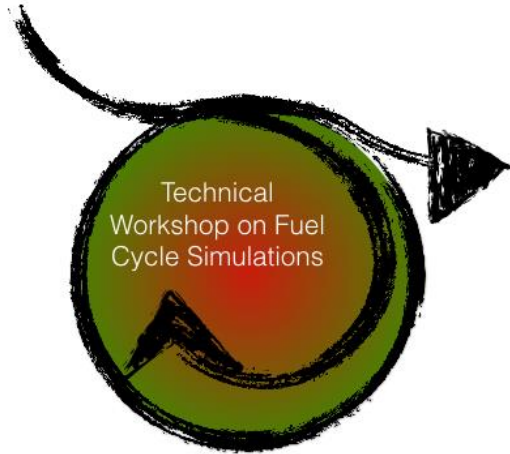




Technical workshop on Fuel Cycle Simulation

Institute of Astrophysics, Paris, 6-8 July 2016

**Shaping participation and innovation in
future nuclear technologies:
the role of electronuclear scenario**

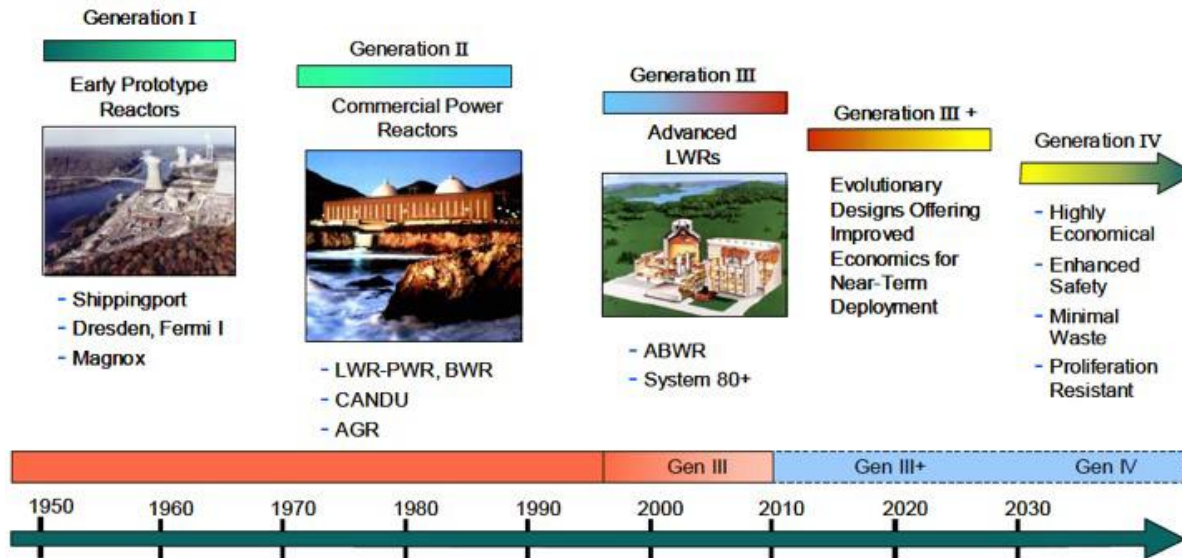


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Research context

- **French nuclear field sector**
- **Decision-making processes and innovation processes related to :**
 - the future of nuclear power (in relation to the energy transition)
 - nuclear waste management



Research questions

- **Initial question:**
 - How are made decisions related to nuclear of future?

- **A central sociotechnical device regarding technological innovation and forms of participation to innovation: the electronuclear scenario**

- **Emergent and refined research question**
 - How electronuclear scenario, as a sociotechnical device, intervenes in the structuring of a community?
 - How professional interactions and institutional dynamics affect electronuclear scenario?

Methods

■ Research setting & design

- A “grounded” and longitudinal approach => observing innovation “in the making”, by focusing on the community of reactor physicists”, in the French arena,
- Observing professionals’ involvement and participation in building and debating electronuclear scenario, and the role of scenario in shaping participation

■ Data collection

- 32 semi-structured interviews (recorded and transcribed): CNRS, CEA, EDF, IRSN
- Observation of 10 meetings (work sessions, workshops, national commissions...)
- Collection of key documents: CNE reports, CEA 2012 report, ppt presentations, working papers

■ Data analysis:

- Identification of different professional roles
- Attention to professionals’ interactions with, dependence on, and access to peers
- Attention to professionals’ access to, participation in and dependence on virtual object (electronuclear scenario)

Scenario & decision-making processes

■ Designing future nuclear systems

- Scientific & technological knowledge building process



- Criteria building & testing process

Role of nuclear scenario studies regarding these 4 processes?



