Weather Adjustment

Introduction

- Explicit extreme weather criteria are important for defining “base conditions” for system planning.
- Weather adjustment of loads to the defined planning criteria is important to ensure the system is planned to serve load levels that may occur in the event of extreme weather conditions.
- Extreme weather criteria can differ across regions due to topographical/geographical features.

Utility Problems

- Most corporate forecasts are “normalized” on the basis of seasonal energy sales, not peak load.
- “Normalization” implies adjustment of a forecast so it represents average, or most expected, load behavior.
- Most utility systems are designed to “just get by” under the harshest conditions.

ABB's Approach

- ABB recommends that forecasts be adjusted to represent electric load in such a way that a "higher than designed" load (due to harsher than normal weather) is handled as a calculated risk.
- ABB will:
  - Determine target weather conditions which are "periodic enough" that falling short is unacceptable
  - Develop models representing the weather dependence of substation loads
  - Adjust the forecast to represent load during these weather conditions

Process & Deliverables

Process

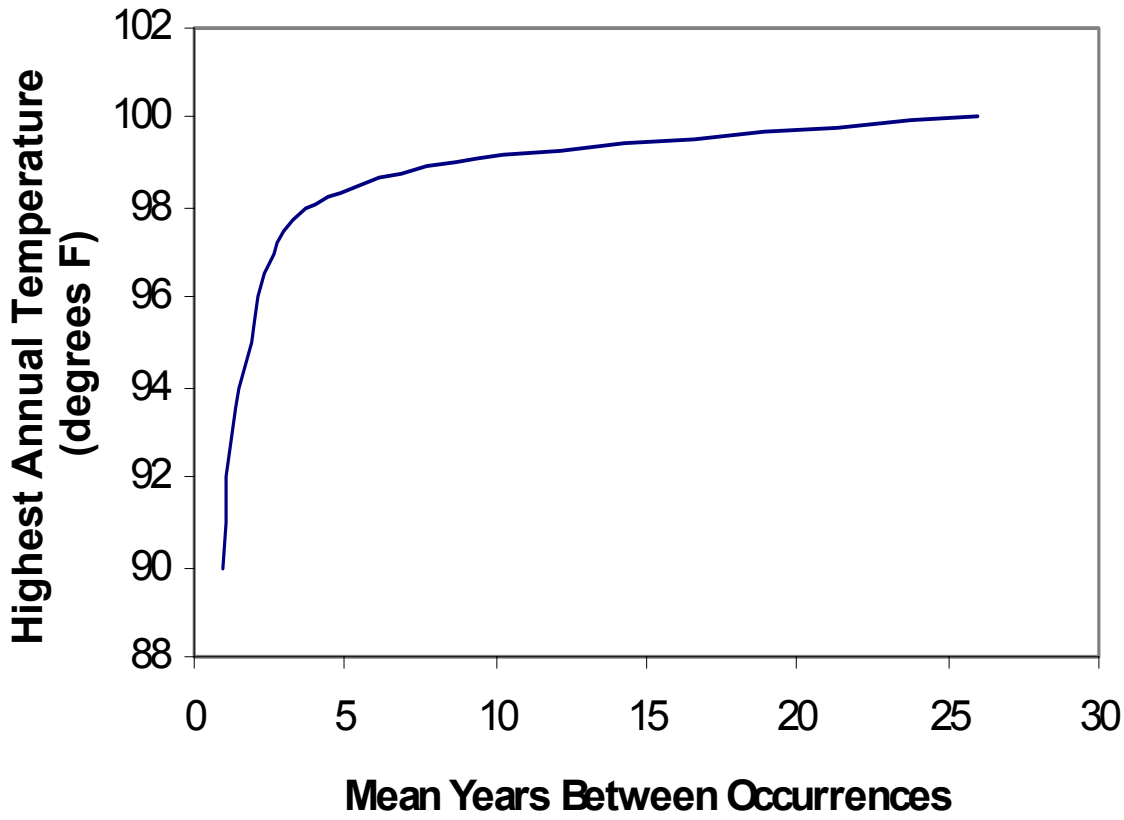
- Determine load dependence on weather conditions
- Determine the likelihood of weather exceeding any specific targets based on historical weather data

Deliverables

- Design targets
- Forecasts adjustments to the targets
  - Identify areas of specific concern
  - Stack rank network performance exposure

Weather Criteria Determination

- Extreme weather criteria can be determined based on risk of exceeding weather conditions and estimated load impacts.



