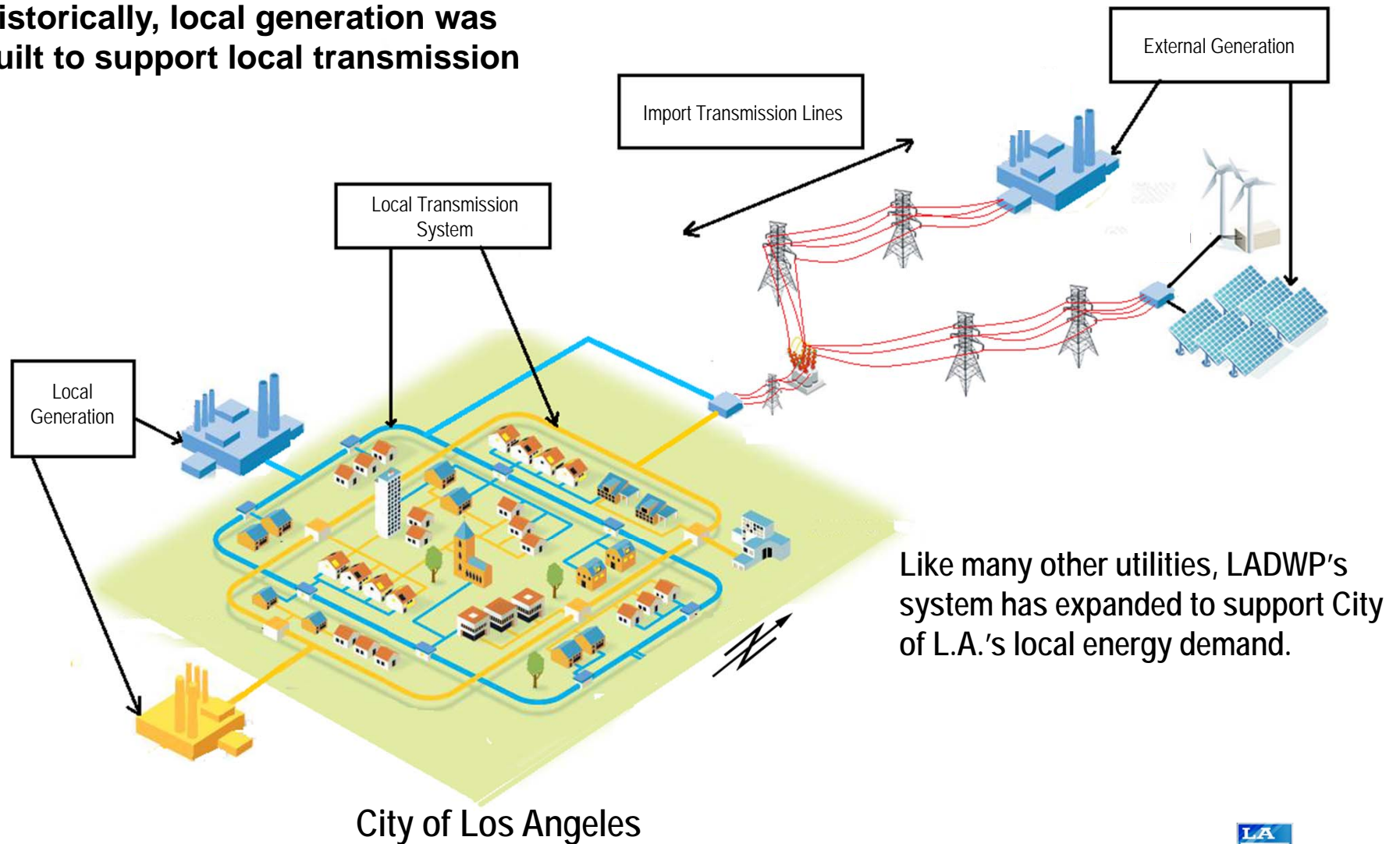


Power System Overview

Putting Customers First   

LADWP System Configuration & Expansion

Historically, local generation was built to support local transmission

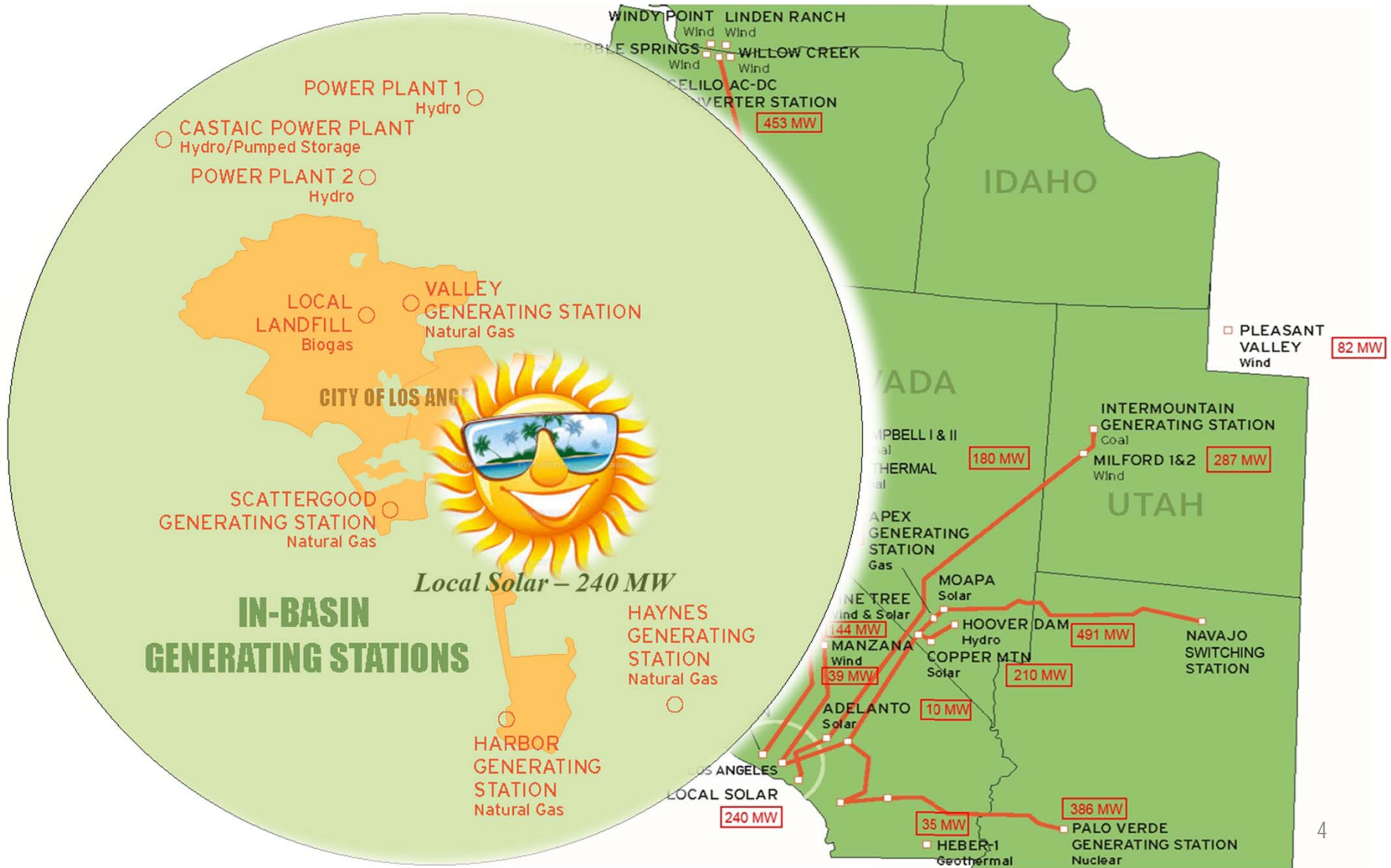


Like many other utilities, LADWP's system has expanded to support City of L.A.'s local energy demand.

How L.A.'s Power Resources Work Together



How L.A.'s Power Resources Work Together



System Reliability - Key Components

No.	Reliability Components	Description
1.	Voltage Support	Ability to maintain a stable system and provide quality power to the customer
2.	System Inertia	Rotating machines maintain grid reliability during system fluctuations
3.	Frequency Response	Ability to automatically adjust output following a power disturbance
4.	Load-Following	Adjusting generation with changing demand throughout the day
5.	Contingency Reserve	Power available in 10 minutes to replace lost generation
6.	Replacement Reserve	Reserve generation needed to relieve “contingency reserve” units
7.	Flexibility Reserve	The ability to compensate for the variable output of renewables

