

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

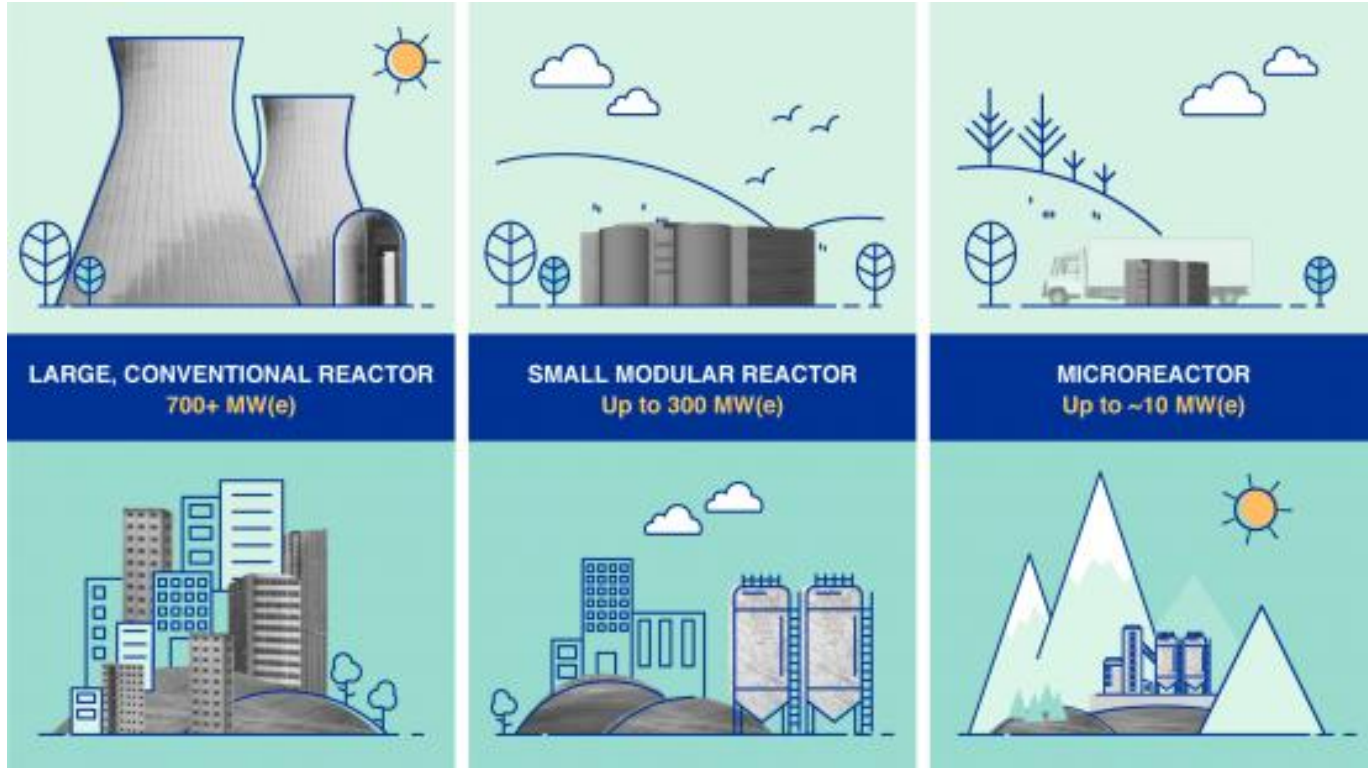
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I. Introduction – SMRs at the forefront of the nuclear innovation race





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 is 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 ;

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



- **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 greenfield 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);

Question:

What expectations do local civil society actors and key stakeholders hold regarding SMRs near existing / legacy nuclear sites? And to what extent do these align with SMR techno-scientific promises?



II. Tentative theoretical framework

The sociology of expectations (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, decommissioning 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, decommissioning and dismantling, Research ;
- ❑ **Est. workforce** : 10 000 ;
- ❑ **Nearby communities** : Seascale, Drigg, Gosforth, Egremont, Whitehaven, Beckermest ;





III. Methods

A. Data collection

- **A total of 34 semi-structured interviews (18 in France; 16 in the UK) ;**
- **With local / regional stakeholders near Marcoule and Sellafield :**
 - Belonging to “nuclear communities” near these two specific sites;
 - Local civil society representatives (community foundations, NPOs, environmental activists, etc.); local elected officials; local industrial actors; etc.
 - Both pro- and anti-nuclear
- **With national / state-level actors active at, or near these sites :**
 - Supply chain actors; National pro- and anti-nuclear advocacy groups; Nuclear decommissioning authorities; Site operators; etc.,

