RUC Problems and a Proposed Solution
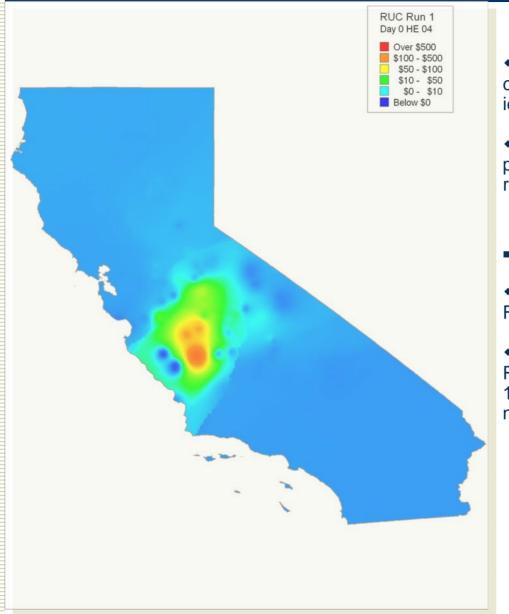
RUC Requires Immediate Reform

- Off-line simulations, as well as participant simulations, have convinced SCE that RUC is fundamentally flawed and requires material changes in order for the CAISO/FERC/market participants to have a reasonable expectation MRTU will produce just and reasonable results

- Many things have changed since RUC was conceived

  - The CPUC's RA program has been implemented and refined over the last three years
  - FERC imposed significant "underscheduling charges" that apply in every instance that an LSE's purchases more than 15% of its load from the real-time market
  - FERC and the CAISO has proposed - and SCE has supported - providing non-RA generators a 30-ICPM capacity contract if the unit is committed via an "Exception Dispatch"
  - CAISO software requires RUC to be run 24 hours a day, every day, even when load has purchased quantities that exceed the CAISO forecast
  - CAISO operations has gained a better understanding that many real-world solutions to contingencies/operational issues are note represented in RUC

- The role of RUC should be reevaluated in light these developments and in light of its flaws clearly demonstrated throughout the simulation process
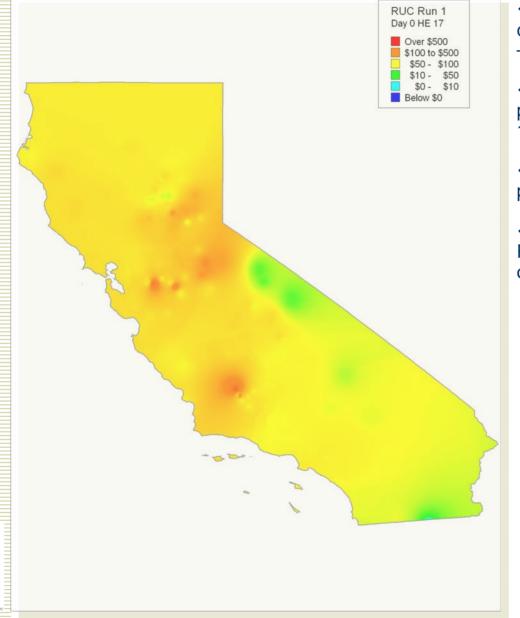
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Controlled Results: Problems of High Local RUC Prices with Small Quantities of RUC

RUC Run 1
Day 0 HE 04

- Over $500
- $100 - $500
- $50 - $100
- $10 - $50
- $0 - $10
- Below $0

- ◆ RUC price results are from the controlled off-line simulation (Case 0 – ideal conditions)

- ◆ Even under very minimal RUC procurement, we observe inappropriate results
    - ■ Procurement was only 130 MW

- ■ Negative RUC prices throughout state

- ◆ Prices twice the cap seen in greater Fresno area

- ◆ Note that California has a locational RA program that gives the CAISO 115-117% of the their monthly peak capacity needs in every month
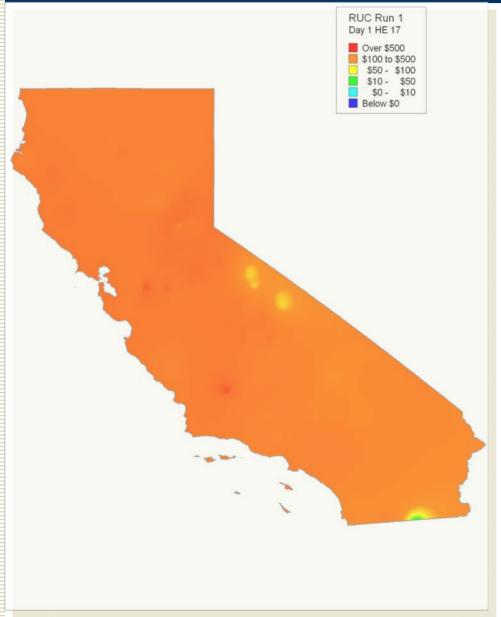
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RUC Problems: High system-wide prices and Extreme Local Prices at Peak Hours

RUC Run 1
Day 0 HE 17

- Over $500
- $100 to $500
- $50 - $100
- $10 - $50
- $0 - $10
- Below $0

- ◆ RUC price results are from the controlled off-line simulation (Case 0 – ideal conditions)