Mandatory Federal Reliability Standards

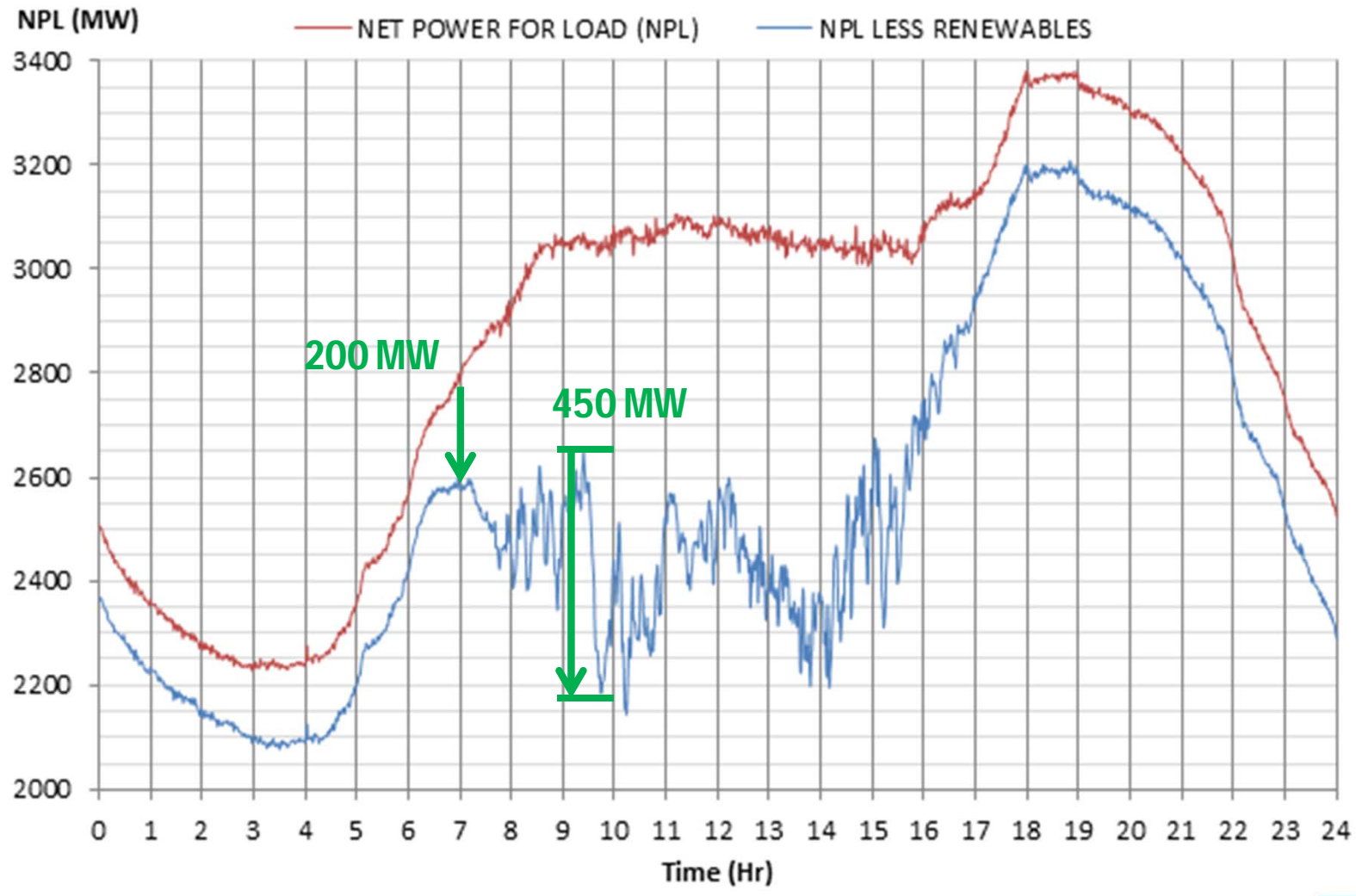
- **Balancing Authority:** Essentially, an entity responsible for continuously balancing customer demand and generation, while providing sufficient additional generation to handle load variations and to provide for loss of resources
- As a “Balancing Authority,” **LADWP’s** authority area includes Los Angeles, Glendale, and Burbank
- Selected Standards include:

No.	Reliability Standard	Metric	Description
1.	BAL-001-2	Control Performance Standard (CPS1)	CPS1 is intended to measure how well the Balancing Authority is able to balance its generation with load.
2.	BAL-002-1	Disturbance Control Standard (DCS)	Each Balancing Authority shall continuously maintain and utilize its “contingency reserve” to serve load immediately in the event of system failure.
3.	BAL-002-WECC-2a	Contingency Reserve	Each Balancing Authority shall have a specific quantity and type of “contingency reserve”, available within 10 minutes, equal to the greater of either the “most severe single contingency” or “3% load + 3% generation”.
4.	BAL-005-0.2b	Automatic Generation Control	Each Balancing Authority must follow specific requirements regarding Automatic Generation Control (AGC) that are necessary to calculate Area Control Error (ACE) and to routinely deploy the Regulating Reserve.

