(Dis)empowered Communities:
A Comparative Study of Decommissioning Nuclear Sites (2025-2030)

Dr. Davide Orsini

Change! Fellow

Rachel Carson Center, LMU – Munich

P.I. (Dis)Empowered Communities Project

www.disempoweredcommunities.com

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The Nuclear Decommissioning Collaborative
Socioeconomic Decommissioning Solutions

Rachel Carson Center, LMU – Munich



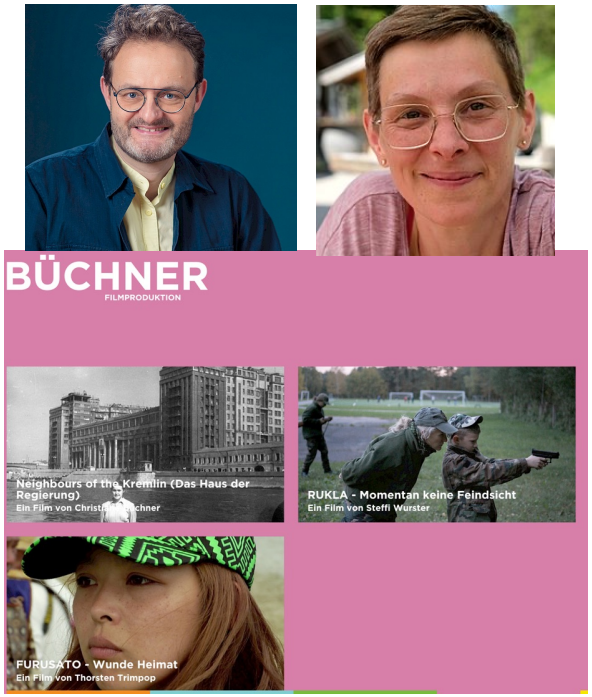
Dr. Davide Orsini, Ph.D., P.I.



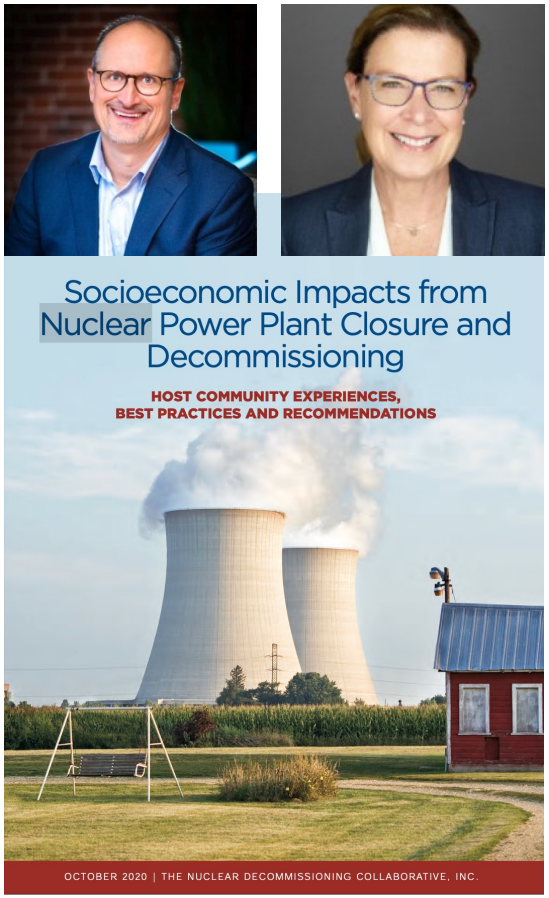
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Nuclear Decommissioning Collaborative

