Small Modular Reactors for the Czech Market: An update – 2024

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Dear Readers,

In the autumn of 2023 we released a publication entitled *Prospects of Small Modular Reactors in the Czech Republic*. Its authors were Professor Stephen Thomas of Greenwich University and Edvard Sequens, an energy expert from the Calla organization, who framed his conclusions in the Czech context. Since then, many changes have happened in the field of nuclear energy and small modular reactors. These changes have been economic and political, but the technological development has not yielded any essential transformations. In the autumn of 2024, ČEZ, a state-owned company, announced it is establishing a strategic partnership with the British firm Rolls-Royce SMR, into which it also plans to invest significant resources. It is necessary to add that Rolls-Royce has yet to complete a first installation of a modular reactor, which of course is decidedly no small feat. This is projected to happen during the 2030s in Great Britain. On Czech territory, the locality in Temelín has been chosen for this project. It made sense to us, therefore, to include a separate chapter on Rolls-Royce in this update, dedicated to its history and its technology in detail. You can also read about other developments in small modular reactor technologies and their crucial markets in Europe and worldwide. Just as in the first edition, here too Edvard Sequens aptly and briefly summarizes the situation in the Czech Republic. This offers quite important insights, as in addition to ČEZ there are others who are interested in building small modular reactors in the Czech Republic – Sokolovská uhelná, Orlen and others.

At a time of intensifying climate crisis, more and more governments in Europe and worldwide are banking on nuclear as a panacea, but there are not enough realistic views of this subject available in the public space. For that reason, we have decided to publish this update, which reflects on current events in the branch of small and medium modular reactors.

I wish you informative, pleasant reading,

Klára Pleskačová, Energy & Climate Program Manager, Heinrich Böll Stiftung Prague

1. Introduction

In the year since our report on the prospects for small modular reactors (SMRs) was published, there have been several significant developments in the markets that will be key in determining whether SMRs can be brought to market – in the USA, Canada and the UK – and in determining the technologies that appear to be closest to deployment. ČEZ identified seven designs of SMR that it was considering, all smaller versions of the two dominant existing technologies, Pressurised Water Reactors (PWRs) and Boiling Water Reactors (BWRs) but has since narrowed its focus first to four designs for the Temelín site and then to the Rolls-Royce design, although other designs are said to be under consideration for follow-on projects. There have been regular announcements of cooperation agreements, for example, between national governments, or between regulators, or between vendors and customers as well as possible orders, but these have little significance, requiring a minimal commitment of resources, and appear to be more to do with public relations than real progress towards commercialisation.

For one of ČEZ's selected technologies, the Framatome Nuward design, the Czech, Finnish and French safety regulators had announced a joint regulatory review of the design in 2022.[1] EDF had signed a memorandum of understanding with ČEZ to develop the Nuward design. However, in 2024, EDF/Framatome abandoned the design (see below), so if these memoranda of understanding and cooperation agreements are substantial, then the work done under them was wasted.

Technology suppliers frequently promise local factories and significant local employment in the markets they are targeting, but the building of factories in export markets is inconsistent with the claims for the technology that the building of components in bulk on production lines will reduce costs.

1. *https://tinyurl.com/26xmy57v*

ČEZ's seven candidates were:

- **Rolls-Royce SMR. 477MW PWR.**
- **GE-Hitachi BWRX-300. 300MW BWR.**
- **Holtec SMR300. 300MW PWR.**
- **Westinghouse AP300. 300MW PWR.**
- **NuScale VOYGR. 77MW PWR.**
- **KAERI SMART. 100MW PWR.**
- **Framatome Nuward. Built as a pair of 160MW PWRs.**

This list had been reduced from the 11 designs ČEZ was focusing on in 2019. Three of the designs not pursued were a Chinese design, ACP100, a Russian design, RITM200, and an Argentine design, CAREM.[2] The Westinghouse design did not exist in 2019, so two of the 11 designs are not known.

The Nuward design was abandoned by Framatome in July 2024. It stated:[3] 'To address the needs expressed by the market timely [sic] and competitively, EDF and NUWARD shift the SMR product strategy towards the development of a design based on proven technology bricks only.' In short, Framatome was going back to the drawing board. Any replacement design is well beyond the time-scale of relevance to Czechia. The KAERI SMART design appears to have little customer interest worldwide and none in Europe or North America, so is also not discussed further. The future of the NuScale design is in doubt after the collapse in December 2023 of its best sales prospect, the US UAMPS project.

