Solar Eclipse and Control Room Update

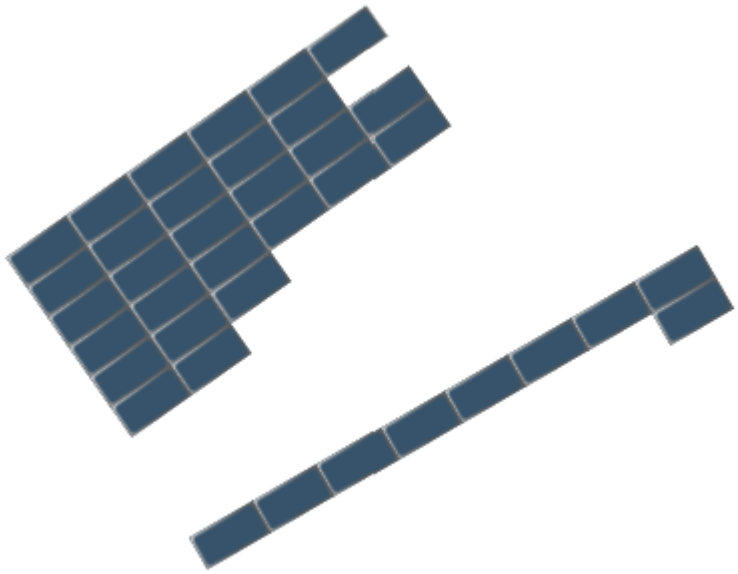
Part 5

Energy Freedom Project

22 August 2017

Home Rooftop Solar Configuration

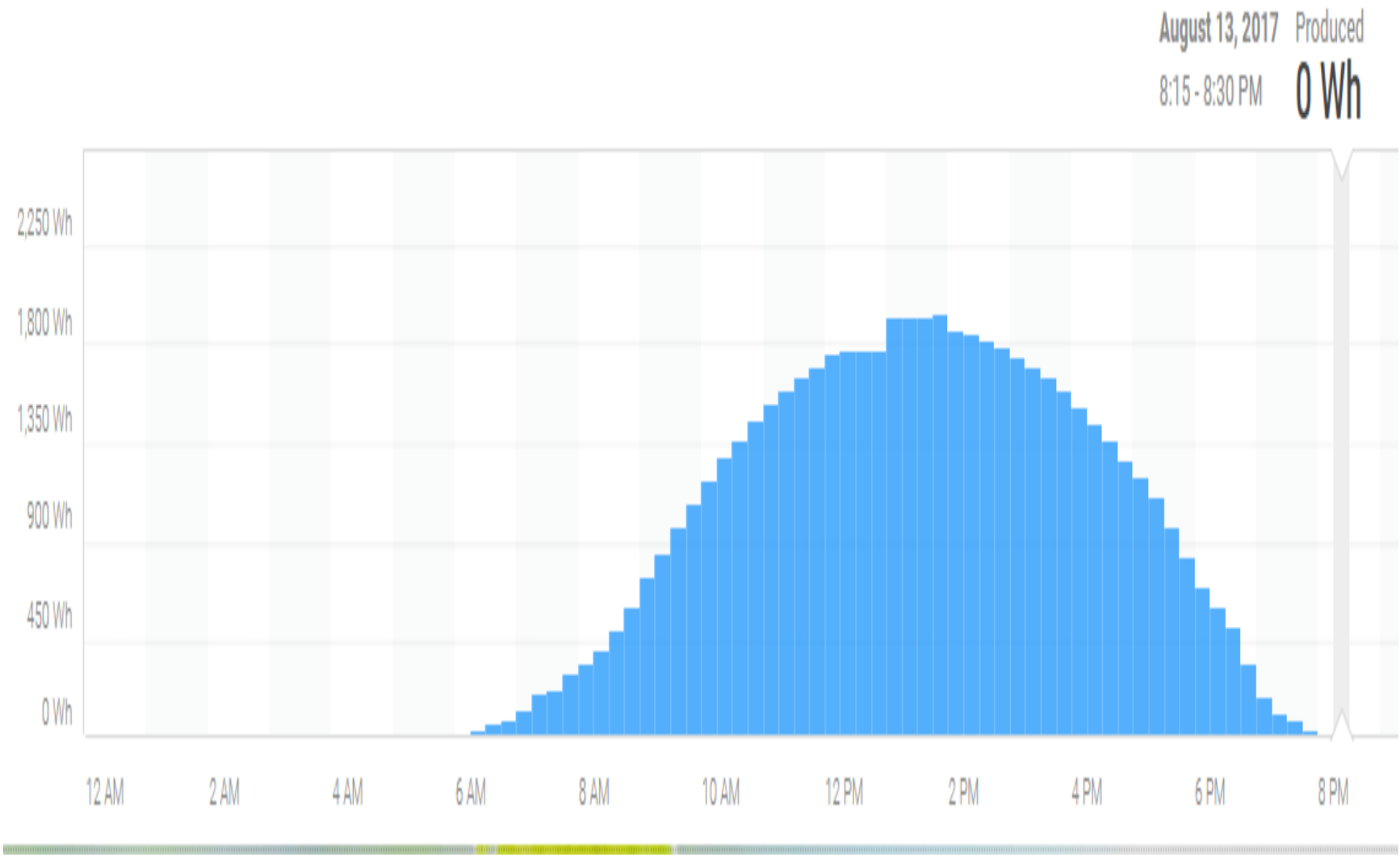
- Southwest roof with 28 panels
- Southeast roof with 9 panels
- maximum production capacity is 9.8 kW
- clouds are very disruptive but other phenomena are active