Challenge of Maintaining Reliability

Example #1

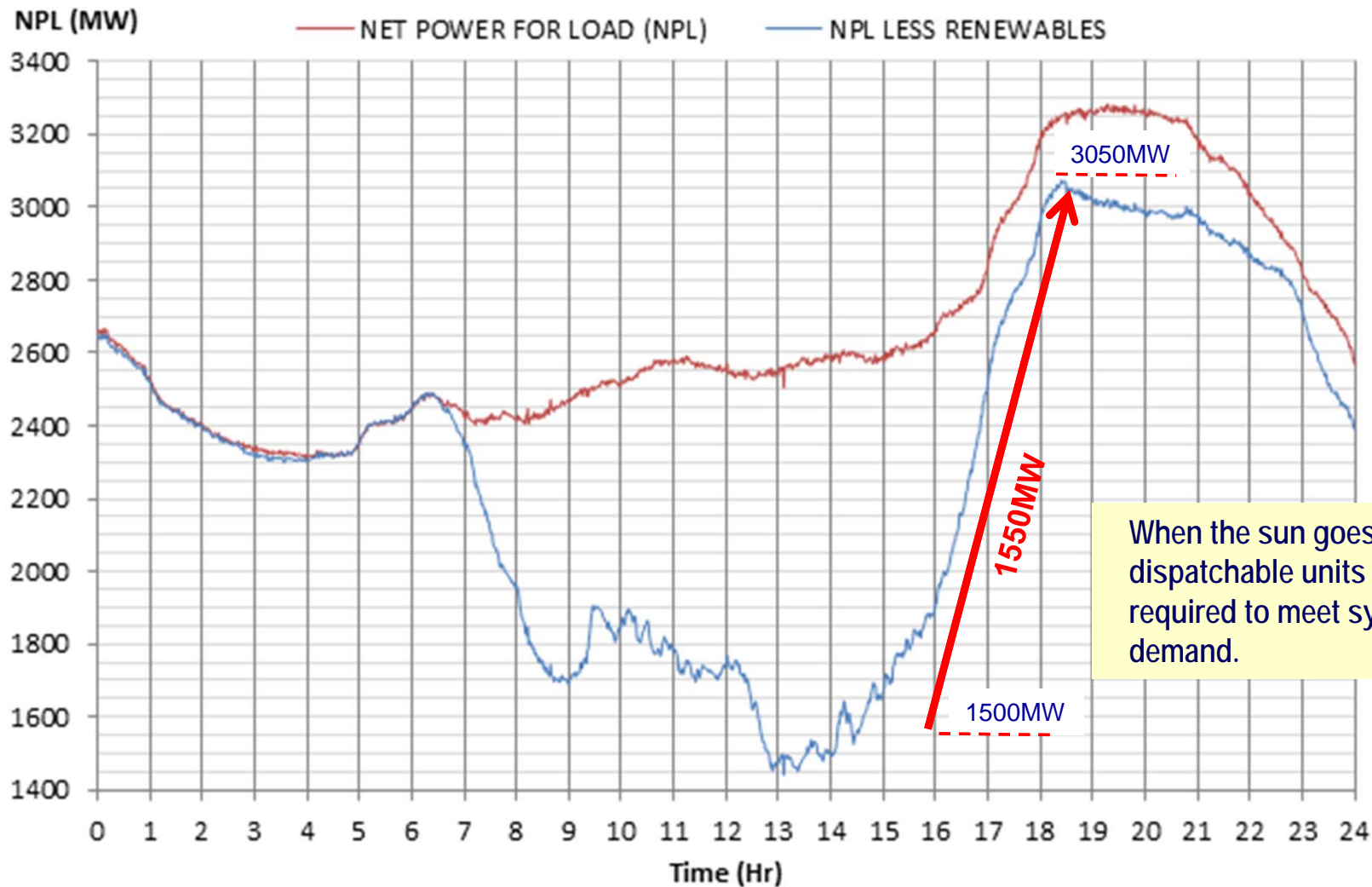
Net Power for Load (NPL) for 02/21/2017



Challenge of Maintaining Reliability

Example #2

