



GUAM POWER AUTHORITY

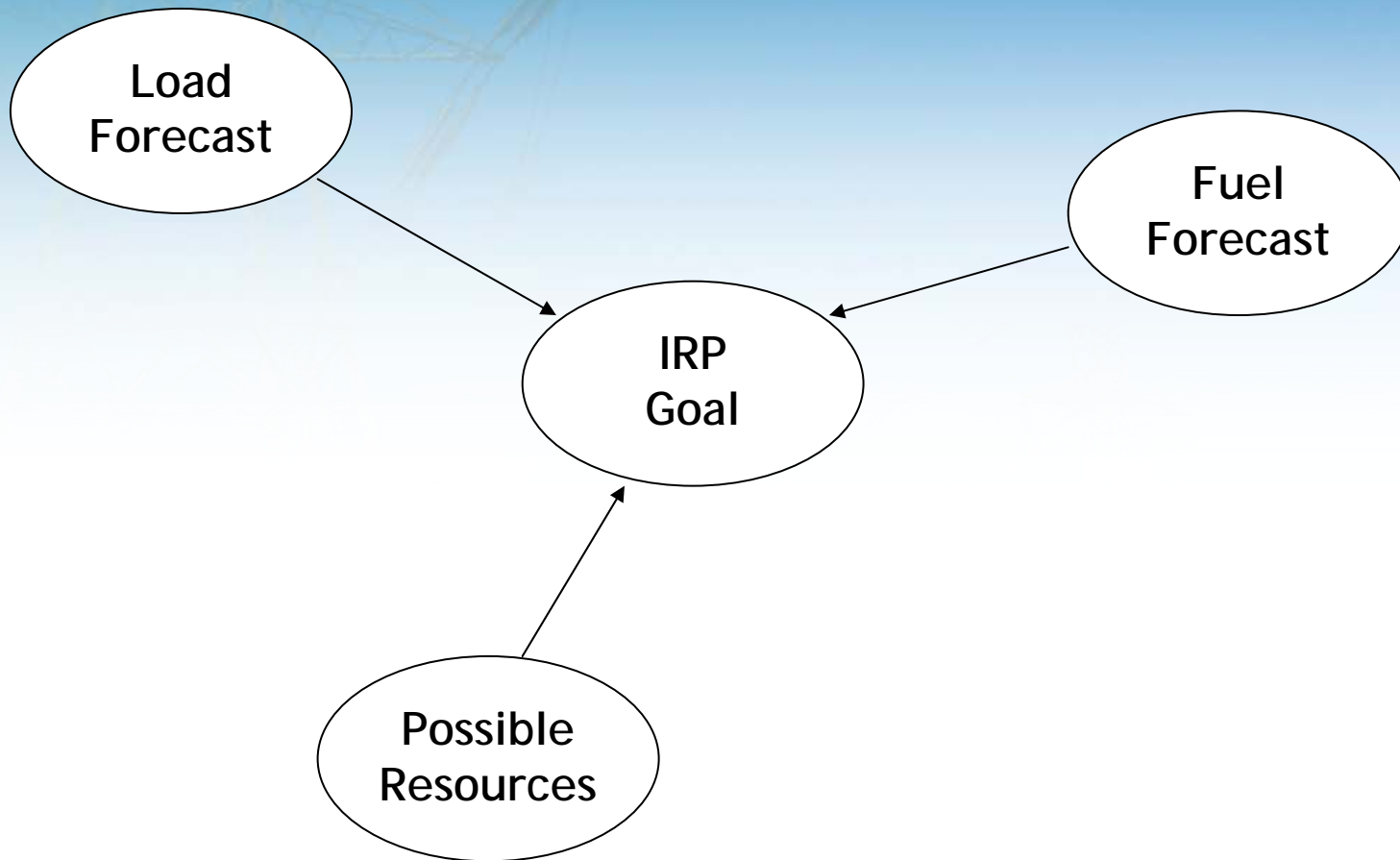
# Load and Resource Balance



November 29, 2007



**Mind Powered: Insight with Impact.**



# The Issues

- Reserves: spinning, operating, reserve margin
- Determination of required amount of system generating capacity to ensure adequate supply
  - Scenario-based reserve policies
  - Loss of Load Expectation based policies
- Load duration curve - What is the appropriate type of generation mix