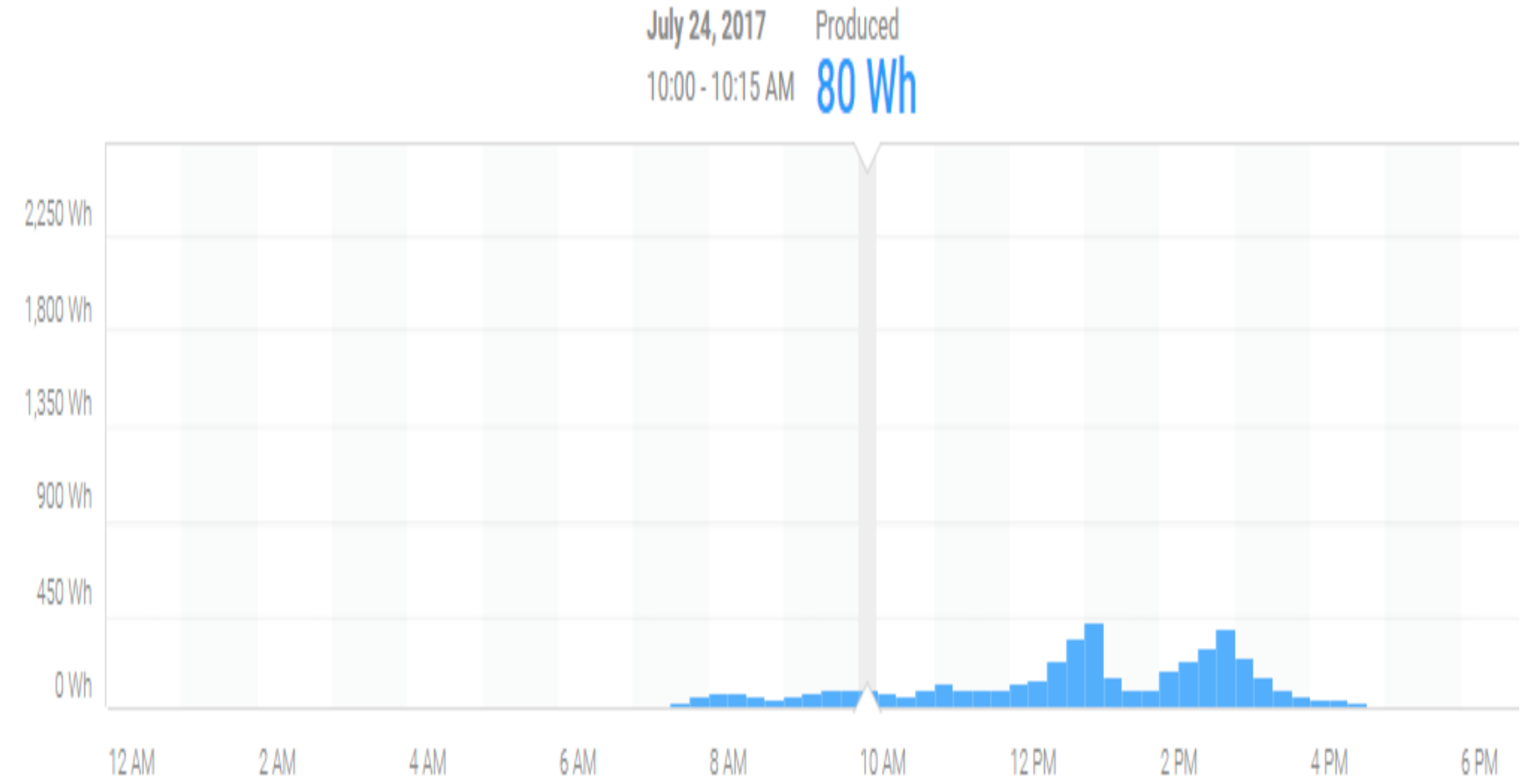
Energy Production

- Graphs of 4 production days with different performance are next
  - A near perfect solar energy production day
  - A really terrible solar energy production day
  - A day when Hydro One failed for a couple of hours
  - Solar Eclipse of 21 August 2017 (51% blockage)
- Graphs are Watt-hours vs. time of day
  - 15 minute time lapse vertical bars
- Lifetime Production from 3 April 2017
  - 6.8 megaWatt-hours