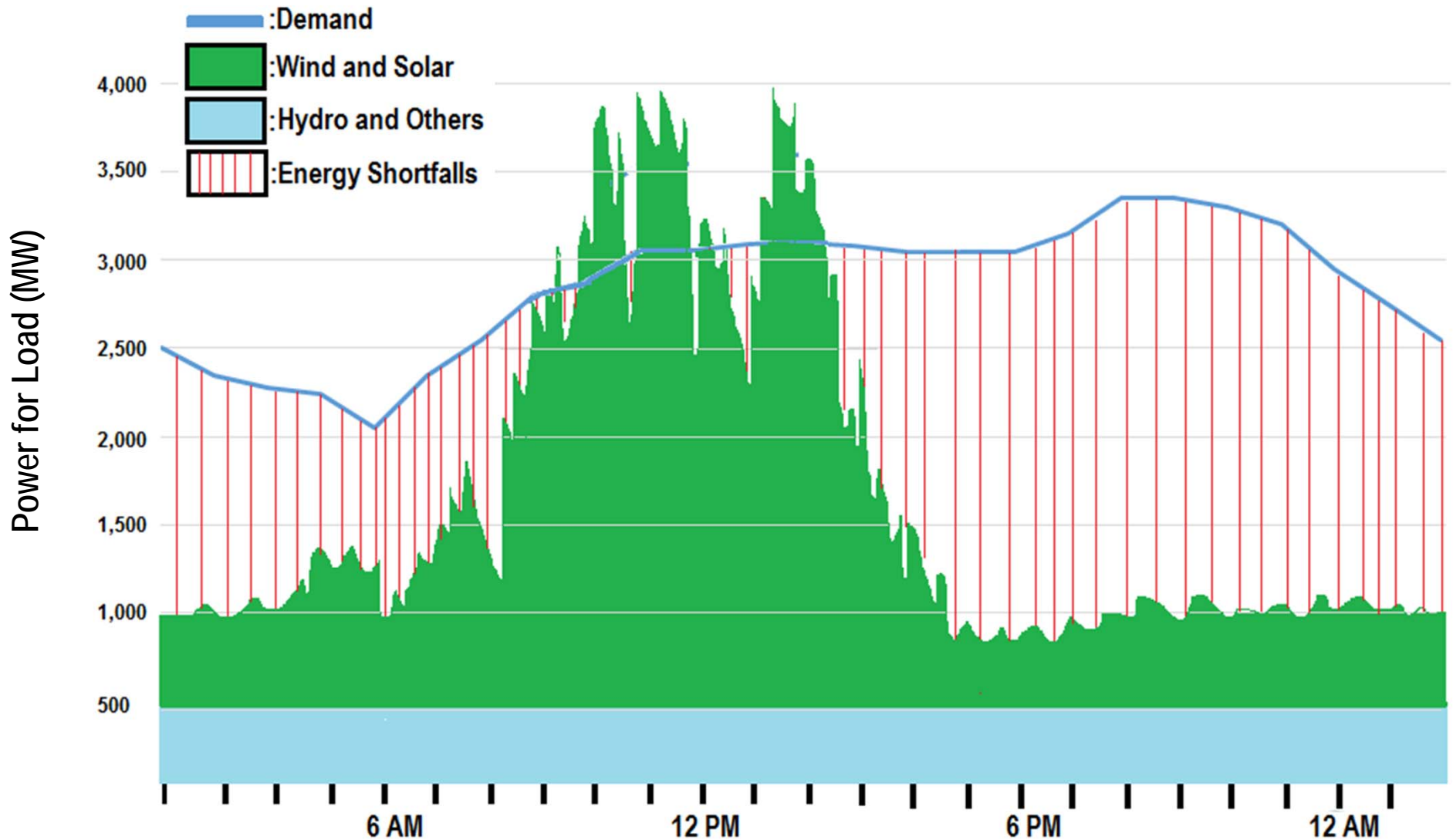
Net Power for Load (NPL) for 02/26/2017



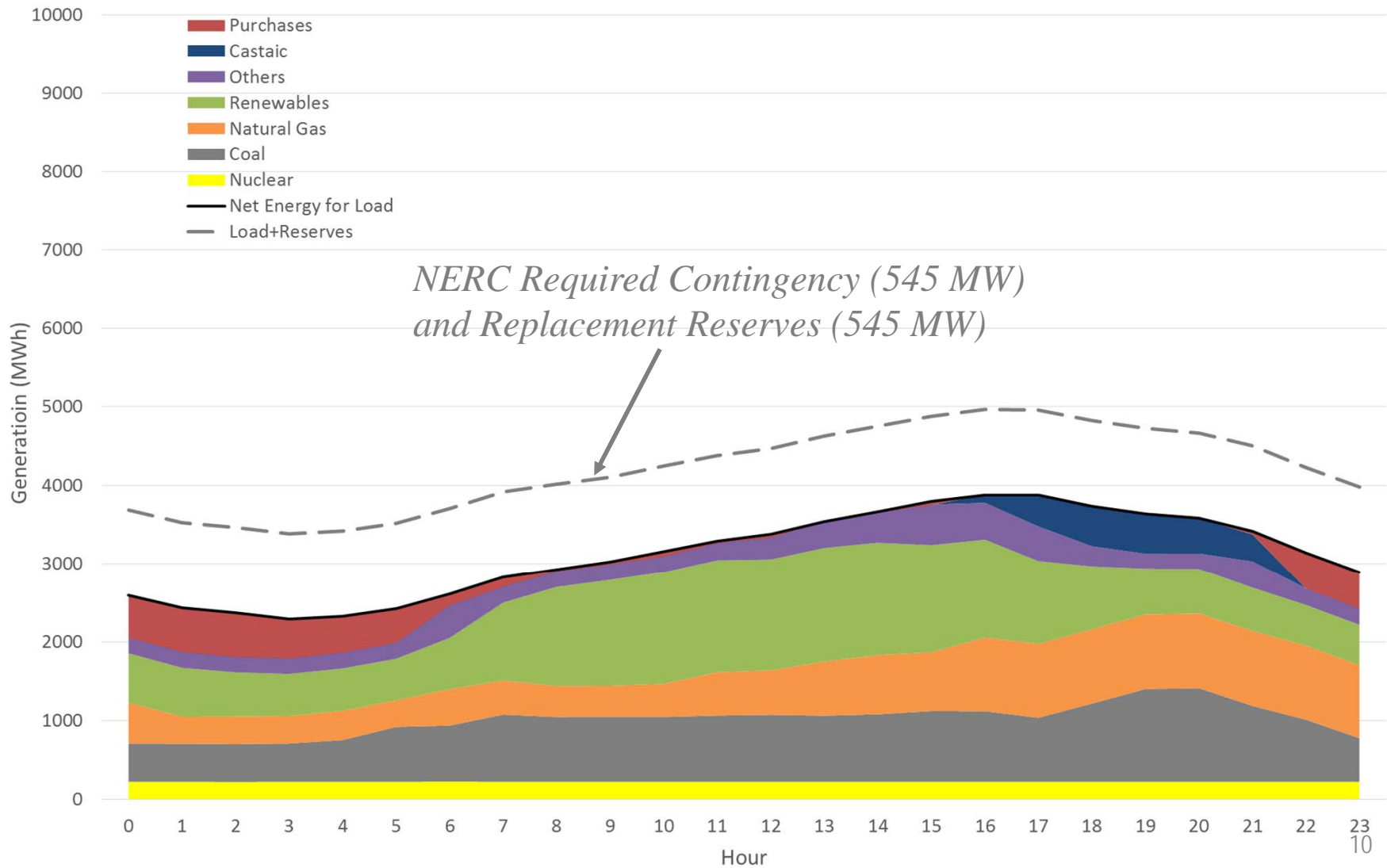
When the sun goes down, dispatchable units are required to meet system demand.



