W CHEMICAL ENGINEERING

UW DIRECT Capstone Project Proposal

The project should allow trainees to cement the acquisition of data science skills and develop proficiency in the conduct of team-based interdisciplinary research

PROJECT NAME: Global Adjustment Peak Prediction Hedging

SPONSOR NAME:
May we list you on our website as a partner DIRECT project partner? Yes
Will graduate students be asked to sign a non-disclosure agreement? Yes

PROJECT DESCRIPTION: Background: Enel X has customers that participate in a special system peak program aimed at optimizing cost of energy in batteries. In this program, if Enel X storage or load is dispatched by our customers (ie, make their electricity load small) during the five highest hour long peaks in the year of the total grid, Enel X is rewarded at approximately $100/kW. The system peak program was designed by the local utility to lower peak electricity load on the grid.

What We've Done: We designed an algorithm to forecast these peaks, predicting the top two hour peaks on a high probability day. The battery is a two-hour battery, ie at the highest power possible, the battery will discharge from full to empty in two hours.

Project for UW Students: We would like to know: what is the trade-off between spreading the battery over a longer time but discharging less? Secondarily, what if instead of forecasting the top two peaks, we instead forecasted the probability at each hour? Could this result in higher savings?

The goal of this project would be to analyze the expected savings if customers were to go with a low-risk, hedging strategy compared to a higher risk non-hedging strategy.

DESCRIPTION OF DATA TO BE USED: Grid electricity average power data (Enel X can provide)

PROJECT START DATE: 3/30/20	**PROJECT END DATE:** no later than 6/19/20

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PROBLEM TO SOLVE/OBJECTIVE:
The first objective is to determine: if the configuration of maximum discharge power was altered for the battery (ie, treat the battery like a 2.5 hr battery or a 3 hr battery compared to a 2 hr battery), and forecasts were changed accordingly (predicting more than 2peak hours), find the effect on savings.

Assumptions that can be held true:
1. If a system peak hour is forecasted and there is battery power available, the battery will discharge at its maximum discharge power.
2. Customer is paid for hours discharged during top five peaks in the year at a rate of $100/kW

Students will need to alter or make their own peak prediction algorithm. They will be given access to Enel X's algorithm and platform. They will then make an analysis of risk-adversity vs. reward. If students alter Enel X's peak prediction algorithm, Enel X would not permit the details to be released to the public domain.

The secondary/alternative object is: create an algorithm with variable risk aversion. The high-risk, high-reward setting would treat the battery as a two hour battery and discharge fully then. The low-risk, low reward setting could distribute the battery in any way to retain some savings. Assumption one may be ignored in this case.

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TIMELINES AND DELIVERABLES:

May 15:
1. Define method and KPI of measuring risk
2. Complete simulator to be able to run year-long simulations of battery activity based on algorithm (following very simple battery rules – battery will discharge according to the algorithm and recharge during the night).
3. Complete code that measures KPI: Percentage of system peak dispatch achieved vs. risk level
June 19:
4. Complete study across 4 years of sample data.
5. Bonus: Complete study across 7 years of sample data.

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UW FACULTY CO-ADVISOR:

PROJECT TEAM MEMBERS:

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