13 August 2017
Near perfect solar day

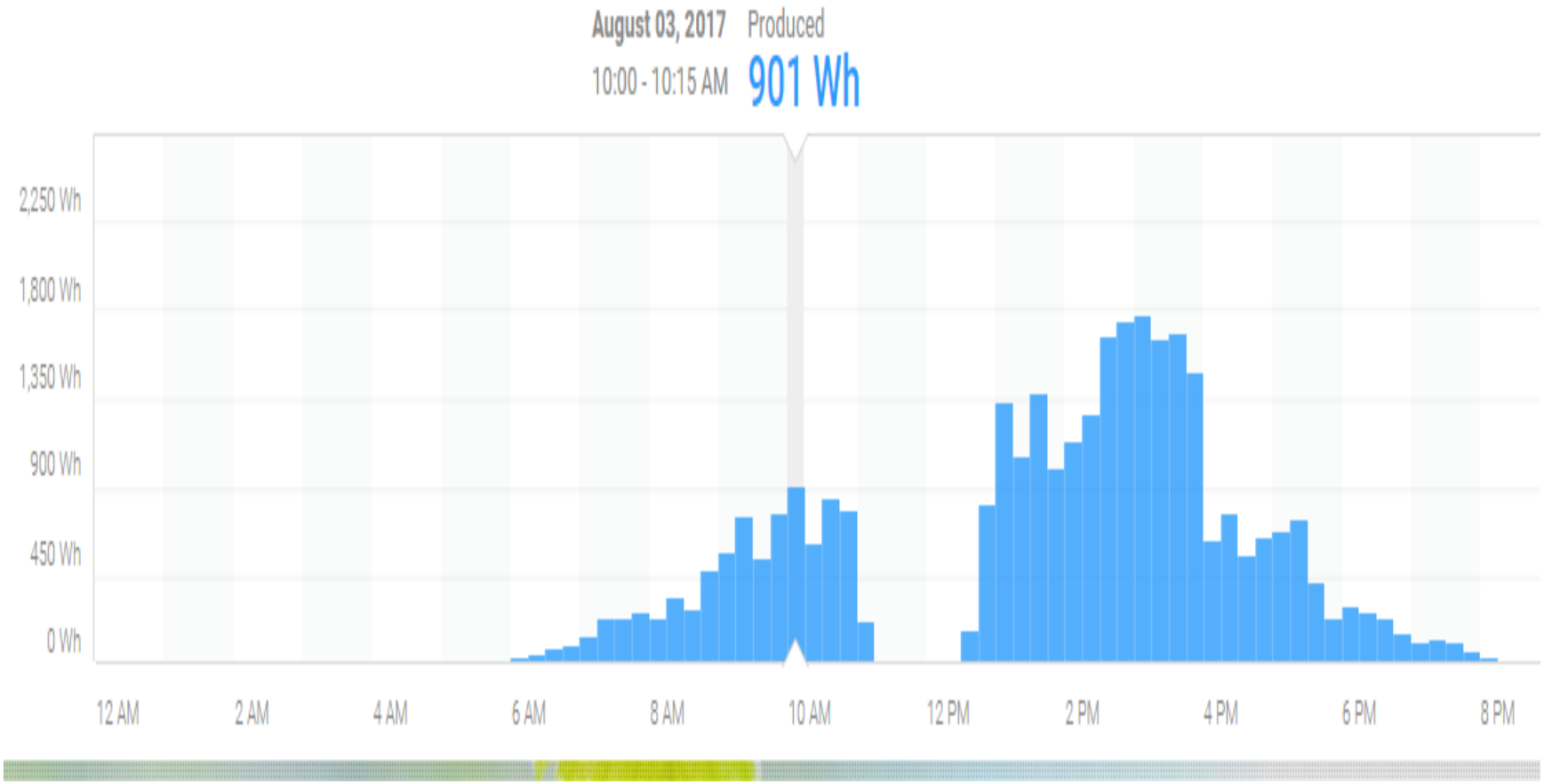


Terrible Solar Day
all due to clouds

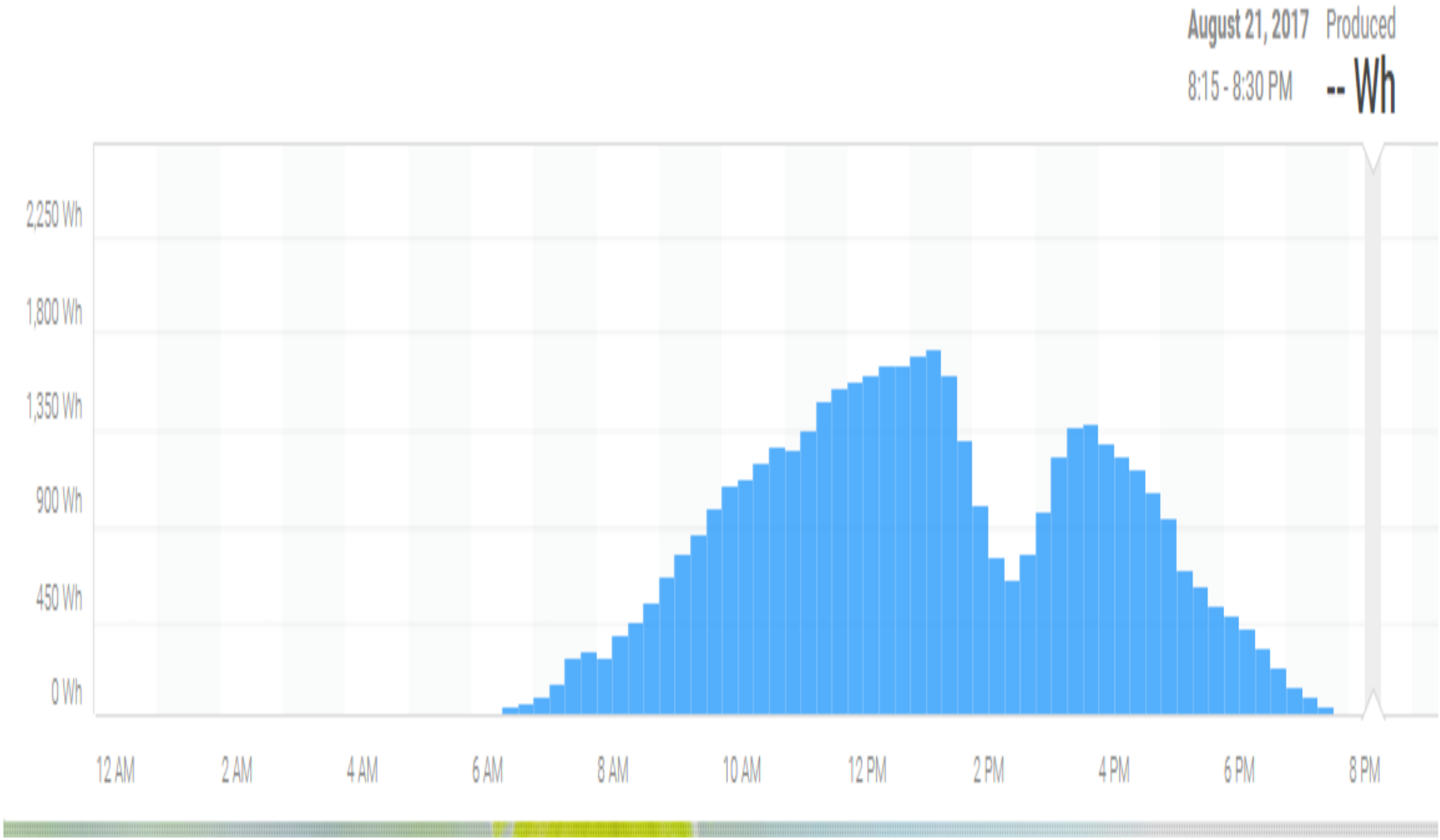


Hydro One Power disruption
Solar production shutdown

Cloud variations throughout the day



21 August 2017
51% Blockage Solar Eclipse



Solar Energy Performance

