



GUAM POWER AUTHORITY

# Load Forecast & Key Drivers

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# Managing For Uncertainty Requires Forecasting

*Forecasting future electric demand is the leading issue in determining future plans. Development of generation resources is a long lead-time business. Long lead-times allows risk to compound over time.*

# What Is A Load Forecast?

- Future loads
  - Demand (MW)
    - Drives the need for capacity
  - Energy (MWh)
    - Drives the selection of type of capacity
- By customer type
  - Sales and Revenues
  - Cost of Service Allocations
- Discrete events
  - Addition of Large Loads
  - Economic and Population Effects of DOD Buildup
- Key Drivers
  - Population growth
  - Growth in Tourism
  - Growth in DOD loads
  - Impacts of customer energy use choices

# Load Forecast Objectives

- Exploring the range of possible futures rather than simply trying to predict the most likely one
  - Feasibility
  - Desirability
  - Policy

# How is a load forecast done?

- Field investigation
  - What is the local development story?
  - What is the utility planning objective?
- Determining the Drivers
  - Weather, economic growth, external events like tourism of military/infrastructure
- Gathering Time Series Datasets and Data Checking
- Regression Analysis
- Testing the Model
- Developing the forecast based upon judgment and insight
- Updating the inputs and the Model

# Tools Used

- Hourly historical weather as recorded at the international airport
- Economic history as quantified by GovGuam agencies
- Baseline economic forecasts by Moody's for Guam and Japan
- E-Views statistical package
- Proprietary GPA load and sales models developed by Mangilao
- Proprietary GPA load and sales reports developed by Mangilao in consultation with SPORD

# What is a load resource balance?

- A load resource balance looks at the following:
  - System Peak Demand requirements and reserve policy to determine the amount of installed capacity
  - Load Duration Curve to determine the type of capacity additions needed

# Generation Reserve

- Generation Reserves come in several flavors
  - Operating Phase
    - Spinning Reserve
    - Operational Reserve
  - Planning Phase
    - Reserve Margin
- Choice of Generation Addition Affect Each

# Reserve Margin Policy

- Reserve Margin is a major driver in determining when generation additions are made to a system
- Two Types of Reserve Margin Policy
  - Scenario-based: N-1, N-2, N-3
    - Scenario-based N-m based planning criteria do not show how reliably a system can serve demand requirements
    - Simpler to understand
    - Minimal information required
  - Loss of Load Probability (LOLP)
    - Complex stochastic models
    - Historical information required

# Generation Addition

- Generation capacity may be added for several reasons:
  - Reserve policy is violated
  - Addition of new capacity lowers system costs
  - Fuel diversity policy
    - Includes renewable resource goals
  - Reduction of risk

# Key Drivers & Uncertainty

- Tourism Growth
- DOD Growth
- The local economic outlook
- Impact of Customer End Use Choices
  - Efficiency improvements
  - Distributed Solar and Wind
  - Demand management

# Tourism Growth

- A one Yen decrease in the Y/\$ exchange rate leads to an increase in visitation of 905 visitors/month
- An increase in real Japanese personal income per capita of Y100,000 (1995 Y) leads to an increase visitation of 27,292 visitors/month
- Since tourism is largely uncorrelated with DOD activity, it gives Guam's economy better diversity - an improved ability to endure business cycles
- Between 2006 and 2026 the number of tourist quality hotel rooms on the island will increase from their current level of 8,000 rooms to a total of 14,300 rooms, an increase of 75%
- 10,200 new permanent local jobs will be created

# DOD Growth

- Guam is envisaged by DOD as another Diego Garcia, strategically situated to balance China and N Korea
- Military and infrastructure spending will total \$7-\$11+ billion (2006 \$) by 2020 - \$700+ million annually through 2010
  - Assumes that GPA will be serving all DOD loads
- The timing and composition of spending is uncertain beyond 2010, but the DOD strategic vision and the need for spending will continue
- The effect on electricity sales results from an increase in the number of households - military and non-military - to be served by GPA, and a dramatic increase in the number of medium to large sized commercial accounts created to serve the new infrastructure
- 16,500-26,000 new civilian jobs will be created by 2020

# Customer Behavior

- The number of customers is determined by the outlook for economic development
- Energy consumption per household is determined by household size, income and the real price of electricity
- We do not expect household composition to change dramatically
- Real income per household will grow, increasing consumption
- Consumers have proven to be very responsive to real price increases
- Conservation will only result from building codes, DSM or higher real electricity prices
- The penetration of distributed customer generation (etc.) will be driven entirely by project economics, including DSM subsidies