- ◆ During the peak hour, RUC procurement reaches about 1200 MW

- ◆ We observe high system-wide prices and extreme local prices

- ◆ Note that because of flaws in the RUC design, the optimization passes over $0 RA capacity that is available

RUC Problems: Extreme System-wide Prices during Peak-Hour Procurement

RUC Run 1
Day 1 HE 17

- Over $500
- $100 to $500
- $50 - $100
- $10 - $50
- $0 - $10
- Below $0

- ◆ RUC price results are from the controlled off-line simulation (Case 1 – IFM clears below forecast)

- ◆ Situation degenerates further under greater RUC procurement

  - ◆ In this graph, RUC procurement reached about 6000 MW

- ◆ Prices are high all over CA however these system-wide prices are the result of a very small quantity of marginal procurement (less than 25MW)
  - ▪ Partial RA unit bidding $100 for non-RA capacity
  - ▪ $250/MWh transmission constraint violation
  - ▪ Result is system-wide prices >$350/MW

- ◆ Note there was $0 priced RA capacity available, but the optimization as currently formulated did not select it

RUC's Price Formation is Fundamentally Flawed

◆Note: While all ISO/RTO's have a reliability commitment similar to RUC, the CAISO is the only ISO/RTO that attempts to price capacity in this commitment. Further, they attempt to price it on a nodal basis.

◆ We observe many instances of high system-wide prices and extreme local prices when there is RA capacity available for $0, **why?**

  ◆ Recall California's RA program is locational, and gives the CAISO 115-117% of their peak-hour capacity need in every month

◆RUC's structural flaws include:

  ▪ RUC is *sequential* to the day-ahead energy market. Every commitment and dispatch from day-ahead is now a "constraint" in the RUC process. These hundreds of additional constraints on top of all transmission, unit operation, bid constraints and contingency analysis, makes it difficult for RUC to find solutions

  ▪ Partial RA units (e.g. a 100MW unit that sold 99MWs of RA can bid this last 1MW at $250) can set system-wide/local prices, even though there are $0 RA units available

    ▪ Why? If bids (plus administrative constraint violation penalties) are cheaper than the start-up costs of an RA unit, the bid will be selected

    ▪ The Objective function effectively minimizes under a "pay as bid" calculation, even though bids establish market clearing prices; it also fails to recognize broader market impacts

  ▪ RUC fails to recognize real-world operational solutions to contingencies (e.g. turning off pump storage) and instead tries to solve all problems with commitments – often when there is no competitive solution

  ▪ Besides the $250 bid cap, RUC has no market power mitigation for non-RA capacity

    ▪ Similar product, but no alignment/mitigation like ICPM pricing

  ▪ CAISO runs RUC every hour of every day even when they face no reliability issues

  ▪ RUC is not required to utilize all feasible RA capacity before selecting non-RA bids

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Potential Consequences of RUC's Flaws

- RUC's inappropriate capacity _price signals_ threaten to undermine MRTU (by distorting energy and Ancillary Services markets), as well as California's RA process

    - Similar distortions in Replacement Reserves unnecessarily cost consumers hundreds of millions of dollars during the 2000 energy crisis

- RUC capacity prices create an apparent "opportunity cost" for Day-ahead energy sellers, that will distort day-ahead bidding and may undermine existing market power mitigation measures

- Flawed RUC prices signals will distort future bilateral forward contracting

- Thus RUC present the very real possibility of completely undermining MRTU and California's RA program, and offers no tangible benefits in return

- The CAISO's markets are required, by law, to produce just and reasonable results

    - If is clearly imprudent to implement a market that is known to be flawed

    - FERC cannot rely on market based rates unless they have reasons to expect workable competitive results from the market. Given the flaws in RUC's formulation and simulation results, there is no reasonable basis to conclude RUC will produce competitive results

Solution: Run RUC as an Advisory Reliability Process

◆The CAISO should run RUC off-line and use it for its originally intended purpose: To ensure the CAISO has suffecient capacity in real-time to reliably operate the grid

◆The CAISO can use all of the existing RUC software infrastructure to select RA units and to issue RA units commitment instructions

- Settlement for RA units remain unchanged and uses existing MRTU software

◆The CAISO should adopt a "RA First" RUC approach in which only RA capacity is used in the off-line RUC run

- Grid Operations should review the result of this initial run
- If Operators are satisfied they can operate reliably (including real-world solutions that are not modeled in RUC), the process is complete
- If there are remaining issues that must be addressed by committing non-RA units in the day-ahead time frame, the CAISO should issue an Exceptional Dispatch
  - They could do a 2nd pass run of RUC that included non-RA unit or manually commit
  - Award the unit a 30-day ICPM contract if committed
  - Grid operations must consider real-world alternatives to issues/contingencies (e.g. cut pump load, cut local load) before selecting the non-RA unit

◆In conjunction with California's RA program, this solution ensures

- 1) RUC does not undermine MRTU or California's RA program, and
- 2) The CAISO has a reliable grid (RA provides local capacity and 115% monthly peak needs)
- 3) No delay in MRTU implementation (uses existing software and settlement mechanisms)

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