- Solar energy production is highly non-linear
- Predicting performance is low quality
- Expect the unexpected
- However, 6.8 megWatt-hour energy delivered to the Hydro One grid since March 2017

Progress Update

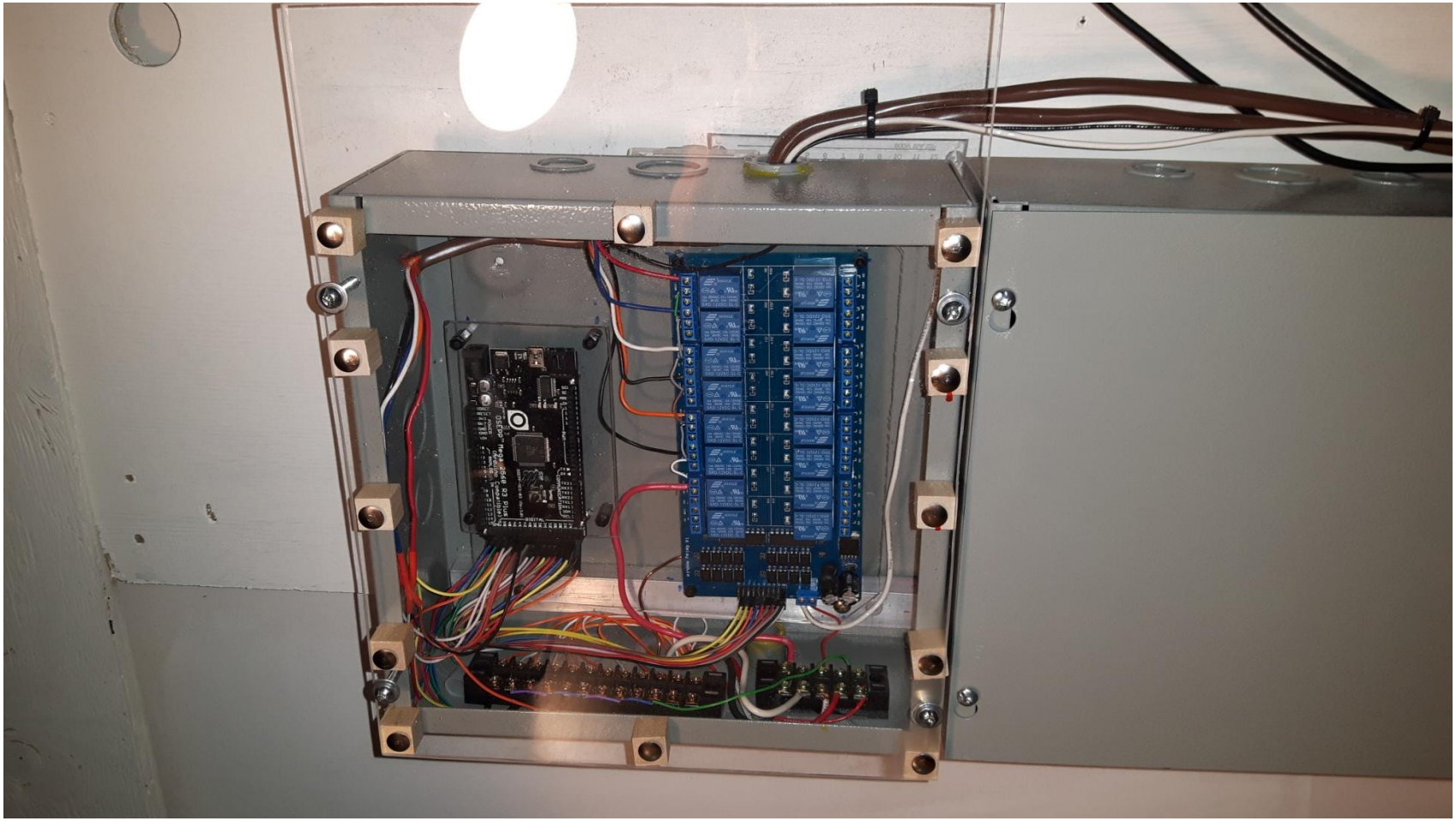
- The Energy Freedom Project is progressing
  - Solar subsystems are installed
  - Tesla home battery is expected very soon
    - Operations will take a substantial step forward
  - Ground Source Heat Pump design is preliminary
  - The Control Centre advances daily.
    - The following slides show advances since the part 4 update of 30 July 2017
    - Main task is Electric Vehicle and home energy load management

