mechanisms). The National Plan for the Management of Radioactive Materials and Waste (PNGMDR) specifies that the provision scheme has to be reviewed periodically by an independent commission.

There have been recurrent disputes between ANDRA and the waste producers concerning the total costs of the Cigéo facility, and no agreement on the total cost has been achieved. In 2005, a committee composed of representatives of Andra, the waste producers, ASN and the energy ministry agreed upon a reference cost of 13.5-16.5 billion euros over a period of the expected more than 100 years operational lifetime (including construction, operation and closure) of the facility. In 2014, the waste producers estimate the cost at €14 billion, i.e. only a half of ANDRA's cost estimate of €28 billion (Cour des Comptes 2014, 18).

12. Concept/national strategy for interim and long-term waste storage

During the 1980s and 1990s the option of burying nuclear wastes in granitic formations was examined in depth but was abandoned not only for geological reasons, but also because of fierce protests from the local communities of the affected areas. In 1994 the government launched site investigations in the departments of Gard (clay), Meuse (clay), Haute-Marne (clay), and Vienne (granite). In 1996 the sites Meuse and Haute-Marne were merged to create the current site at Bure.

The Waste Act 1991 (the "Bataille Law") stipulated that research should be conducted in parallel on three management options: reversible or irreversible geological disposal, partitioning and transmutation, and long-term near-surface storage. In 1998 the government adopted the principle of reversible geological disposal (>100 years), which was confirmed by the Planning Act in 2006. While research is being undertaken on the three options, deep geological disposal nevertheless remains the reference option. Furthermore, the relevance of the principle of reversibility has been called into question, not least because step-wise closure of the repository still remains the objective.

After the government selected Bure in 1998 as the only potential candidate for hosting a repository, advanced research began on deep geological disposal at the Bure underground research laboratory (URL). The repository is expected to enter into operation after 2025.

Cigéo is designed to accommodate all high-level and long-lived intermediate-level radioactive waste. Long-lived ILW, such as radium-bearing residues, graphite and tritiated waste will be disposed of in near-surface disposal within a low-permeability clay host-formation at a depth of 15 meters for radium-bearing waste and down to 200 meters in an underground installation for graphite waste.

13. Legislative and regulatory framework

Nuclear waste management is subject to the general legal framework prescribed by article L.541 of the Environment Code (Act n° 75-633 of 15 July 1975), and the associated decrees concerning the disposal of waste. According to the Environment Code, waste producers remain responsible for their waste until it is safely disposed of. The Code also contains stipulations on the need for public information.

In 1991 the Parliament adopted the Nuclear Waste Management Act, the "Loi Bataille", which introduced broad consultations at different levels of policymaking. The law provide a legal framework for the creation of underground laboratories and stipulated research on three different axes: separation/transmutation, deep geological disposal and long-term near-surface storage.

Since 1995 the "Barnier Law" (Loi Relative au Renforcement de la Protection de l'Environnement) requires that any significant public work be subject to public debate organised under the auspices of the National Commission on Public Debate (CNDP).

The Bataille Law was updated in 2006. The so-called "Planning Act" confirmed the principle of reversible geological disposal as the reference option, but required that research continue on long-term near-surface storage as well as on partitioning and transmutation. The law specified a procedure and timetable for the authorisation of a repository. It obligated ANDRA to submit, by 2015, for government's approval a proposal for the creation of a repository, including a detailed definition of reversibility. It also stipulated that a public debate be organised by CNDP, as a prerequisite for the authorisation of a disposal facility. Finally, the Planning Act of 2006 foresaw the implementation of a National Plan for the Management of Radioactive Materials and Waste (Plan national de gestion des matières et des déchets radioactifs - PNGMDR), which it is updated every three years. The third PNGMDR, for 2013-2015, was released in August 2013. By confirming the principle of reversible geological disposal as the reference option and by requiring that continued research be pursued on the two other options now considered as "complementary" (sub-surface storage; and partitioning and transmutation), the French Government reconfirmed the orientations of the 1991 Nuclear Waste Act.