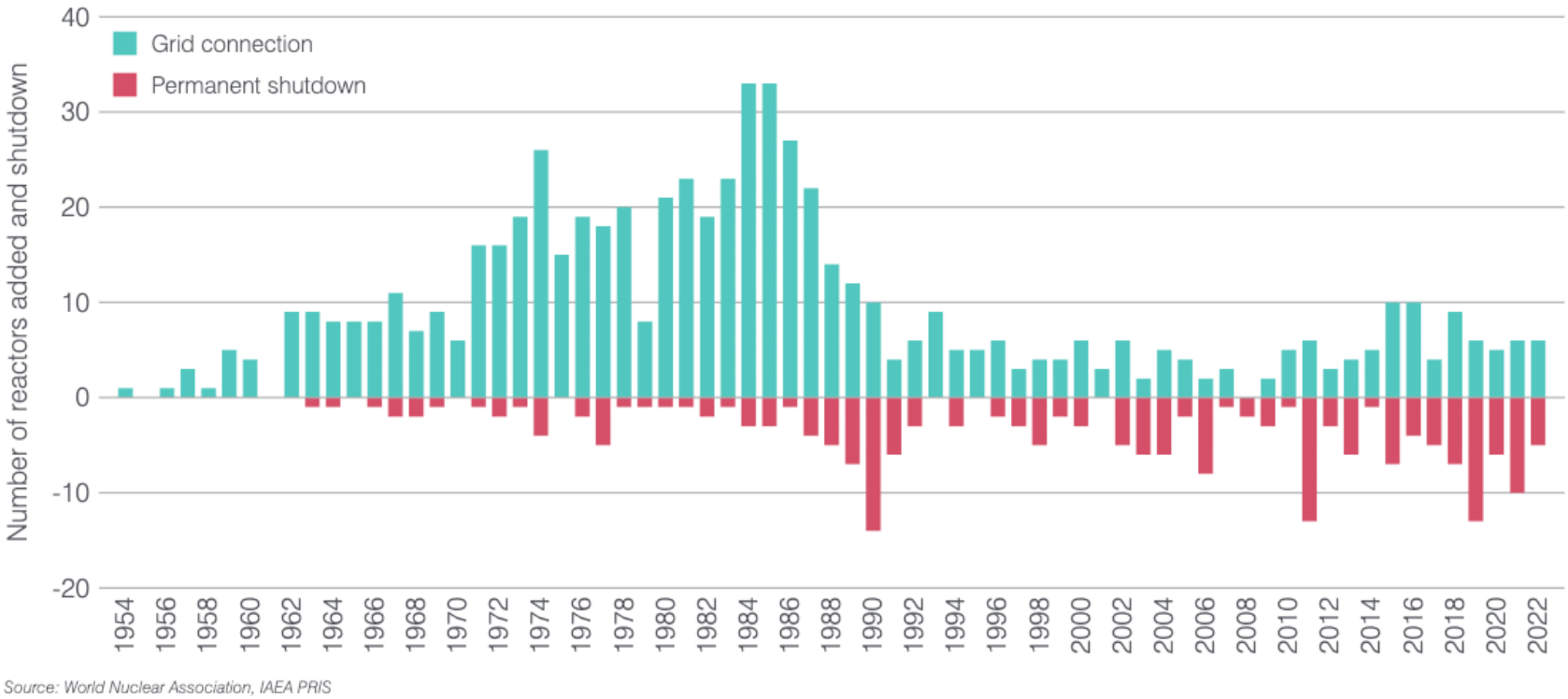
Research question

What happens to nuclear power plants and other nuclear facilities when they shut down?



