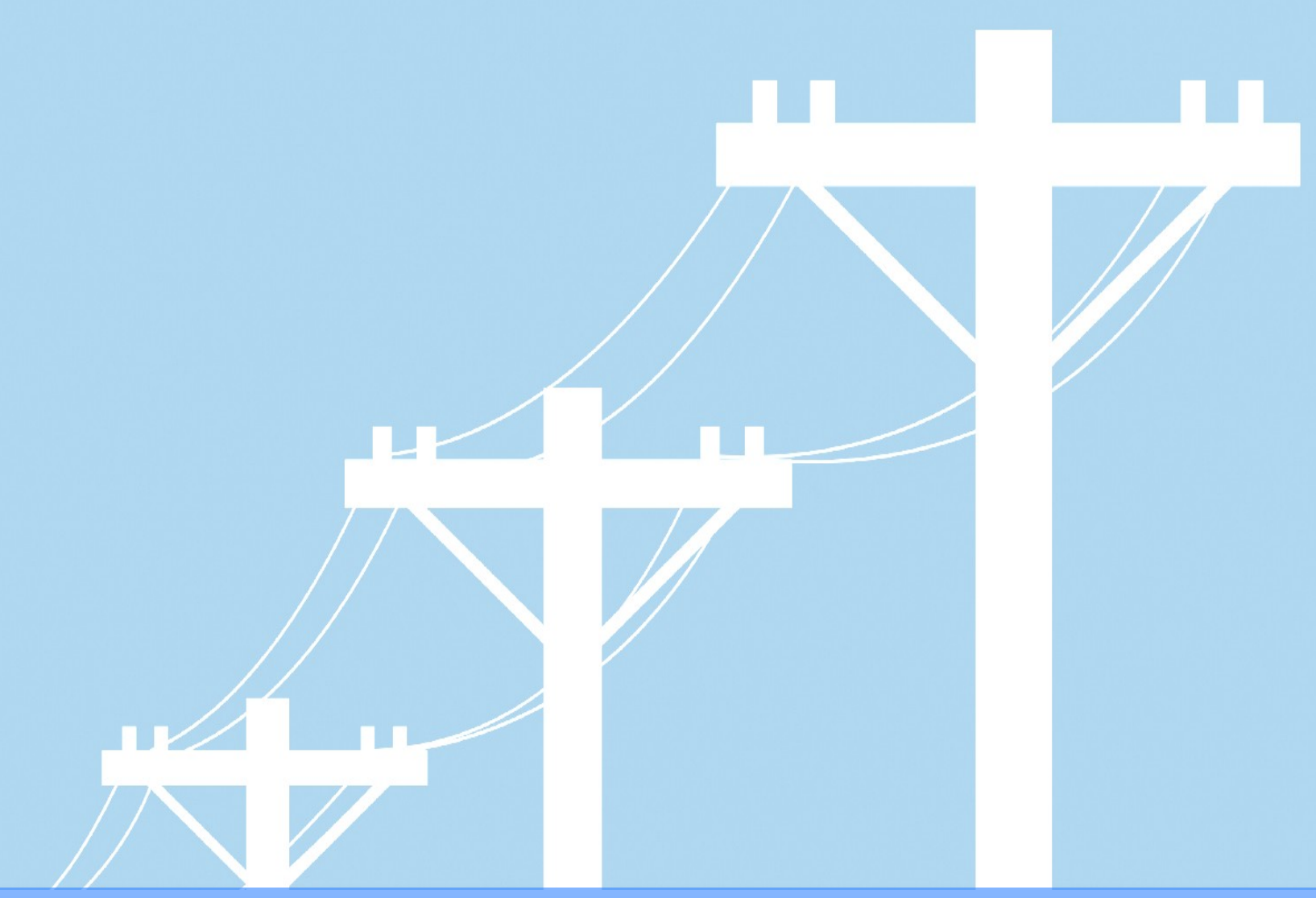


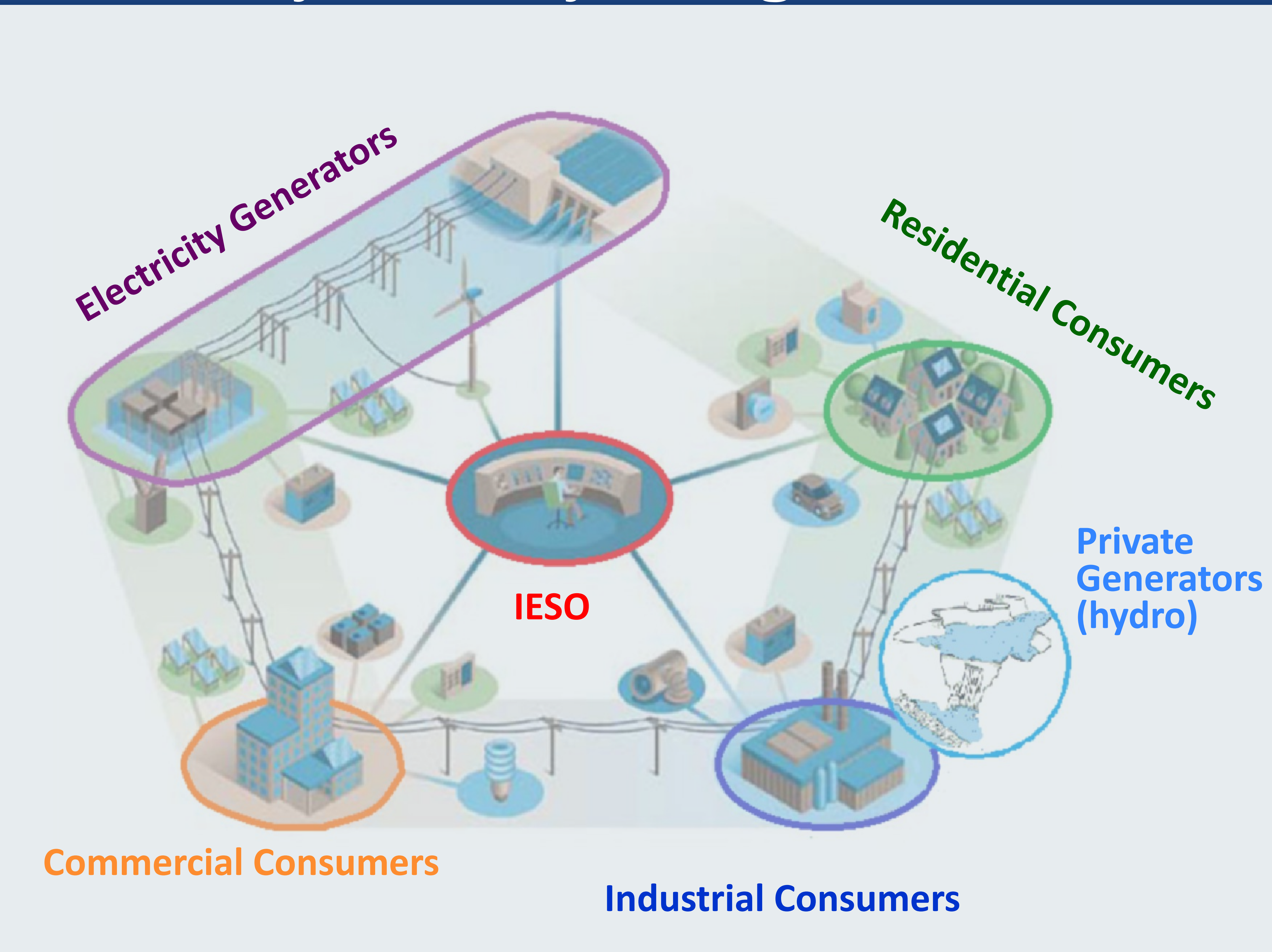
Electricity Cost Reduction with Optimal Hydroelectricity Generation