August 2017 Control Centre

Observations

- Box #1 (far left) is now a relay centre with an Arduino Mega in charge. Clear plastic permits viewing and protects wiring.
- The 7 foot rack on the right now has a pretty face. Still some trimming required.
- The cable runs on the top and bottom of the 5 boxes will be hidden soon.

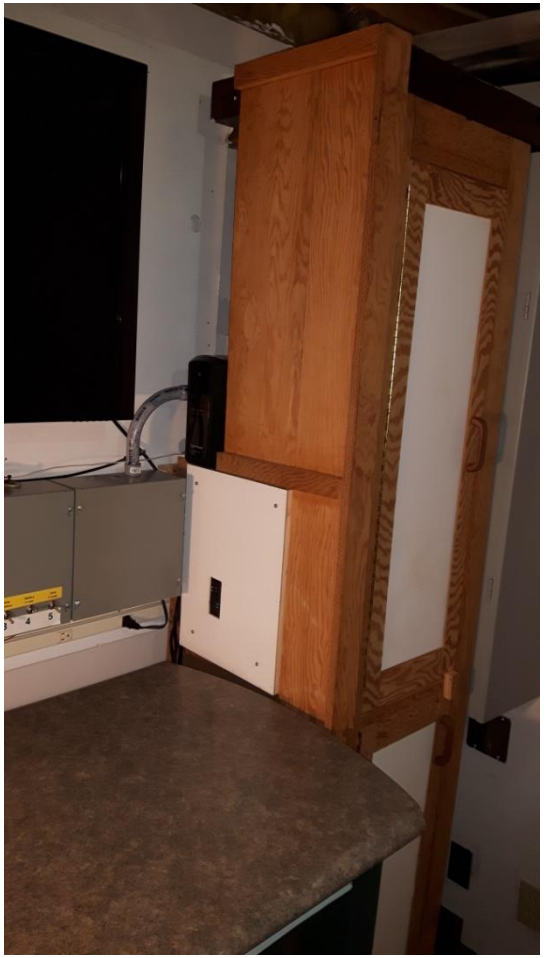
Relay Complex



Observations

- There are 16 relays on the board on the right and another 8 available with add-on boards to the Arduino mega 256 (on the left).
- Many I/O pins are active. Only 7 relays are wired but many 5 VDC sensors are telling the software of the state of the main contactors.
- Clear plastic is standing off by 1 cm wooden blocks to permit ventilation.
- Finishing left of box will be done after the Tesla battery is installed on the plywood there.

Main Rack



Observations

- Mid-picture white board hides the many cables going to the 4 channel KVM (keyboard, video, mouse) switch. Only the manual push button and some status LEDs are visible.
- Above the KVM panel is the UPS (uninterruptible power supply) for emergency power to the electronics and one 4 Watt LED emergency light.
- Still some finishing required to close this right to the back wall.

Main Electronics Tower

- The grey box is the main contactor box shown previously in an update.
- Two whiteboard doors protect the upper chamber and the lower chamber of electrical equipment like power supplies and Raspberry Pi computers.
- Some finishing is still required to close out the lower right and add trim to equipment rack.

End Status Report

- The next status report will show the Tesla battery integrated into the Control Centre.