In March, ČEZ stated it had narrowed its focus to four designs, although it does not specify which designs have been chosen.[4] In the media, it was reported that three designs were being considered, Rolls-Royce, GE-Hitachi and Westinghouse. Given the abandonment of the Nuward design, the collapse of the only potential order for NuScale and the lack of customer interest in KAERI, if there is a fourth design still being considered, it is likely to be Holtec.[5]

2. *https://tinyurl.com/4hr9xhj7*

3.*https://tinyurl.com/yatvye7d*

4. *https://tinyurl.com/mtwdabmd*

5. *https://tinyurl.com/yra5jjbt*

2. Key Markets

2.1. The USA

In the USA, the main development was the cancellation of the UAMPS project for a cluster of six NuScale VOYGR reactors in December 2023. The remaining US project with any significant progress is a plan for the Tennessee Valley Authority to build four BWRX-300 reactors at its Clinch River site. However, as the US regulatory authority, the Nuclear Regulatory Commission (NRC), has not started a review of this design, a process that typically takes more than four years, a firm order is, at most, some way off.

The 50MW version of the NuScale design completed its review by the NRC in January 2023 after a five-year process. However, the design had been superseded by larger versions, first 60MW and, in 2020, a 77MW version. Given that the 50MW version was not on offer, there was no reason for the NRC to deal with all of the issues; for example, the issues regarding the steam generator were not resolved.[6] A review of the 77MW design was started in 2023, but given its more than 50% higher power density and the unresolved design issues, this will be a substantial process and is not expected to be completed before 2026.

2.2. Canada

While Canada has arguably been the most aggressive country in pursuing SMRs, there has been little significant progress in the past year with the PWR and BWR designs which are also under consideration in Czechia. The main projects of relevance to Czechia are the plans by Ontario Power Group (owned by the government of Ontario) to build four BWRX-300s at its Darlington site, and by Bruce Power Group to build four BWRX-300s at its Bruce site. The design has only completed two of the three stages of the Canadian Nuclear Safety Commission (CNSC) Vendor Design Review. This is 'to determine whether GEH understands CNSC regulatory requirements and the extent to which the reactor design meets those requirements.'[7] It in no way commits the CNSC to a positive verdict on the permissibility of the design, so, as with the Tennessee Valley Authority project, a firm order is several years away.

6. The NRC identified six "challenging and/or significant issues," two of which involve the steam generator.

7. *https://tinyurl.com/4wcejw6v*

2.3. The UK

The most solid developments have occurred in the UK. In March 2022, the government announced it would run a competition to identify the best SMR designs (a competition to find the best SMR was announced in 2015 but was not completed), although little progress appears to have been made on this until 2023, when a call for tenders by potential SMR suppliers was published.[8] The call for tenders had a budget of £20bn (€23bn), to be spent up to 2038. In March 2022, a new publicly-owned body, Great British Nuclear (GBN), was announced with the mission of 'helping projects through every stage of the development process and developing a resilient pipeline of new builds'.[9] Its first task has been to conduct the SMR competition.

Despite being announced in April 2022, GBN was only formally created in January 2024; it has no headquarters, it appears to have no budget, its management is only on an interim basis, and it appears to have no permanent staff. It announced a shortlist of six designs in October 2023 (the same designs as Czechia is considering except for KAERI SMART).[10] It is not clear whether any serious applicants were not shortlisted. GBN stated it would announce the designs that would be supported in Spring 2024 with contracts awarded in Summer 2024. The expectation is that the list of six would first be reduced to four, with two companies finally awarded contracts. This timetable was quickly overrun and a decision on the two successful companies is not expected before Spring 2025. The Nuward design has been withdrawn, but the other five shortlisted companies, including NuScale, submitted bids.[11] In September, the remaining shortlist of five was reduced to four with the rejection of the NuScale bid.[12]

There is a parallel, but apparently unconnected, process of reviewing SMR designs in the Office of Nuclear Regulation's (ONR) Generic Design Assessment (GDA) process.[13] Companies apply to the government, which carries out a 'readiness' assessment to determine whether the ONR will be required to review the design. The Rolls-Royce design review commenced its GDA in 2022 and the Holtec and GE-Hitachi designs commenced their reviews in 2023 and 2024, respectively. Westinghouse applied for a review of its AP300 design in April 2024, and in August 2024, the ONR was instructed to carry out a GDA on the AP300 but by November 2024, this review had not started. NuScale did not apply for a GDA.

