Futureproofing ageing nuclear sites – Local Perceptions of Small Modular Reactors near Marcoule and Sellafield

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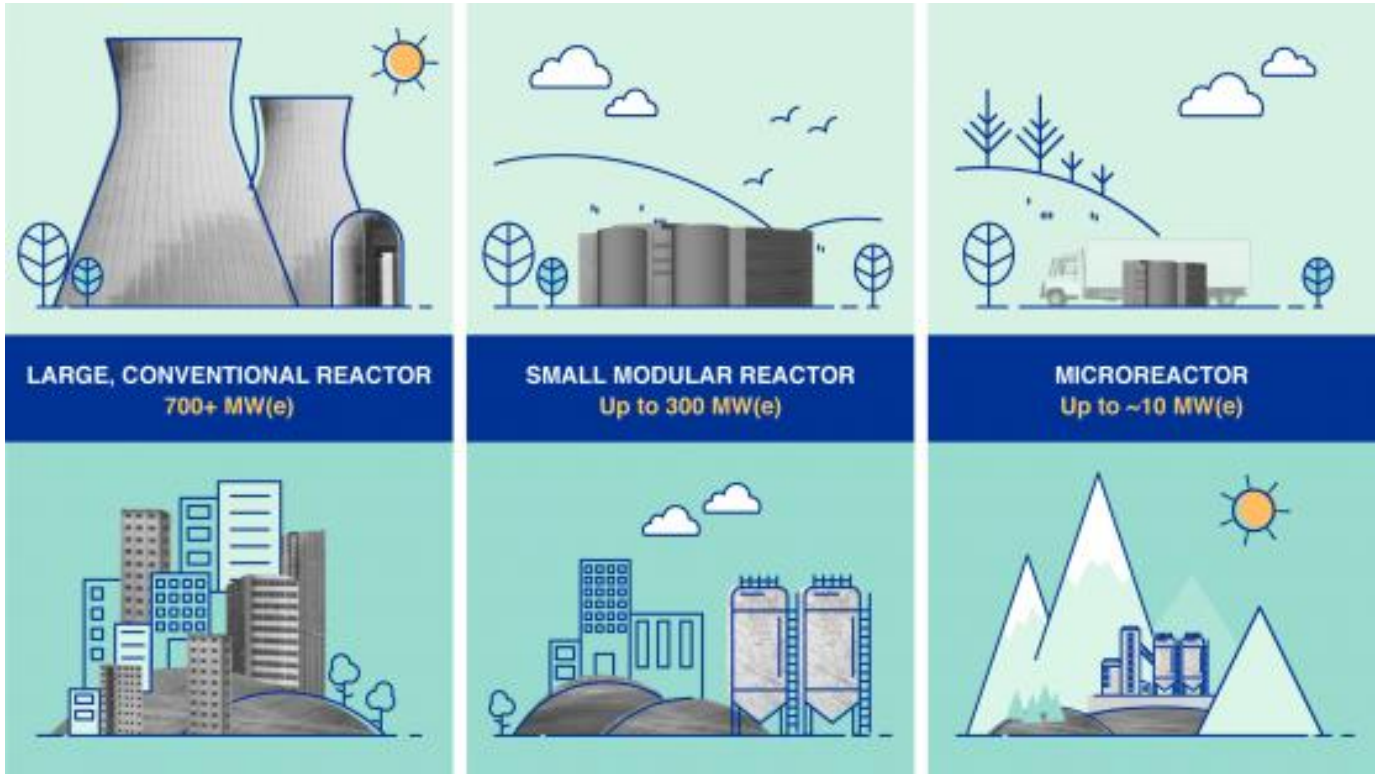
I. Introduction – SMRs at the forefront of the nuclear innovation race



https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs

I. Introduction - SMRs at the forefront of the nuclear innovation race

"But SMRs are a promising technology and there is a race underway. The race is among leading countries and companies to prove this technology and bring it to market."

