



Pacific  
Northwest  
NATIONAL LABORATORY

# Rapid Prototyping Lab

*Where engineering expertise, modern tools, and rapid processes combine to provide efficient, affordable solutions*



U.S. DEPARTMENT OF  
**ENERGY**

The Rapid Prototyping team provides unique engineering services to clients as they work to bring to reality first-of-a-kind systems, materials, and components. Our rapid design development (prototyping) services are based on a collaborative and multidisciplinary approach. Through hands-on development and experimentation, we work with clients—internal and external to Pacific Northwest National Laboratory (PNNL)—to develop working solutions that can be a starting point for final design development.

From three-dimensional (3-D) computer-aided design to 3-D printing, we have a multitude of advanced tools at our disposal for solving advanced engineering problems. We work out of our own laboratory (Room 1228) in the Biological Sciences Facility on the PNNL campus. Considered a true makerspace, the laboratory is where we explore the performance of prototypes through a process of rapid iterations.

Recent R&D 100 awards and multiple patents prove our team's strengths in problem-solving and designing field-deployable solutions.

## Expertise

With a range of services and technologies, we are the perfect one-stop shop for all phases of your project's life cycle, from prototype design to experiment, and throughout all phases of testing. This not only assures continuity, but provides the following additional benefits:

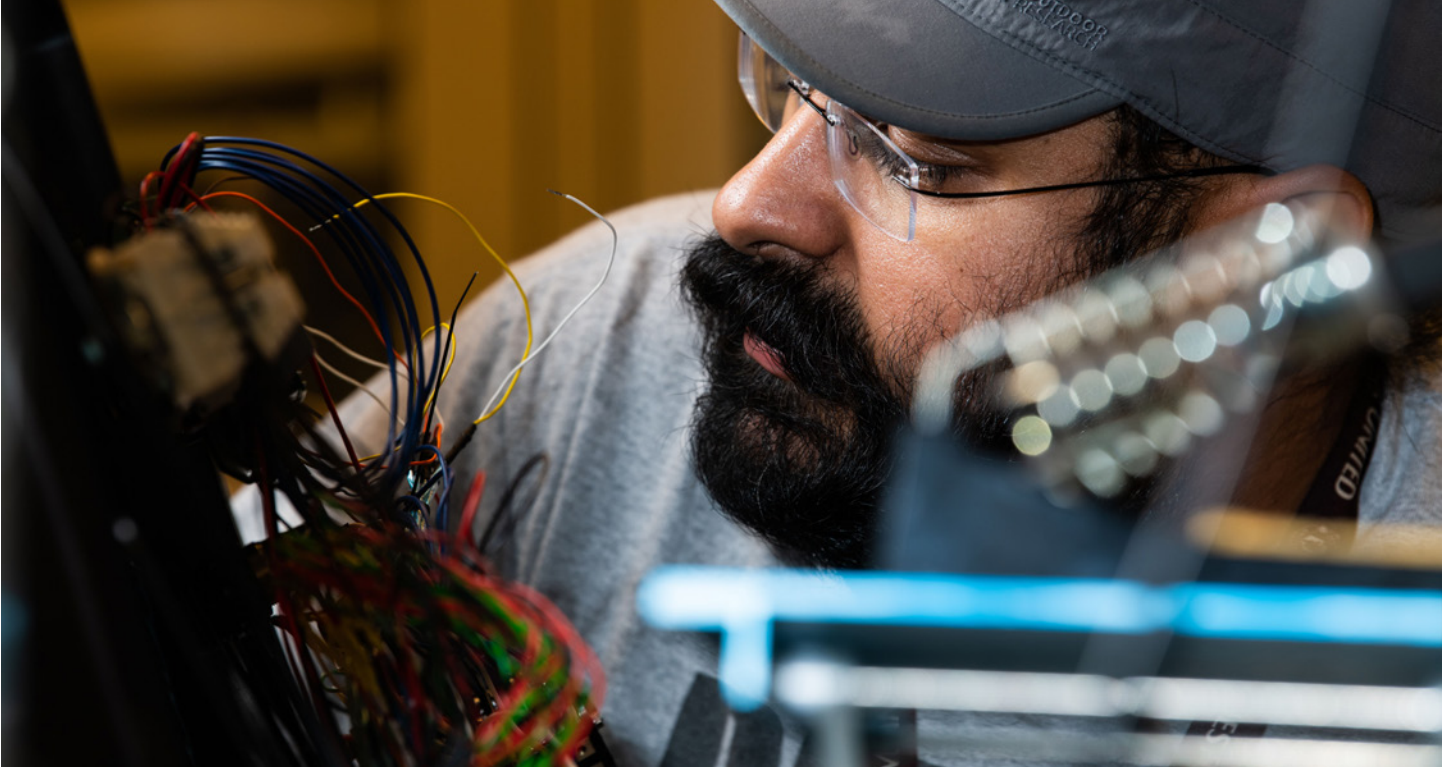
- design development, even with a limited budget or tight schedule
- design concepts, even with limited information or not-yet-known correlation to published information
- problem-solving, even if the design is not optimized, limits are not known, or a solution is not obvious
- assistance when conventional fabrication techniques are not practical
- innovative engineering review or analysis; brainstorming
- independent analysis and testing
- computer code validation of designs that may include thermal or flow variants



