

The value of integrating small modular nuclear reactors in a renewable energy grid

PhD scholarship

Renewable energy is playing an increasingly important role in our electricity generation, and it is clear that future electricity grids will have substantial penetration of variable (non-dispatchable) renewable energy sources. This will help reduce the carbon intensity of the electricity sector, but it comes with its own challenges, such as balancing a variable load (the consumers) with a variable supply (the generators), frequency and voltage control, and increased price volatility. Services that address these issues are costly and, for the most part, not environmentally friendly. However, nuclear small modular reactors (SMRs) may provide a carbon-free, cost-effective solution to help stabilize energy grids while also generating additional clean energy.

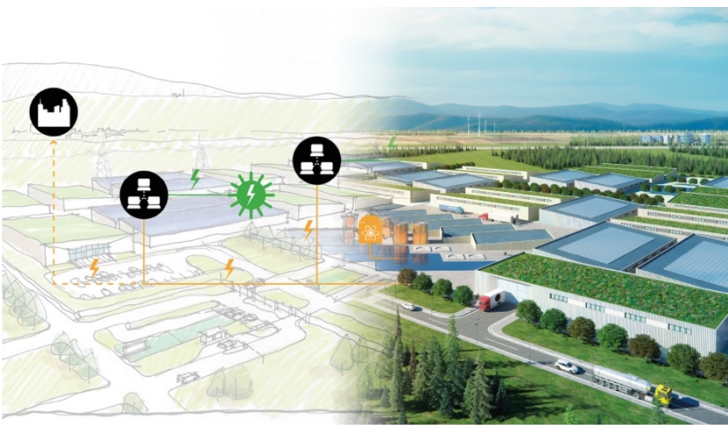


Figure 1 – Solar-nuclear integrated scenario, by third way energy.

Historically, nuclear reactors were considered “base-load generator” (i.e. produce constant power 24/7 at >95% capacity factor), but reactors can, and have been, also used to “load follow” the demand of the electricity grid. The reason why reactors mostly run as base-load generators is a purely economic one: once the reactor is built, the energy is virtually free (akin to solar cells), so to maximize profit one wishes to maximize energy production. However, with increasing share of non-dispatchable generators in the grid, more value might be

placed on load-balancing and ancillary services than on electricity generation. This raises the questions: what is the true value of nuclear SMRs in electricity grids with high penetration of renewable energy?

The project is supported by a generous scholarship of \$38,600/year stipend plus up to \$10,000 of travel support. Candidates with an exceptional track record may be eligible for additional scholarship top-ups. The candidate will be supervised by [Dr Patrick Burr](#) and [A/Prof Iain McGill](#), and will work within a tight-knit, inclusive, and enthusiastic group of diverse background. We value diversity and encourage applications from all backgrounds to apply. A background in any of energy markets, electricity grid operations, or nuclear power production is welcome.

Send email applications and queries to p.burr@unsw.edu.au. When applying, please include your CV and transcript of most recent or current degree.