# Reserves - Planning for the Instant

- Spinning reserve
  - Describes the total amount of generation available from all units synchronized (spinning) on the system, minus present load and losses being supplied
  - Must be carried so that the loss of one or more units does not cause too far a drop in system frequency thereby preventing system blackouts
  - The risk of instantaneous generation loss requires that ample reserve on the other units make up for the loss in a specified time

# Reserves -Next Hour and Day

- Operating reserve
  - Includes rapid start units such as combustion turbines and diesel units, interruptible loads, interconnection ties to other utilities
- Purpose
  - Replacement of committed capacity that has failed
  - Uncertainties in forecast

# Reserve

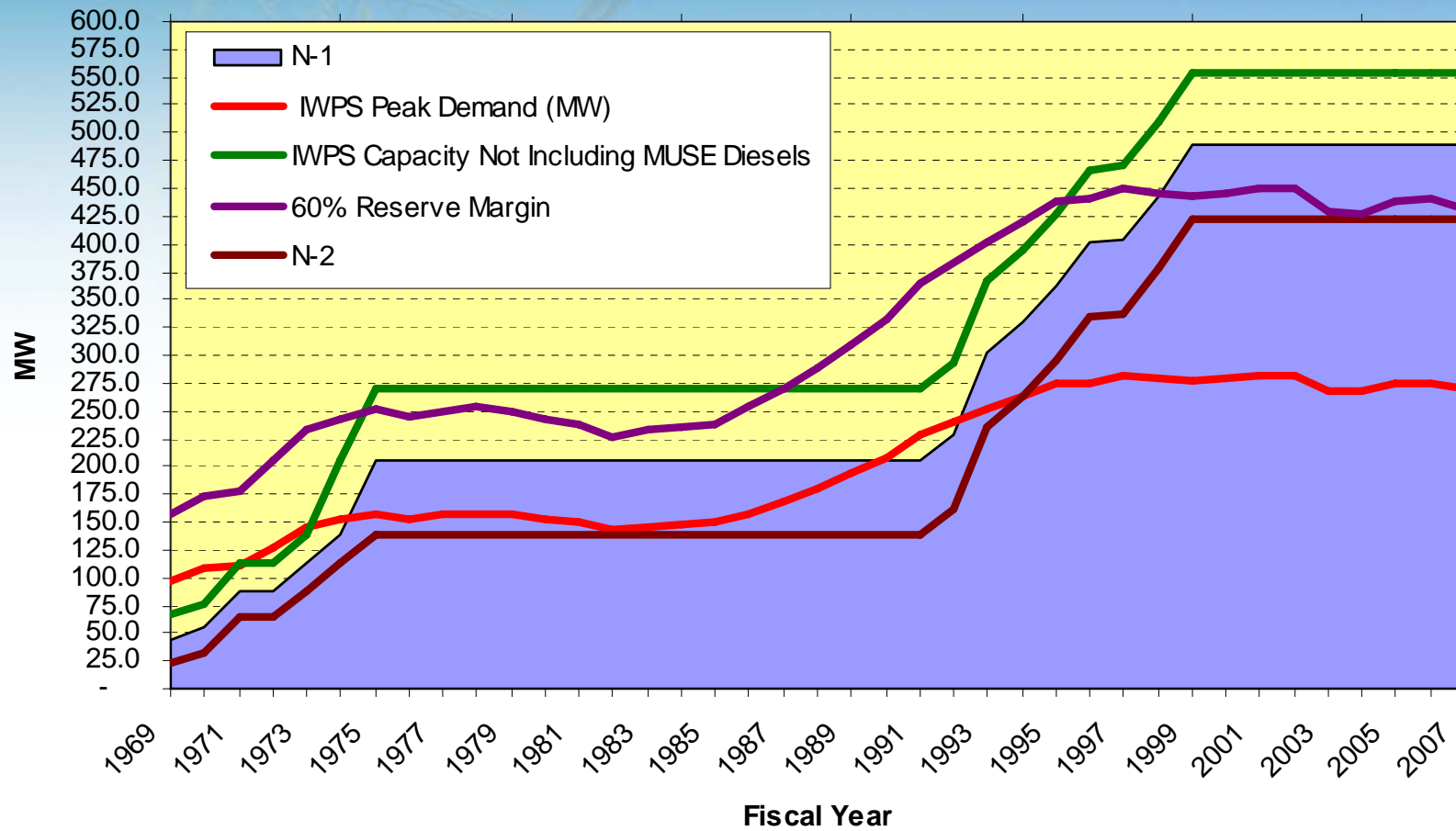
## Long-Term Planning for Generation System Reliability