(von der Leyen, 2024)

- 98 SMR projects at various stages of development in 2024 (NEA, 2024) ;
- Most projects in the United States, Canada, the United Kingdom, and the EU ;
- Spearheaded by startups; traditional nuclear actors; national laboratories;
- Policy backing in growing (e.g., EU Industrial Alliance on SMRs, national measures, etc.);

I. Introduction - SMRs at the forefront of the nuclear innovation race

- **SMRs are touted as a cornerstone of future energy landscapes (e.g., Sovacool, 2019; Kari et al., 2023), promising :**
  - Lower capital costs and lead times compared to large reactors (i.e., factory production and module transportation for direct onsite assembly);
  - Greater flexibility (i.e., suitable in remote areas; non-electric applications; etc.) ;
  - Decarbonization of energy production (including in hard to abate sectors) ;
  - Improved safety (i.e., using passive cooling & safety systems) ;
  - Greater social acceptability ;

- **Yet, little is known about how SMRs are perceived in areas that may potentially host them in the future. Especially near existing / legacy nuclear sites :**
  - The literature on siting controversies highlights that a strong NIMBY effect remains associated with new nuclear projects (e.g., Di Nucci & Brunnengräber, 2017; Woo et al., 2017; Easterling & Kunreuther, 2013);
  - Public authorities have typically resorted to concentrating new nuclear infrastructure within existing nuclear sites (e.g., Greenberg et al., 2017);

What expectations do local civil society actors and stakeholders hold regarding SMRs near existing / legacy nuclear sites?

And to what extent do these align with the SMR socio-technical promise?

II. Tentative theoretical framework

The sociology of expecations (e.g., Van Lente et al., 2012; Borup et al., 2006; Joly, 2010):

- Expectations as “real-time representations of future technologies, situations and capabilities” (Borup et al., 2006, p. 286);
- Expectations carry values connected to the (dis)advantages assumed to derive from a technology or scientific field;
- They are performative, shaping strategies and collective practices in the development of a technology or scientific field;
- Promises as positive expectations, used as rhetorical devices by *promise makers* in the economy of techno-scientific promises (Joly, 2010);

Instead of the usual focus on *promise makers,* what about the expectations held by *promise takers* in the economy of promises ? SMR expectations held by local civil society actors and key stakeholders near existing nuclear sites.

II. Tentative theoretical framework

Nuclear communities (e.g., Vilhunen et al., 2022; Venables et al., 2012; Peele et al., 2019):

- Identity building and sense of belonging associated with the nearby nuclear site (i.e., *sense of place*) ;
- Risk perception and trust in nuclear (i.e., the role of familiarity; risk perceptions differ from areas more remote from nuclear sites) ;
- Economic and social dependency (i.e., relative affluence as a compensation accepting environmental and health risks; but also creates a form dependency) ;
- Resistance and activism (i.e., grounded in local issues, motivations can differ from national or global antinuclear movements) ;
- Etc.

Such aspects will likely be useful for interpreting SMR expectations near existing nuclear sites.

II. Case studies – Marcoule (France) and Sellafield (UK)

- **Two legacy nuclear sites with historic relevance for the nuclear industry through past activities :**
  - **Marcoule (1956, Gard Department):** First UNGG reactors (G1, G2, G3), Military PU production, Prototype / Experimental reactors (e.g., Phénix), Waste processing (e.g., HLW vitrification facility plant; waste reprocessing plant), etc.
  - **Sellafield (1942, West Cumbria):** First NPP in the UK (Calder Hall), Military PU production (Windscale Piles), Prototype / experimental reactors (e.g., WAGR reactor), Waste processing (waste vitrification facility; waste reprocessing plant), etc. ;
- **Both sites are now mostly dedicated to decommissioning and dismantling activities, waste processing activities, research, (MOX production at Marcoule) ;**
  - Marcoule est. workforce : 5000
  - Sellafield est. workforce : 10000
- **Both sites were earmarked for possible SMR siting :**
  - Marcoule : NUWARD SMR ;
  - Sellafield : Rolls-Royce SMR, Westinghouse AP300 ;

II. Case studies – Marcoule (France) and Sellafield (UK)

Marcoule

- **Location :** Gard department, Occitanie region, France ;
- **Creation :** 1956 ;
- **Main operators :** CEA, Orano, Cyclife (EDF), Steris ;
- **Main activities :** Waste processing, decomissioning and dismantling, Research, MOX production ;
- **Est. workforce :** 5000 ;
- **Nearby communities :** Chuslan, Codolet, Bagnols-sur-Sèze, Orsan, L'ardoise

