



# FPoliSolutions

## Stars Align for FPoliSolutions' Success

After the company's launch as a founder-driven, consulting startup in 2013, FPoliSolutions, LLC's (FPoli) initial DOE SBIR grant was awarded in 2016. FPoli's CEO, Cesare Frepoli, reminisces that "our passion was to create kind of a dream team so that we could go back to the drawing board and do things in a more modern, efficient way." And that is exactly what the SBIR grant started for FPoli and for the nuclear reactor design market.

The company's initial \$150,000 Phase I grant from the Office of Nuclear Energy (NE) in 2016 under the topic *Advanced Technologies For Nuclear Energy* was the first star to align for FPoli. The award, titled *Multi-disciplinary Integrated Data Management Tool for Industry Applications* enabled FPoli to begin to redevelop and commercialize Idaho National Lab's (INL) RAVEN<sup>1</sup> software – an integrated data and simulation management framework. The RAVEN software is essentially a workflow engine for nuclear reactor design with the capability to drive simulators and model complex systems. The development of RAVEN started in 2012 to satisfy the need to provide a modern risk evaluation framework to the nuclear engineering community. RAVEN eventually evolved into an open

## FAST FACTS

### LOCATION

Pittsburgh, PA

### TECHNOLOGY

Safety and simulation software

### PHASE III SUCCESS

Revenue: 7-figure revenues

Employment: 10 employees

### IMPACT

Accelerating carbon neutral nuclear technologies to market

### DOE PROGRAM OFFICES

Office of Nuclear Energy (NE)

### CONTACT

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<https://www.fpolisolutions.com>

<sup>1</sup> <https://raven.inl.gov/SitePages/Overview.aspx>

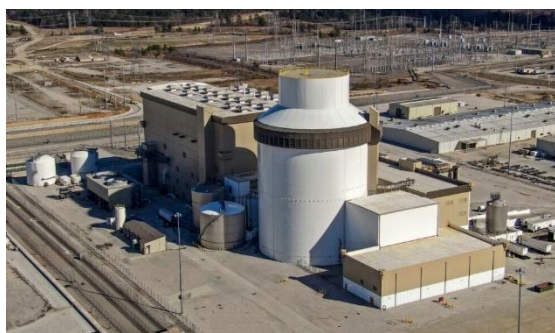
software platform for industry-wide use. The FPoli team set out to modernize the RAVEN solution and make it more accessible, usable and adaptable to modern nuclear reactor design alternatives. In addition to the technical milestones achieved during the initial grant, CEO Frepoli was able to begin building his dream team of nuclear engineers.

Subsequent to the 2016 award, FPoli applied for and was awarded Phase II and Phase IIb grants to complete the work of redeveloping and replatforming the RAVEN system. The three grants, totaling \$2.25mm, provided funding to embed software modules of the RAVEN system in a more efficient manner and to move the software to a cloud architecture to enable better multi-user environment. The result is a modern generic API which allows customization of services that leverage the ‘under the hood’ capabilities of RAVEN as a workflow engine. FPoli has been using the framework in its commercial work when dealing with modeling and simulation. This benefits its customer base which includes Advanced Reactor Developers, Nuclear Power Plant (NPP) operators, national laboratories, and the Naval Nuclear Laboratory<sup>2</sup>.



*Columbia Class Submarine*

As FPoli was working on the rebuild of RAVEN technology, two major technology transitions were occurring in parallel making for a star-alignment trifecta for success. The first of the market transitions was a major move to the cloud to platform critical software applications. Software-as-a-Service (SaaS) essentially was born with associated low-cost system development capabilities and platforms amenable to continuous deployment models. The access to services such as AWS allowed a low-cost bootstrap of FPoli IT infrastructure. The nuclear industry historically required very complex and expensive IT infrastructures which required investment only possible in large established corporations. The advent of the cloud allowed small startups such as FPoli to access vast computation resources at relatively low cost and most importantly in a scalable fashion. Per Frepoli, “leveraging cloud technology, you can really bootstrap a company very easily at very low cost. Software development and distribution tools for cloud technologies can significantly reduce startup costs.”