B. Data analysis

- **Thematic analysis, inductive coding ;**
- **Identifying these various actors’ expectations regarding SMRs ;**



Level	France	UK
Local & regional stakeholders : industries, local elected officials, civil society members	Local Mayors	Cumberland Councilors
	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	CND
	ANDRA	NFU (NFU North)
	APNI	BECBC
	Réseau Action Climat	



IV. Preliminary Results

N.B., these are very preliminary results :

- Analysis is still ongoing (especially regarding national / state-level actors) ;

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

- Many interviewees reported that 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, local economic actors, local territorial development divisions actively develop strategies to attract SMR projects in the area ;

Marcoule area:

"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

“We are currently preparing a promotional dossier that we intend to send to all SMR actors whose projects have been labeled and supported by the State under France 2030. The message is: ‘Marcoule exists, the territory wants to host an SMR, and we are open to working with you.’ This is a strong political project: to state clearly that Marcoule must host an SMR. We will not simply wait for stakeholders to come to us” (Direction of the local Planning and Territorial Development department, Marcoule Area)

Sellafield area:

“it’s a very competitive process — there are some really strong contenders. The other shortlisted areas are the West Midlands, the Tees Valley, and South Yorkshire. [...] And there’s another point: one of the competitors, the West Midlands, is where Rolls-Royce’s nuclear facility is already located — the one they use to make submarine engines, for example.” (Local LEP direction, Sellafield area)

“Our MP, Josh McAllister, has been lobbying in government to get the NDA to release the land, but since the NDA is government-owned, they’re still steadfast in wanting to keep it in case they need it.” (BECBC Nuclear Group Chair, Sellafield area)



IV. Preliminary Results

B. SMRs 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 ;

“[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)



IV. Preliminary Results

“Decommissioning will take a long time and it does create jobs, but as the work progresses it becomes less hazardous. At that point there’s a risk that funding is pulled, even though the cleanup still needs to continue. Decades from now, once the most hazardous parts are dealt with, some of those jobs might disappear”
(Cumberland Council Councillor, Sellafield area)

“Apart from that, we are more of a laboratory for how to carry out decommissioning than a site for new and dynamic projects. This places us in a paradoxical situation regarding the attraction of young talent and the ambition to offer ‘jobs of the future.’ How can we attract people if, even without knowing the exact figures, they believe that in 30 or 40 years there will be no more work? It is, therefore, difficult to be attractive enough for families to settle here.” (Head of local supply chain association, Marcoule area)



IV. Preliminary Results

- Additionally, both areas have experienced the loss of heavy industries in the past, leaving deep social scars and a fear of losing yet another major industry in the area (the nuclear sector):
 - Arcelor Mittal Steelworks near Marcoule
 - Heavy steel industry, iron and coal mining near Sellafield
- Consequently, SMRs are perceived by many local stakeholders 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 and services) ;



Marcoule area

“It would undoubtedly be, first and foremost, a way to secure long-term employment. Once the reactor is built, staff will be needed to ensure its operation, which would help maintain a certain number of jobs in the region.”

(Engineer-researcher at CEA Marcoule)

“The objective is to restore Marcoule’s momentum for development with new value. We are not only engaged in dismantling Phénix; we are not only involved in Orano Melox activities, which are gradually shifting towards La Hague — or rather are increasingly at risk of being directed there; the question is how to secure the site’s future by introducing new activities, new jobs, and a renewed ecosystem built around these new installations.”

(Direction of the local Planning and Territorial Development department, Marcoule Area)

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)

“It would also give Sellafield a new sense of purpose. At the moment, there’s no clear vision for the future. We’re just winding down, and I think that has an effect on people’s morale. You know, if you do a good job decommissioning, maybe you could earn the right to host a new reactor. That kind of thing.” (Innovation Lead expert at Sellafield)



IV. Preliminary Results

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

- Local areas are (reportedly) characterized by a high degree of support and trust in nuclear energy :
 - The nuclear sector is a historic and important component of local economies with multigenerational familiarity among local residents ;
 - Local nuclear opposition is limited and is marginalized (some testimonies of verbal threats and physical abuse) ;
- Local residents have (reportedly) high expectations regarding the economic benefits and job creation potential of any kind of 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 mining industry, 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, Marcoules 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 shoe in for one to get built because the local community would support it.” (Cumbria 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, Marcoules area)



