Determining the New York Control Area (NYCA) Installed Reserve Requirements

Presented to the NEPOOL Power Supply Planning Committee

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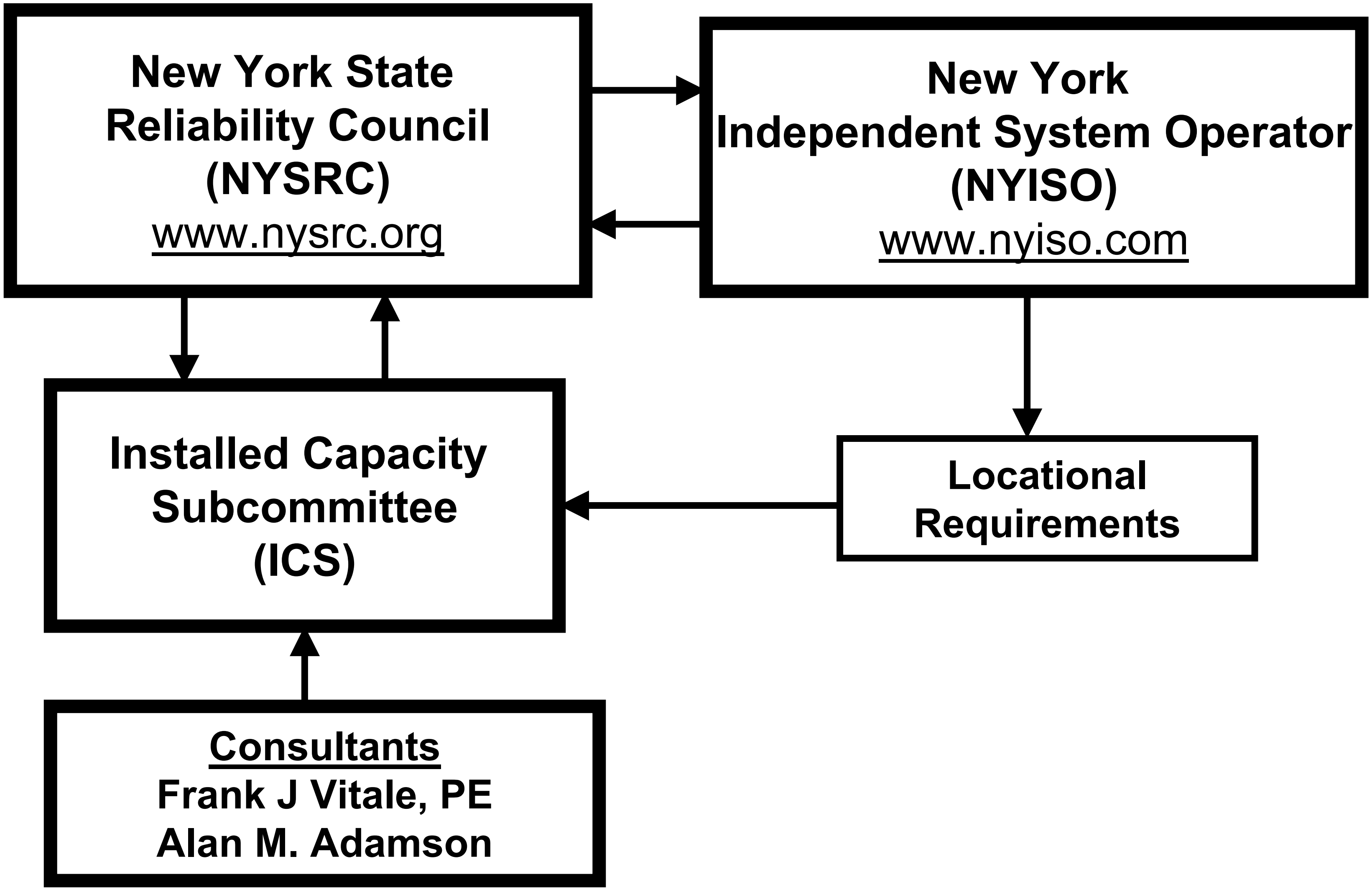
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Subcommittee
(ICS)
Locational
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Determining NYCA's Installed Reserve Margin (IRM)