## Approach

The rapid prototyping team prides itself in its “design thinking,” an iterative and collaborative, non-linear process that starts from a deep understanding of clients' challenges. This, in turn, drives a cycle of new prototype development and testing that rapidly evolves ideas into solutions.

We then commit to an agile methodology, by which clients partner with us on the project's management. This results in “sprints” that ultimately shorten a potentially onerous feedback loop.



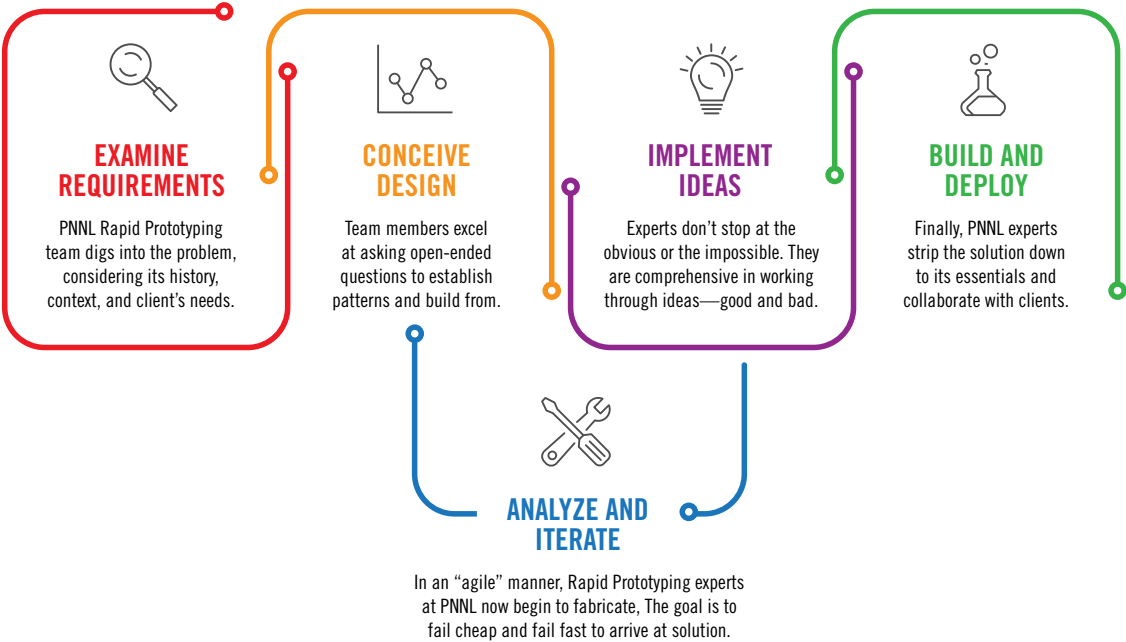
# Services

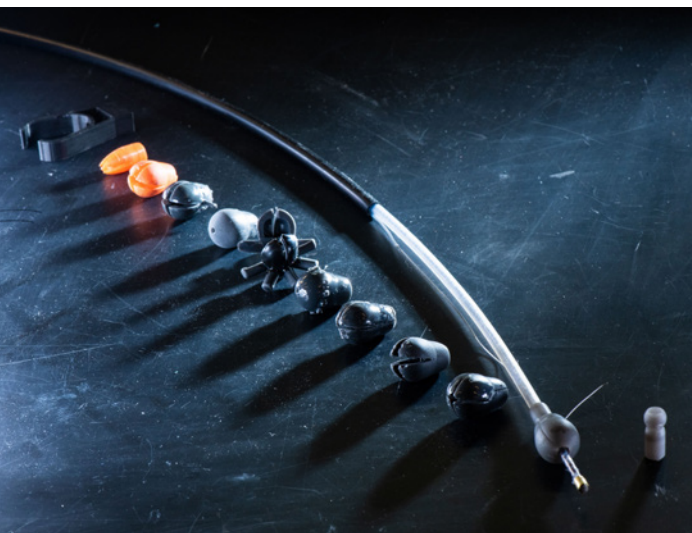
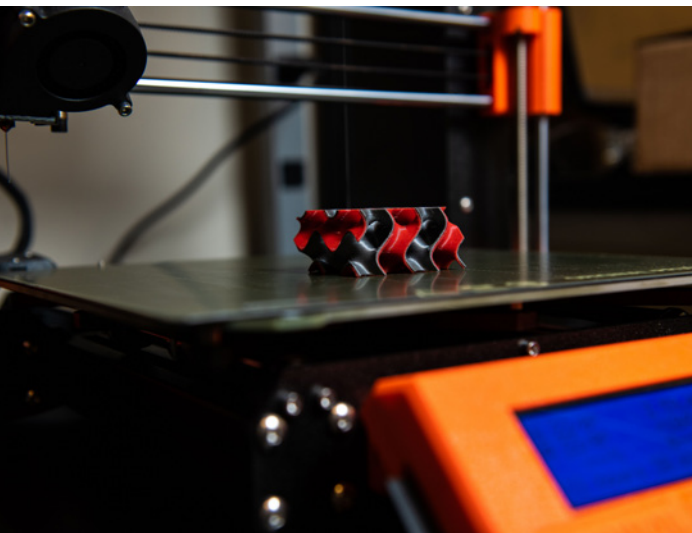
## Rapid Prototyping Team

Team members use broad hands-on engineering expertise and modern equipment to design, fabricate, and test prototypes to meet clients' mechanical, electrical, chemical, and control systems objectives.

The team overcomes clients' problems by using electronics, 3-D printing, rapid fabricated parts, mechanical construction, parasolid design, computational modeling, and simulant selection.

### The Five Phases of PNNL Rapid Prototyping





## A Closer Look at the Process

**EXAMINE** – Dig into the client's problem, taking its history, context, and the client's unique needs into consideration.

**DESIGN** – Use open-ended questions to establish patterns and use the answers to build from. Some of the approaches and tools used in this process include the following:

- parasolid modeling
- computational modeling
- schematics
- piping and instrumentation diagrams (P&ID).

**IMPLEMENT** – Comprehensively work through all ideas—good and bad—generated during the design phase. Some of the approaches and tools used in this process include the following:

- scaled systems
- instrumentation and control
- 3-D printing
  - resin, filament, metal
- product mockups
- scaled models
- mechanical construction
- laser cutting
- soldering
- functional testing.

**ITERATE** – Fabricate in an agile manner, with the goal to fail cheap and fail fast to quickly arrive at a solution.

**DEPLOY** – Strip the solution down to its essentials and collaborate with clients on final steps.

## Ready to partner with PNNL?

An initial 'free' consultation, typically an hour, is available to explore your needs and potential savings in cost and schedule.

### For more information, contact:

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Photos by Andrea Starr | Pacific Northwest National Laboratory. All photographs taken following COVID-19 precautions at time of photo shoot.