



The 3x Challenge: A Time of Transition for the Nuclear Industry

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By Paul Murphy

The pronouncement to triple nuclear capacity by 2050 was one of the major stories to come out of COP28.¹ It reflects a recognition of two important considerations: the challenge (and humanitarian / environmental imperative) of meeting Net Zero goals, and the importance of nuclear energy in achieving these goals.

However, after popping the champagne and preparing to toast this ambition, one has to wonder if someone forgot to bring the champagne flutes to the party. To quote Phil Jackson (former head coach of the Chicago Bulls), when asked about Michael Jordan's rumored return to basketball after his baseball dalliance/exile with the Chicago White Sox, "It's a reality, but it's not a reality." To create another mental image, the nuclear industry has been the dog chasing the car, but when it finally grasps the bumper in its mouth, it realizes it is the bumper of a bus. In short, missing from the 3x by 2050 story is, "how it is actually supposed to happen?".

So, with all the enthusiasm around nuclear energy's place in global decarbonization, how does the industry avoid squandering this opportunity? To spin another metaphor, it comes down to blocking and tackling – in other words, the basics.

What are the basics? Reasonable minds can debate at the margins, but the "basics" come down to creating viable projects, financing them, and delivering them.

Project Viability

For the last decade, the nuclear industry has been in a mode of technology development, relatively speaking. The enthusiasm around Small Modular Reactors and Advanced Reactors has dominated the nuclear conversation, but the developers of these new technologies now have to make the transition from technology development to project delivery. If reactor developers see themselves only as "technology providers," then someone has to play the role of "project developer." While national governments might drive demonstration projects forward with cooperative funding, and major regulated utilities can wear the "developer cap" (as project integrator), more entities are needed to file the developer role, if nuclear energy (both large and small reactors ... yes, large reactors are more relevant than ever, given the 3x Challenge) is going to meet the 3x Challenge. Absent the creation of viable projects, the 3x Challenge cannot be met – while it is critically important to set the 3x goal, it becomes meaningless unless projects are properly structured, which is a unique skill set.

In addition, even if developers do enter the playing field, three additional factors need to be addressed: (1) developers (absent major (i.e., well-capitalized) regulated utilities) will still expect a turnkey (albeit not a lump sum turnkey) solution from the vendors; (2) funding

(from governments) needs to be made available to support project development and structuring prior to Final Investment Decision (FID), given the length of time and cost from project conception to FID; and (3) cost overrun facilities (from governments; to be repaid from revenues over time) need to be put in place, especially for the first wave of new reactor builds.

To be clear, the risk is not about the technology; if it gets licensed by experienced regulators, it will work. Instead, it is about structuring and developing a “good project,” which takes considerable time and effort before the main financing can be obtained (not to mention the program development costs that newcomer countries must also fund). Yet, even if a “good project” can be crafted, government support still remains in order to achieve overall project viability, considering all the obstacles that nuclear power projects must surmount, unlike other infrastructure projects. Support, in terms of electricity offtake (amount, tenor, price) and completion facilities, can be justified on two grounds: first, the economic benefit analysis should demonstrate the larger benefits of the project that are not captured by the project’s owners (e.g., decarbonization, energy diversity, energy security, asset life, job creation (both temporary and permanent), supply chain and secondary economy, tax revenue, etc.); and second, the recognition that clean, baseload electricity constitutes critical infrastructure in modern society / within industrial economies.

Project Financeability

Traditionally, nuclear power projects have been funded by governments or by regulated utilities. For example, every commercial reactor built in the United States was built in a regulated market (at the time of construction). Examining new build efforts in the United Kingdom right now, the Contract for Difference and Regulated Asset Base approaches are essentially a return to regulated markets, without actually doing so.

There are lessons to be learned here. First, nuclear power projects need strong economics over the long term, recognizing that Gen III+ reactors will get licensed for 60 years, which means that they should run for 100 years (if properly maintained, recognizing that the Gen II fleet got was licensed for 40 years, and they are being extended to 60- and 80-year operating periods). Second, regulated structures are better at de-risking projects, from a financing perspective.

In the new technology space (and probably in the large reactor space for the time being, too), we will not be seeing lump sum turnkey contracts. That means that a reasonable (in terms of the cost of money and the repayment terms) completion facility will be needed to backstop the project. Absent such a facility, a financing plan will be incomplete, in which case both lenders and investors will be reluctant to support the facility.

