Empowering Prosumers in Electricity Markets Through Market Design and Learning

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Challenge:

Distributed energy resources (DERs) provide prosumers the ability to actively participate in the energy economy. How should prosumers and aggregators learn how to participate in the wholesale-retail energy marketplace? Different actors here have different computational resources and access to information about the overall system.
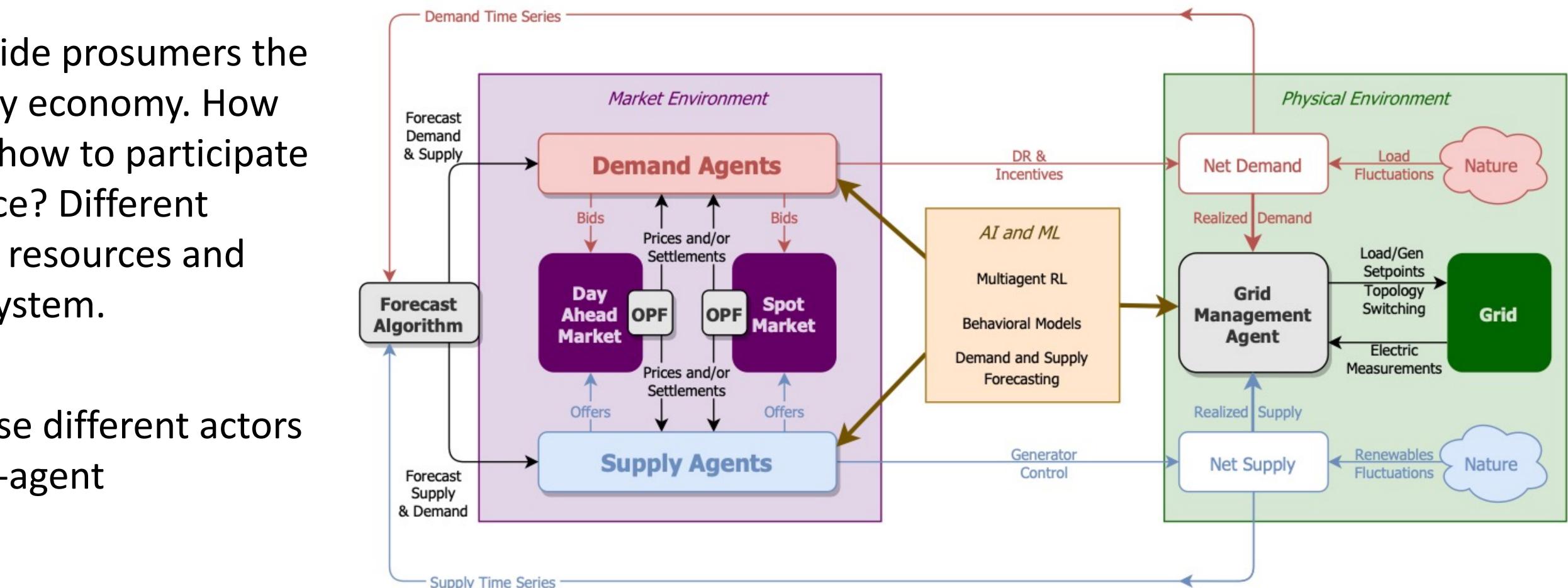
Solution:

Modeling, analysis and simulation of these different actors in the energy marketplace through multi-agent reinforcement learning (MARL).

Scientific Impact:

- Advancement of MARL theory and its practice within electricity markets. Theory will apply broadly to other CPS
- Creation of a simulation platform to understand learning algorithms and electricity market design

Electric utility companies and independent system operators need frameworks to analyze the impact of rapid DER integration at the grid-edge. This work facilitates DER integration and thereby, promotes a sustainable smarter grid.

This work supports specific activities for broadening participation in computing (BPC). PIs are committed to promote gender and racial diversity in their groups. Specific K-12 activities such as summer camps and curriculum development are planned.

Simulation platform to understand electricity market design is targeted for broad dissemination among the research community. Applications of MARL algorithms and its theory to other CPS will be explored.