8. *https://tinyurl.com/3ezt2zcs*

9. *https://tinyurl.com/bdnjk29a*

10. *https://tinyurl.com/24tayrvv*

11. *https://tinyurl.com/2mhaf8jt*

12. *https://tinyurl.com/5b8kft2e*

13. Step 1 is primarily for information exchange, step 2, the first substantive assessment step, is to identify issues that need detailed examination, and in step 3, the applicant works with ONR to resolve these issues. While the ONR website states that the applicant must pay ONR's costs, and while this was the case for assessing large reactors, the government is paying the costs for the SMRs it has instructed ONR to assess.

3. The technologies

3.1. Rolls-Royce SMR

While Rolls-Royce talks about interest in export markets, it appears the UK is its only serious market prospect at present, at least up to the September announcement by the Czech government of a strategic partnership between the company and ČEZ.[14] It entered the UK Generic Design Assessment (GDA) process in April 2022, completing the first step of three in April 2023 and the second in July 2024. Completion of the third step is expected in 2026. At that point, and if successful, the design can be built at any site in the UK subject to site-specific assessments. It might take three years for a site to be selected and assessed, so the earliest a firm order can be placed would be 2029. In the parallel but separate process of selecting the best SMR designs[15] for the UK, the Rolls-Royce design was part of the shortlist of six designs being considered, with two designs expected to be selected to be taken through to a final investment decision.

3.2. GE-Hitachi BWRX-300

In the USA, the GE-Hitachi design started a 'pre-application review' in December 2019 with the NRC that is still ongoing.[16] There is no information on when this review might finish and when a full Certification process might start. Given that this is likely to take at least four years, it is likely to be complete around 2030 at the earliest. The design has been selected by the TVA for its Clinch River site, but until Certification is complete, the project cannot proceed.

In Canada, the design has completed two stages of the three-stage 'vendor design review' (VDR) similar to the US NRC pre-application review process, and the CNSC found 'some technical areas that need further development in order for GEH to better demonstrate adherence to CNSC requirements.'[17] No reactor design has been licensed for construction in Canada for more than 40 years, so it is not clear what review process a new reactor design would undergo and how long it would take. However, it seems likely that it will be several years before Bruce Power and Ontario Power Group are able to place firm orders for the BWRX-300 for their Bruce and Darlington sites.

In the UK, in January 2023, GE-Hitachi requested that a GDA be carried out on its design, and in January 2024, the UK government instructed the ONR to carry out the first two stages of a GDA. In September 2024, Stage 1 was still underway. This process is expected to take four years if all three stages are carried out, so it is unlikely to be complete before 2028, with first order unlikely before 2031.

14. *https://tinyurl.com/2au5kxax*

15. *https://tinyurl.com/24tayrvv*

16. *https://tinyurl.com/krr56xas*

17. *https://tinyurl.com/4wcejw6v*

3.3. Holtec SMR-300

In the USA, SMR (Holtec) did not initially propose its SMR-160 design to the NRC until late 2023, when its new design, SMR-300, was announced. SMR (Holtec) has suspended pre-application activities on the SMR-160 design[18] and is engaged in pre-application activities on the SMR-300 design. The design is, therefore, a long way from being orderable in the USA and the potential US projects identified, e.g., Oyster Creek, are a long way from being realised.

In Canada, the superseded SMR-160 design completed step one of the CNSC's VDR in 2020, but no further work appears to have taken place since then and the SMR-300 does not appear to be under consideration.

In the UK, Holtec requested that a GDA be carried out on its SMR-160 design in December 2022, and in late 2023[19] the UK government instructed the ONR to carry out the first two stages of a GDA. In August 2024, the design completed stage 1 of the process.[20]

GBN shortlisted the SMR-160+ (later renamed the SMR-300) in October 2023 for consideration for a contract to design, certify and build reactors of this design in the UK

3.4. Westinghouse AP300

The AP300 design was only announced in May 2023, so progress with regulatory reviews and identification of projects is limited. In the USA, the pre-application for design certification only started in May 2023. In the UK, Westinghouse applied for a GDA in February 2024, and in August 2024 the government instructed ONR to carry out the first two stages of a GDA. Unlike the Holtec and GE-Hitachi designs, no mention was made of a government contribution to the costs of a GDA. No review is underway in Canada.