- To meet Reliability Criterion
- Use the General Electric Multi-Area Reliability Simulation Program (MARS)

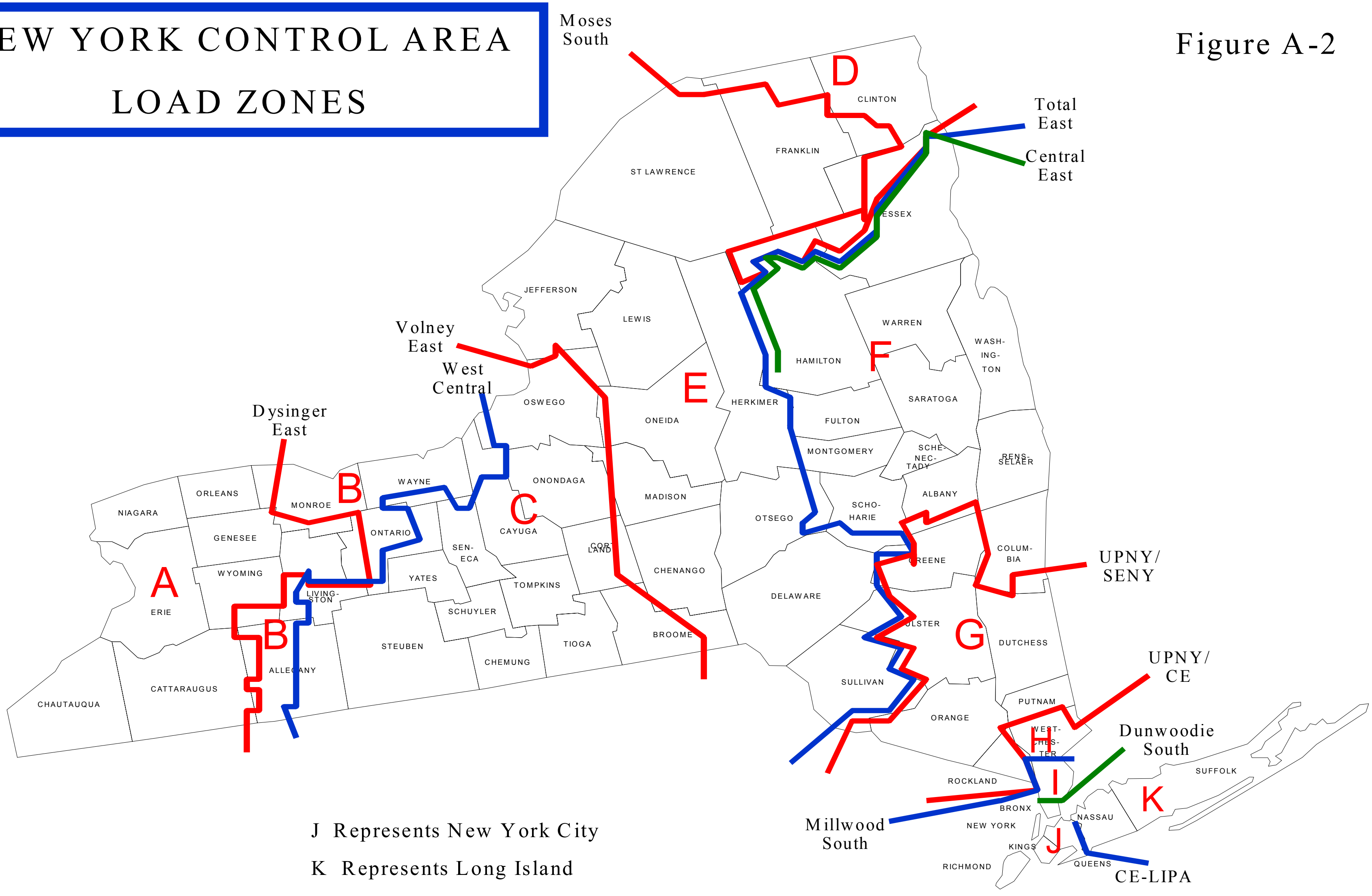
Reliability Criterion for a Generation Shortage