# Customer Response to Changing Prices

	<u>Elasticity</u>
Residential	-0.4458
Small General Non Demand	-0.3757
Small General Demand	-0.4157
Private Outdoor Lighting	-0.4427
Govt Small Non Demand	-0.2891
Govt Small Demand	-0.5362
Agency Street Light	-0.0281
Navy	-0.1128
Peak	-0.1066

- A 1% real increase in end-use electricity prices will reduce residential usage by 0.44%
- The peak is affected also, but not nearly as much

# Are the drivers of growth related?

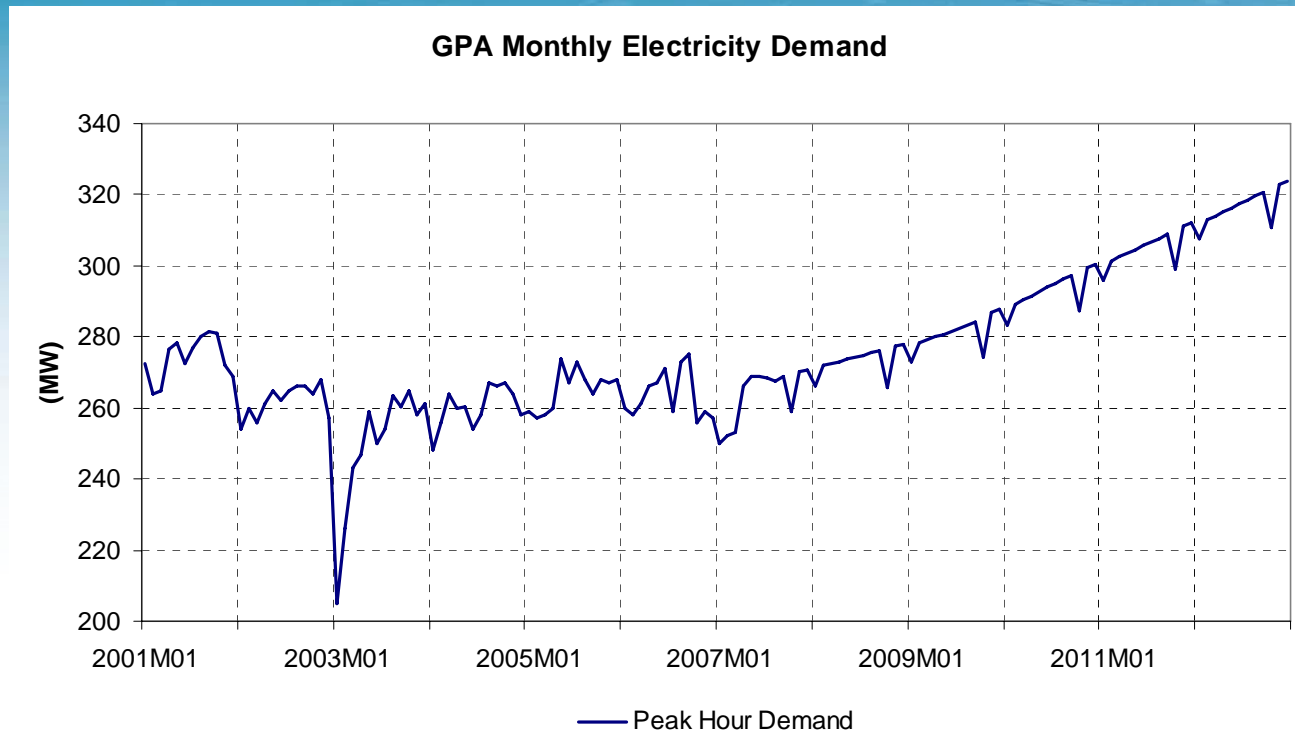
- Until very recently, there was almost no organic growth on Guam
- We are expecting a great deal of growth from the completion of local military/infrastructure projects
- Significant growth will also come from a rapid spurt of development in the tourism industry, helped by the falling dollar
- These two sources of growth are uncorrelated, giving confidence that a period of very rapid economic growth is about to occur

# Primary Scenarios Developed

- Baseline Scenario (36%)
- Low DOD Infrastructure - High Tourism (24%)
- High DOD Infrastructure - Low Tourism (24%)
- High DOD Infrastructure - High Tourism (16%)