- Planning Reserve
  - How much installed capacity should be in place to meet generation reliability or contingency policies?
  - Long-term planning for long lead time investments

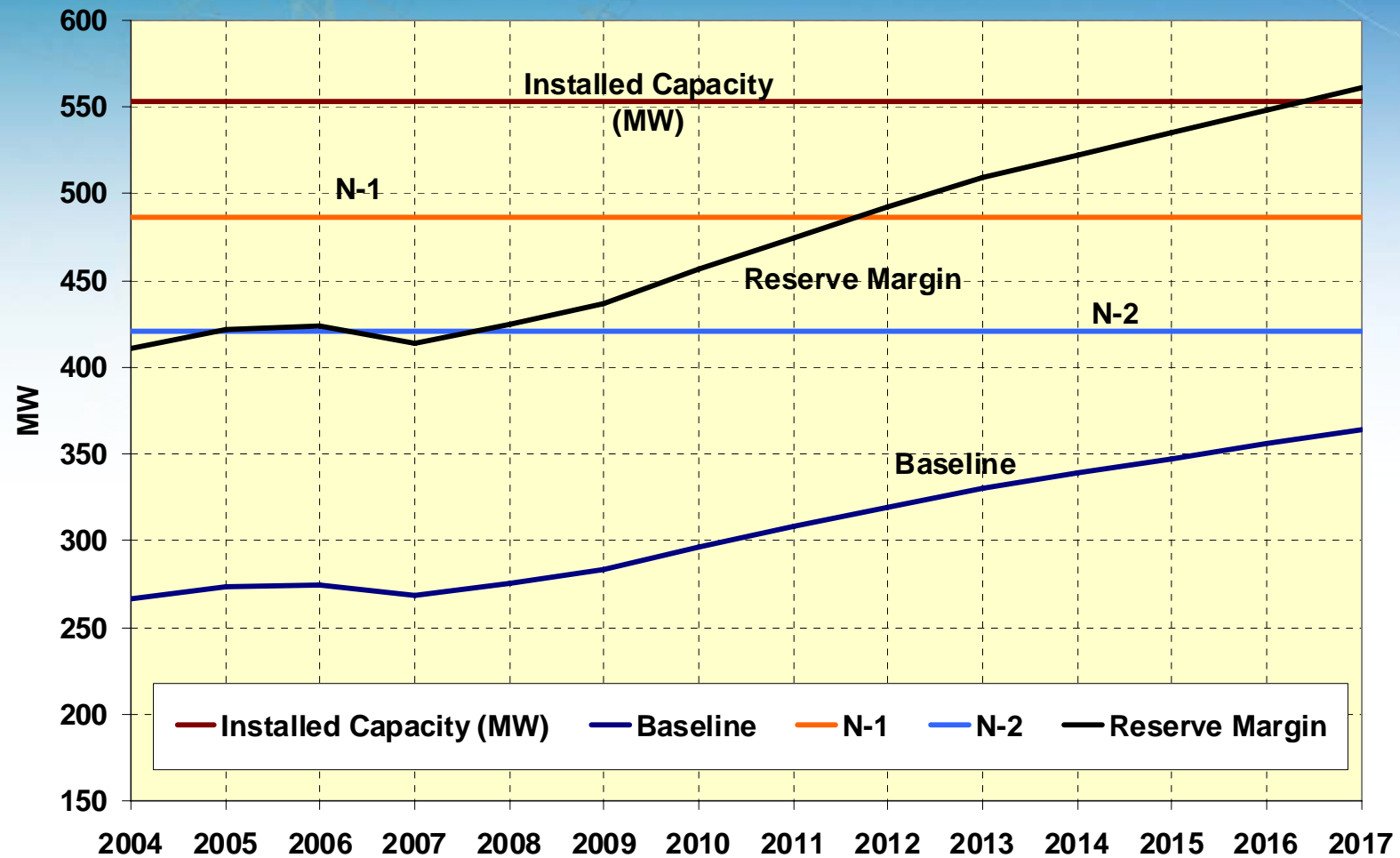
# Ensuring Adequate Supply

- Two Philosophies
  - Scenario-based reserve policies
    - Provides only a relative statement of generation system reliability or ability to serve loads
    - Covers discrete defined unit outages
      - N-1, N-2, ... N-m criteria
  - Loss of Load Probability (LOLP) based policies
    - Provides a higher measure of reliability or ability to serve loads

