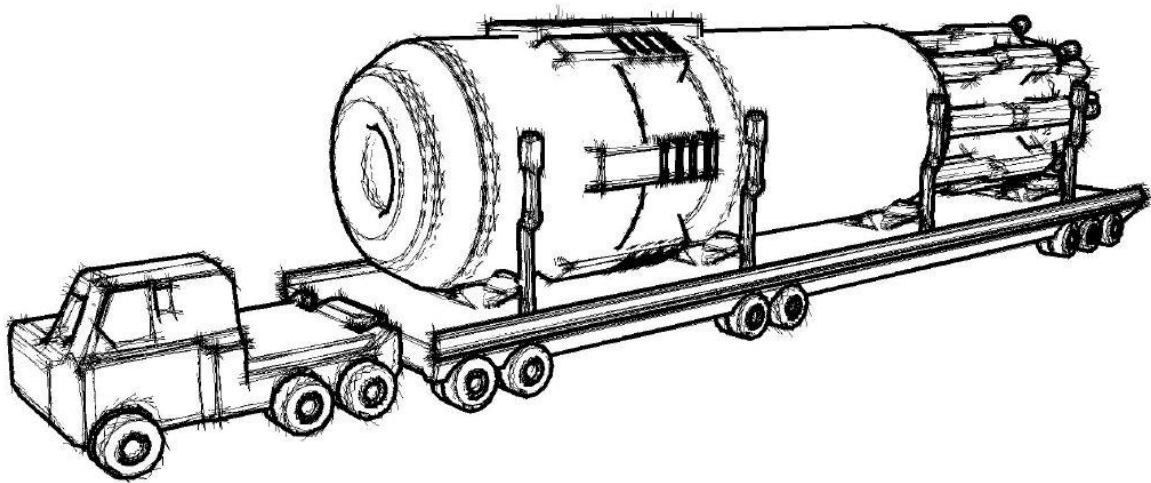


Small Modular Reactor deployment: NuScale Power in focus

Exclusive interview with Mike McGough, Chief
Commercial Officer at **NuScale Power**



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Foreword:

Last week I was given exclusive access to Mike McGough, Chief Commercial Officer at NuScale Power. In this far ranging interview I was struck by the amount of progress NuScale has made in the last decade, going from relative obscurity to one of the world's leading small modular reactor technology providers.

For those unaware of NuScale's history- It was founded based on research funded by the Department of Energy in 2000. By 2003 that source of funding had been completed. The scientists working on the programme sought to obtain related patents, this goal was achieved by 2007. NuScale Power was created with the view of commercializing the technology. After an extremely tricky few years of financial hardship, this nascent technology was spotted by Fluor, a giant in the EPC world. Since then NuScale has only grown, with a particular high coming in 2013 when the US Department of Energy announced that the company had won a major competition and would receive federal funding. This funding allowed the DoE to provide matching funds to share in the cost of developing, licensing and commercialising the reactor.

The NuScale story is one that clearly highlights the growing momentum in the small modular reactor industry. The appetite for large scale new nuclear projects, especially in developed nuclear markets, has waned. The inherent risks of cost overruns and vast capital expenditure, has spooked investors and utilities, causing many to stray away from large scale plants. The result has been a growing focus on SMRs as the future of the nuclear industry.

In this unique interview I asked Mike McGough to reveal the current state of play in regards to NuScale activities, the potential hurdles NuScale will have to navigate, their interest in the UK market and where they see NuScale growing globally.

I do hope you find this useful,



Tom Sapsted
Director
Nuclear Energy Insider
t. +44 (0)207 375 7523
e. toms@fc-bi.com

First and foremost could you perhaps give us an overview of yourself and your role at NuScale?

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Sure, thanks Tom. Obviously always pleased to have a chance to talk to you at Nuclear Energy Insider. We recognize you as one of the organizations that is trying to focus on some of the important issues in the industry and particularly those associated with SMRs by virtue of organising topical-specific conferences. We appreciate the work that you guys do.

