

# Autonomous Control for Next Generation Nuclear Power: Hardware Validation with Emerson Ovation

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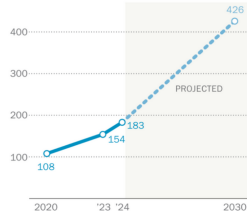
**Goal:** Develop autonomous hybrid control systems with mathematical guarantees of safe and correct behavior that lower operating costs for nuclear power.

## Problem:

Nuclear power is ideal for future energy needs, but is expensive.

Electricity consumption at U.S. data centers is expected to more than double by 2030

Total electricity consumption by U.S. data centers (terawatt-hours)



Source: Pew Research Center, Data from IEA

Source (30yr LCOE) Total (\$/MWh) O&M (\$/MWh)

Adv. Nuclear	88.24	16.15
Natural Gas	39.94	1.68

Source: EIA Annual Energy Outlook 2022

## Solution:

To reduce operating costs, we will build autonomous controllers with mathematical safety guarantees.



Synthesizing Procedures with Formal Methods



Discrete Automata and Control Theory



Safe & Secure Autonomous Controllers

## Proof:

We will demonstrate TRL 5 readiness through hardware-in-the-loop validation with an Emerson Ovation control system.



Controller Implementation on Ovation



ARCADE HiL Interface



Simulated Nuclear Power Plant