The magnitude of the problem

Figure 14. Reactor first grid connection and shutdown 1954-2022

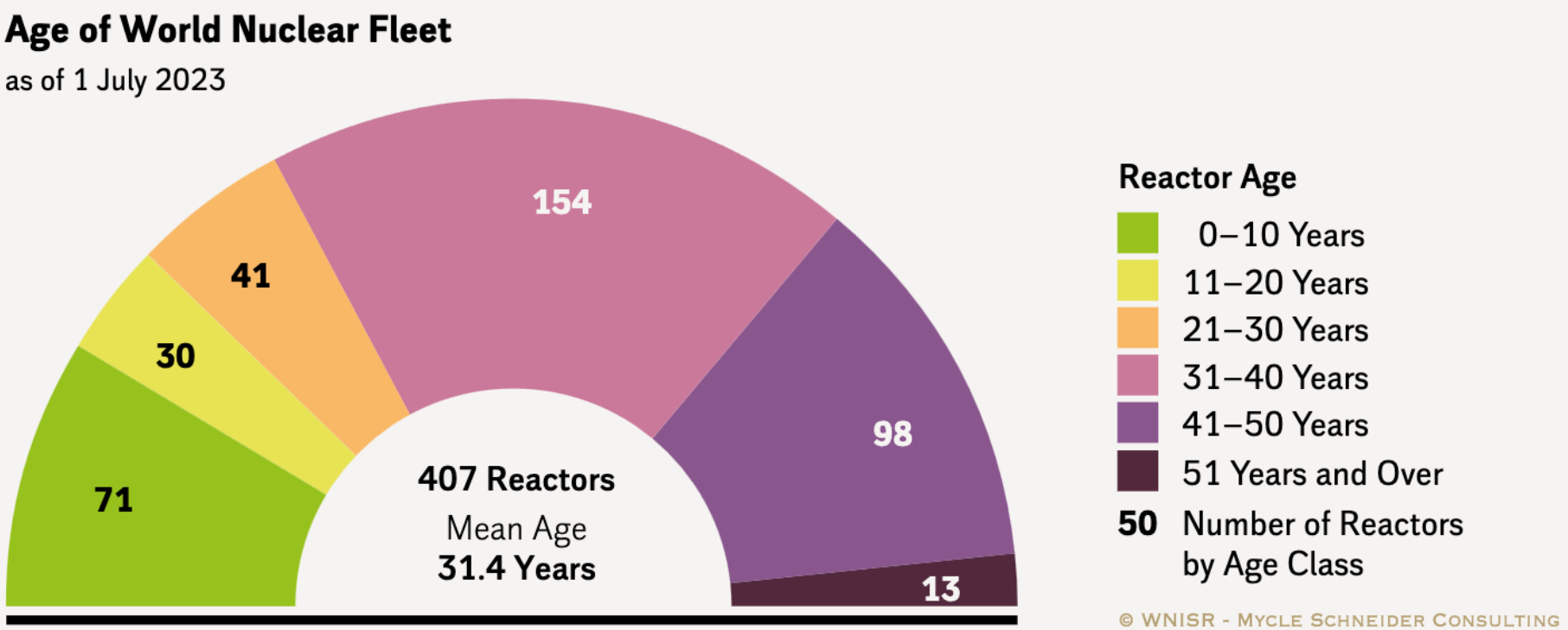


Source: World Nuclear Association, IAEA PRIS

“Worldwide, as of mid-2024, **213 nuclear power reactors have been closed**, corresponding to over 106 GW of permanently retired capacity. **Only 23 have been fully decommissioned**, although some are still awaiting release from regulatory control, **and only 9 have been returned to greenfield conditions**, meaning the sites are available for unrestricted use. An additional 145 reactors are in some state of decommissioning, while 45 reactors are in a long-term enclosure (LTE) state.”

Source: World Nuclear Industry Status Report 2024, p. 297.

Figure 18 • Age Distribution of Operating Reactors in the World



Sources: WNISR, with IAEA-PRIS, 2023

Existing knowledge and knowledge gaps in decommissioning

- Technical
  - How to safely cut, remove, isolate, trasport, and condition highly radioactive materials.
- Financial
  - How much does it cost to decommission different nuclear facilities?
  - Who pays?
- Social and ecological
  - How do environmental conditions influence decommissioning strategies? Environmental impact assessment?
  - What to do with the site and who decides?
  - What happens to host communities during and after decommissioning?

What is nuclear decommissioning?

- The process of safely closing a nuclear power plant (or other facility where nuclear materials are handled) to retire it from service after its useful life has ended. This process primarily involves decontaminating the facility to reduce residual radioactivity and then releasing the property for unrestricted or (under certain conditions) restricted use. This often includes dismantling the facility or dedicating it to other purposes.

- Source: US Nuclear Regulatory Commission

- A long and uncertain transitional phase during which a “place” of production becomes a site with material “out of place” that needs to be isolated, treated, and eventually transported elsewhere to be disposed of.

Stakeholder involvement? Words vs facts

During decommissioning most host communities face enormous challenges for which they are not economically and administratively prepared, while international and national regulators continue to portray decommissioning as a technical-only endeavour that needs to be unilaterally communicated to non-experts.