My title at NuScale is Chief Commercial Officer which is kind of a broad title; it basically means I am responsible for the company's worldwide efforts to secure customers as owners and operators of the NuScale Small Modular Reactor.

Included within that purview are sales and marketing efforts, business development, communications, such things as trade shows and media management. I am the spokesperson for the company and commercial operations in terms of how we communicate with our customers and the development of proposals that are commercial offerings of our capabilities. So that, broadly, is the scope of my responsibility.

So we've had plenty of exciting news coming from NuScale over the last six months. Could you please give us an idea of what's been happening and where NuScale is up to at the moment?

It could take weeks to describe everything we've been doing in the last six months but I'll try to give you the high points.

Since we received the Department of Energy's funding award (that contract was completed last May) we've been growing the ranks of the company. We now have over 600 people on the project, including employees and contractors working to complete the design and to complete the design certification application. And the focus, of course, is to have the application go into the Nuclear Regulatory Commission late next year.

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Very recently we met with the NRC, and on June 17 we sent a joint letter to the NRC; joint between NuScale and UAMPS (Utah Associated Municipal Power Systems), they're our first customer and will be the first owner of a NuScale plant). And the work that UAMPS is doing today includes finding the precise site where that will be located, most likely somewhere in the state of Idaho. In that June 17 letter to the

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NRC we told the NRC that the DC application submittal date will be between October 31st and December 31st of 2016. So that is a very important specific date we've given to the NRC. The NRC was very eager to know - with some precision -, what the window of time would be for that submittal.

In that same letter, UAMPS also specifically identified to the NRC the date window for which they intend to submit their Combined Operating License Application, or COLA, for short. So UAMPS COLA submittal date will be between the 4th quarter of 2017 and the 1st quarter of 2018. That is the first calendar quarter. Those dates are important milestones that, of course, are predecessor events leading up to the construction and operation of the first NuScale project for UAMPS.

Now, you break that down into what other things are going on that need those steps, because those are obviously a long time from now, but there is a tremendous amount of work that has to be completed. We are very actively engaged with the Nuclear Regulatory Commission to ensure that we have a clear understanding of what their expectations are of what our design certification application will look like.

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Of course it's covered by law, what we have to describe in the design certification application. But since this will be the first application for a small modular reactor and as SMRs are different from big reactors, there are some things that require a different perspective from the NRC. So up to now we have made 48 presentations to the Nuclear Regulatory Commission and we have 45 additional planned and scheduled engagements with them that will review those types of details.

We are submitting 17 additional topical reports to the NRC. A topical report is basically a formal standalone licensing submittal that results in the NRC providing a safety evaluation report. So those topical reports are very critical--sort of subsets of our design certification application. We meet with the NRC New Reactors Office every week to review and plan and schedule, and the efforts leading up to that certification application submittal late next year. We've had seven meetings with them since the end of April and have four more scheduled for this month of July. In addition, we have four multi-day nuclear regulatory commission team visits that will occur to NuScale facilities in Oregon before the end of October. That is, before the end of October this year.

The scope of those will include the new reactors office management visits, the Nuclear Regulatory Commission QA and Projects Organization, review of our human factors engineering works and finally a very important visit by the ACRS (the Advanced Committee of Reactor Safeguards). They are touring our

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test facility, the control room simulator and the full scale upper module mock-up which we just completed a couple of months ago, and is being finally assembled actually this week. The ACRS visits will be in the third week of July where a very senior committee of NRC regulators will come and observe the work we've been doing.

So that's it. I'm trying to give you the high points. Those are a few of the highlights, much of which is focused on ensuring that we meet those critical milestones for submittal of the design cert application.