*Georgia Power and Light's Vogtle Unit 3*

The second technology transition that broke in FPoli’s favor was the advent of advanced nuclear reactors designs. Advanced nuclear reactors<sup>3</sup> (Generations III+ and IV reactors) currently under development hold the promise of a new Nuclear Renaissance, like the new AP1000 Vogtle Unit 3<sup>4</sup> in Waynesboro, GA, and NuScale SMR which are becoming more prevalent in the market. Many of the Gen IV reactors are still in early stage of licensing. In particular, the safety case for the deployment of new reactors remains a very expensive proposition. The

<sup>2</sup> <https://navalnuclearlab.energy.gov/>

<sup>3</sup> <https://www.energy.gov/ne/advanced-reactor-technologies>

<sup>4</sup> <https://www.georgiapower.com/company/news-center/2023-articles/vogtle-unit-3-goes-into-operation.html>

recent 2023 Advanced Reactor Roadmap published by NEI and EPRI indicates that the NRC review fees are expected to continue to grow exceeding \$70 million in some estimates for future applications. FPoli's strategy has been to streamline the legacy RAVEN toolset while developing a highly automated framework to handle the complex workflow of design and document the safety case. This will provide cost reductions and add transparency and easier traceability of information which is required in the regulatory process. Legacy methods are a mix of tools and methods which evolved over the history of the nuclear industry since the 1970s and require cumbersome and sometimes obscure processes to assemble the information needed to prove the safety of the plants. The licensing of the new reactor designs with such legacy methods would have been slowed down because of updates required to the collage of legacy system software. This dynamic drove a greater need for newer more advanced analytical tools and frameworks that could adapt to the advance nuclear reactor designs. FPoli was ready for the challenge. As CEO Frepoli recalls, "things really came together, the use of digital technology, for example, to expedite things to make it more transparent from a regulator standpoint."

In all, per SBIR.gov, FPoli has been awarded 8 SBIR grants: 4 Phase Is and 4 Phase IIs, totaling just under \$5mm. All of those grants were from DOE. By leveraging the RAVEN work and additional the SBIRs, FPoli has built out a suite of four product/service offerings<sup>5</sup>:

- OGMA: The Digital Implementation of USNRC Regulatory Guide 1.203 (from the RAVEN work)
- RISE: A Smart Safety Case Builder for The Design and Licensing of Nuclear Reactors
- ADALIX: A Digital-Twin Enterprise Infrastructure for Plant Asset Monitoring and Predictive Maintenance
- GAIA: Intelligent Dispatch and Optimization of Multi-Commodity Energy Systems

Each of the products were initially used internally at FPoli and imbued with the decades of experience that the FPoli engineers possess. Then, the software has been hardened and released as productized systems.

CEO Frepoli's nuclear engineering dream team is headquartered in Pittsburgh, PA and now up to 10 full-time employees, with one new employee onboarding in the summer of 2023. There are also two open positions in the company.

FPoli revenue in software sales and services in 2022 was seven figures; all directly attributed to the SBIR awards for the rebuild of a configurable RAVEN in the cloud. With the additional software products recently added to FPoli's suite of applications, 2023 revenues are planned to increase by nearly 20% (mostly from the RAVEN replatform) and 2024 are projected to nearly double in the \$3.5-\$4mm range. And as Frepoli looks to the future, he plans to dig into Phase III contracting possibilities<sup>6</sup>. The suite of FPoli software is immediately relevant at other agencies in the federal government that require nuclear reactor safety and modeling.

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<sup>5</sup> <https://www.fpolisolutions.com/software>

<sup>6</sup> <https://business.defense.gov/Portals/57/Documents/SBIR%20Phase%20III%20Contracting.pdf>