Stochastic modeling of flexibility needs and use of SERVM model for analysis

Donald Brooks
Energy Division

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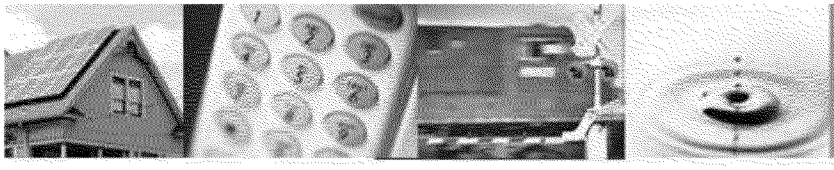
California Public Utilities Commission

Overview of presentation

- Need for stochastic modeling versus deterministic modeling
- Nature of problem – uncertainty and variability
- Use of SERVM to assess uncertainty and variability, as well as test possible remedies



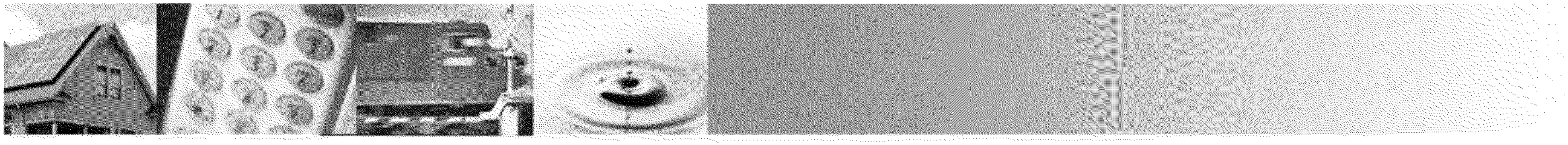
Deterministic/Stochastic analysis - comparison

Deterministic Analysis

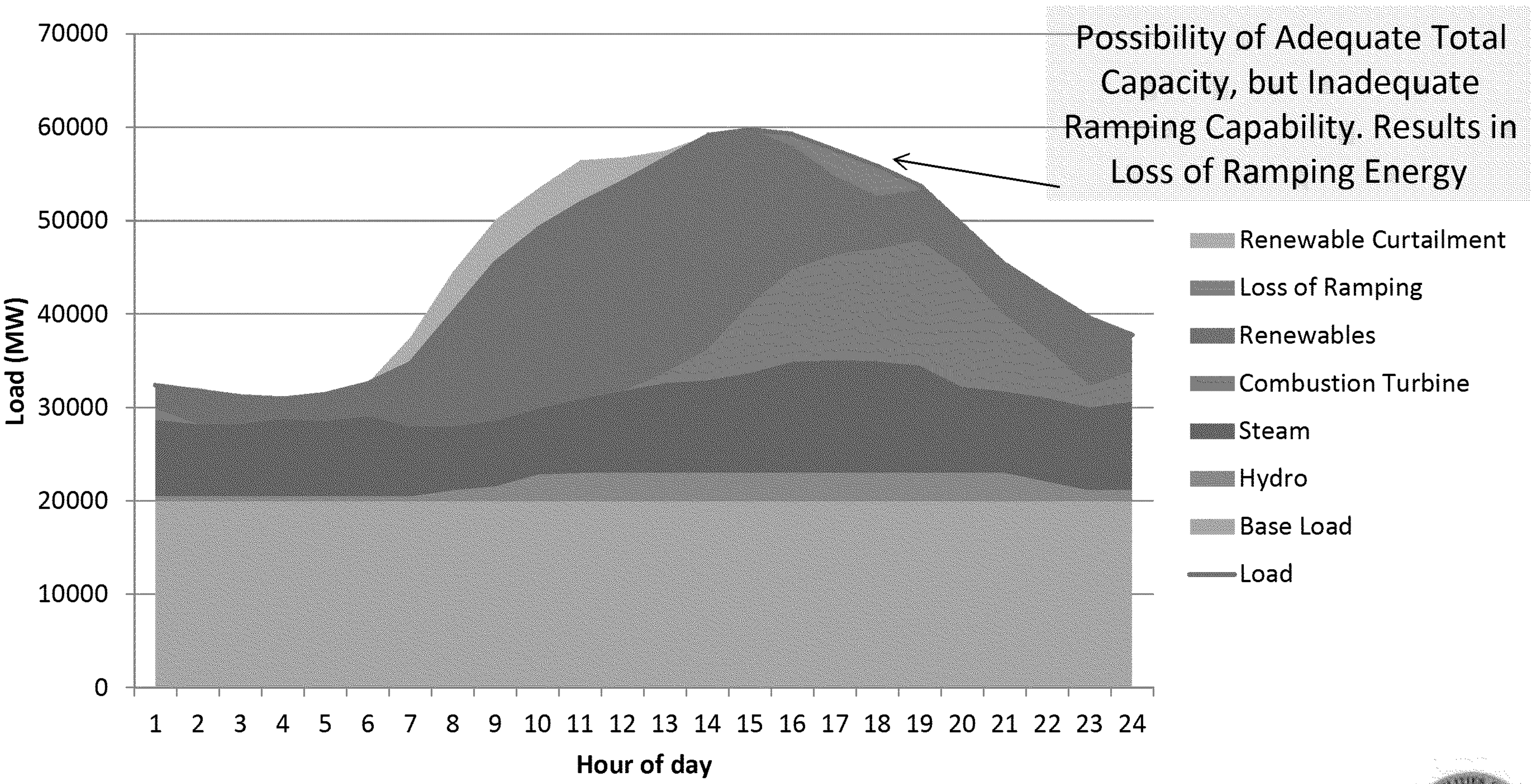
- Far less data intensive
- Able to constrain model more easily for real world dispatch
- Able to accurately illustrate dispatch with incredible granularity as to timeframe and location – better at power flow modeling for example
- Existing metrics and much easier to compare with other studies
- Drawback – prone to overweight "artificial" dispatch scenario