The "Transparency and Security in the nuclear field" Act of 13 June 2006 (TSN Act) created the National Agency for Nuclear Safety (ASN) as a nuclear safety authority independent of the government and the nuclear industry.

14. Institutional framework/ Actors

Institutional actors/ Regulatory functions

The National Agency for Nuclear Safety (ASN) is an independent administrative authority, which regulates nuclear safety and radiation protection. It is composed of an independent board of five commissioners, a General Directorate and eleven decentralised divisions. It also provides information to the general public on matters within its areas of competence. Together with the Ministry for Energy, it is responsible for the preparation of the National Plan for the management of radioactive materials and waste (PNGMDR). ASN is assisted by a technical support organisation, IRSN, which is responsible for radiation and nuclear safety, and as such plays a key role in decisions concerning Cigéo.

The Autorité de Sûreté Nucléaire Défense (ASND) is the safety authority responsible for military waste.

Operator/Implementer

The National Radioactive Waste Management Agency (ANDRA), is a commercial and industrial public establishment in charge of radioactive waste management, under the tutelage of three ministries: environment, energy, and research. Andra is also responsible for designing, siting, constructing and operating disposal facilities and defines criteria for waste packages.

Other keys actors

The National Assessment Board (Commission Nationale d'Evaluation - CNE), is in charge of evaluating and reviewing the various R&D programmes concerning high-level and intermediate-level waste management. Formally CNE is not a regulator, as it cannot grant any license, yet it cannot be considered as an implementer either. Nevertheless, it has a key role in the progress of the geological disposal project. The annual report of CNE is first submitted to the government, then forwarded to Parliament, and further to the parliamentary office of science and technology (OPECST), before finally being made public. The task of the OPECST is to inform and advice Parliament on matters relating to scientific and technological choices.

The High Level Committee (CHN), chaired by the minister of Energy, is in charge of the advancement and monitoring of the local economic support measures associated with the URL and Cigéo.

The High Commission for Transparency and Information on Nuclear Security (HCTISN), a multistakeholder organism, organises periodic consultations and debates around the topic of radioactive waste management.

The Local Information and Monitoring Committee (CLIS), set up for the Bure underground laboratory, informs the public, facilitates dialogue between stakeholders, and monitors the activities at the laboratory.

The departmental authorities and the local municipalities in the proximity of Cigéo are key local-level counterparts of the state actors in the planning process.

15. Status of the siting procedures (including plans and processes for the selection of adequate sites and licensing process)

In 2009 ANDRA submitted to the government its proposal for the creation of CIGÉO (Centre Industriel de Stockage Géologique) and specified an area of 30 km^2. After the examination by ASN, CNE and by international experts, the government approved the proposal. Before granting the licence, the principle of reversibility will be formalised in an Act to be voted in Parliament.

The construction of Cigéo should begin by 2017 and the facility is to become operational by 2025. It is designed to host high-level radioactive waste for 100 years. Periodic safety reviews and consultations at ten-year interval are planned for the facility since its entry into operation.

The repository is located at the depth of ~500 metres in clay formation and is expected to host about 10,000 m^3 HLW and 70,000 m^3 ILW.

Compensation mechanisms

The "Bataille Law" of 1991 introduced the possibility of economic support to potential host municipalities. Largely in order to enhance local acceptance of the project, economic support measures were implemented when Bure was designated to host for the URL. Two additional nuclear power operator taxes (one for economic development and one for scientific and technological diffusion) have been implemented to support the development of the local municipalities and the two departments concerned by the URL. The funds are managed and distributed by Public Interest Groups (GIP)

established in each of the two concerned departments. Today, about € 30 M. per year is allocated for each department, to be distributed to municipalities and local actors.

The communities can use freely ~10% of the funding, which is allocated to the communities on a pro rata basis in accordance with the population size of the municipality in question. The rest of the funding is granted to projects, through process whereby the Public Interest Group in question selects the projects to be funded. The decision-making process involves voting, with departmental authorities and the prefecture holding the majority of votes, leaving local authorities with little say on the funding decisions. The Planning Act of 2006 gave priority in the allocation of funding to the communities within a ten-kilometre radius from the URL.

