



Laser cutting technology used for advanced industrial manufacturing.  
Source: UK Nuclear Advanced Manufacturing Research Centre



Cooks once spent hours cutting vegetables but are now prepping them in minutes with a food processor. Similarly, advanced manufacturing methods at nuclear power plants old and new are cutting through previously laborious tasks in a fraction of the time and cost.

## ADVANCED MANUFACTURING

# Costs on the chopping block

Technological advancements have radically changed the way today's nuclear plants operate, worldwide.

New technology also promises to reap massive savings in what has been the most challenging area of cost management for the nuclear industry: upfront construction costs.

Last year, the United Kingdom government brokered a landmark deal with the nuclear industry that aims to deliver billions of pounds in contracts to UK manufacturers and suppliers while industry must meet cost reduction targets, including a 30 per cent decrease on new build project costs.

Enter the Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC) based at the University of Sheffield, formed to help industry deliver on that promise while helping UK manufacturers win work in the nuclear field.

The innovation chefs at the centre are slicing and dicing—applying advanced manufacturing and construction innovations to simplify nuclear component manufacturing and assembly.

The techniques can sound obscure, but they're nothing short of revolutionary in exacting cost reductions while improving quality.

For example, the UK's Nuclear AMRC and its industrial and research partners are developing an adaptive fixturing system to ease the movement of large parts around a factory, and ensure precision through a range of innovative forging, machining, welding, inspection and assembly processes. The new system could halve the production time of manufacturing large components.

Similarly, factory-built and shippable modular components for Small Modular Reactors (SMRs) create substantial construction savings.

The added value begins right with the trades work in the factories. A collaboration between Nuclear AMRC and the US Electric Power Research Institute (EPRI) uses a SMR pressure vessel prototype to demonstrate new methods that reduce welding time from about 10 days to just two hours. The work, part of a larger four-year collaboration, aims to reduce the total time needed to produce a SMR pressure vessel from around two and a half years to less than 12 months.

Nuclear plants internationally are also integrating artificial intelligence (AI) into many applications, automating techniques for machining and inspecting large components. In one instance, a six-axis industrial robot has been equipped to grind, deburr and polish fuel racks, removing a time-consuming manual process that comes with a vibration-related health risk for workers.

AI and virtual reality are the newest technologies being employed to improve nuclear effectiveness. And yet, sometimes innovation is as simple as applying an already-proven process in a new way.

Such is the case with a well-established process to manufacture components by pressing metal powder under very high pressures and temperatures to achieve uniform structures with superior material properties. This process, used for 25 years in the oil and gas sector and more recently in naval nuclear applications, could be a cost-effective way to produce complex piping joints and large valve bodies in nuclear plants.

Cumulatively, these and other innovations being developed in the UK and elsewhere by industry, government laboratories, and academia worldwide are transforming the cost profile of nuclear energy to a slimmer version of its former self with a far healthier bottom line.