Left alone

TOP



DOWN

A socioecological approach



The cooling towers are reduced to rubble (Image: PreussenElektra)

ISAR NPP cooling tower. Photo: DØ, October 2022.

Credit: Hongyu Liu/The Patriot Ledger



UEIL QUI SOMMES-NOUS ? ENJEUX FOCUS ACTUALITÉS CONTACT

onnement énergétique, **la**
aires a un impact immédiat
les entreprises sous-
entrale nucléaire, ...

TCH, qui a pour objectif
nucléaire comme une
rice d'activités
transformation durable de



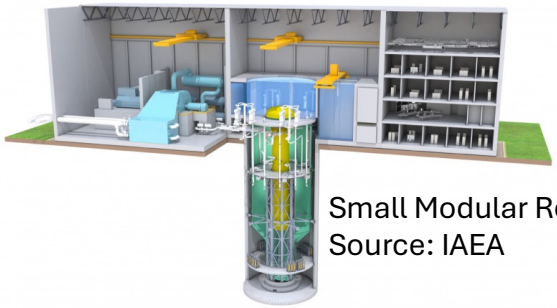
tiels, à la diffusion des
informations, à la mise en relation des acteurs afin qu'ils deviennent des
opportunités pour la **Wallonie.**

DÉCOUVRIR LA SUITE ↘

Post-decommissioning?