The only identified project is in the UK, four AP300s for the Community Nuclear Project, a new private consortium only established in September 2022and listed as a dormant company in Teesside (NE England) until September 2023 with little apparent substance.[21] It claims the reactors could be in operation by 2034, but this is unrealistic given the steps that need to be accomplished before the completion of new reactors. Nevertheless, the AP300 was one of the six designs shortlisted by GBN for UK government contracts.

18. It is not clear when the SMR-160 design was replaced by the SMR-300. There was no announcement about this by Holtec. The ONR reported it had started a GDA on the SMR-300 in October 2023, yet the GBN selected the SMR-160 for its shortlist of SMR designs in October 2023.

19. *https://tinyurl.com/2tjhpa5w*

20. *https://tinyurl.com/2tjhpa5w*

21. *https://tinyurl.com/4pavw5n5*

3.5. NuScale VOYGR

The Utah Associated Municipal Power Systems (UAMPS) project to build NuScale reactors in Idaho was announced in 2015 as a project for twelve 50MW reactors. It was subsequently revised to twelve 60MW reactors and then to six 77MW reactors before being abandoned in December 2023. The 50MW design started a Certification Review by the NRC in 2016 and was completed in 2023,[22] by which time the design had been superseded by the 60MW and then the 77MW version. The 77MW began a new review with the NRC in 2023, with completion expected in 2026.

In the UK, NuScale has not requested a GDA. In Canada, the NuScale 60MW design was reported to have started a VDR in 2020, but the design is not in the CNSC's list of completed and ongoing VDRs and does not appear to be a serious candidate for any Canadian SMR projects.

4. Conclusions

The flow of announcements about developments with the SMRs has continued unabated in 2024, but the only firm developments are mostly negative, notably the abandonment of the UAMPS project for the NuScale design and the abandonment of the Framatome Nuward design. Increasingly, authoritative commentators are raising questions about the credibility of the claims made for SMRs. For example, a former Chair of the US Nuclear Regulatory Commission, Alison McFarlane, said:[23]

"In the past few years, investors, national governments, and the media have paid significant attention to small modular nuclear reactors as the solution to traditional nuclear energy's cost and long build times and renewables' space and aesthetic drawbacks, but behind the hype there is very little concrete technology to justify it."

The essential process of comprehensive regulatory design review is far from complete, with the first designs, the Rolls-Royce SMR in the UK and the NuScale VOYGR design in the USA, expected to be completed in 2026. Other designs appear to be at least two years behind.

The issue for potential customers is that ordering SMRs will be a gamble at least until, and if, large numbers of the reactors are ordered. Until large numbers are completed and in operation, it will not be known whether the promises on cost and buildability will be fulfilled. For vendors, developing a design to the point of commercial availability is an expensive, risky process likely to cost in excess of $2bn, requiring cash to develop the design, take it through the regulatory review processes in target markets, and set up component supply factories.

The history of failed promises by the nuclear industry gives no reason to believe the promises made for LWR SMRs are any better founded than the promises made for their predecessors.

22. *https://tinyurl.com/36uyzdru*

23. *https://tinyurl.com/3sytexf7*

The Rolls-Royce SMR

Stephen Thomas

In September 2024, the Czech Government announced that ČEZ had selected the Rolls-Royce SMR over the six other SMR designs it had been considering.[24] On October 29, 2024, ČEZ signed a partnership agreement with Rolls-Royce SMR Limited. ČEZ also intends to invest in the company and become a 20% shareholder.[25] The first reactor is supposed to be built at the Temelín site.[26] Government ministers promised that the Czech Republic would profit by supplying equipment for the reactors not only in the Czech Republic but also for other markets. To date, the Rolls-Royce SMR development has been done in the UK with few other markets emerging. However, soon after the Czech announcement, there were press reports that Rolls-Royce was also expecting orders imminently from the Netherlands and Sweden.[27]

24. *https://tinyurl.com/2p8v2fe4*

25. *https://tinyurl.com/mr3ehbfp*

26. *https://tinyurl.com/mpufr6xn*

27. *https://tinyurl.com/2ce8ext5*

5.1. Development in the UK

The problem for Rolls-Royce in developing their SMR design is that while its brand is globally known and prestigious, it is a relatively small company; its core business is selling aircraft engines and, to a lesser extent, supplying submarine reactors using US designs. For a non-core business, it cannot afford to take the financial risk and the time it would take to develop a new reactor design to the point of being commercially available without strong assistance from government and the guarantee of orders. This assistance would include paying for design development costs, obtaining regulatory safety approval, setting up component manufacturing facilities and allocating sites for reactors. The extent of the risks and of the timescale is illustrated by the experience with the NuScale design. It has been under development for 20 years at a cost of about $2bn, including $1bn of US taxpayer money, yet the design on offer still has not completed a regulatory safety review, much less obtained a firm order, and after the collapse of the UAMPS project, its future is in doubt.

