NAYGN DURHAM

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Sustainable Environment, Small Modular Reactors and the New Generation of Nuclear Technologies

SMR technology has been discussed a lot lately and we wanted to find out what it's all about

The need for actions to tackle high CO2 emissions has become a hotly debated topic around the world. A drive to move towards low-carbon economy and steer the ship in the right direction for climate change is scrutinized and dissected in many ways, with the common goal in hindsight and that is to save our planet Earth and its inhabitants.

According to Intergovernmental Panel for Climate Change (IPCC), in order to keep the temperature rise limit to the target 1.5C, governments need to cut emissions of greenhouse gases by 45% by 2030. So how do we cut so much of the greenhouse gas emissions? There are many possibilities and one obvious path as we all know, lies in the power generation industry. The shift from using oil, gas and coal to renewable sources such as wind, solar, hydro, and wave energy is one solution. The other solution that is often not discussed as much as the renewables is nuclear. Nuclear has a very small carbon/environment footprint for power generation that often goes unnoticed. To make things better, there are many new developments happening in the nuclear world that is worth noting.

Canadian Nuclear Laboratories (CNL) has broken down the description of SMRs into three parts.

Small: Per CNL planning purposes, an SMR is expected to produce between several hundred kilowatts to a maximum of 300 MW of electrical output. Even the maximum output is less than half of what a conventional power reactor produces (roughly about 800 MW).

Modular: Both the construction and operation of SMRs are referred to here. The plan is to construct them in modules as well as operate sequentially, so to operate based on power demand by adding or removing.

Reactor: This refers to a design based on new fuel, new material and new design with the ultimate goal of producing a safer, efficient and cost effective reactor than the designs created in the past.

Now that we know what SMRs are aiming to achieve, how can we tell if it aligns with the worldwide need to reduce CO2 emissions and lessen its impact on climate change?

Being a nuclear technology, SMRs have the advantage of being a low emission power source that resonates with the demand to lower greenhouse gas (GHG) emission. This will particularly be an advantage for remote, off-grid locations were clean energy sources are not very easy to find. Many SMR concepts are targeted for remote, off-grid communities or industries, such as mining. Currently, diesel is the main source of energy for these communities and industries which first of all is expensive and a major source of greenhouse gas emissions. The possibility of replacing diesel generators and fossil fuel based power in remote communities with SMRs is a win against our climate change battle. Also, the modular construction provides potential benefits in the transport, installation and decommissioning of the SMR. Production of smaller units will have a smaller carbon footprint in the construction, maintenance and operation of these reactors as well.

There are many concepts out in the market for SMRs already. One of the designs that intrigued me a lot is Terrestrial Energy's Integral Molten Salt Reactor (IMSR). IMSR employs a sealed and replaceable reactor core unit with a lifetime of about seven years. The ability to replace safely ensures that these reactors provide high energy while maintaining cost-competitiveness necessary for commercial use. Another interesting fact about these reactors is its use of molten-fluoride salt reactor which uses less than 5 percent low-enriched 235U. The molten salts are excellent heat-transfer fluid with high boiling point, which helps with capturing and dissipating the tremendous amount of heat produced via nuclear fission. If you are interested in gaining more insight on similar developments, please refer to the following link. The article delves into the journey of molten salts SMRs, recent developments and how nuclear can meet global energy goal while reducing our carbon footprint.

Besides the environmental benefits, SMRs could be used for a whole lot of non-electric applications and could potentially provide a more cost-effective option for power. To learn more and how it can benefit in particular, please go to the following page on the CNL website. And, if you have any interesting facts to share about SMRs, please let us know. Another article of interest to learn about nuclear power and its current developments in Canada can be found in the following link. It also touches upon SMRs in page four of the article.

NAYGN Durham Lead Focus

The success of our chapter is due to numerous individuals that show immense dedication, effort, professionalism and a genuine intent to support the future of nuclear power. From this edition onwards, we will be featuring one of our Leads in every newsletter for the great work they have been doing for us.

In this edition, we will get to hear from Wajih Hamouda, Public Relations Lead, NAYGN Durham.

1. Tell us a little bit about your academic and professional background.

I studied mechanical engineering at McMaster University. In my day-to-day work at OPG, I analyze and solve plant problems using the principles of statics, dynamics, vibrations, fluid mechanics, and heat transfer. The methods range from simple hand calculations to state-of-the-art numerical simulation tools.

2. What is your role in NAYGN Durham? What do you do?

I am a Public Relations Lead. Under Diana Urrego's leadership, we seek to raise awareness about nuclear energy by engaging with the general public. For example, we participate in events at Universities where we talk to students about working in the nuclear industry. As we all know, students generally don't get to meet many practicing engineers while studying, so they greatly appreciate the opportunity to speak to a 'real' engineer. In the process, they learn about the positive impacts of nuclear energy, and they then help us spread the word to their peers, friends, and family!

3. Why did you join NAYGN?

It was a gradual transition. One of the formative experiences of my time at McMaster was a visit to Fukushima in 2013, after the unfortunate tsunami and nuclear incident. I came to understand that an engineer's role in society goes far beyond the work that is done at the office. There needs to be an effort to engage the public, to explain the reasons we do our jobs and what the benefit is to society. You can have the most brilliant engineering idea, but if the public doesn't understand what it's for, then it's useless. I started becoming involved in NAYGN a few years ago through community events organized by Miral Chauhan, and slowly, under Matt Mairinger and Michael Saliba's encouraging and inclusive leadership, I got more and more involved and here we are today.

4. Any message you have for members?

If you are interested, get more involved! It's a great way to get to know your fellow co-workers and nobody will pressure you to commit more time than you're comfortable with.

Thanks to Wajih for his insightful piece. Stay tuned for more stories from our NAYGN Durham family in our upcoming newsletters. If there is particular topic you would like to see in the newsletter, feel free to message me with your suggestion.

About the author

Tanvir Ahmed works in the Components Engineering department at OPG's Darlington Nuclear Generating Station. He obtained his Bachelor's Degree in Mechanical Engineering from the University of Toronto (U of T) with specialization in Energy Systems and Machine Design. His interest lies in leadership and professional development, advocacy for carbon-free energy sources and innovation in power generation technologies. He is an avid traveller who enjoys photography, sketching and sports.