II. Case studies – Marcoule (France) and Sellafield (UK)

Sellafield

- **Location :** West Cumbria, Cumbria, UK ;
- **Creation :** 1942;
- **Main operators :** Sellafield Ltd. ;
- **Main activities :** Waste processing, decomissioning and dismantling, Research ;
- **Est. workforce :** 10 000 ;
- **Nearby communities :** Seascale, Drigg, Gosforth, Egremont, Whitehaven, Beckermet ;

III. Methods

A. Data collection

- **Approx. 15 semi-structured interviews per case, 31 conducted so far (still ongoing) ;**
- **With local / regional stakeholders near Marcoule and Sellafield :**
  - Belonging to the “nuclear communities” near these two specific sites:
  - Include : Local civil society representatives (community foundations, NPOs, etc.), local elected officials, local industrial actors, etc.
- **With national / state-level actors active at, or near these sites :**
  - Supply chain; Advocacy groups; Nuclear decommissioning authorities; Site operators; etc.,
- **1 focus group with citizens per case (planned) ;**

B. Data analysis

- **Thematic analysis, inductive coding ;**
- **Identifying these various actors’ (both pro and anti nuclear) expectations regarding SMRs ;**

Level	France	UK
Local & regional stakeholders : industries, local elected officials, civil society members	Local Mayors	Cumberland Counciliors
	Departmental Councilors	Sellafield Ltd.
	Local Chamber of Agriculture	Lake District National Park
	CLI	ZeroCarbon Cumbria
	Business Development Office	Local Enterprise Partnership
	Cyclium	Cumbria Trust
	CEA Marcoule (Atalante lab)	Sellafield Consultants
	Halte aux Nucléaires	Cumbria Community Foundation
	SPN Gard	
National & state-level actors active at, near the sites	ASN	ONR
	IRSN	NDA
	OPECST	NIA
	CRIIRAD	CoRwm
	ANDRA	CND
	APNI	NFU (NFU North)
	Réseau Action Climat	BECBC

IV. Preliminary Results

N.B., these are very preliminary results based on the interviews :

- Transcription and analysis are still ongoing ;
- 30 % analyzed ;

A. Marcoule and Sellafield: willing candidates for future SMR projects

- According to local elected officials, at national level, both sites actively compete with other potentially adequate sites (e.g., Tricastin in France, Bradwell in the UK, etc.) ;
- Local elected officials and industry representatives actively develop strategies to attract future SMR projects in the area ;

"Now, learning that we were potentially in a leading position for the SMR [NUWARD], I was thrilled. We're doing everything we can. In fact, recently, the president of the agglomeration wrote a letter that was signed by all 44 mayors, the senator, the deputies, all the local politicians. We all signed the letter, which was sent to the President of the Republic." (Local Mayor, Marcoule area)

IV. Preliminary Results

B. SMRs are perceived as an opportunity to futureproof Marcoule and Sellafield

According to local elected officials and local economic actors (but not only) :

- Marcoule and Sellafield are mostly dedicated to decommissioning and dismantling activities (which generate long term, well-paid jobs);
- However, decommissioning and dismantling activities are usually negatively perceived by local stakeholders:
  - These activities will eventually come to an end ;
  - This conveys the sentiment that the sites are in decline ;
- SMRs as way to maintain the relevance of ageing / declining sites, and preserve local economies :
  - Replace symbolic decline (dismantling, decommissioning) with a new future-oriented construction project ;
  - Ensure new, long term, contracts for the local nuclear supply chain (a significant part of local economies) ;
  - Attract new businesses in the local area with clean / decarbonized energy and possibly revive old industrial activities (e.g., “green steel”) ;
  - Boost the revenues for local municipalities by attracting new businesses (this would help maintain and improve local infrastructures) ;

Decommissioning activities are negatively perceived :

“[Dismantling] It still carries somewhat of a negative perception. We’re removing an installation, not creating one. As a result, it doesn't have a positive connotation, either economically or in terms of human resources." (Local CLI representative, Marcoule Area) ;

The urge to keep the sites relevant with new nuclear (SMR) projects :

“We had various things at Marcoule, both in terms of defense and in the civilian sector, which were a source of local pride because of their technology and their uniqueness." (Departmental Councilor, Marcoule area);