I will mention one other thing that we received from the Nuclear Regulatory Commission just a couple of weeks ago. In fact, it was formally issued on 8 June (that was the date of the letter). The NRC issued the NuScale Design Specific Review Standard. I think we've talked about this issue a few times in the past. The DSRS is a sort of guideline of understanding between the regulator and the applicant. In this case NRC has provided a draft of their expectations for how they will review the specifics of the NuScale design against new plant licensing requirements. We were very, very happy to receive this. In fact the NRC told us back in April that they would give that to us by the end of July, so to receive it in June ahead of schedule is always a good thing. We're very actively reviewing a document with 117 sections that require our review and comments. Our comments are due back by the end of August. This is a very important milestone that we've received the DSRS. And we are engaged in completing those comments and providing them back to the NRC.

We're also in the final stages of commissioning our rebuilt NuScale Integrated System Test (NIST) facility. This is the one third scale prototype which has been operational since 2003. We've done a significant overhaul and replacement of some of the components that have been used very hard for the last 12 years in preparation for starting the final certification tests, which will begin by the end of July.

You mentioned quite a few milestones there. Are there any potential hurdles you foresee at this point?

Well it's a gigantic schedule; the schedule has something like 9,000 line items in it so watching the critical path items on the schedule are many and varied and they change every day. Right now one of the important milestones is the testing itself.

So our attentions are focused in support of this design certification application which will be a 12,000 page document. That document describes how the plant is designed and will operate. But the NRC doesn't just accept our mathematical modeling, they want to know the results of physical testing. So our design cert application must show not just the calculations about how the plant will work, but it must be backed up by results of physical testing; that's what the prototype does.

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So the integrated system test facility allows us to do physical testing on a fully instrumented (over 700 instruments) one-third scale prototype. This allows us to take measurements of temperatures, pressures, flow rates, heat transfer and steam quality quality, and all those operating characteristics and say, this is what we said it would be in our mathematical modeling and this is what our instruments measured on an actual physical prototype. And then you compare the two and, of course, you want to see them match up and that you have validated your postulated performance of the physical equipment. The testing efforts are a very important piece of that puzzle.

And in other news it was announced that your CEO, John Hopkins, has been made Vice Chairman by the US Chamber of Commerce Board of Directors. How will this impact NuScale? And what does it mean for SMR deployment globally, if anything?

John is a respected senior leader in global business enterprises and has been active in the Chamber of Commerce for many years. We were delighted for John that he was asked to take on this role and he is enthusiastic to do it. John has been involved at NuScale for about four years and CEO for about three years, now. His involvement at NuScale overlapping with his senior role at the Chamber provides opportunities for, perhaps broader exposure to the activities of NuScale simply by virtue of the people John will interact with regularly in his Chamber role.

So we don't expect it will have some instant shot in the arm type of impact, but we do expect that it will provide some senior leaders of large companies - all of whom depend on reliable inexpensive carbon free base load energies for their enterprises – with new insights. They will perhaps become a little more familiar with the idea of a small modular reactor and with NuScale in particular.

Going forward, how are you going about developing your supply chain, both within the US and globally? And are you going through any form of procurement process at the moment looking to establish suppliers?

Yes. It's a broad question. I'll try and give you an executive summary. NuScale, as we were developing our technology back in the first decade of this millennium, we were building our supply chain in slow steps. Frankly, if I'm a supplier and I'm looking to provide my capabilities and equipment to a company I'm going to want to know that company has some potential of delivering orders.

So I would say that in the 2000 to 2010 period, even out to 2011, there was probably some reluctance by suppliers to make too big of an effort to sell their goods and services to NuScale because it wasn't

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clear how successful NuScale was going to be. We didn't have any customers, we didn't have secure financial backing, we didn't have sort of a clear line of sight to the completion of the design certification and we didn't have a clear sight of how, or if, we might be supported.