Background—Mining Company

- Company has private hydroelectric generation capability
- Generation capacity is insufficient to meet all electricity consumption
- \$1M lost through current generation strategies

Electricity Industry Background



Electricity Concepts

- Independent Electricity System Operator (IESO):** Balances the supply of and demand for electricity in Ontario
- Hourly Ontario Electricity Price (HOEP):** Base cost charged to customers who buy electricity from grid (\$/MWh)
- Pre-Dispatch Price:** IESO's forecast of HOEP
- 5 Coincident Peaks:** Charges to an industrial customer based on their contribution to the 5 highest peak demand hours in a year (basis for 66% of client's bill)

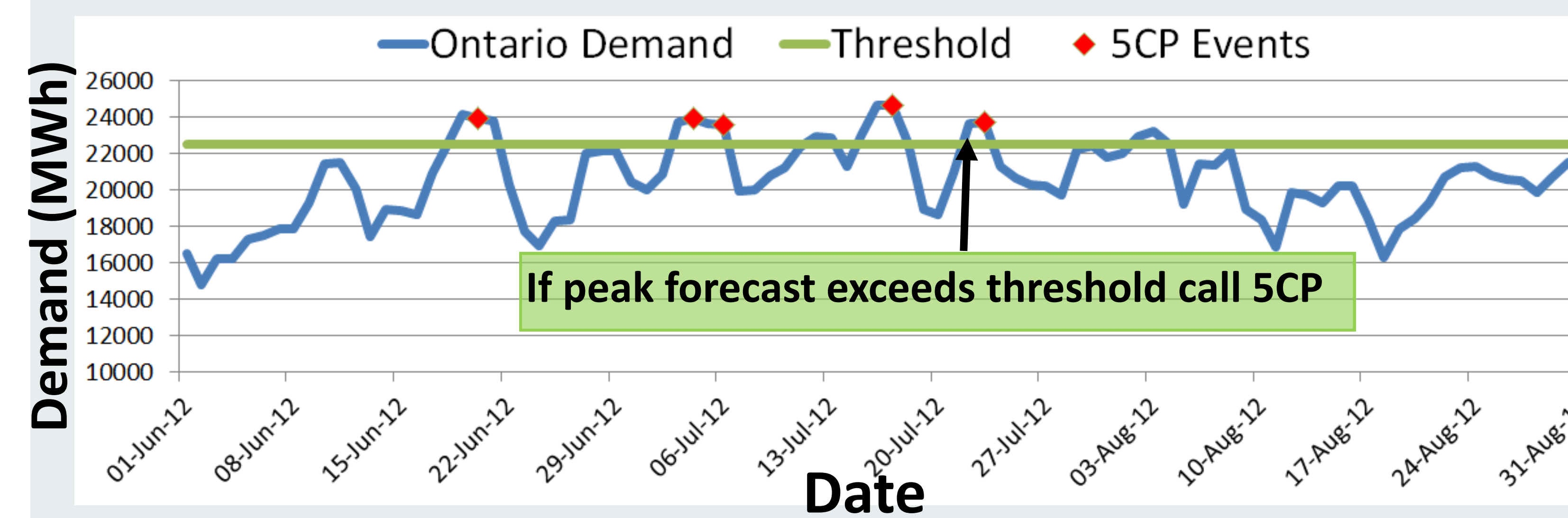
Objectives

Create a decision support system that reduces electricity costs while maintaining hydroelectric generation standards through:

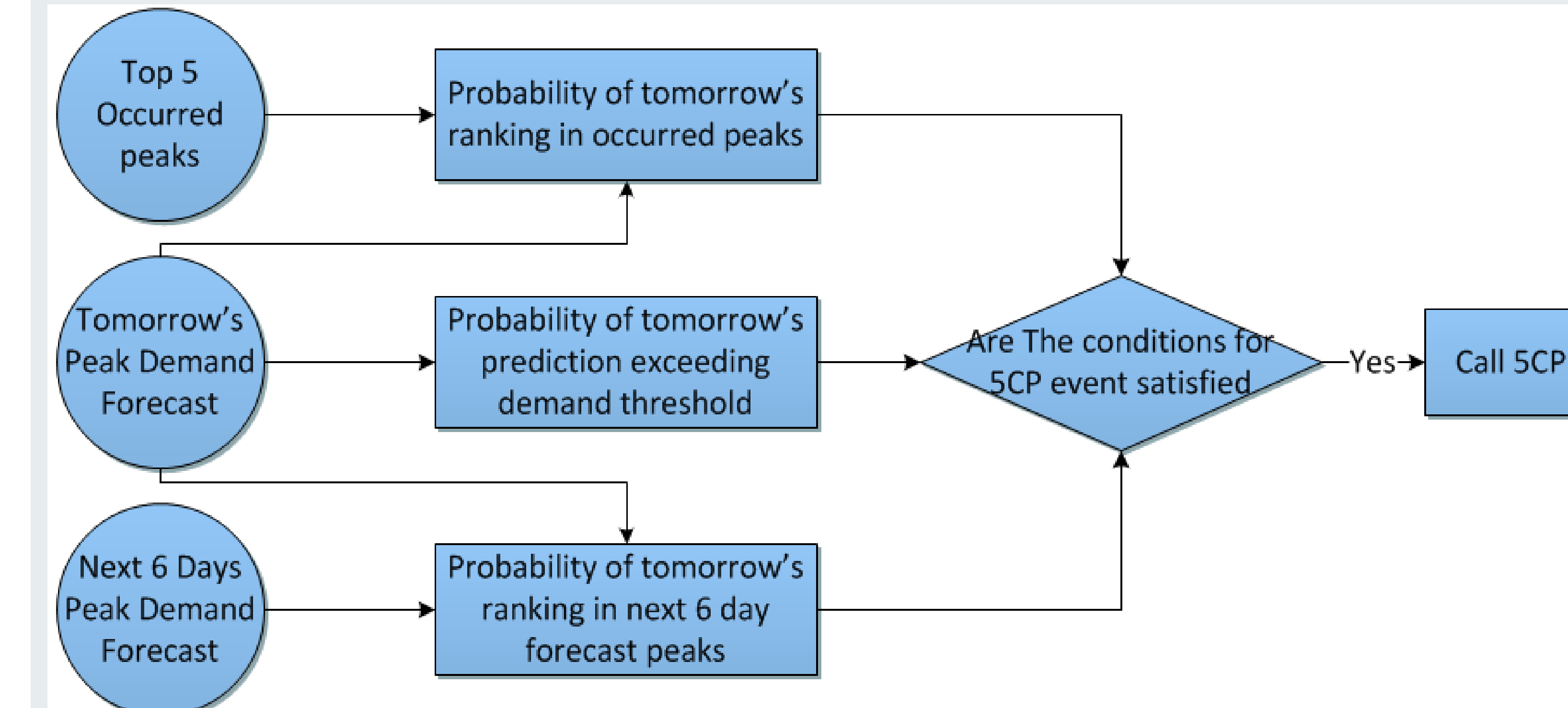
- 1 Minimizing penalties during high electricity-usage days
- 2 Maximizing the benefit of hydroelectric generation