- Fixed Installed Reserve Margin
- Loss of Largest Unit
- Loss of Energy Expectation (LOEE)
  - Used mainly by hydro systems
- Loss of Load Expectation (LOLE)
  - Due to a lack of generation
  - Most widely used
  - Used by NYSRC (1 day in 10 LOLE)

Areas Modeled

NEW YORK CONTROL AREA LOAD ZONES

Figure A-2



J Represents New York City

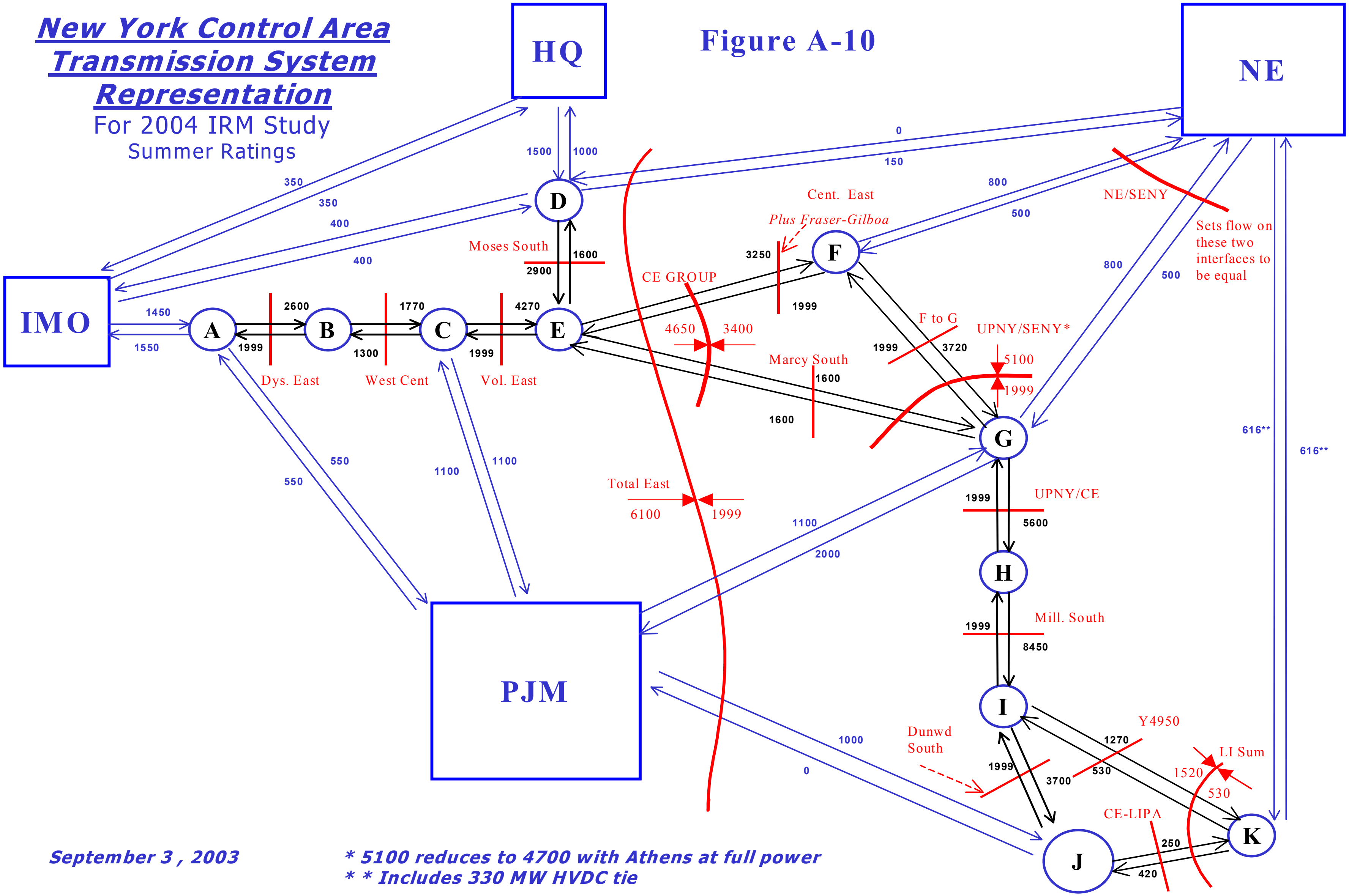
K Represents Long Island

New York Control Area Transmission System Representation

For 2004 IRM Study

Summer Ratings

Figure A-10



September 3 , 2003

** 5100 reduces to 4700 with Athens at full power*

** * Includes 330 MW HVDC tie*

MARS Program

- Developed by GE with
  - New York Power Pool (NYPP)
  - Empire State Electric Energy & Research Corp.
  - Roy Billinton PhD.

