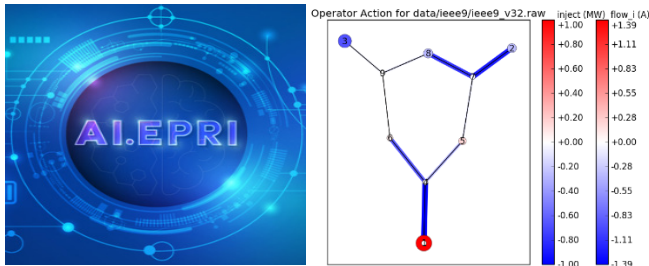


# Incubatenergy® – Open Innovation Collaborative: Reinforcement Learning Challenge for Utility Operations Control



## Background, Objectives, and New Learnings

EPRRI founded and has led the Incubatenergy Network since 2014, helping connect electric industry stakeholders to incubators, accelerators and their portfolios of emerging startups working in clean energy, energy storage, transportation, built environment and electrification. This *Incubatenergy Open Innovation Project* expands on this model to provide energy stakeholders an opportunity to engage innovators, entrepreneurs, and early-stage technology developers from across the globe to identify and rapidly assess potential solutions to specific, high-value, energy industry challenges.

This open innovation collaborative effort will identify an industrial energy–electricity innovation need (topic), solicit stakeholder organizations, both in and outside of the energy sector, to support a challenge ‘event’ to facilitate innovation and seed research, and define the challenge timeframe, organization, deliverables, and awards.

Project outcomes may result in:

- Identification of novel, unique, and/or non-traditional Artificial Intelligence/Machine Learning-based solutions to address an application needed for utility operations, grid systems or controls.
- Expose a diverse array of Artificial Intelligence and/or Machine Learning (AI/ML) technologies and approaches to grid operation of electric power systems.
- Acceleration of potential collaboration between domain experts within and without the industrial energy–electricity for research and development (R&D) and demonstration projects

## Project Highlights

- Enable digital assistant(s) for utility network operations control center operators
- Engage widely with computer science and artificial intelligence (AI) research community
- Utilize AI/Reinforcement Learning/Machine Learning algorithms for real world power system problems
- Shared model of research and innovation funding

## Benefits

EPRRI’s approach is to employ collaborative leveraging in this “open innovation challenge” by seeking techniques that generate R&D insights disproportionate to the available research funding. The goal is to accelerate electric power and energy system learning. This application of early-stage and emerging AI/ML technologies in real-world applications helps connect a broad array of stakeholders both within the industrial electric power, utility and energy technology space as well as across the AI/ML developer space.

The results of this project are expected to enhance the technical and business understanding of AI/ML technologies with potential deployment in utility operation of electric power operations and controls in connection with energy systems. This has the potential to enable implementation of promising novel approaches and solutions for improved capability and efficiency with cost optimization in managing grid assets and operations. Outcomes are intended to result in identification or exposure of applications and outputs that increase the accessibility of electricity markets, improve the efficiency of providing electricity to users, improve accessibility of renewable energy, and/or potentially reduce the cost to manage the power system of the future

## Project Approach and Summary

In 2020 a challenge a collaborative project team launched the Learning to Run a Pow Network (L2RPN) challenge. The aim was to get machine learning and power system specialists to compete to develop a reinforcement learning based agent to control a synthetic power network. The challenge builds on a multi-annual approach by the project

team to “gamify” the challenge of power grid control. EPRI participate on the steering committee of the project which is led by Réseau de Transport d'Électricité the transmission system operator in France.

The participants are asked to develop agents on a test power system with a set of generation, load and outage scenarios. The submitted agents are then placed in a scoring environment with never before seen scenarios. The agents are scored based on their ability to keep the power grid intact and prevent collapse by switching and redispatching on the system when overloads occur on lines.

Scientific advancement has been consistently stimulated by incentive competitions with prizes to enable innovative and collaborative approaches to complex problem solving, such as power grid control. Accordingly, prizes will be presented to the winning entrants, based on transparent scoring criteria and the challenge is operated in accordance with the rules of hosts of the platform, chlearn.org. As a condition of entry, all entrants and winning entries will be open sourced in the public domain by EPRI on a non-discriminatory basis for the benefit of the entire energy community, and the public.

If a challenge requires use or publication of data, all funders and participants must agree to provide or cause its provider to give EPRI and its funders, participants and the public, an unrestricted and unlimited license to the data, free of charge, and to require the same of its sub-tier providers.

If a challenge requires the use or publication of specific intellectual property, all funders and participants must agree to provide or cause its provider to give EPRI and its funders, participants and the public an unlimited and unrestricted license to the intellectual property, free of charge, and to require the same of its sub-tier providers.

Participation in this challenge is open to the interested public, subject to the referenced public domain license and publication requirements. The challenge concludes in October 2020 and the results will be presented at a (virtual) workshop at the NeurlPS 2020 conference, one of the most prestigious events in the machine learning field.

Funders are invited to contribute to the prize fund for the competition. Funders will be invited to participate in the steering committee of the project, to provide guidance in award criteria and selection, and participate in the implementation of the competition.

Funder participation and consistent representation is expected in all advisory committee working groups, planning sessions, and project meetings (virtually and in-person). Each funder must assist in:

- Defining the industrial power system challenge
- Establishing the assessment criteria
- Developing the awards (i.e., ‘best’ proposal, ‘most novel’ proposal etc.)
- Evaluating the submitted agents against the assessment criteria
- Assisting in down-selecting proposals and selecting awardees

### **Research Value**

This project results in the identification, engagement, and assessment of technologies that address industry-prioritized needs and research gaps and leverage peer resources to minimize cost and risk.

### **Deliverables**

- Open Innovation challenge topics definition
- Submitted proposal, with reviews
- Proposal screening and awardee identification

### **Price of Project**

Minimum US \$4,000. Project will be initiated once US \$20,000 has been contributed.

### **Project Status and Schedule**

The project duration is 3 months, with deliverable timing as follows:

- 2020 Challenge, results presented at a workshop at NeurlPS 2020

### **Contact Information**

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