

Unit 4 Cooling Tower

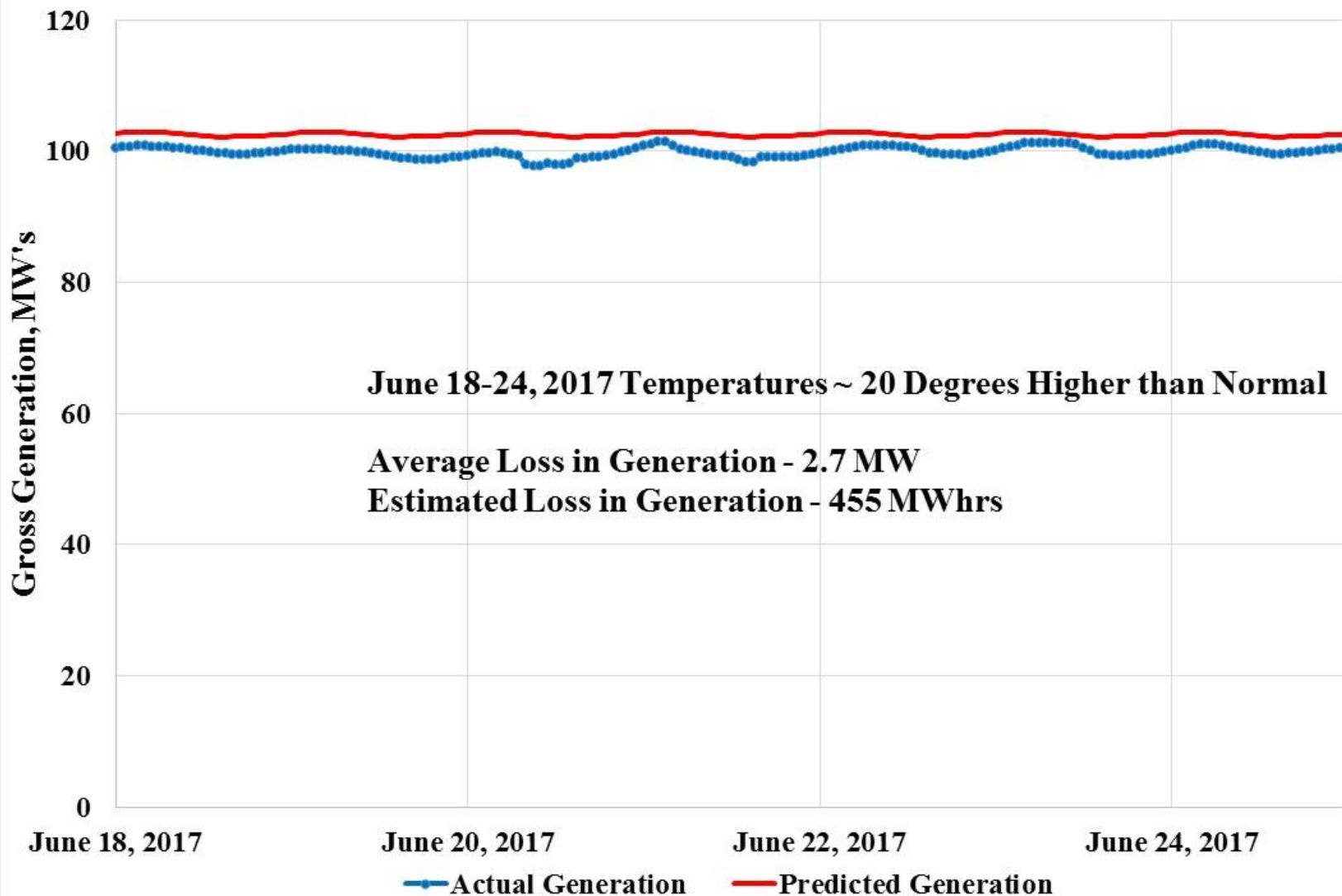


July 3, 2017

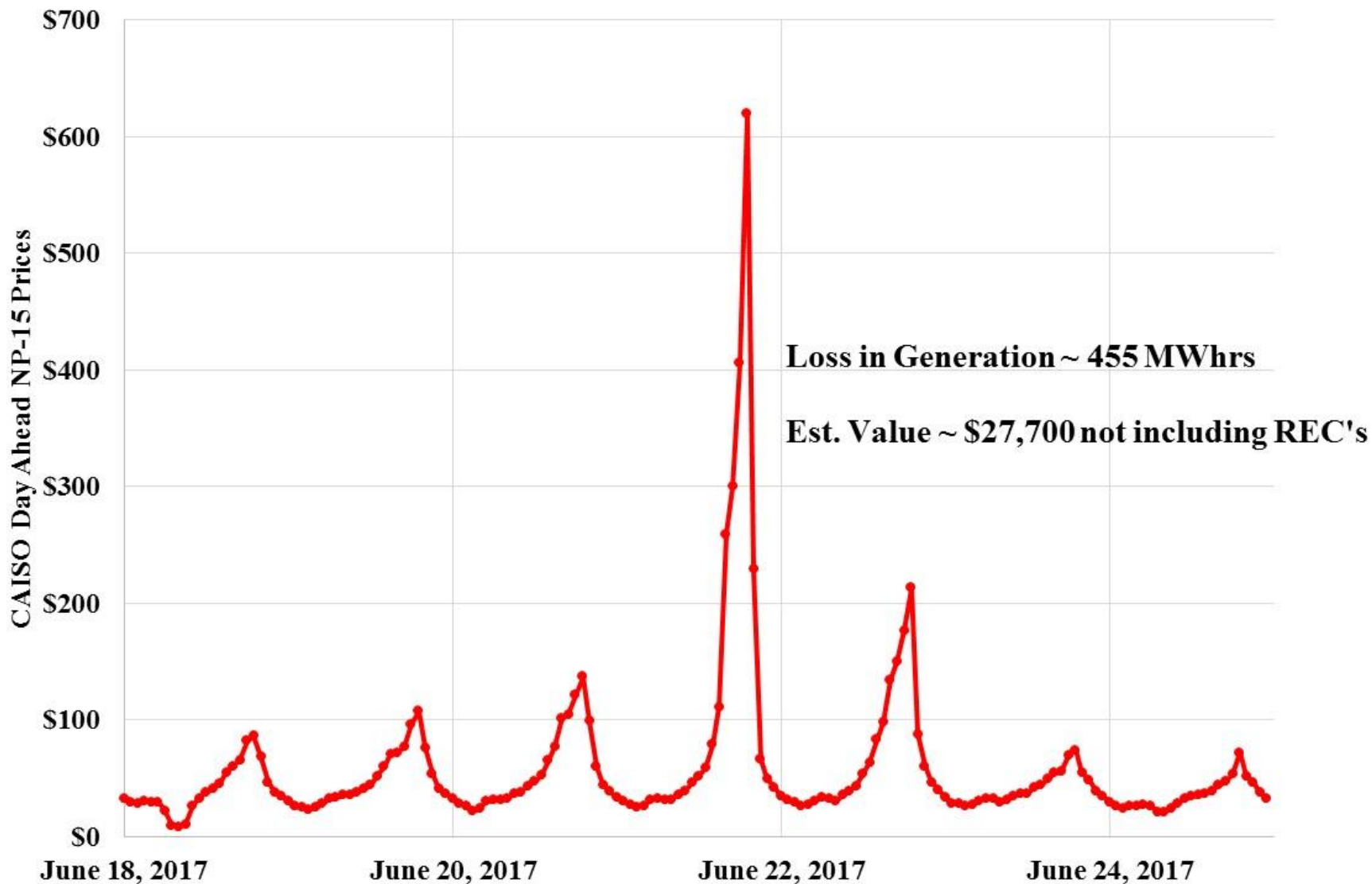
Heat Related Generation Losses at the GEO

- The Cooling Tower's primary function is to cool the water that is coming out of the Main Condenser so that it can be recirculated through that same condenser to cool the incoming steam to water
- When outside temperatures increase, the Cooling Tower will lose its ability to efficiently cool the water that is being used to cool the condenser steam and the water temperature increases
- This increased water temperature decreases our ability to create the desired vacuum in the condenser and our MW output for the Unit is lowered
- Another issue created by high heat is the inability of the Unit to condense the necessary steam into water in the tower which creates a 'negative water balance' situation causing our Cooling Tower Basin Level to drop ('negative water balance')
- If the negative water balance drops the Basin level enough, make up water has to be put in the basin to raise the water level sufficiently to continue pumping to the condenser and keep the unit on line
- This is particularly true when night temperatures are high and if the Units are not running at their original rating (Units 1&2 are not, Unit 4 is)
- Fortunately, the Plant 2 to Plant 1 make up water pipeline project was proposed and approved a few years ago and it was able to keep up with water demand at Plant 1 and the unit was able to continue to generate at full load during the recent heat

NCPA Geothermal Facility Generation June 18-24, 2017



CAISO Day Ahead NP-15 Prices June 18-24, 2017



GEO MW Output During Heat Wave

- It is normal during the Summer months to see a 3 MW or more swing in output from night to day because of ambient temperature changes
- ~ 20 Degrees F hotter than normal (June 18-24, 2017)
- Average decrease in output of 2.7 MW's beyond the normal 3 MW daily summer swing
- Estimated loss in generation ~ 455 MWhrs due to extreme heat
- Estimated value of ~ \$27,700 not including REC's