- It is a **sequential** Monte Carlo simulation

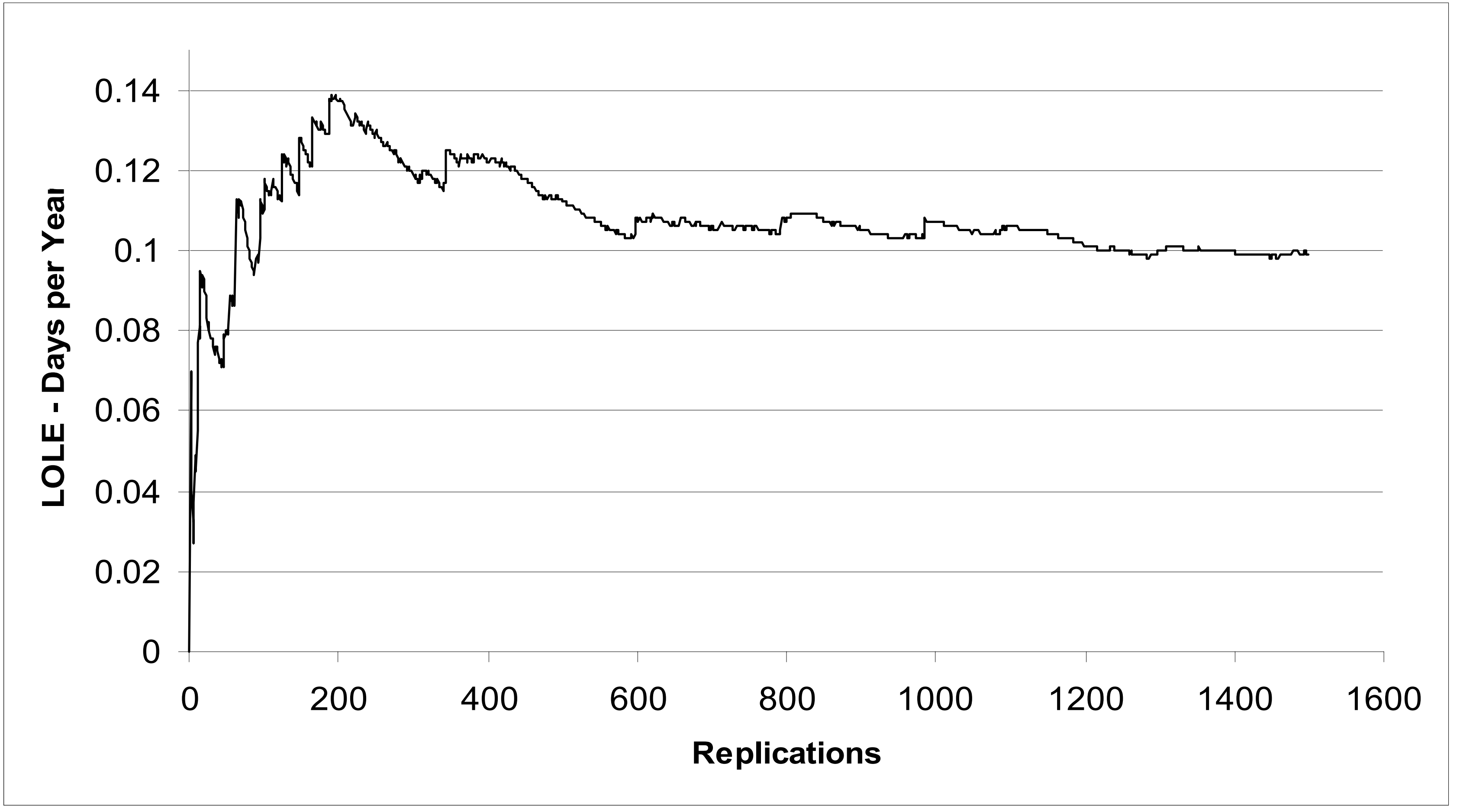
Monte Carlo Simulation

- Random events to be considered
  - Generator forced outages
  - Cable forced outages
  - Variations in forecasted loads
- System scenario created by randomly drawing availability of equipment and load demand
- Reliability indices determined for given scenario
- Year is simulated with different sets of random events until statistical convergence is obtained

Factors Influencing Convergence

- Number of units and size relative to load
  - Many units small in comparison to load results in less year-to-year variation and faster convergence
- Strength of transmission network between interconnected Zones and Areas
  - Strong ties reduces yearly variations
- Level of reliability
  - Highly reliable systems converge more slowly

Sample Output



MARS Methodology

- **Based on a full sequential Monte Carlo simulation**
- **Chronological system simulation performed by combining**:
  - Randomly generated operating histories of units through time
  - Hourly chronological load cycles
  - Transmission links
- **Year simulated until convergence criterion is met**

MARS Program Models

- Generating Units and associated outages
- Loads for each area
- Transfer limits between Zones and Areas

Input Data

- Generating units
  - Summer and Winter Ratings
  - Scheduled Outages
    - Compared to historical
  - Full and Partial outages
    - Now using a five year history based on GADS data
    - Includes postponable maintenance outages
    - Additional deratings not captured by GADS
  - Temperature Deratings
  - Hydro Deratings
  - Additions and Retirements

Input Data continued

- Loads for each Zone and Area
  - Full 8760 hours available
  - Align summer and winter peaks of each Area
  - Usually just model peak hours for each Zone
  - Load Uncertainty model

Input Data continued

- Transfer Limits
  - By Interface
  - By Groups of Interfaces
  - Cables modeled with forced outage rates