- Extreme weather criteria can differ across regions due to topographical/geographical features (e.g. mountains / piedmont / coast).

Model Use

- Adjustment factors based on peak load estimates computed from extreme and actual weather conditions.

$$\text{Adjustment Factor} = \frac{\text{Extreme Weather Peak Load Estimate}}{\text{Actual Weather Peak Load Estimate}}$$

- Adjustment factors applied to actual peak load to determine weather adjusted peak loads.

$$\text{Weather Adjusted Peak} = \text{Adjustment Factor} * \text{Actual Peak}$$

ABB

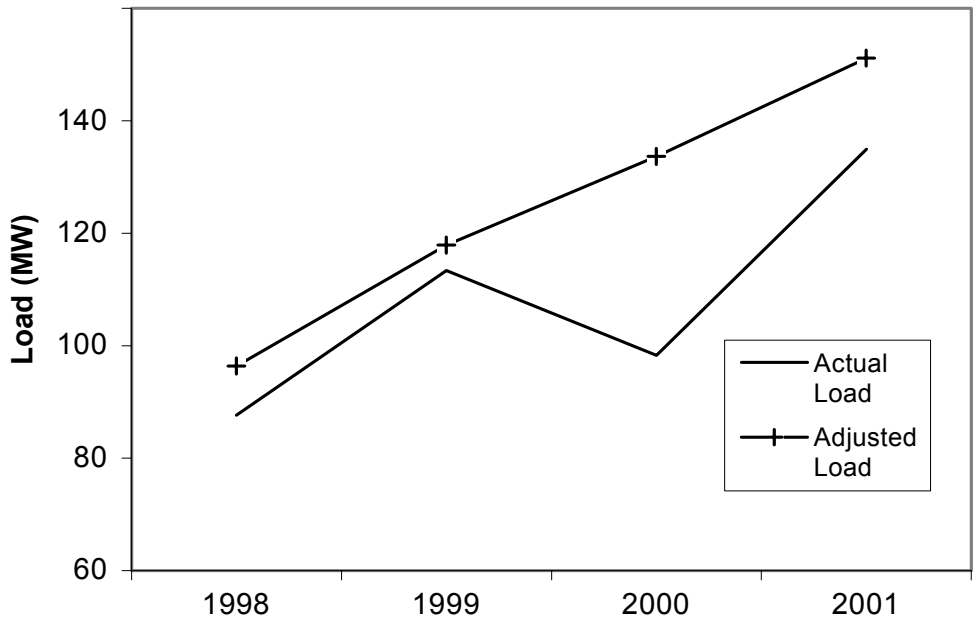
Weather Adjustment Development

- Weather adjustment is performed on a “per substation” basis to account for the variation in weather sensitivity among substations.

1. Determine regression model parameters
2. Compute estimated peak load based on regression model and actual weather conditions
3. Compute estimated extreme weather peak load based on regression model and extreme weather conditions.
4. Compute weather-adjustment factor.
5. Apply adjustment factor to actual peak load.

Weather Adjustment

- Weather adjustment supports trending and comparison of annual substation loads on an “apples-to-apples” basis.
- It also provides statistically valid support for regulatory need determination.



	1998	1999	2000	2001
Actual Load (MW)	87.6	113.4	98.3	134.9
Adjustment Factor	1.10	1.04	1.36	1.12
Adjusted Load (MW)	96.4	117.9	133.7	151.1

Results

- Cost-effective capacity level
- Adjusted load levels for frequent weather conditions
- Recorded peak loads for yearly comparison & to support trending to identify load growth patterns among substations and feeders.

Next Steps

- Assess if weather variations do pose a challenge for the utility.
  - Formulate an agreement
- Identify utility team members to support this effort
- Develop and approve proposal for weather analysis
- Collect system load data & related outage information
- Perform study