So if you go into 2011, late 2011, when Fluor stepped in, well that immediately got suppliers' attention, because a company like Fluor is not typically acquisitive by nature. But to make a major investment in a company like ours is a validation of what we're doing, from the perspective of a company that hopes to be the worldwide constructor of NuScale plants. So that was the first step, I think, that probably put a jolt into the supply chain and got attention from some major suppliers that we might not have received attention from before.

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But if you fast forward to the Department of Energy FOA competition when we won and when we were found to be, as we currently are, the sole remaining US developer of small modular reactors receiving nearly a quarter billion dollars of Department of Energy matching funds, that too got the attention of suppliers and the supply chain world.

Last year in August we held our first ever supplier day event and we said we were going to open our doors and invite anyone who wants to be a prospective supplier to come to NuScale and sit with our supply chain team and tell us about their company and capabilities. We asked them also to complete some supplier surveys and those types of things.

When we announced that event we thought we might get 20 or 30 people to show up and within a week we had 60 people signed up. When it took place less than two months after we announced it, 137 people representing over 80 companies from five countries showed up in Idaho Falls for our suppliers' day event.

From that, our Vice President Supply Chain, Scott Bailey and his team, have been able to find other companies that we may not have been aware of to help provide the various different services that are necessary to help us complete the design certification and eventually the completion of the manufacturing plant.

We've recently signed a major contract with Areva for fuel design; we are opening an office in Richland, Washington where some of that work will take place. As you know we opened a major office in

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Charlotte, North Carolina and Rockville, Maryland. We have expanded the reach of the company. And we have enhanced our ability to attract qualified suppliers by virtue of some of the successes we have seen in the market place and in other arenas.

You've now met many suppliers - both in the US and globally. If you had one message or one area of focus for them, what would you say to suppliers out there or potential suppliers for NuScale?

I think, again, if I'm a supplier I would want to decide how much effort I should put into supporting the development of specific components for the NuScale design. I would want to know that NuScale is actually going to sell their plants and therefore sell some of my supply components.

In one of our projects (when we reach the point where UAMPS or other prospective customers sign a contract with us) it will be for 12 NuScale power modules. So if you have a component that is in a NuScale power module, you will have 12 of them in the first project. (Any NuScale plant will immediately have multiples of the components that go into the NuScale power module).

The second thing I would say is that as the market has contracted for SMR suppliers. This is very similar to what happened historically globally in nuclear power plants. If you go back to the seventies, there were six or seven suppliers in the United States which shrunk down; now there's only two. There's Westinghouse and GE. There used to be Combustion Engineering and General Atomics and Babcock and Wilcox providing large nuclear power plants to the utility industry.

“If you have a component that is in a NuScale Power Module, you will have 12 of them in the first project”

If you look a few years back there were multiple suppliers actively developing small modular reactors; that market has contracted. So the suppliers who want to see their components go into the marketplace will recognize, by virtue of NuScale's leadership in that market, we are most likely to be the ones to provide them a revenue stream.

If you look beyond the United States, just taking the US for a moment, with continued pressure on carbon generated baseload, it's very easy to see how utilities might consider replacing their aging and retiring coal plants with a plant like a NuScale power plant.

We think there is a real opportunity in the US domestic market and there are similar pockets of opportunity internationally in places like the UK and China, some places in Latin America perhaps and the Middle East and elsewhere in Asia. That's why we're working as hard as we are to complete the design certification and to be prepared to meet the demand we see exists for our product.

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You've got the NuScale Exposition taking place in August. I'd like to hear a little bit more about that. What are the aims of this event, what's on the agenda, and what are you hoping to get out of it, who are you hoping to see there?

The NuScale Exposition basically arose from a demand from the marketplace; that's how we do things. If our market tells us they want certain things, then we will try our best to fulfill those needs. What has happened is, because of the things I talked about before, there's been a growing interest in what we're doing and the interest comes from the regulators (NRC is showing significant interest), the financial community, banking interests, people who may be financing future NuScale plants, people who are interested in taking an equity position, interest in us as a company, suppliers who are eager to engage with us, prospective customers and, of course there is a tremendous amount of media attention. Not a day goes by when I don't get a request from someone in the media to either interview or visit our facilities. In addition, we have a 24 member advisory board of prospective customers all of whom are eager to stay current on what NuScale has been doing.