1 5 Coincident Peak Predictions

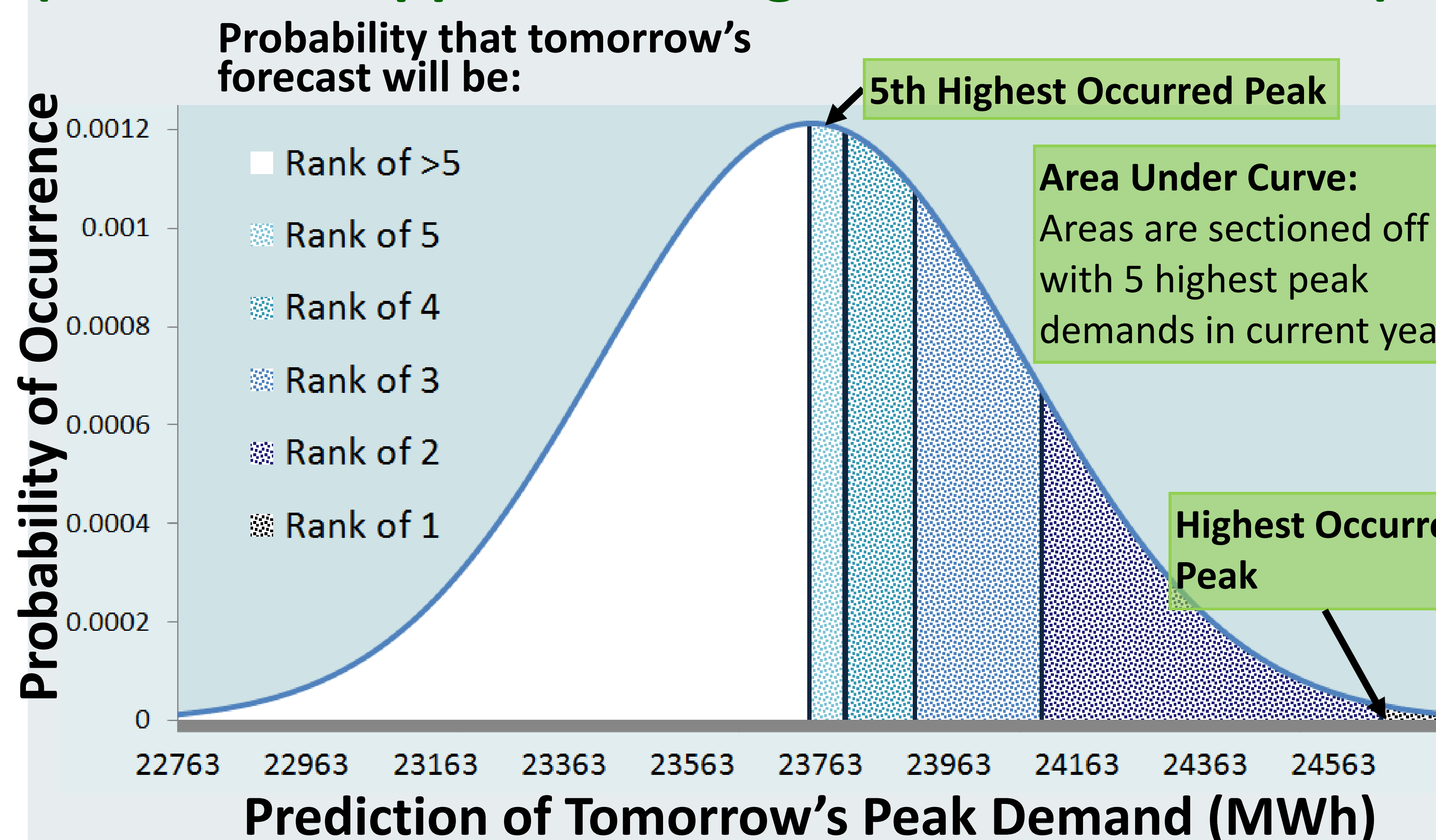
Current Strategy — Constant Threshold



Proposed Strategy — Stochastic Prediction



IESO's Next Day Prediction vs. Occurred Peaks (Stochastic approach using normal distribution)