Describing electronuclear scenario (ENS)

■ 3 main components of scenario as a tool and an activity

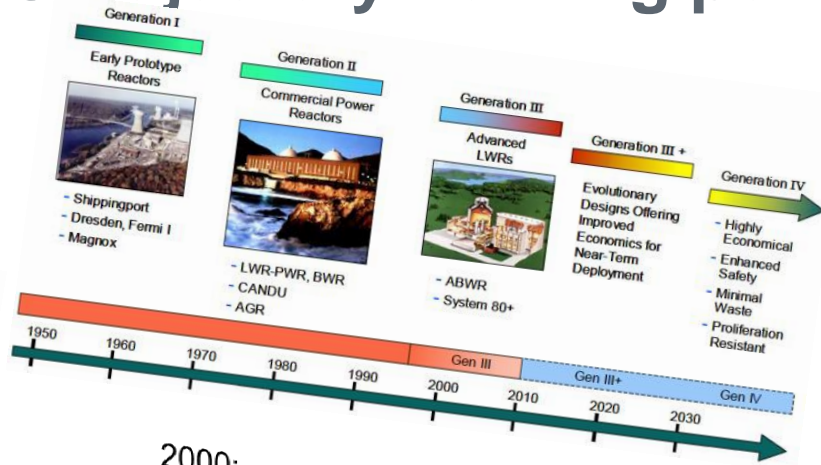


■ A double status of ENS:

- The ENS as a support in evaluating innovative nuclear technologies
- The ENS as an innovation in itself

ENS trajectory: turning points

L'entrée dans le champ démocratique: la loi Bataille de 1991



1991: Bataille Law

2000: GIF Forum

2010: official ASTRID project launch

12/2015: 2nd review of research in relation to 2006, CEA

1998: Stop of Superphénix

Discourse of J. Chirac 2006 Law (sustainable management of radioactive material and waste)



12/2012: 1st review of research in relation to 2006 Law, CEA



Participation in scenario as a social ordering process

	Configuration 1 Emergence and structuring of a social world	Configuration 2 Cooperation / collective work	Configuration 3 Segmentation of the social world
Period (& Turning points)	1991 – 2006 « Bataille » Law	2006 – 2012 Discourse of J. Chirac	Since 2012 (2012 Review)
Actors			
Interactions			
Primary work activity			
“Role”			
Dominant forms of ENS			
ENS component debated			
Technological innovative concepts			
Participation			

Participation in scenario as a social ordering process

Configuration 1 Emergence and structuring of a social world

Period (& Turning points)	1991 – 2006 <i>“Bataille” law</i>
Members	CEA – EDF – AREVA – CNRS
Interactions	Integration
Primary work activity	Research (separation / transmutation – nuclear waste)
“Role”	Nuclear physicists & engineers
Dominant forms of ENS	Profusion / diversity of ENS and concepts (realistic or “exotic”)
ENS component debated	Observable outputs Inputs : technological concepts
Technological innovative concepts	Concepts non hierarchical (SFR, VHTR, ADS, MSR...)
Participation	Open participation Premises of a community

Participation in scenario as a social ordering process

	Configuration 1 Emergence and structuring of a social world	Configuration 2 Cooperation / collective work
Period (& Turning points)	1991 – 2006 <i>“Bataille” law</i>	2006 – 2012 <i>Discourse of J. Chirac</i>
Members	CEA – EDF – AREVA – CNRS	CEA (EDF – AREVA) – CNRS
Interactions	Integration	Cooperation “It has been very efficient, and we continue to finance all these works”
Primary work activity	Research (separation / transmutation – nuclear waste)	Research & Development
“Role”	Nuclear physicists	Reactor physicists (Focus on Systems & Scenario studies)
Dominant forms of ENS	Profusion / diversity	Realist scenario
ENS component debated	Observable outputs	Input assumptions
Technological innovative concepts	Concepts non hierarchical (SFR, VHTR, ADS, MSR...)	Hierarchy between concepts (1 st place = RNR) “Realist” vs “exotic”
Participation	Open participation	Biased participation