If we answered every query for a visit to a NuScale plant we'd need full time staff to do nothing but host tours. This didn't seem a very efficient way of doing things and it could distract our employees from their real job which is to complete the designing, getting the testing done, getting the design certified. So we decided that because of this barrage of requests, to hold the NuScale Exposition at a window of time and provide all of those constituents the opportunity to see our physical facilities, to see the test facility, to see the control room simulator, watch simulated operational and accident scenarios on the simulator, and see the full scale upper module mock up.

They could also hear from senior officials from the Department of Energy, from senior elected officials both in the state of Oregon as well as federal elected officials, and to hear from the people at NuScale who are behind this project. There's nothing as powerful as seeing the people who are doing the work and seeing the equipment they have developed along the way.

During the NuScale Exposition we will have a number of presentations by these senior officials and we will have poster sessions on specific aspects of our design and poster sessions by 10 of our most important suppliers describing their role in the NuScale power module development.

So it's going to be a very busy couple of days with a lot of moving parts but we believe it will provide the opportunity for anyone that may be an interested constituent in NuScale get the opportunity to interface with all the right people. We're really pleased at the response we've received so far. It's an invitation only event so it's not an open house where anyone can come; we're being selective because we only have a limited number of people we can support; we already have over 190 registered attendees and it's still almost a month away. So it's promising to be a very exciting opportunity for us to

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showcase our capabilities and a great opportunity for people interested in a very short period of time, in 48 hours, to see everything we're doing.

You mentioned it was invitation only, is there a way which they could be invited to this event or is there a way they can get in touch with you?

Yes, absolutely. There is a link on our website called NuEx or they can just email us and they should provide an explanation of why they would like to attend. Space is somewhat limited and we're not encouraging general attendance but rather we will invite those whose work may be specifically related to the NuScale small modular reactor deployment.

Let's turn our attention globally I was at the NIA New Build Conference a few weeks ago in the UK and Andrea Leadsom, the Energy Minister, gave a very strong indication of a potential market for SMRs in the UK. How do you view the market over here; do you see an opportunity for NuScale; do you see an opportunity indeed for Britain as a whole?

Absolutely. We're very bullish about the opportunity for small module reactor deployment in the UK. We've been actively engaged in the UK for about a year and a half now, exploring and trying to understand what the interests and needs might be from the UK; and we've become bullish from those discussions. We basically did our research with knowledgeable people in the country. We think it's a tremendous opportunity as the UK goes through the evolution from aging nuclear plants and sorting out how to meet a baseload electricity supply need while at the same time meeting the aggressive climate change goals of the UK government. There is a very short list of baseload electricity generation resources to choose from.

“We're very bullish about the opportunity for small modular reactor deployment in the UK.”

We have also been following closely the average time to deploy large nuclear plants. And of course the price tag associated with large nuclear plants can be daunting. The price tag associated with a NuScale plant is substantially smaller and our short deployment schedule requires less time for deployment of capital. So we think the combination of the UK needs over the next 10 to 15 years and the design of our plant and its capability to meet those needs provides an excellent nexus of capabilities and needs. So we are very excited about the opportunity in the UK.

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In the long term the NuScale supply chain strategy is to have a manufacturing base, one in the US, one somewhere in the general EU and one somewhere in Asia. We think the UK is an excellent location where we might site a manufacturing location for NuScale power modules to be deployed within the European Union.

“We think the UK is an excellent location where we might site a manufacturing location for NuScale power modules”

And you’re coming to the *Nuclear Energy Insider’s SMR Summit in October* to give a keynote speech, or a representative from NuScale will. What are you hoping for? What will your message be here to the community in the UK? What are you hoping to get from the event itself?