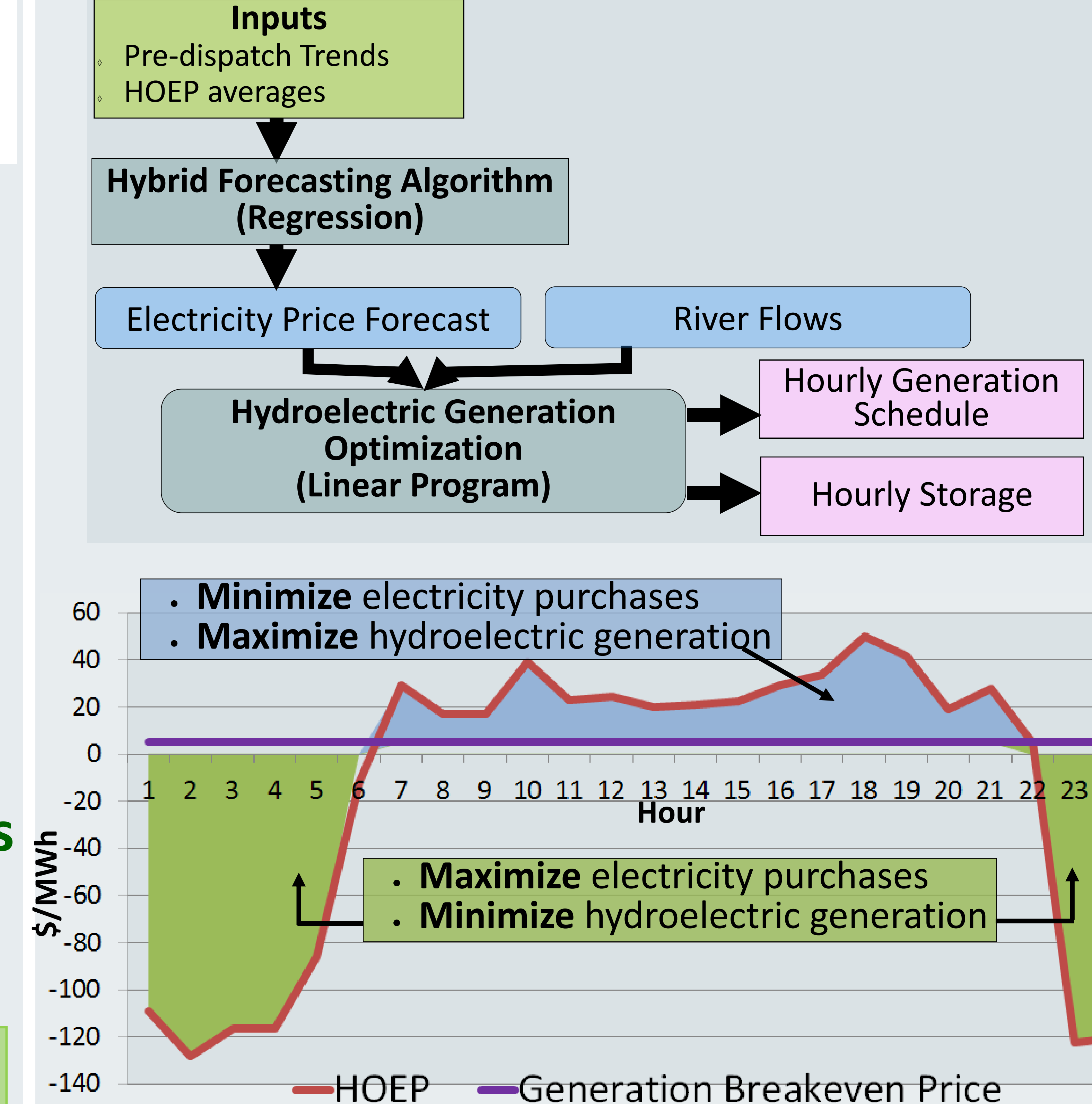


2 Hydroelectric Generation

Current Strategy — Block Generation

- Hours 01-09: minimum generation
- Hours 10-21: maximum generation
- Hours 22-24: minimum generation

Proposed Strategy — Dynamic Generation



Results

- 76% less costs and 44% accuracy improvement with dynamic generation
- Reliable 5CP predictions considering forecasted and occurred demand
- No negative environmental or safety impacts — sustainable design