



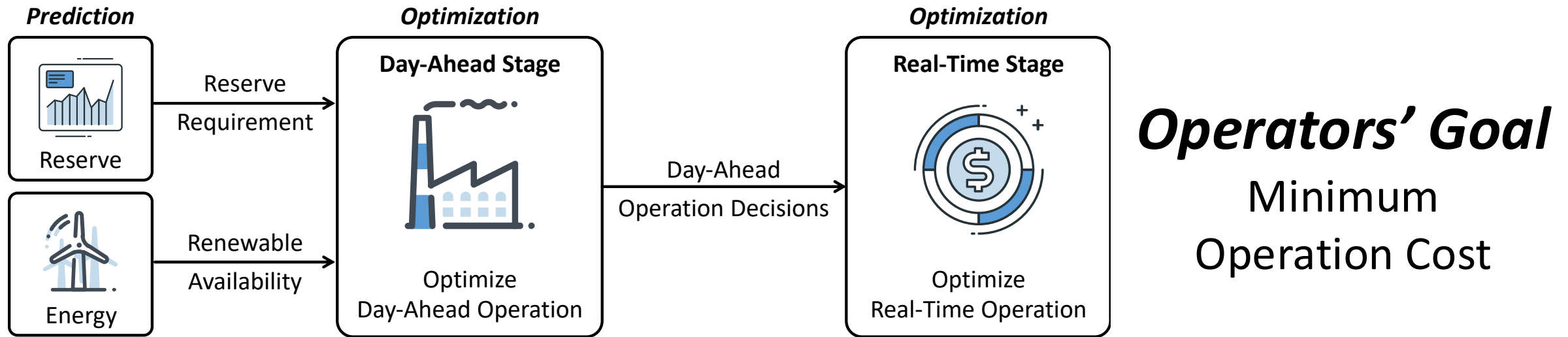
# ***Boosting Power System Operation Economics via Closed-Loop Predict-and-Optimize***

*Xianbang Chen, Ph.D. Candidate  
Lei Wu, Ph.D., FIEEE*

*Stevens Institute of Technology*

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# *Problem Statement: Operations in Open-Loop Predict-then-Optimize (O-PO) Framework*



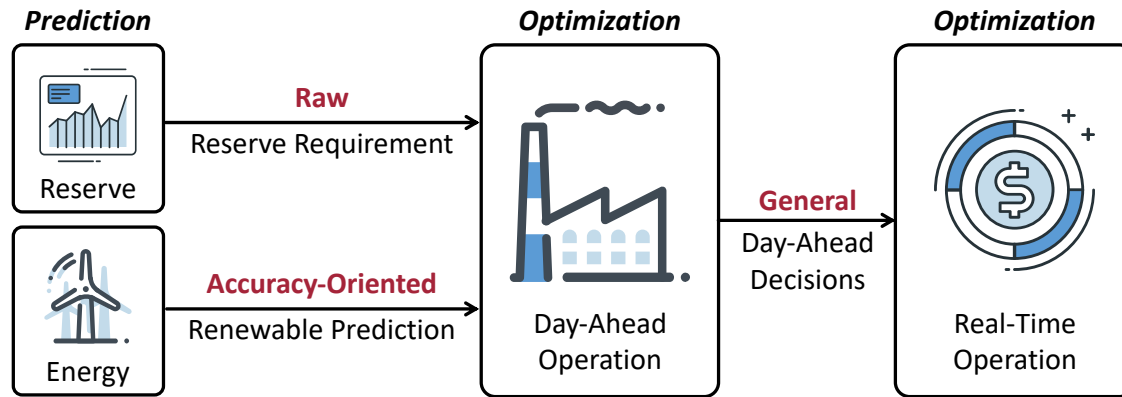
## *Economic Flaws in O-PO*

- **Redundant** reserve requirement
- More **accurate** prediction **may NOT** lead to **lower** operation cost as systems are nonlinear



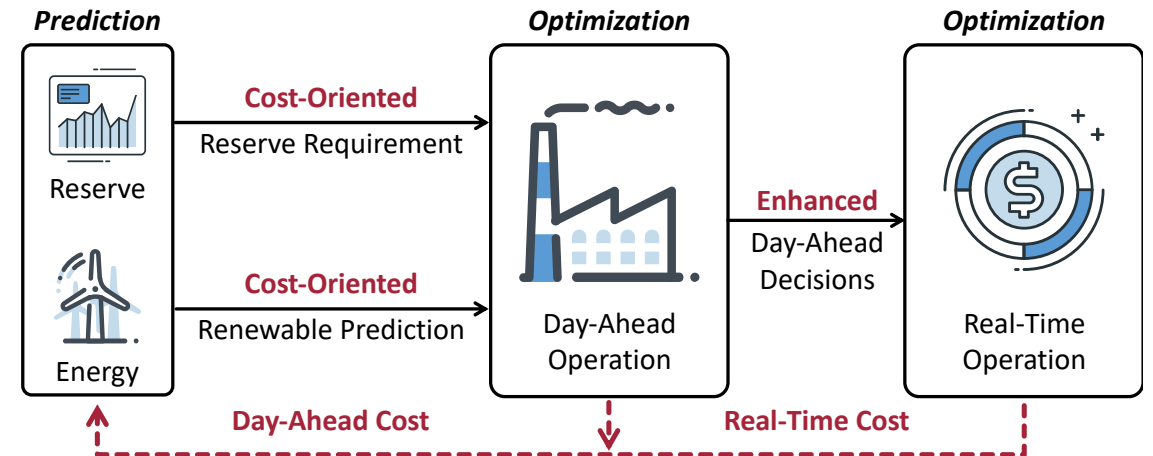
# Presented Solution: Operating in Closed-Loop Predict-and-Optimize Framework

## Open-Loop Predict-then-Optimize (O-PO)



- **Accuracy-Oriented:**  
Prediction pursues *statistical accuracy*
- **Open-Loop:**  
Prediction is myopic to operation cost

## Closed-Loop Predict-and-Optimize (C-PO)



- **Cost-Oriented:**  
Prediction pursues *lower operation cost*
- **Closed-Loop:**  
Operation cost is fed back to prediction

## ***Results on 4 Systems with Real-World Operation Data***

- **Effective Cost-Oriented Learning:**  
**0.82%-4.44%** improvement on cost
- **Compatibility:**  
Compatible with ***industry practice***
- **Applicable to Large-Size Systems:**  
Equipped with an ***accelerated*** algorithm

## ***Future Implementations***

- Boosting profit for Portland General Electric's hydropower projects



## ***Sponsors and Partners:***



**National Science  
Foundation (USA)**



**Department of Energy  
(USA)**



**Portland General  
Electric (USA)**



**PSEG**

**Public Service Electric & Gas  
(USA)**