In 2017, Rolls-Royce announced its SMR design, then to be either 220MW or 440MW. The latter was later chosen and subsequently uprated to 470MW - about the same size as each of the four reactors in operation at Dukovany and most of the reactors built in the UK. As late as 2021, it was claiming that first power from a Rolls-Royce SMR would be in 2030, an assumption it said was 'realistic and low-risk'.[28] It claimed that by 2050, Rolls-Royce could be producing units in 'the high 100s to low 1000s'.

In evidence to a UK Parliamentary Committee, and in the company's product brochure, Rolls-Royce set down nine conditions that the UK Government would have to meet if Rolls-Royce was to proceed with developing the design. The toughest of these was a guarantee for 7GW of orders (16 reactors). Others included government funding to develop the design, build factories, allocate sites and assist with finding global markets.[29] These were conditions that no government could have accepted, but they set down the marker that strong government support was needed. The UK Government awarded Rolls-Royce £18m in November 2020, with a further £210m matched by £250m of private sector funding to allow the design to be developed sufficiently to get it through the UK's comprehensive safety review, the Generic Design Assessment (GDA). The GDA started in March 2022. The GDA comprises three stages; the most substantive is the third. Government funding was to take the design through the first two stages and these were completed in July 2024. Stage three has now commenced, but it is not clear how it will be funded and whether it can be successfully completed in the forecast two years.

The picture was complicated by a decision in 2022 by the UK Government to conduct a competition to identify the two best designs of an SMR most likely to be able to be deployed in the UK by the mid-2030s. The successful companies would be awarded contracts worth £10bn each, to be spent by 2038.[30] The Government claims the GDA process and the competition are entirely separate, although this makes no sense. What would be the point of giving a large contract to a design that failed the GDA?

28. *https://tinyurl.com/acsdsj6w*

29. *https://tinyurl.com/3zdrjj7h*

30. The government stated: 'The designs chosen today [the six designs shortlisted last October] are considered by the government and Great British Nuclear - the government-backed body driving forward nuclear projects across the country - the most able to deliver operational SMRs by the mid-2030s.'

The successful bidders in the competition would also be allocated sites by the government which would be suitable for SMRs. The budget and timescale clearly imply funding all the way through to completion of construction, including the purchase of two demonstration reactors of each design. A Final Investment Decision to buy the reactors is forecast for 2029. It seems highly likely that, given it is the only UK-based option, and given Rolls-Royce's status as a UK champion engineering company, the Rolls-Royce option will be one of the two successful bidders.

The competition is being run by the newly-created, government-owned Great British Nuclear (GBN) company.[31] In October 2023, GBN announced a shortlist of six companies (likely to have been all the applicants) including Rolls-Royce, which it expected to reduce to four companies in Spring 2024 with the two winning companies announced soon after. In September 2024, the reduction to four companies was announced. As with the shortlisting, there appears to be little GBN had to do. One of the six shortlisted, the Framatome Nuward design, has been abandoned by Framatome, and the credibility of the NuScale VOYGR design is in doubt following the collapse of its US UAMPS order. It was therefore no surprise that the NuScale option was eliminated.[32] The other three designs are also the ones CEZ was previously reported as favouring: The GE-Hitachi BWRX-300, the Holtec SMR300 and the Westinghouse AP300.

The logic of the UK competition is hard to understand. If the priority is early deployment of the best designs, this implies choosing a design already close to deployment that does not need large development funding. While Rolls-Royce is a British-based company, the other three are all US-based, and it is hard to see how it is appropriate for UK taxpayers' money to be used to subsidise large US companies such as GE and Westinghouse.