IV. Preliminary Results

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

According to local industry representatives and elected officials, such advantages include :

- The presence of an established local supply chain, nuclear competences, and expertise (Marcoule and Sellafield) ;
- Land availability (Marcoule and Sellafield);
- Providing sufficient power to ensure present and future site operations at Sellafield :
 - Need a steady supply of energy to ensure safe site operations (formerly: Calder Hall, Gas powered turbines) ;
 - Expected rise in energy demand due to the future construction and operation of a GDF near Sellafield ;
- Overcoming logistical issues (insufficient road and train infrastructure) that would hinder the construction of any new large NPP (Sellafield) ;
- No need to upgrade the local grid infrastructure (Marcoule and Sellafield)



IV. Preliminary Results

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

➤ **Possible concerns among farmers (Marcoules and Sellafield) :**

- To some extent, winemakers in the Marcoules area may express concerns over possible a negative image consequence for their products (historical precedent: opposition to nuclear waste geological repository laboratory) ;

➤ **Environmental and landscape preservation (Sellafield):**

- Sellafield is located only a few kilometers west from the Lake District National Park, a World Heritage site that attracts much Tourism ;
- Adding an SMR to an already complex site (Sellafield) could potentially affect the World Heritage status of this area ;
- Park authorities are particularly concerned with landscape preservation and any new nuclear development should preferably happen away from the park

“I think, is that any nuclear development, including things like disposal facilities or new reactors, should happen at a certain distance from the Park. And that’s the case currently. So, if new proposals come forward — for SMRs, for instance, or for geological disposal — I believe our position would not be to support or oppose the idea in itself, but to say: keep this away from the Park. Certainly, not inside the Park boundaries.”
(Lake District National Park direction, Sellafield area)



IV. Preliminary Results

➤ **Safety concerns associated with the co-location SMRs 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 add yet another layer of complexity for safety and security at the site ;

➤ **Unclear what local energy needs an SMR can fulfill (Marcoule and Sellafield)**

- Besides supporting industrial activities at Marcoule and Sellafield there are few energy intensive industries in the wider area;
- West Cumbria already exports energy to the national grid; The Gard region already has large hydroelectric capacity installed

“Sellafield is a peculiar beast. I understand the common sense of building new nuclear facilities next to old nuclear facilities. But there is a question... And this is something that, when I became a politician responsible to the community rather than the industry, that concerns me about co-location, particularly co-location to a site like Sellafield, which has such massive amounts of high level nuclear waste within it for which there will be no solution for many years.” (Cumbria trust representative, Sellafield area)



V. Concluding remarks

The relative quietness of dissenting voices

- Dissenting voices, in particular anti-nuclear and environmental activists, were difficult to identify and reach near Marcoule and Sellafield ;
- Local support for the continuation of nuclear sector activities was reported as particularly high in communities directly adjacent to both sites. However, opposition seems to grow more prevalent in communities located farther from these sites, which are far less dependent on the nuclear industry:
 - France : Nimes, the Cévennes area
 - UK: East Cumbria, the Lake district national park
- In some instances, in particular near Marcoule, anti-nuclear discourses are actively suppressed by pro-nuclear activists:

"When we go to the nearest significant town to Marcoule, called Bagnols-sur-Cèze, and try to hand out leaflets or put up posters, we are not well received. Once, a small team of us was even cornered by someone who, armed with a rifle, prevented them from moving while calling the gendarmerie to intervene. The gendarmerie, having other priorities, told them to leave it alone." (Environmental activist, Marcoule area)



V. Concluding remarks

A local appetite for new innovative nuclear projects near Marcoule and Sellafield

- Nuclear (reportedly) has a strong social license in the nuclear communities near both Marcoule and Sellafield ;
- Several key stakeholders are actively developing strategies to attract SMR projects ;
 - Local territorial development divisions, local economic actors, local elected officials, local supply chain, etc.
 - Local economic actors lobbying and meeting with SMR startups; preparing promotional material to attract developers; Local MPs lobbying the government; etc.
 - There is a fierce competition between the few suitable sites at national level ;
- This appetite is fueled by a perceived necessity to *futureproof* ageing nuclear sites ;
 - Maintain and revitalize local economies, preserve nuclear expertise locally, and maintain the quality of life and attractiveness of local communities ;
 - Replace activities associated with decline (dismantling, decommissioning) with a new future-oriented construction project ;



Thank you for your attention !

Any questions ?