Further, as mentioned previously regarding the need for a creditworthy, long-term offtake structure, if the pricing set in the offtake structure (either regulated or a long-term power purchase agreement or similar facility) is economically attractive for the project, the initial financing (higher risk during construction period, therefore higher cost of money) can be refinanced (as well as any government-funded element within the project, thus enabling the government to redeploy its capital) at more attractive rates, thereby lowering the average cost of capital for the project.

With vendors not well capitalized and constructors unwilling to expose their balance sheets to completion risk, the project owners are left with the pricing exposure on the projects. The only way to reconcile this current risk allocation within the market is to de-risk the project through other government-supported means, thereby creating the market liquidity that will be necessary to meet the 3x Challenge.

Project Deliverability

Even if the project is structured well and the economics and risk allocation would seem to support financeability, project execution – the deliverability of the project – has to be believable and achievable. Fundamentally, the industry needs to overcome the lost experience factor resulting from the lack of nuclear projects over the last several decades. In order to meet the 3x Challenge, multiple EPC² Contractors need to mobilize on a global scale. Similarly, the supply chain needs to scale up in advance of projects to support demand. This mobilization and scaling is not without risk, and here, again, is an

area where governments can support the nuclear industry, so that industry players do not suffer from exposures when projects are delayed or cancelled (see Japan Steel Works in the 2000s). Low interest loans, with adjustable and long-term repayment terms, could be one mechanism to encourage supply chain investment.

Further, while the first wave of projects might experience conservatism from EPC Contractors and supply chain participants, in terms of pricing and other risk factors, those same companies need to demonstrate how they will improve their risk strategies and pricing over time, recognizing that government support is not a blank check or an “all you can eat” meal. The industry must demonstrate now that it is willing to shoulder greater risks over time.

Finally, investment in people must occur. Young people must see the attractiveness of careers in the nuclear industry, as there is a need for personnel at all levels of the nuclear industry – developers/owners, operators, regulators, contractors, supply chain providers, labor (and we need a lot of it), and researchers. Once again, government educational support (undergraduate, graduate, trade schools, etc.) can help to give potential entrants the necessary push.

Concluding Thoughts

Several days after Phil Jackson’s quote, Michael Jordan did actually return to the Chicago Bulls, and they went on to win 3 more NBA titles. While it may seem that the 3x Challenge is insurmountable, we must recognize amount of operational capacity that was brought online in the United States³ from 1970 through the mid/late 1980s and in France⁴ from the late 1970s through the 1990s. Collectively, we used to know how to do this. Remember, though, that we kept it simple – we kept it to blocking and tackling. Further (and beyond the scope of this article, but equally worthy of thoughtful discussion), the regulatory process simply cannot take so long and be so expensive – it must be streamlined and harmonized (across jurisdictions) to facilitate more rapid (yet responsible) deployment. The regulatory authorities are essential partners in meeting the 3x Challenge, and such partnership does not need to compromise regulatory independence.

So, how do we get back to blocking and tackling? First, we really have to want to do “this” – meeting the 3x Challenge. We’ve said we want to do this, but are we really willing to do what it takes? If we are, the basic principles of project viability, financeability, and deliverability remain and stand the test of time. The 3x Challenge requires an alignment of industry and government. It also requires an “all hands on deck” mentality, meaning that no one nation can go it alone. The supply chain is international. The construction models will involve international partners. In short, collaboration among allies and friends will be essential (and necessary to counter Russia and China), especially in the early days of this 3x “moment” – getting started necessitates that we each focus on what we do best, moving on from “there” as we get farther along the delivery path. Finally, this global mobilization needs to consider the Developing World, adjusting our models and tools to account for some of the unique challenges for newcomer countries.

We all know that Rome wasn’t built in a day, and we won’t solve the 3x Challenge overnight; however, by taking a long view and by thinking in terms of fleet models and public-private partnerships, the necessary drivers can establish the path for all that needs to be followed in order to meet the 3x Challenge.

[1]<https://www.energy.gov/articles/cop28-countries-launch-declaration-triple-nuclear-energy-capacity-2050-recognizing-key>

[2]Engineering, Procurement, and Construction

[3]<https://www.world-nuclear.org/country/default.aspx/United%20States%20Of%20America>

[4]<https://www.world-nuclear.org/country/default.aspx/France>

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