Dry casks for spent nuclear fuel at NPP.
Source: US NRC

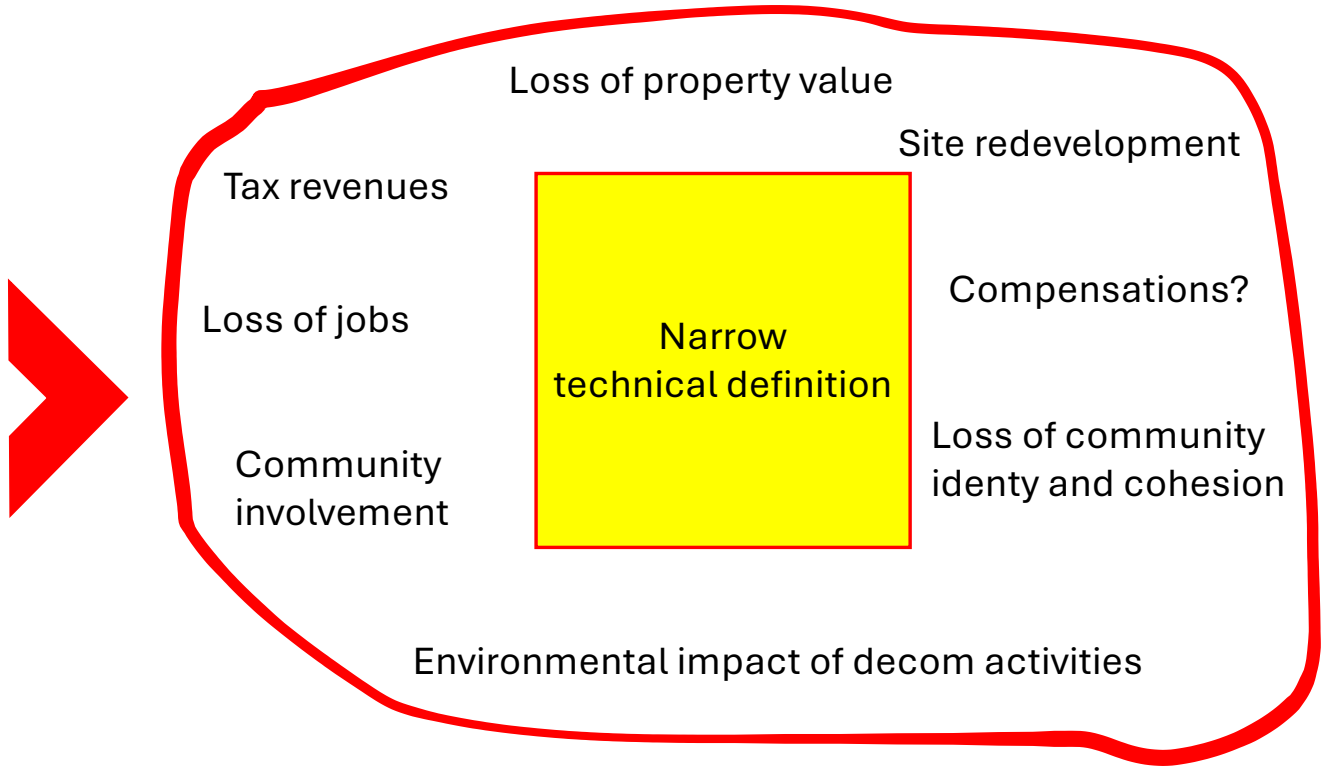

Small Modular Reactor
Source: IAEA

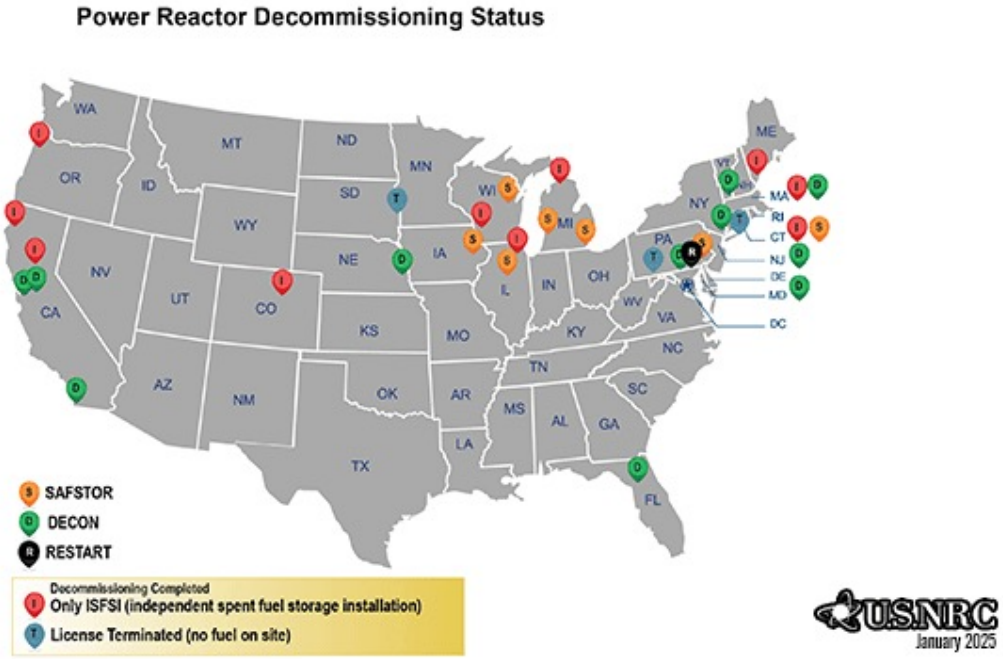

Niederaichbach NPP site, Bavaria.
Source: Davide Orsini

The burden of interested communities

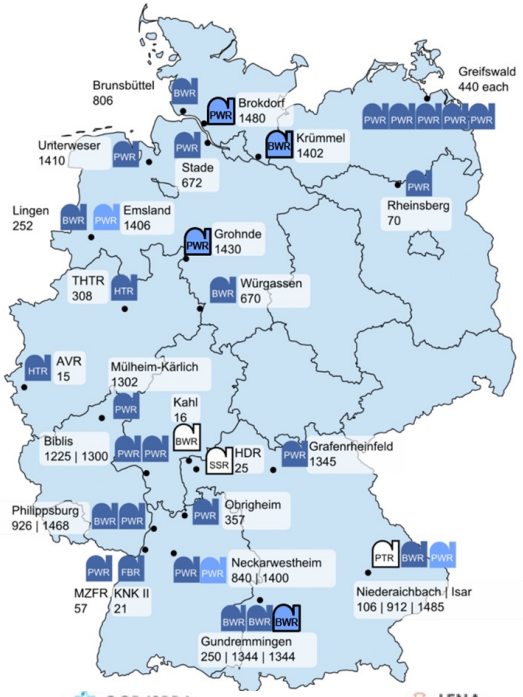
CONTEXT

- Regulatory process of decommissioning
- Decom financial scheme?
- Technical characteristics of facility
- Waste disposal routes and management
- Environmental characteristics of each site