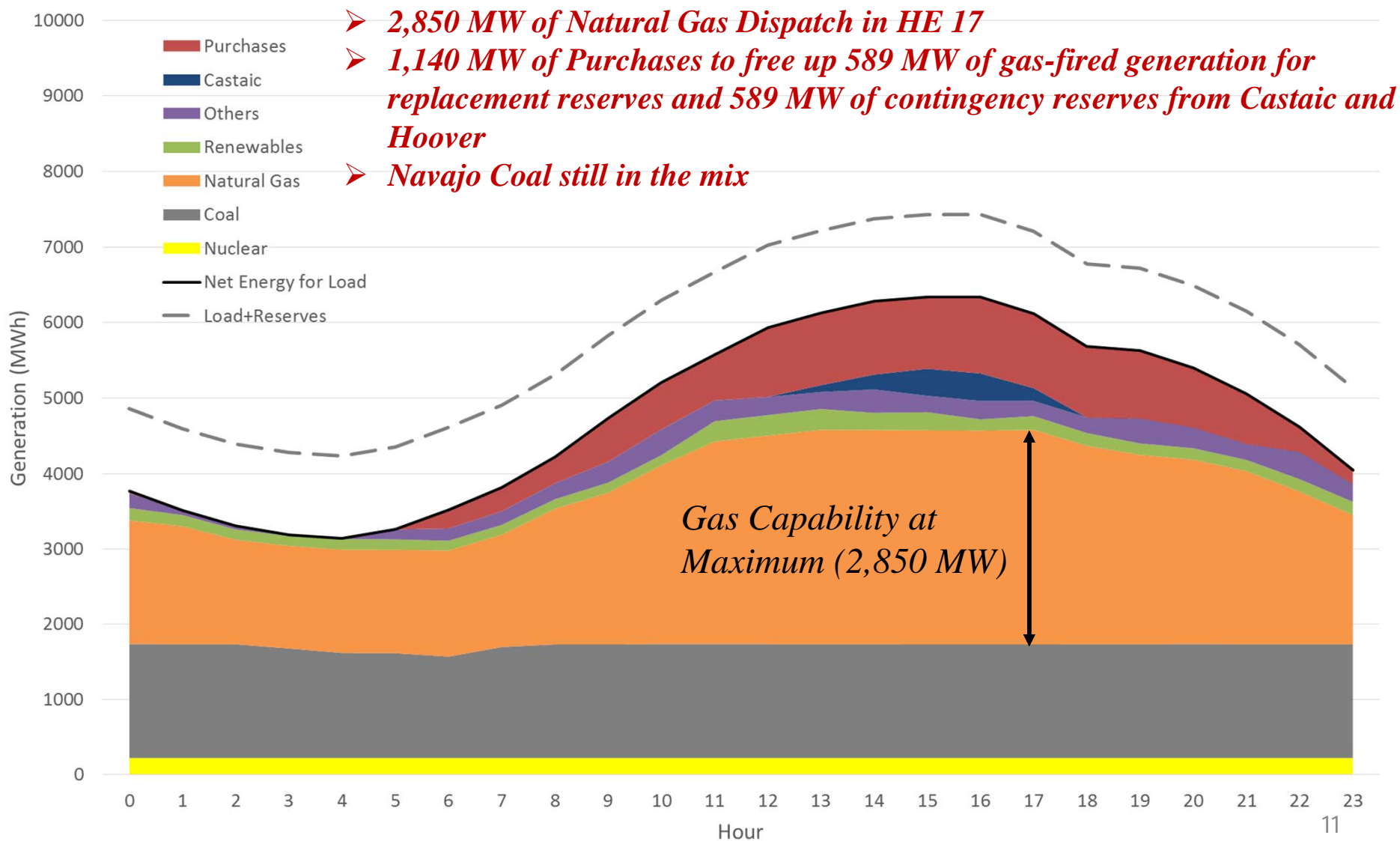
Overcoming Energy Shortfalls