If these contracts are concluded, it must be assumed they would be phased and dependent on successful completion of each stage, for example, the successful completion of a GDA. So, this phasing means that even such a long, apparently lucrative contract – up to £10bn, and running till 2038 - does not give Rolls-Royce any certainty that it will end up with firm reactor orders. The contract would cover just two reactors for each supplier, not the 16 Rolls-Royce wanted.

The date for FID of 2029 is not overly pessimistic. The GDA will take at least a further two years, and assessing the site and getting planning approval will take at least another three years if it is done rigorously. If it takes a couple of years to move from FID to construction start, and if we accept the claims that the reactors can be built in four years, that means the cost and reliability of the reactors will not be proved until the late 2030s.

If Rolls-Royce is not successful in winning orders in its home market, the UK, it is unlikely it will be successful in export markets. Potential buyers will want to see the technology demonstrated and proven.

So, while this GBN-run process is likely to be a step forward for the Rolls-Royce design, there still remains a significant risk that even if Rolls-Royce is selected through the competition, it could end up spending a large amount of its own cash and more than a decade of effort and still end up with nothing in terms of reactor orders to show for it.

31. This body was announced in March 2022, but the company was only created in January 2024; as of September 2024, the executives were all interim appointments, and all staff were seconded, with recruitment not expected to start until the permanent executive was appointed. The company still has no headquarters

32. *https://tinyurl.com/2atbaf8z*

5.2. Gaining public support

The Rolls-Royce design starts with a strong advantage in the UK and elsewhere because of the prestige of the brand; it is one of the few large British engineering companies with a global reputation. The British public will therefore be receptive to claims that the design will be a world-beater and that global markets will open up to it. If things are going slowly, government indecision, bureaucracy, red-tape and obstructive regulation will be blamed rather than any failings of the technology or of Rolls-Royce.[33] All potential customers, including the Czech Republic, will be under similar pressure to make an investment decision soon or risk losing out on a lucrative opportunity.

In 2017, Rolls-Royce forecast a global market of about 20 reactor export sales by 2035 in addition to the 16 it expected from the UK. Export orders were quickly promised, with an order for Jordan said to be close. In November 2017, not long after the design was announced, the Kuwait News Agency published a story headlined 'Jordan, Rolls-Royce sign MoU to build SMR in Kingdom'.[34] The order did not materialise.

Rolls-Royce uses the siting of factories and the jobs to go with them as weapons in its propaganda. In April 2024, it announced it had abandoned plans to build two component factories, citing delays in the government SMR competition as the reason.[35] Given that the final investment decision for reactors chosen in the SMR competition was not expected until 2029, it is hard to see why a factory would be needed in 2024.

33. *https://tinyurl.com/yc7czk7z, https://tinyurl.com/4vvr58m4, https://tinyurl.com/3bx9mzma, https://tinyurl.com/4kkdrzwd*

34. *https://tinyurl.com/yc3y6z4h*

35. *https://tinyurl.com/mr2ehffz*

5.3. What is the role of the Czech Republic for Rolls-Royce?

The ČEZ made it clear when it chose Rolls-Royce that it expects construction of an SMR to overtake construction of a large reactor in Dukovany, with the first SMR said to be 'in the 2030s', 'before the start-up of the new large Czech nuclear unit which is planned for before 2040'.[36] If the Czech Republic was not willing to order the first-of-a-kind of a new reactor design, this means its first order would not be until 2030, and if it wants to see the costs and performance of the reactor demonstrated before it buys, it will not be till the late 2030s.

Reports that factories will be set up in the Czech Republic, implying less work for UK manufacturing, will also increase pressure on the Czech and UK governments to firm up their commitments to Rolls-Royce and accelerate the timetable. It would be surprising if similar offers of local employment were not made to Sweden and the Netherlands.

In the reports for the Czech/Rolls-Royce agreement, the Czech Prime Minister Petr Fiala said:

"That is why from the beginning we try not only to build them, but also to participate in their global production and development. In addition, the establishment of a strategic partnership between ČEZ and Rolls-Royce SMR will be a great opportunity for Czech companies that have many years of experience in the nuclear industry."

The ČEZ CEO Daniel Beneš said:

"The strategic partnership with Rolls-Royce SMR will allow us to use our long-term experience in the field of nuclear energy in combination with the high technological maturity of the British company."

The Rolls-Royce SMR CEO Chris Cholerton said:

"This important strategic partnership further strengthens Rolls-Royce SMR's position as Europe's leading SMR technology, and will put ČEZ, Rolls-Royce SMR and its existing shareholders at the forefront of SMR deployment."