Our Executive Vice President, Tom Mundy, who has been leading our efforts in the UK, will provide the keynote address. It’ll be a further opportunity for NuScale to put forth - to a broad audience within the UK - our views of our plant and how it might meet those future needs. We have recently done a substantial amount of work on what we refer to as the NuScale Diverse Energy Platform, NuDEP for short. In these studies what we have done (and this is at the behest of our prospective client base) who have said to us, you know your design for this NuScale plant has individual 50 mW modules in groups of 12, would it be possible for you to independently deploy those modules perhaps for some modules in the plant being used to generate electricity and some other modules being used for de-salinization, hydrogen production or coupled with an oil refinery or to be used to integrate with intermittent power supplies such as wind or solar?

We have completed studies on each of those types of applications and we believe because of the unique configuration of the NuScale plant it lends itself to deployment in a broad group of applications which haven’t been considered for nuclear baseload. So this incremental ability to deploy the modules will be something that we will talk about during the UK SMR conference.

Obviously, there’s a lot of wind being discussed in the UK. One of our prospective customers, UAMPS, as well as a prospective customer in the North West both have a substantial amount of wind generation and that wind generation can come on and off line very quickly in very large amounts. The NuScale plant is designed with a feature that we refer to as NuFollow(TM). NuFollow is load following that allows us to vary the output of the plant in very short time periods to match the intermittent generation that may come from a wind farm. We think these are some unique opportunities to deploy a NuScale plant in this regard in the UK as well.

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SMR
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Small Modular Reactor UK Summit
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Looking globally, you mentioned there about potentially setting up a manufacturing base in Asia as well, so do you think it could bring huge benefits to new areas?

One of the areas in Asia that we are very keen on is Japan. As Japan now begins the process of restarting their reactors, we believe there will be say in the next 5 years, 20 reactors operating in Japan that will be the restart of the existing fleet. The Japanese economy suffered severely with the loss of the 54 operating nuclear plants they had providing reliable clean baseload electricity.

Now this has caused the cost of natural gas in Japan to be in the high teens of dollars per mm btu....and with those kinds of natural gas prices that hurts their ability for industrial output and economic growth. The Japanese economy needs - and will depend upon - proper implementation of safe and efficient nuclear generation.

And the NuScale plant, because it is designed specifically to be immune to the effects of a station black out event like those that we saw at Fukushima, we believe that the Japanese people will be eager to consider those safety attributes for future deployment in Japan. We've had a number of contacts, with and from, members of Japanese government as well as Japanese utilities and we believe that in the next four to five years as they start to contemplate new nuclear power development, we believe that there is a great opportunity for NuScale SMRs to fulfill that need.

Just to wrap up, is there anything we should be looking out for in the press in the coming months? Any big announcements?

When those testing activities take place you'll hear discussions of those. You'll likely hear some additional significant announcements regarding some of the key parts of our supply chain that we've been actively negotiating with prospective suppliers.

You'll certainly see a summary of the NuScale Exposition once its completed, at the moment it looks like it will be a very successful event; there's quite a bit of media coverage planned. So I'm sure there will be some stories.

Conclusion:

The ambitious NuScale agenda clearly demonstrates the growing momentum in the SMR industry. Will this be the next generation of nuclear? Will the success continue in the US and abroad? Which suppliers, utilities, and nations will capitalize?

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NuScale will be discussing the answers to just a few of these questions at the SMR UK Summit taking place in London on 20-21 October. They will be joined by the likes of Lord Hutton, Dame Sue Ion plus representatives from KPMG, PwC, CNNC, Fortum, Rolls-Royce, Energy Technologies Institute, NNL and many more. This is the only place for you to make SMRs a commercial reality, address the next steps in siting and licensing and build the SMR supply chain for the next generation of nuclear energy.

To learn more visit the event website at: <http://www.nuclearenergyinsider.com/smr-uk/>

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