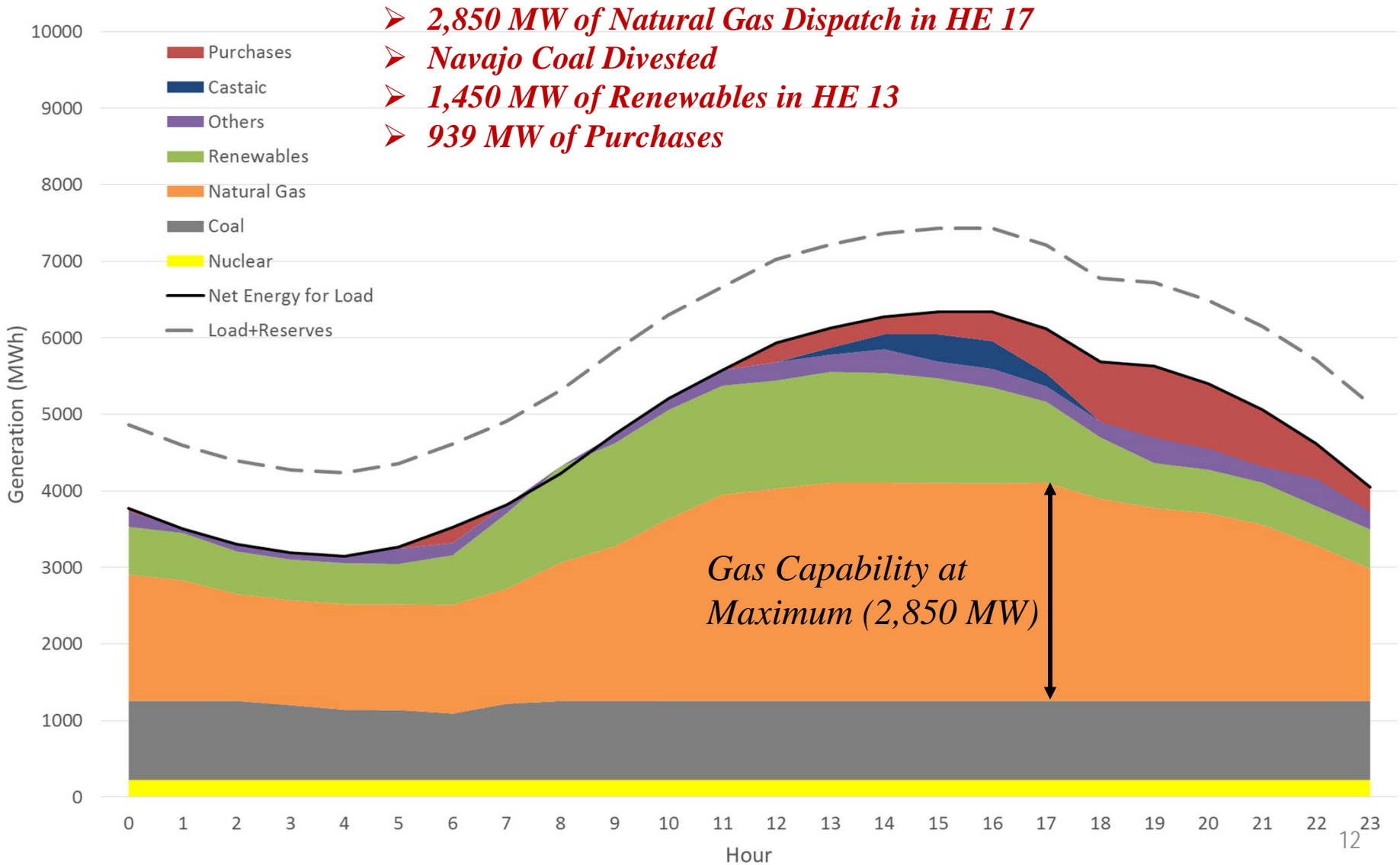
June 2, 2017 (Typical Day)