In addition to the legally mandated support through Public Interest Groups, waste producers provide direct support to municipalities, in order to strengthen the local acceptance of Cigéo.

The current GIP financing period terminates in 2014 and the future of economic support is uncertain. The waste producers advocate the abolishment of economic support measures as unnecessary once Cigéo is in place, arguing that the facility will generate its own tax revenue for the communities.

According to estimates released for the public debate in 2013, the direct jobs generated by Cigéo would amount to 1,300-2,300 during the 7-8 years of construction of the facility, and 600-1,000 during its 100 years of operation. In addition, Cigéo was expected to generate 2,000 – 4,000 indirect and induced jobs – a significant potential contribution in a sparsely populated area with a relatively high unemployment level.

16. Information policy and participation processes including civil society

Since the 1980s the site investigations generated intense local opposition and prompted the government to declare in 1990 a moratorium in the search for a site. As a consequence, dialogue and greater citizen engagement and participation were introduced, and led to the adoption of the "Bataille law". Consultation at the local and departmental level has since then been a permanent feature of policy, whereas the regional-level authorities have been only loosely involved in the governance of Cigéo.

In 1993 the government reinitiated the selection process and asked the departments to volunteer as hosts for an URL. Thirty departments expressed their interest. Local citizen opposition emerged quickly, although local politicians were predominantly in favour of the projects. In 1997 public inquiries were conducted in view of the creation of an URL. After the exclusion of the sites in Gard and Vienne – for reasons related to both geology and local opposition – Bure was left as the only candidate. Local critics have pointed out that the absence of alternatives to Bure is in conflict with the law 1991, which stipulated that at least two potential sites for underground laboratories should be examined.

In November 1999 a Local Information and Monitoring Committee (CLIS) for the Bure underground laboratory, a pluralistic committee composed of representatives of the state, ANDRA, local politicians, local business and civil society organisations, was set up in order coordinate public debates and information flow. Once the construction of the URL had started, public protest increased and some local opponents criticised CLIS as an instrument designed to legitimise Cigéo. The advocates of Cigéo, in turn, accused CLIS of being merely a platform for the opponents of Cigéo to spread their "propaganda".

In 2005-2006, the National Commission for Public Debate (CNPD) organised a national public consultation on the country's nuclear waste management policy. One of the main conclusions of the national debate was that near-surface long-term storage should be examined as an option on equal footing with geological disposal. This conclusion was nevertheless not reflected in the main outcome of the debate, the Planning Act 2006.

In 2008 ANDRA sent a public call for expression of interest to 3,115 municipalities, whose geology was considered appropriate for hosting a disposal facility for low level, long-lived waste. Some 40 municipalities expressed their interest – one in the region of Picardie and the rest in Lorraine and

Champagne-Arndenne. Studies conducted by ANDRA, reviewed by the safety authority (ASN) and the National Assessment Board (CNE), resulted in the selected by the government of two municipalities – Auxon and Pars-les-Chavanges/Aube – for final consideration. However, as a result of public opposition, both communities withdrew their candidature in 2009.

In May 2013, the National Commission on Public Debate (CNDP) launched a mandatory four-month public consultation process on Cigéo. Due to strong local opposition that prevented the two first public meetings from taking place, CNDP replaced the planned public meetings by debates on the Internet, and extended the consultation process by two months. To compensate for the failure, CNDP organised in early 2014 a "consensus conference", which recommended slowing down of the schedule, notably the introduction of in-situ experimentation of the disposal concept before the full implementation of Cigéo.

In its response to the conclusions of public debate and consensus conference, Andra confirmed some slight changes to the planning of Cigéo. The operation of the facility would begin in 2025 with a "pilot industrial phase", and the licencing process would be divided into two phases: in 2015, Andra would present a preliminary summary project proposal, followed by a fully-fledged licence application in 2017. At both stages, CNE, ASN, local and regional authorities and the OPECST would examine the proposal. Uncertainties still prevail concerning the future decision-making process, notably on the degree to which Parliament would be involved in decisions concerning the definition of reversibility and the final authorisation of Cigéo.

