The University of Illinois Energy Mix

Micro-reactor Group Meeting

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December 5, 2019

ILLINOIS

Outline

Overview

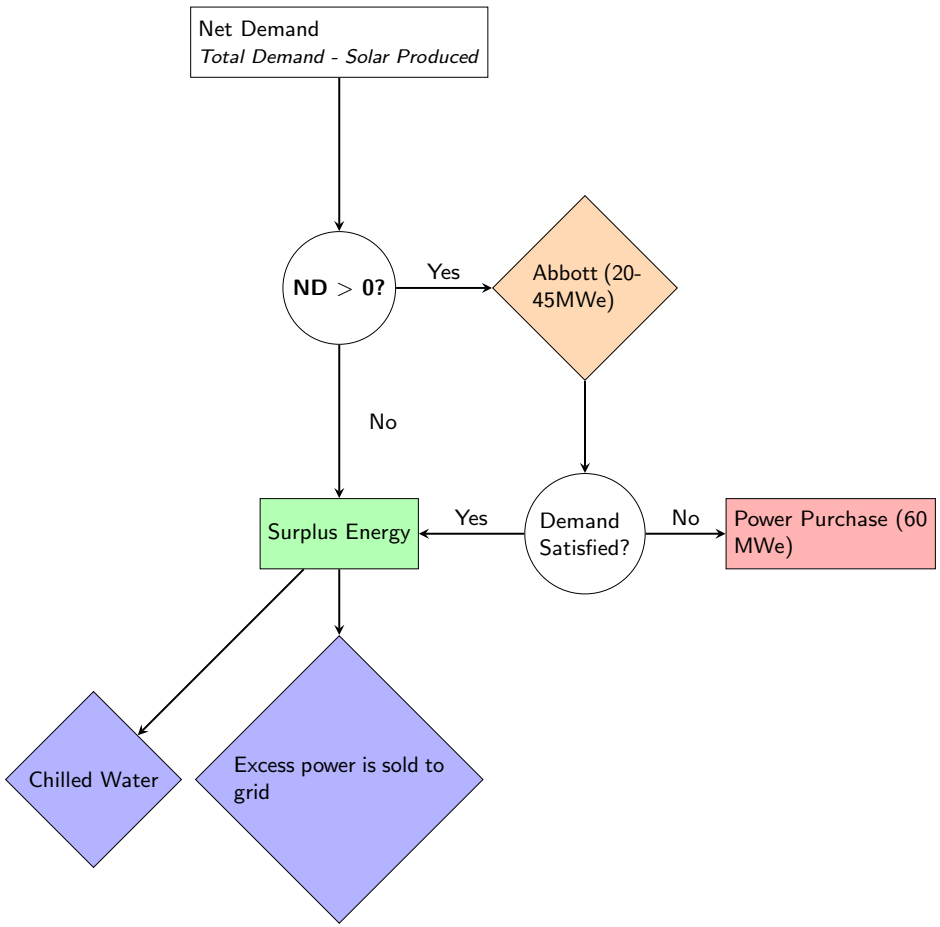
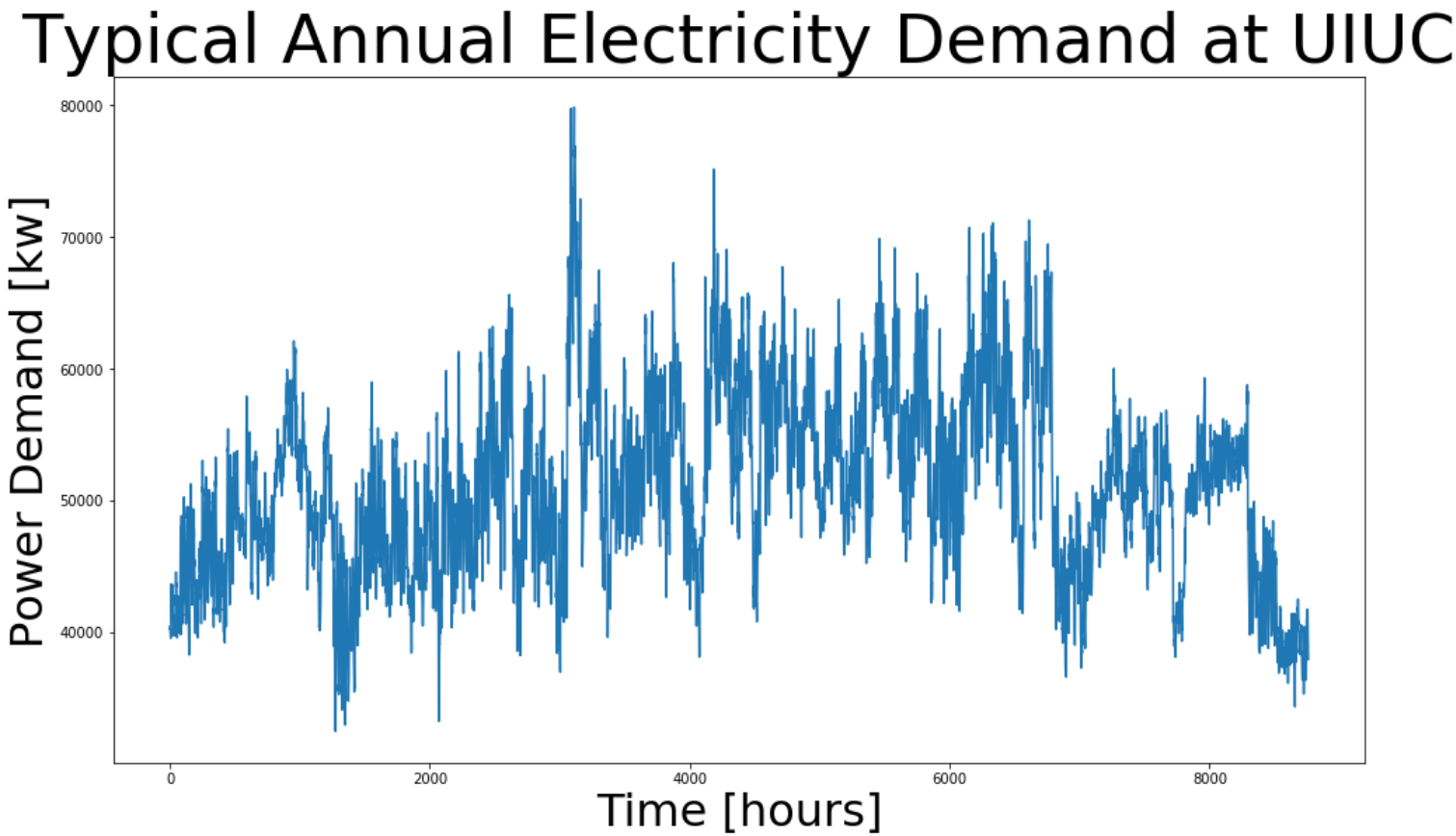
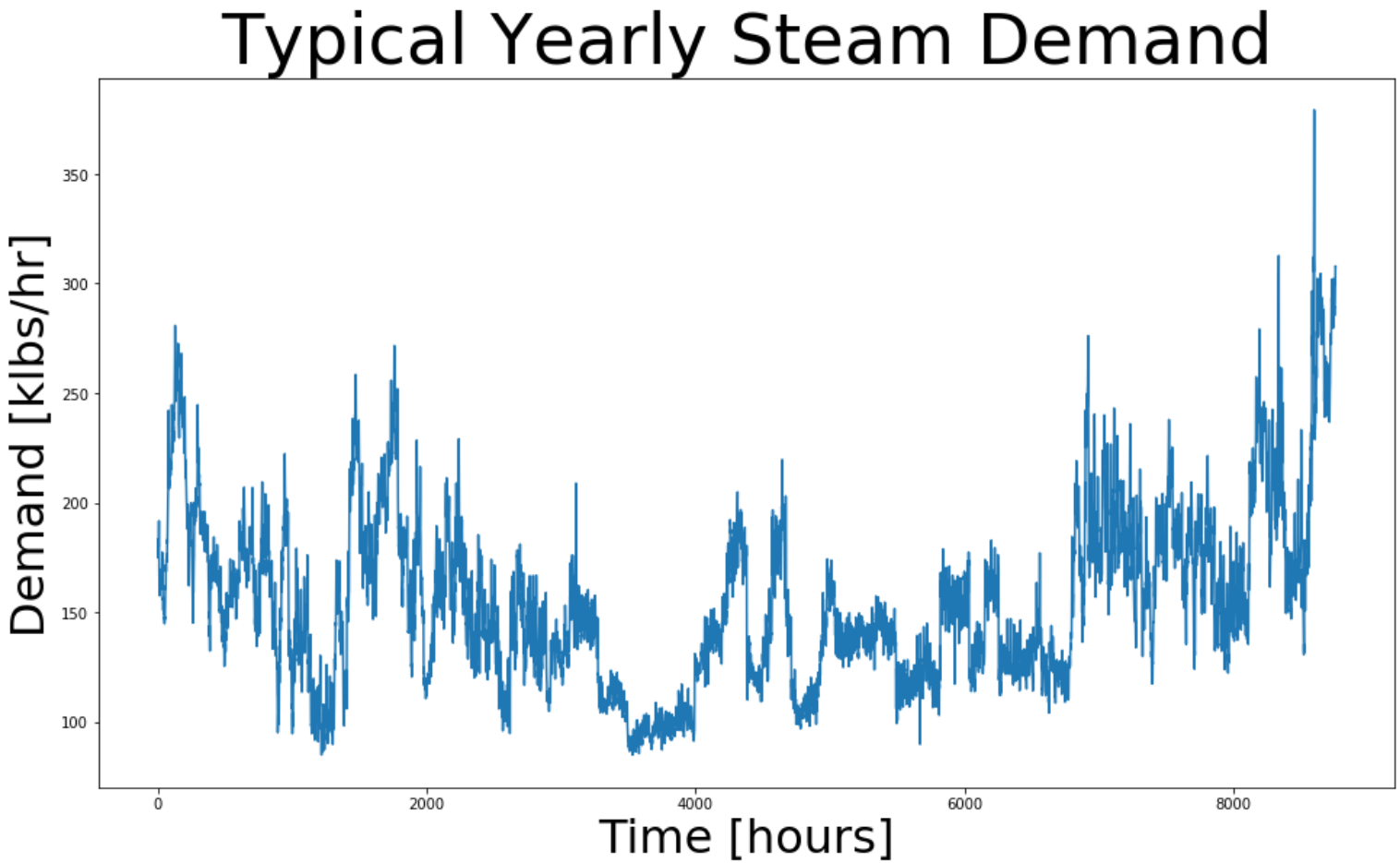