# Historical



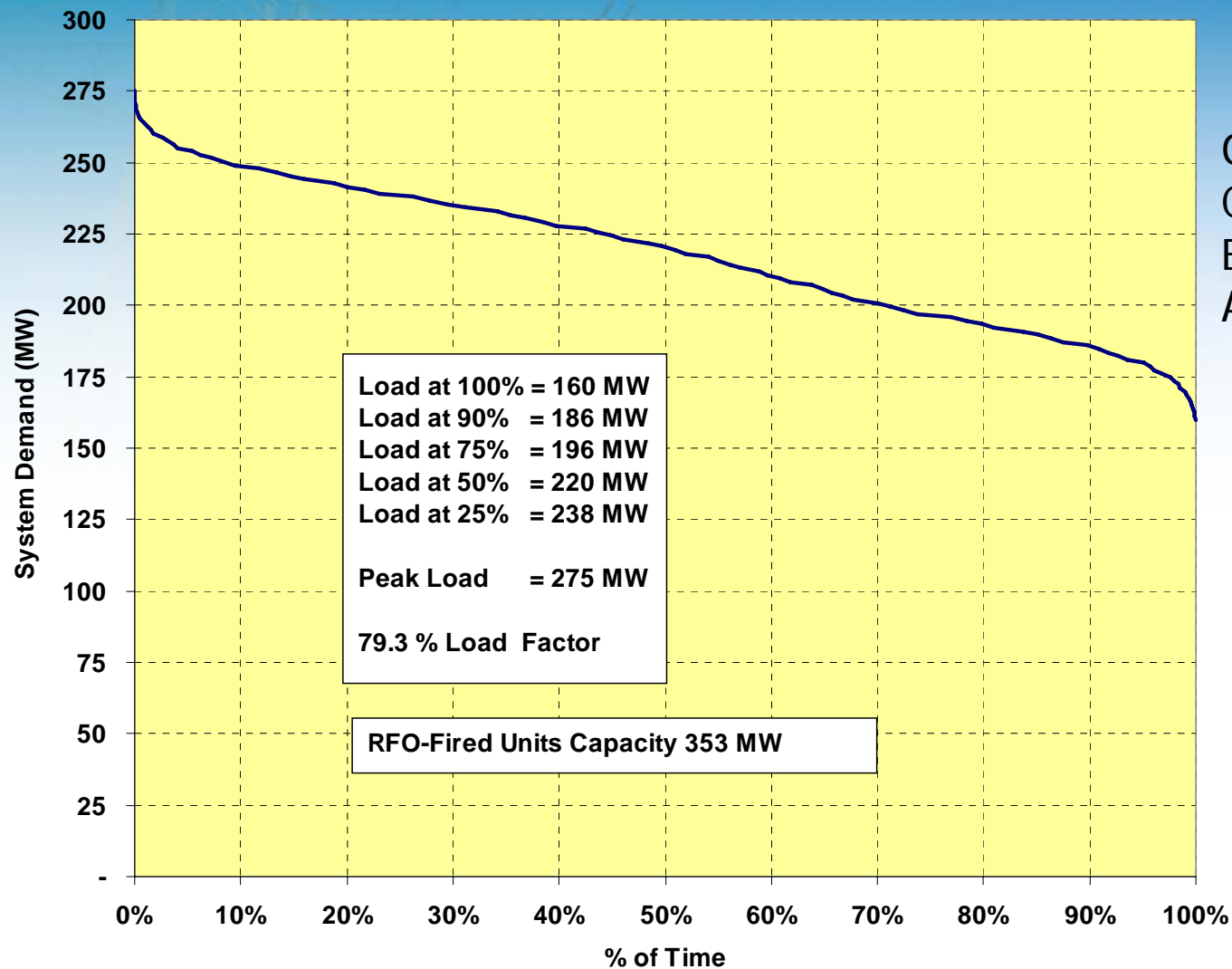
# Load/Resource Balance - Reserves



# Capacity Addition Guidelines

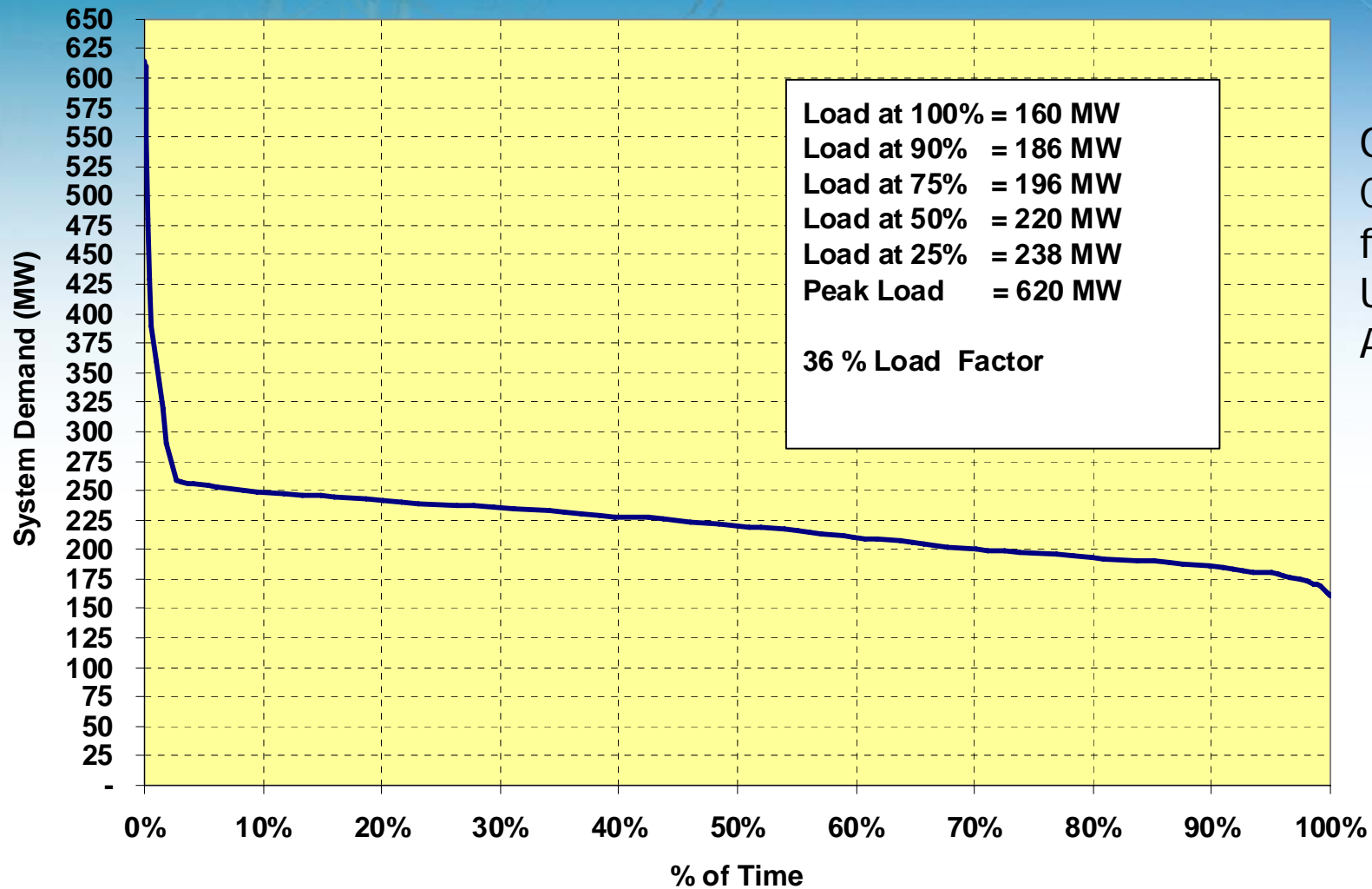
- Rule of thumb
  - Generation unit additions should be sized between 7% to 15% of peak demand
- Generation systems with large units are less reliable than systems of the same size with appropriately sized units and will require more installed capacity
- Increasing unit availability increases generation system reliability and reduces required reserves

# GPA FY 2006 Load Duration Curve



Good  
Candidate for  
Baseload Unit  
Additions

# Load Duration Curve - Low Load Factor



Good  
Candidate  
for Peaking  
Unit  
Additions

Not suggesting GPA will ever have a 600+ MW Peak

# What can bring in units prior to reserve margin violations?

- Addition lowers total system costs
- Fuel diversity policy
- Unit retirements
- Risk



- Questions