Following the 2011 Fukushima nuclear catastrophe, a poll conducted by OpinionWay between March 30-31, 2011 concluded that 57% of the respondents were in favour of phasing out nuclear energy, with 20% being strongly in favour, while an Ifop poll from June 2011 showed 77% support for the abandonment of nuclear (15% quickly and 62 % over a period of 25-30 years), while only 22% wanted the nuclear programme to continue. Historically nuclear energy has enjoyed relatively high acceptance in France, yet the criticism has increased since the end of the 1990s: from the early 2000s onwards, polls have shown a slight majority (44%-52%) considering that the benefits of nuclear outweigh its downsides, while 36%-50% saw the negative aspects of nuclear as greater than its benefits (IRSN 2013).

Despite progress towards greater transparency (notably the 2006 Law on Transparency in nuclear matters), a deep mistrust of experts, technocrats and state actors in the nuclear sector still persists. Such mistrust is reflected for instance in the deep scepticism around the local economic support measures, which are widely regarded as instruments designed to "buy" the acceptance of the local communities. Opinions at the local level are divided and ambiguous, given the potentially significant socio-economic benefits on one hand, and the uncertainties and concerns relating to radiation risks and the potential degradation of the image of the region surrounding a nuclear waste disposal facility.

17. Sources

Cour des Comptes (2012): Les coûts de la filière électronucléaire. Rapport public thématique. In: www.ccomptes.fr/fr/content/download/1794/17981/version/6/file/Rapport_thematique_filiere_electronucleaire.pdf. Last accessed on 19.02.2014

Cour des Comptes (2014): le coût de production de l'électricité nucléaire - Actualisation 2014. In: http://www.ccomptes.fr/Publications/Publications/Le-cout-de-production-de-l-electricite-nucleaire-actualisation-2014. Last accessed on 16 July 2014.

International Nuclear Safety Group (INSAG) (n.d.): Stakeholder Involvement in Nuclear Issues. In: www-pub.iaea.org/MTCD/publications/PDF/Pub1276_web.pdf. Last accessed on 20.02.2014.

IRSN. 2014. Baromètre IRSN. La perception des risques et de la sécurité par les Français. Résultats d'ensemble. Juin 2014. . Fontenay-aux-Roses.

Lehtonen, Markku (2014): Governance of nuclear waste storage in France, in: Mez/Brünnengräber/Di Nucci/Schreuers (2014): Governance of Nuclear Waste Management: An international Comparison, Springer VS, to appear in August 2014.

Ministry for Ecology, Sustainable Development and Energy (MEDDE) (2013): French National Plan for the Management of Radioactive Materials and Waste 2013-2015, August 2013. In: www.french-nuclear-safety.fr/index.php/content/download/39940/295204/file/French+National+Plan+for+the+Management+of+Radioactive+Materials+and+Waste+2013-2015.pdf. Last accessed on 20.02.2014.
OECD–NEA (n.d.): Radioactive Waste Management Programmes in OECD/NEA Member Countries – France, March 2014. In: http://www.oecd-nea.org/rwm/profiles/France_profile_web.pdf. Last accessed on 25.03.2014.
OECD–NEA (n.d.): Radioactive Waste Management and Decommissioning in France, March 2014. In: http://www.oecd-nea.org/rwm/profiles/France_report_web.pdf. Last accessed on 25.03.2014.
reuters.com (2013): Majority of French want to drop nuclear energy-pol. In: www.reuters.com/article/2011/04/13/france-nuclear-poll-idAFLDE73C0ZI20220413. Last accessed on 25.03.2014.
World Nuclear Association (WNA) (2013): Nuclear Power in France. In: http://www.world-nuclear.org/info/Country-Profiles/Countries-A-F/FRance/. Last accessed on 19.02.2014.