Stochastic Analysis

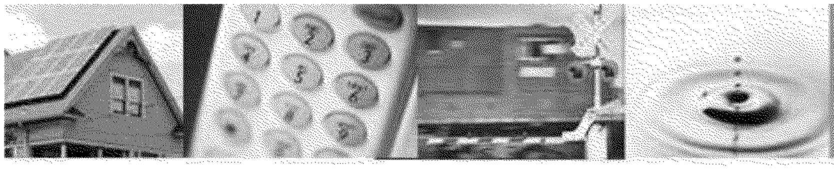
- Much more data intensive
- Analyzes range of inputs and range of results – does not overweight one pretreated scenario of load and resource dispatch
- Difficult to compare – lack of existing metrics or standards
- Ability to model a much broader range of variability in inputs and outcomes with iterative Monte Carlo simulation



Nature of problem – duck chart in reverse

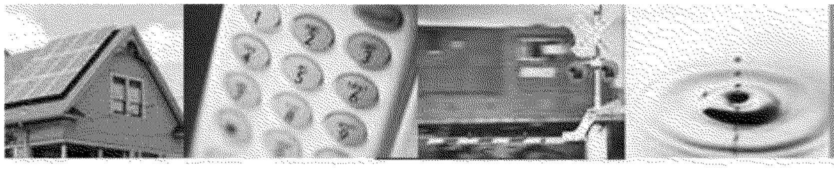


Source – presentation made by Astrape consulting to CPUC staff



Overview – key points of proposal

- Analysis is iterative – start with hourly Monte Carlo simulation
  - Flexibility analysis is add-on to more traditional ELCC/LOLE analysis
- Optimize base case to calibrate at desired reliability level – currently California has large reserve margin, likely need to remove capacity to ratchet down to 1 in 10
- Once base case is calibrated, engage “flexibility logic”.
- Two main elements of flexibility issues
  - Dispatch **UNCERTAINTY**
  - Inherent load/wind/solar/etc. **VARIABILITY**
  - Both elements force dispatchers to rely on fast ramping or operationally flexible resources



Iterative Analysis

Start with LTPP Base Case

1. Fill out base case for test year (i.e. 2024)
2. Standard LOLE/ELCC analysis – hourly increments – 8760 time steps per year
3. Monte Carlo simulation to assess impact of variability in key inputs
4. Optimize reliability to 1 in 10 reliability metric – may result in adding capacity to increase reliability or remove capacity to decrease reliability
5. Chart outage events –when they happen, how long are they expected to last, what is the magnitude of outages?

Add Flexibility Analysis

1. Start with 1 in 10 optimized 2024 base case
2. Gather data on uncertainty
3. Enable unit constraint and intra-hour logic in model – uncertainty and variability
4. Measure increase in unreliability – longer outage events, more frequent outage events, greater unserved energy
5. Result is increase in need for flexibility for dispatch uncertainty as well as load/resource variability
6. More detail on model will be forthcoming

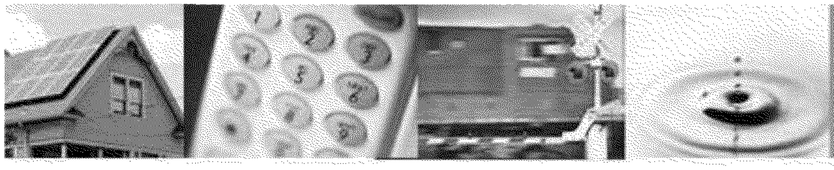
Next Steps – where do we go from here?

Procedural

- Issue formal proposal into LTP proceeding describing approach
- Publish data sets, assumptions document
- Publish results to stakeholders, hold workshops
- Prepare for June 6 workshop
- For questions and suggestions – donald.brooks@cpuc.ca.gov

Analytical

- 2024 Base Case – migrate to new TEPPC 2024 Common Case
- Data development – load/wind/solar uncertainty distributions
- Run analysis as described
- Issue results report to stakeholders



Thank you!
For Additional Information:

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