Figure: The University of Illinois Energy Prioritization

Outline



The typical yearly electricity demand for UIUC. Average need is about 45 MWe, peaks near 80MWe.



The typical yearly steam demand for UIUC. Typical need is about 150 klbs/hr, peaks in the winter over 300klbs/hr.

Outline

Abbott Power Plant

Quick Facts [1]

1. Cogeneration Plant (electricity is a "byproduct" of steam production).
2. Capable of producing 85 MWe (maximum capacity).
3. Capable of producing 800 Klbs/hr of steam (maximum capacity).

South side of Abbott Power Plant.

Quick Facts [7]

- Lifetime capacity factor of 16.8%.
- Rated to produce 4.8 MWe
- Soon to be expanded to 12.1 MWe

UIUC Solar Farm

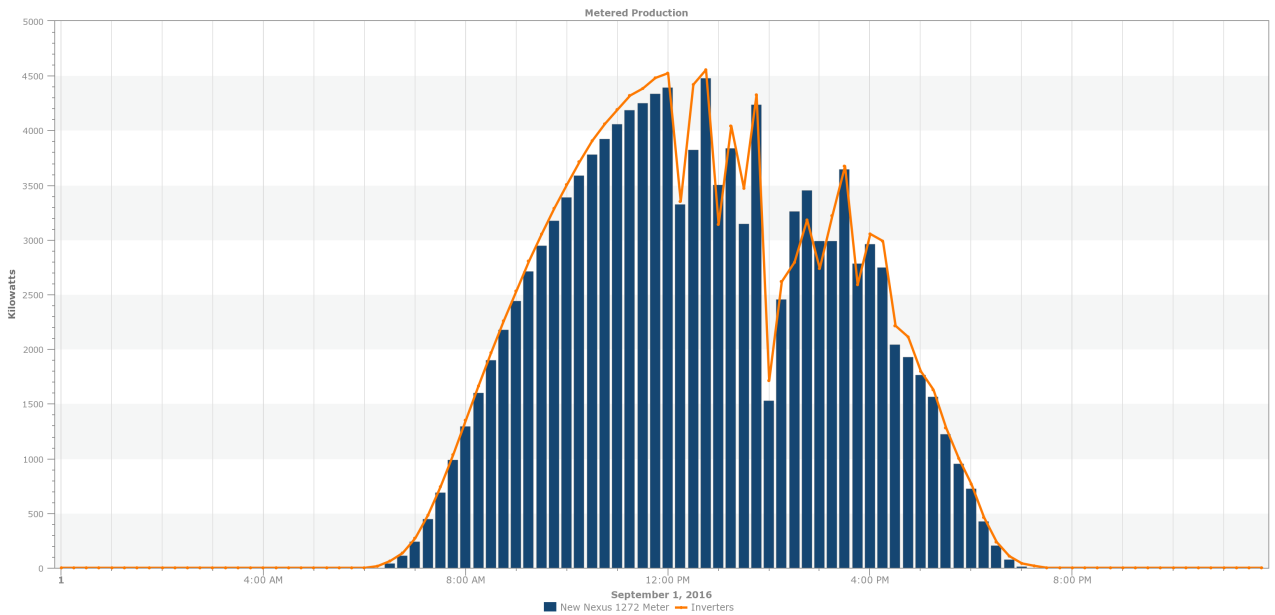


Figure: Actual solar farm data from AlsoEnergy [4]

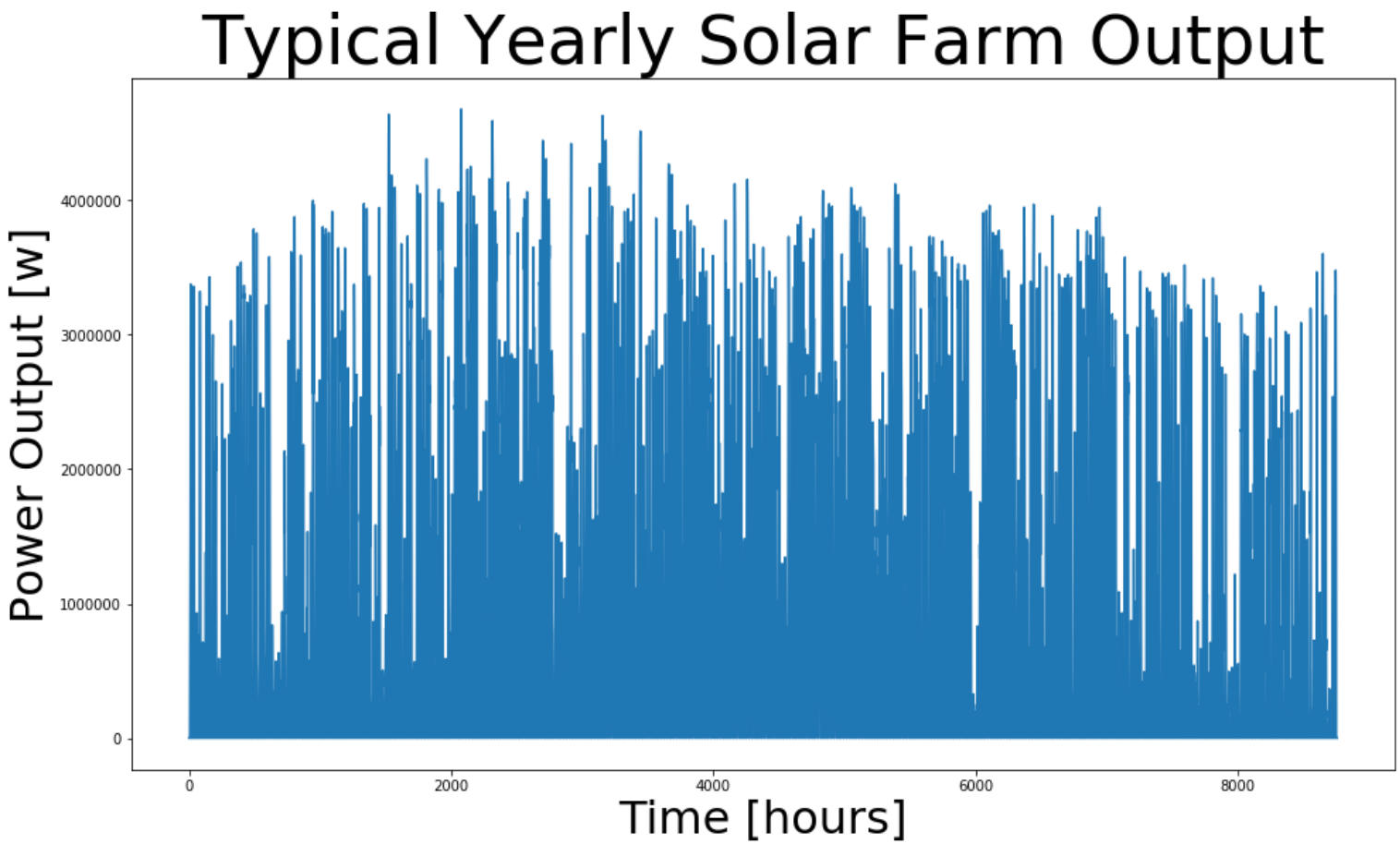


Figure: The typical power output of the UIUC solarfarm over a year.