September 16, 2014 (Historical Peak Day – 6,396 MW)

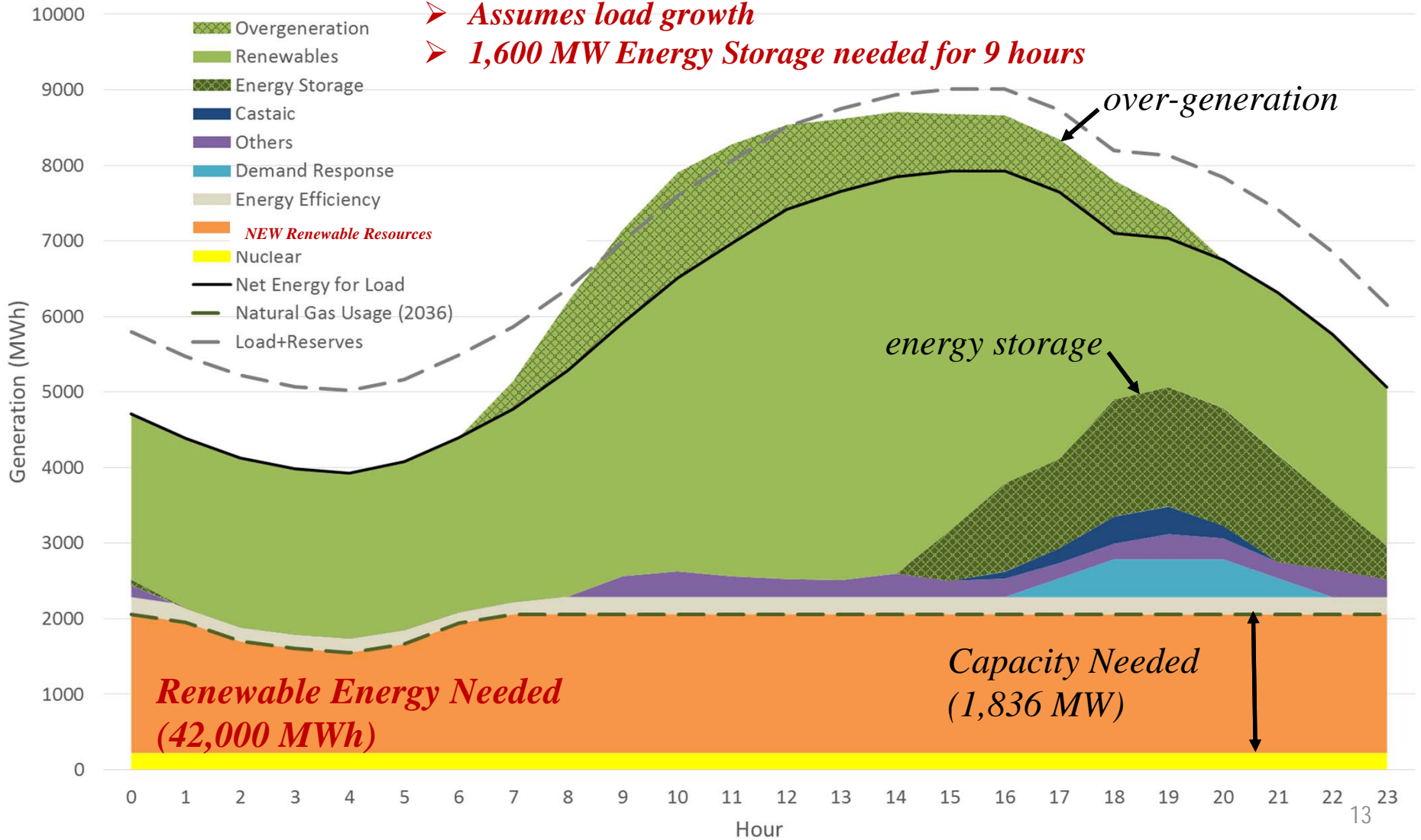


September 16, 2017 (Simulated Peak Day - 6,396 MW)



Summer Peak 2036 (with Load Growth – 7,989 MW)

- *IPP coal is replaced in 2025, Renewables grow to 73% RPS*
- *Assumes load growth*
- *1,600 MW Energy Storage needed for 9 hours*



Questions?