However, it is not clear what any agreements already signed commit the parties to and firm orders may well be some years away unless Czechia takes a rash decision to place an order for a design that has not been approved by a credible regulatory body much less been proven in construction and operation.

36. *https://tinyurl.com/2p8y2fe4*

5.4. Conclusions

Rolls-Royce urgently needs external funding to allow it to continue development of its SMR design up to the point that it can win firm reactor orders. Assuming all the prudent steps are taken, including completion of a comprehensive safety review, full evaluation of the site proposed, and establishment and deployment of the human and financial resources needed to build the plant, all the SMR designs considered by the Czech Republic (and the UK) are at least five years away from a firm reactor order being prudent. Given that none of the possible SMR technologies has been demonstrated, and that Rolls-Royce has no track record in supplying civilian nuclear power reactors, it would seem sensible to wait until the technology has been demonstrated and proven in construction and operation, taking the timescale back a further five or more years.

Potential customers for the Rolls-Royce SMR will be under continuous pressure to speed up the process, with claims that delays will mean the country would be 'left behind', as would opportunities to create local jobs, not just in building and operating the reactors, but also in supplying equipment for local and export orders. Forecasts of the costs and the possible speed of deployment have been consistently and grossly over-optimistic. The impression will also be given to new customers that there are large numbers of other customers for the design. This pressure should be recognised for what it is: Special pleading on the part of Rolls-Royce to shore up their business and reduce the risk to the company of developing a speculative technology.

Small Modular Reactors in the Czech Republic

Edvard Sequens
Calla – Association for Preservation of the Environment

As Professor Thomas has said, ČEZ has already chosen from what were originally seven verified suppliers of this technology and has placed its bets on the developed medium modular reactor from Rolls-Royce SMR. It has concluded a contract with Rolls-Royce SMR Limited on strategic partnership with the aim of contributing to producing these reactors. Although this concrete move forward had already been made, in mid-November 2024 an investigative proceedings was opened for the planned "New Nuclear Power Source SMR in the Temelín Locality" as part of the environmental impact assessment process, although the specific reactor technology has yet to be assessed. In addition to the South Bohemian locality of Temelín, ČEZ is drafting studies for siting an SMR in the localities where coal power plants have been shut down in Tušimice and Dětmarovice.

SUAS Group and Sokolovská uhelná are considering other foreign designs for small light-water reactors in their Vřesová locality (their other locality, Tisová, had to be excluded from consideration because geological conditions there are unfavorable). Currently feasibility studies for these are underway as part of the Phoenix program, supported by the U. S. State Department.

The BWRX-300 boiling-water reactor from GE Hitachi could also be built in the Czech Republic, though. The Polish industrial group PKN Orlen has bet on the successful completion of this type of reactor, and if they manage to develop it in Poland, Unipetrol will consider deploying it in its factory in Litvínov, Czech Republic or in its other chemical enterprises.

As far as the designs of small modular reactors developed in the Czech Republic go, it is still the case that both ČEZ and the other potential investors are not counting on really using them. This is understandable in the case of the advanced Energy Well technologies from the Řež Research Center and in the case of HeFASTo from ÚJV Řež, the development of which will take decades. The development of the concept for the pressurized light-water reactor CR-100, presented by the Řež Research Center in 2021, has been completely halted.

The main investor in the project for the DAVID SMR pressurized light-water reactor is the company Witkowitz Atomica, a supplier to Czechatom. This reactor is designed to supply both electricity and heat. Its planned installation performance of 50 MWe or 175 MWt should facilitate modular assembly on site according to need, in pairs of up to eight reactors. Ukrainian engineers are collaborating on its development and an attempt to take advantage of these reactors in Ukraine has been announced, which is where the pre-licensing assessments should take place. Representatives of this project were also meant to sign an "Expression of Interest" in 2024 with the Government of the Indian state of Maharashtra.

Scientists from Czech Technical University and the University of West Bohemia, who have presented a project for a heavy-water reactor called the TEPLATOR, are oriented primarily toward heating uses. This concept works with spent nuclear fuel and is incompatible with Czech legislation. For that reason, advocates of this reactor from the Teplátor a.s. firm are pinning their hopes on Ukraine and announcing the design of its first functional prototype there. According to the firm's representatives, a contract has been signed to supply this reactor to the Ukrainian city of Slavutych. It has not yet been licensed.

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