Power Purchase Agreements

Quick Facts [6]:

- Power purchase agreement (PPA) with Rail Splitter Wind Farm
- PPA requires UIUC to buy 8.6% of the energy produced by the wind farm.
- Fixed price of 4 cents/KWh
- Sometimes sold back at loss.
  e.g. A windy night when demand is low but the wind farm is producing a lot of electricity.

Chilled Water

Quick facts [2]:

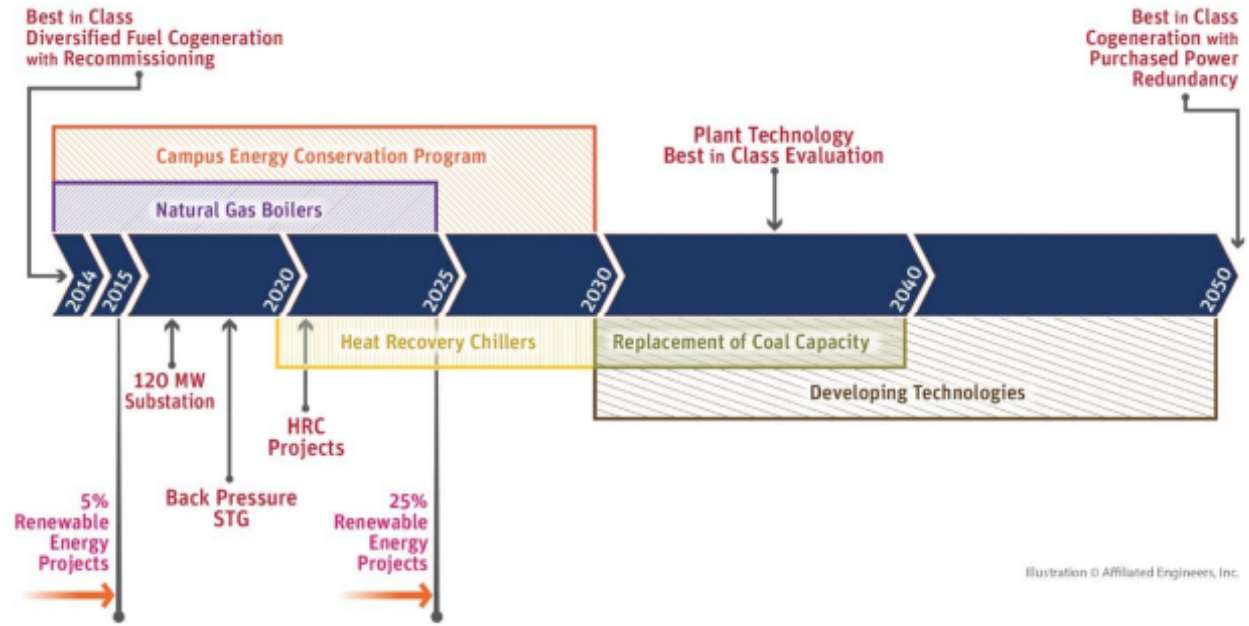
- The energy consumption from chilled water is felt as electricity* demand.
- The only method of energy storage on campus.

*There are also steam driven chillers that are not currently being used.

Outline

Current Work

- Finding the optimal size of a reactor to minimize the cost of electricity and steam.
  Based on a paper [5] that sized a reactor for a similar grid system.
- F & S intends to retire the coal boilers by 2025 and replace it with more PPAs and natural gas [3] according to the UIUC Energy Master Plan, in lieu of alternatives from "developing technologies." These decisions were made to minimize the cost of electricity.



References I

[1] Abbott power plant.

[2] Campus chilled water system.

[3] Affiliated Engineers, Inc.
Utilities production and distribution master plan.

[4] AlsoEnergy.
University of illinois solar farm dashboard.
http://s35695.mini.alsoenergy.com/Dashboard/2a5669735065572f4a42454b772b714d3d.

[5] T. E. Baker, A. S. Epiney, C. Rabiti, and E. Shittu.
Optimal sizing of flexible nuclear hybrid energy system components considering wind volatility.
212:498–508.

[6] Steve Breitweiser.
Wind power: University of illinois at urbana-champaign.

[7] Morgan White.
Solar farm fact sheet.