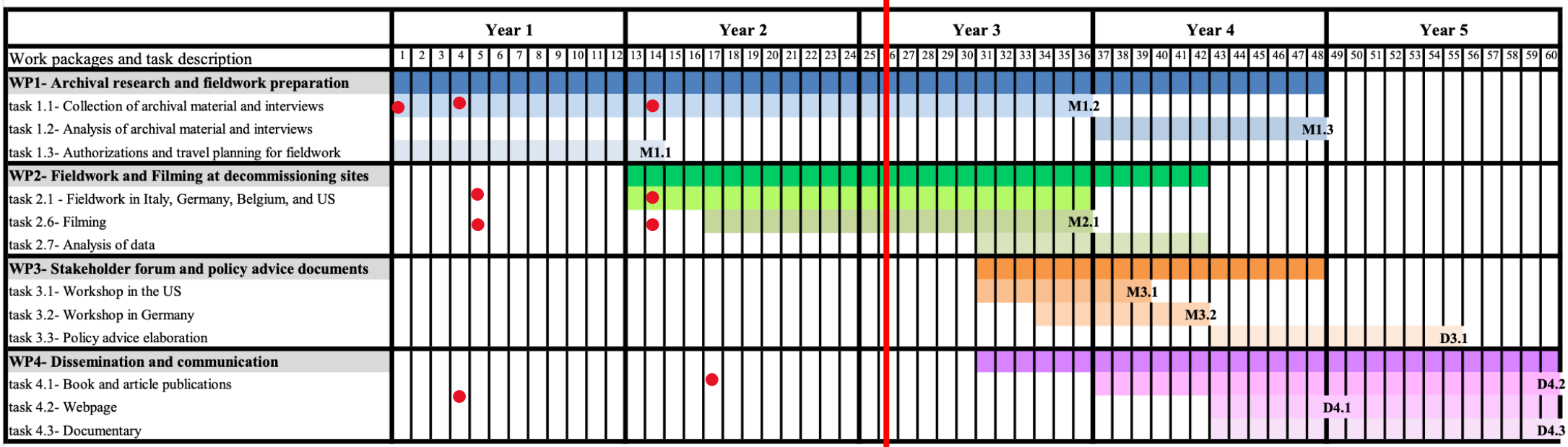

Power Reactor Decommissioning Status
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
PA
VA
NC
SC
FL
NY
ME
VT
MA
RI
CT
NJ
DE
MD
DC
SAFSTOR
DECON
RESTART
Decommissioning Completed
Only ISFSI (independent spent fuel storage installation)
License Terminated (no fuel on site)
U.S.NRC
January 2025


Belgium's nuclear power plants
NETHERLANDS
Doel
Antwerp
GERMANY
Brussels
Maastricht
Aachen
BELGIUM
Liège
Tihange
FRANCE
LUXEMBOURG
Google
BBC


Brunsbüttel
806
Brokdorf
1480
Greifswald
440 each
Unterweser
1410
Stade
672
Krümmel
1402
Lingen
252
Emsland
1406
Rheinsberg
70
Grohnde
1430
THTR
308
Würgassen
670
AVR
15
Mülheim-Kärlich
1302
Kahl
16
Biblis
1225 | 1300
HDR
25
Grafenrheinfeld
1345
Philippsburg
926 | 1468
Obrigheim
357
MZFR
57
KNK II
21
Neckarwestheim
840 | 1400
Niederaichbach | Isar
106 | 912 | 1485
Gundremmingen
250 | 1344 | 1344


CCR ISPRA
LENA
CAMPOVERDE
AVOGADRO
EUREX
TRINO
CAORSO
PROTEX
BOSCO MARENGO
CR CASACCIA
TRIGA
TAPIRO
IPU E OPEC
NUCLECO
LATINA
GARIGLIANO
AGN
ITREC
Research Reactor
Research Center
Nuclear Power Plant
Industrial Operator
Fuel Fabrication Facilities

March 2025



D = Deliverable: M = Milestone

Milestones

M1.1. Travel planning and authorizations completed. Beginning of fieldwork and filming.