“It would help defend the idea that Sellafield is a center of nuclear expertise and up to date with all those things.” (Cumbria Trust representative, Sellafield area) ;

“There is no steel industry anymore. If you had a source of clean energy and could bring about green steel, and regenerate the steel industry in west Cumbria... they would build statues for you to commemorate it. It would be absolutely massive” (Local LEP representative, Sellafield Area) ;

IV. Preliminary Results

C. High (reported) local acceptance for SMR projects near Marcoule and Sellafield

- Local areas are characterized by a high degree of acceptance and trust in nuclear energy :
  - The nuclear sector is a historic and important component of local economies + multigenerational familiarity among local residents ;
  - Local nuclear opposition is limited and is marginalized (some testimonies of verbal threats and physical abuse) ;
  - Opposition grows stronger farther from the sites (e.g., The Lake District National Park near Sellafield) ;
- Local residents have (reportedly) high expectations regarding the economic benefits and job creation potential of any new nuclear construction projects, incl. SMRs ;
- In Sellafield (Marcoule to a lesser extent), this appetite for new nuclear projects is also tied to a sense of pride in the local area's past industrial achievements :
  - Local pride in the old steelworks and coal industry that existed in these areas, but also deep social scars due to the end of these industrial activities ;
  - Now that the sites are ageing, there is a fear of loosing relevance as nuclear industry leaders and innovators (fear of loosing another leading industry that is a source of local pride) ;
  - This fuels a local appetite for new nuclear projects ;

Local residents' acceptance & trust in nuclear:

"We wouldn't send our children to work there if we didn't have confidence in it was safe." (Local LEP representative, Sellafield Area)

Local residents' economic expectations associated with new nuclear projects:

"There's this perception there… they will just see a new nuclear power station, and that equals thousands of new jobs in their eyes" (Local LEP representative, Sellafield Area) ;

"For them, regardless of the SMR technology, it's more about bringing a new facility to the site that could create jobs or... something along those lines" (Local CLI representative, Marcoule Area) ;

Local residents' stance regarding any future SMR project:

"An SMR at Sellafield, […] for the general public, I think if there was a credible model and credible financing, then it would be a shoo in for one to get built because the local community would support it." (Cumbia Trust representative, Sellafield area) ;

"If you had a petition in Bagnols tomorrow to host the SMR, you'd get 100% of the signatures." (Local Mayor, Marcoule area)

IV. Preliminary Results

D. Marcoule and Sellafield reportedly offer site-specific advantages, making them particularly suitable for SMR deployment

According to local industry representatives and elected officials, these advantages are for instance :

- The presence of an established local supply chain, nuclear competences, and expertise (Marcoule and Sellafield) ;
- Providing sufficient power to ensure present and future site operations at Sellafield :
  - Concerns regarding the with a large scale nuclear construction project (Sellafield) ;
  - Insufficient grid and communicatsteady supply of energy to ensure safe operations at the site (formerly : Calder Hall, Gas powered turbines) ;
  - These concerns are further accentuated by the future construction and operation of a Geological Disposal Facility (GDF) near Sellafield ;
  - An SMR would provide the necessary power to ensure safe operations at the Sellafied and for the GDF ;
- Overcoming logistical issues associated ion (road and train) infrastructures near Sellafield for the construction of any new large NPP ;

IV. Preliminary Results

E. But also some site-specific reasons for concern…

- **Possible concerns among farmers (Marcoule) :**
  - To some extent, Winemakers in the Marcoule area may express concerns over possible a negative image consequence for their products (Historical precedent : waste geological repository survey) ;

- **Concerns environmental and landscape preservation concerns (Sellafield):**
  - Sellafield is located a few miles west from the Lake District, a World Heritage site that attracts much Tourism ;
  - Adding an SMR to an already complex site could perhaps jeopardize the World Heritage site designation of this area ;

- **Safety concerns associated with the co-location an SMR and other high risk infrastructures (Sellafield) :**
  - Sellafield is a sensitive site which stores and manages large amounts of high level waste in vulnerable infrastructures ;
  - Adding an SMR would only multiply concerns over safety and security at the site ;

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Thank you for your attention !

Any questions ?

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