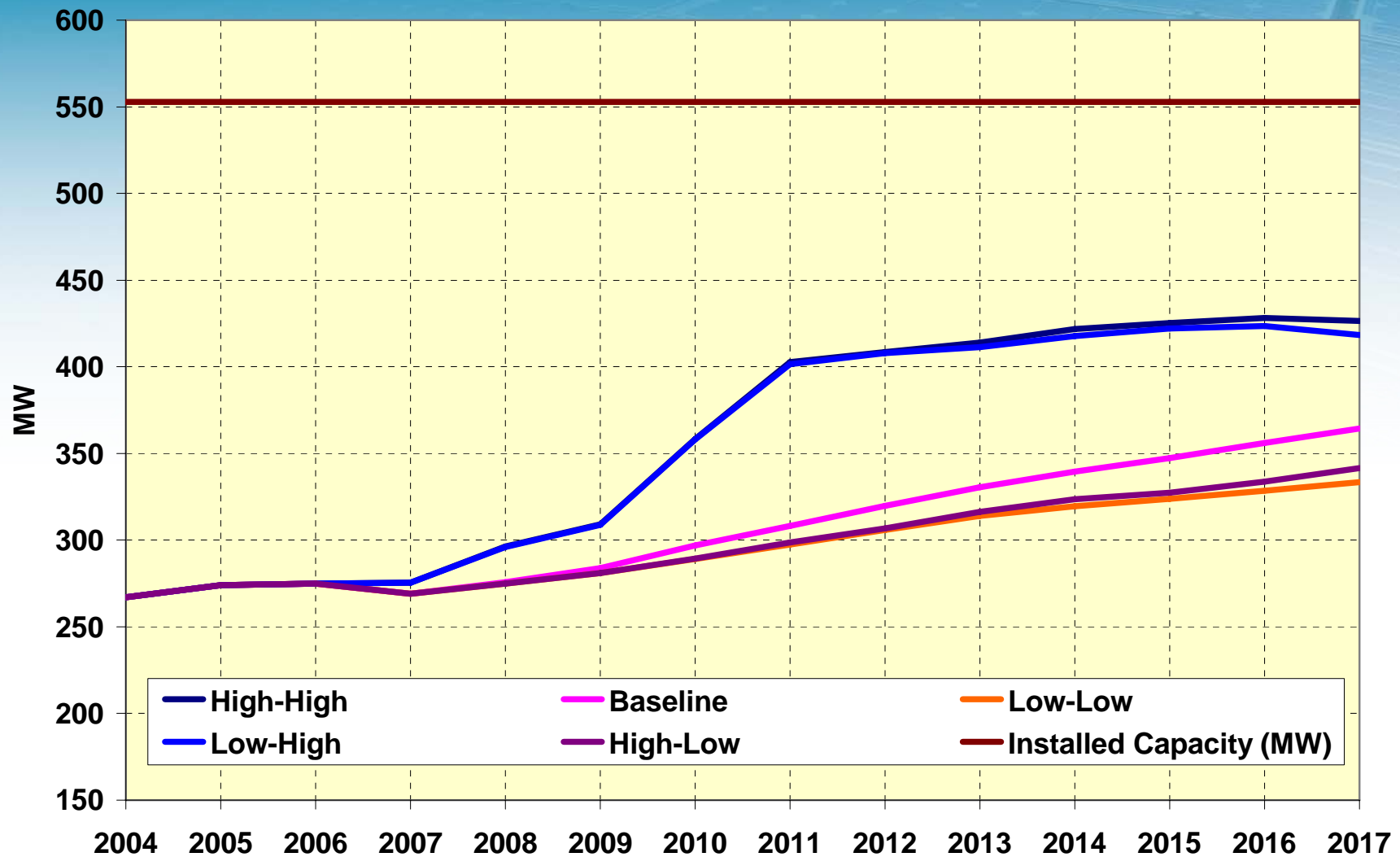
*Since this forecast was prepared, Moodys has recognized this pending development and revised their forecast upward, from 0.6% to 5.4% employment growth. As a result, a new baseline prepared today looks like the high infrastructure-high tourism scenario*

# Load forecast and resource balance for the primary scenarios



- GPA peak hour demand will exceed 300 MW by late 2010
- What would you want to examine?

# Load/Resource Balance - Installed Capacity



# Risks to the Forecast

- The dollar now appears to be in decline. The stimulative effect on tourism is likely understated. For example, we have only considered Japanese tourism.
- DOD spending plans are based on current views of strategic needs *vis a vis* China and N Korea. Any increased concern to this view may lead to much larger or accelerated military/infrastructure spending.
- There is a growing consensus that oil prices are at their peak. *If* oil returns to \$60/barrel, the resulting lower electricity prices may have a stimulative effect on electricity consumption.



*Thank You*

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