M1.2. End of archival work and oral interviews.

M1.3. End of analysis of archival material and interviews.

M2.1. End of filming,

M3.1. Workshop in Germany takes place.

M3.2. Workshop in the US takes place.

Deliverables

D3.1. Policy briefings ready.

D4.1. Webpage completed.

D4.2. Book and articles submitted for publication.

D4.3. Documentary completed and launched.

February/March 2027
Fieldwork starts

Our approach and goals

- What we offer:

1. Providing local communities with evidence-based advice on how to organize and prepare for decommissioning and post-decommissioning redevelopment.

2. Web based open archive of documented experiences that host communities can use to empower themselves!

3. Evidence-based policy recommendations for decommissioning processes by inviting policy-makers to include local communities' needs and perspectives + socioecological and cultural factors into decommissioning plan requirements.

4. Giving visibility to nuclear decommissioning as an integral part of NPPs life-cycle, that needs careful planning and transparent collaborations.



Article

S|S|S

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1–32
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Nuclear Decommissioning and the Political Economy of Waste: Exploring Nuclear Attachments in Italy

Davide Orsini[1]

Abstract
Overshadowed by expert and public debates over reactor safety and waste disposal solutions, nuclear decommissioning is a variably long transitional phase during which host communities face numerous uncertainties regarding their future and nuclear sites' cleanup results. What happens to nuclear facilities when they become obsolete and need to retire? How much does it cost to dismantle a nuclear plant, and what are the socioecological implications of decommissioning projects? Focusing on one case in Italy, this study adopts a longitudinal approach to nuclear site biographies, demonstrating how national regulations, decommissioning funding schemes, technical and environmental characteristics of the facilities, and the socioeconomic conditions of affected communities concur to shape decommissioning projects. My approach builds on recent works on nuclear attachments exploring local communities' ambivalence toward nuclear installations. I argue that decommissioning processes should be analyzed considering larger management schemes, interests, and constraints that at multiple levels concur to form political economies of nuclear waste.

Keywords
nuclear decommissioning, containment, political economy of nuclear waste, nuclear attachments, nuclear facilities' biographies

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Issues Explore About Contact

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READING TIME: 20 MINUTES

(Dis)Empowered Communities: A Conversation with Davide Orsini

by Davide Orsini and Uwe Lübken

Davide Orsini holds a PhD in anthropology and history and a certificate in science, technology, and society (STS) from the University of Michigan. His research has focused on the social, political, and ecological implications of nuclear-power applications after WWII. Davide is PI of the research project "(Dis)Empowered Communities: A Comparative Study of Decommissioning Nuclear Sites," based at the RCC. He previously was a Marie Skłodowska-Curie Fellow at the RCC, a Zurich-Munich Fellow, and assistant professor at Mississippi State University.

Uwe Lübken is lecturer and coordinator of the MA program Environment and Society at the RCC. He has held teaching and research

https://springs-rcc.org/disempowered-communities/

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(Dis)Empowered Communities: A Comparative Study of Decommissioning Nuclear Sites

2025-2030

Share

What happens to nuclear power plants and facilities when their productive life comes to an end? At a time when nuclear energy is being presented as a “green” solution to the climate crisis, this question is an urgent one. While experts evaluate and invest in technological innovations, financing schemes, and guidelines for safely retiring obsolete nuclear facilities, there is a lack of engagement with the problems that local communities face when nuclear plants shut down, including their economic future and the ecological implications of decommissioning operations. The project team addresses this complex issue through the first comparative, multidisciplinary study of nuclear decommissioning in Western Europe and the United States.



(Dis)Empowered Communities brings together scientific partners and partners outside of academia (researchers, non-profit organizations, and filmmakers) to challenge the current



Thank you

KKN Niederaichbach green field. Photo: DO, October 2022.