  - No outage modeled on overhead transmission
- Use Emergency Transfer Criteria
- Allows for post contingency loading to Short Term Emergency (STE) Ratings
- Contracts effect Transfer Limits

Input Data continued

- Order of assistance
- Emergency Operating Procedures include:
  - Special Case Resources (SCRs) as capacity
  - Emergency Demand Response Program (with a limited number of calls)
  - Emergency Purchases are now next to last, instead of first.

Emergency Operating Procedures

Step	Procedure	Effect	MW Value
1	Special Case Resources	Load relief	652 MW
2	Emergency Demand Response Prog.	Load relief	225 MW
3	5% manual voltage Reduction	Load relief	81 MW
4	Thirty-minute reserve to zero	Allow operating reserve to decrease to largest unit capacity (10-minute reserve)	600 MW
5	5% remote voltage Reduction	Load relief	487 MW
6	Curtail Company use	Load Relief)	60 MW
7	Voluntary industrial curtailment	Load relief	143 MW
8	General public appeals	Load relief	10 MW
9	Emergency Purchases	Load relief	Varies
10	Ten-minute reserve to zero	Allow 10-minute reserve to decrease to zero	1200 MW
11	Customer disconnections	Load relief	As needed

Developing the Base Case

- Start with last years Base Case
- Update all the input data
- Use last years locational requirements for the New York City and Long Island Zones.
- Adjust load proportional to each Zone's peak **load** until we get an LOLE of 0.1 days per year.
- Adjust adjacent Areas load so they are **less reliable** then NYCA.

Sensitivity Cases

• Base Case	17.1%
• NYCA Isolated	23.5%
• No load forecast uncertainty	13.9%
• Reduce transfer limits 10%	18.5%
• No constraints between Zone	16%
• Add 240 MW wind	17.7%
• No voltage reductions	19.2%

- No external ICAP - Depends on amount and location
- Fuel Mix - Not an IRM issue

Locational Requirements

- Developed for Zones J (NY City) and K (Long Island)
- Developed by the ISO after IRM is done
  - Uses updated load and generator data
- Trying to do jointly (NYSRC AND NYISO)