Participation in scenario as a social ordering process

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Period (& Turning points)	1991 – 2006 "Bataille" law	2006 – 2012 Discourse of J. Chirac	Since 2012 (2012 Review)
Members	CEA – EDF – AREVA – CNRS	CEA (EDF – AREVA) – CNRS	CEA (EDF – AREVA) <u>vs</u> CNRS / IRSN
Interactions	Integration	Cooperation	Segmentation
Primary work activity	Research (separation / transmutation – nuclear waste)	Research & Development	Development <u>vs</u> fundamental research
"Role"	Nuclear physicists	Reactor physicists (Focus on Systems & Scenario studies)	Engineering <u>vs</u> research
Dominant forms of ENS	Profusion / diversity	Realist scenario	Industrial scenario <u>vs</u> academic scenario
ENS component debated	Observable outputs	Input assumptions	Simulation tool
Technological innovative concepts	Concepts non hierarchical (SFR, VHTR, ADS, MSR...)	Hierarchy between concepts (1 st place = RNR) "Realist" vs "exotic"	Decision regarding concept : choice of SFR => Concentration of historical nuclear actors on this process
Participation	Open participation	Biased participation	Segmented participation

Participation in scenario as a social ordering process

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Conclusion and discussion

- **An innovation process « in-process »**

- **Identifying and qualifying sociotechnical configurations enables to better understand**
 - the current forms of participation,
 - the hierarchy of credibility and legitimacy,
 - and their influence on innovation and decision-making processes.

- **It shows how they are partly inscribed in past dynamics (including professional ones), as well as towed by decisions involving future actions:**
 - The importance of temporal scales and limits
 - Pas experience with the different technologies
 - Knowledge & skills available and stakes regarding management & maintenance

Scenario & decision-making processes

■ Designing future nuclear systems

- Scientific **Clear role of nuclear scenario studies** building process
- Criteria building & testing process
- Decision making **Ambiguous role of nuclear scenario studies** process
- Legal **Ambiguous role of nuclear scenario studies** of the decision process

Perspectives

- **Which involvement of the political world?**
 - Which influence of the political world on scenario studies?
 - Which influence of scenario studies on electronuclear scenario?

- **International comparison?**



THANK YOU!

■ **Questions?**

Question de recherche et démarche d'enquête (1/2)

- **Un questionnement de départ général :**
Comment se construisent les décisions relatives aux filières nucléaires du futur?
- **Un objet incontournable et central : le scénario électronucléaire (SEN)**
- **Une question de recherche affinée :**
Quels rôles jouent le SEN et l'activité de scénarisation dans la construction des décisions?

Question de recherche et démarche d'enquête (2/2)

■ Le scénario vu par la littérature

- Un « outil d'anticipation » à valeur et visée exploratoires (Elzen et al., 2004) qui ...
- ... mêle prévisions, prophéties, promesses (Châteauraynaud, 2012)
- ... offre des « prises sur le futur » (Châteauraynaud, 2012)
- ... relève de la prospective
- ... suppose un raisonnement en termes de « modèles »

■ Une démarche méthodologique et théorique originale :

- analyse de l'activité de construction et de mise en discussion des scénarios
- une approche « enracinée » (Corbin et Strauss, 2012) et longitudinale => observation de la décision « en train de se faire »
- une perspective dynamique et interactionniste : la « communauté des physiciens des réacteurs et du cycle » analysée sous l'angle du « monde social » (Strauss, 1992)

■ Une hypothèse émergente de recherche : le SEN, un support à la construction d'un monde social?

Conclusion

- **La communauté des physiciens mouvante et hétérogène**
- **Concepts en concurrence, pas que le lobby nucléaire**
- **Influence mutuelle entre acteurs : pas pur rapport de domination**

- **Une relation entre décision & monde social à double sens**
 - Le monde social et ses dynamiques internes affectent des décisions externes...
 - ... mais les décisions, événements externes, affectent la forme et les dynamiques internes au monde social

- **Les décisions et le monde social présents marqués par le passé, mais aussi (et surtout) par le futur**

- **Un processus en cours et à suivre, à travers la poursuite du travail d'analyse longitudinale**