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CEC Comparative Cost of Generation Model

Analysis of Results and Recommended Model Changes

May 16th, 2011

Presentation to IEPR Workshop

Executive Summary

Situation: The California Energy Commission's (CEC) Cost of Generation Model (COG) produces a cost ranking of resource types that is inconsistent with Southern California Edison's (SCE) expectations and generally accepted cost rankings.

Solution: SCE establishes a framework and methodology that builds on top of the CEC's existing levelized cost model.

Methodology

In addition to calculating capital, financing, and fuel costs, include indirect costs to adjust for

1. **Economic life**
2. **Capacity dependability**
3. **Time of delivery flexibility**
4. **Integration requirements**

Presentation

Compare resources with equivalent capacity factors using a screening curve.

This framework allows for a more meaningful comparison of resource costs.

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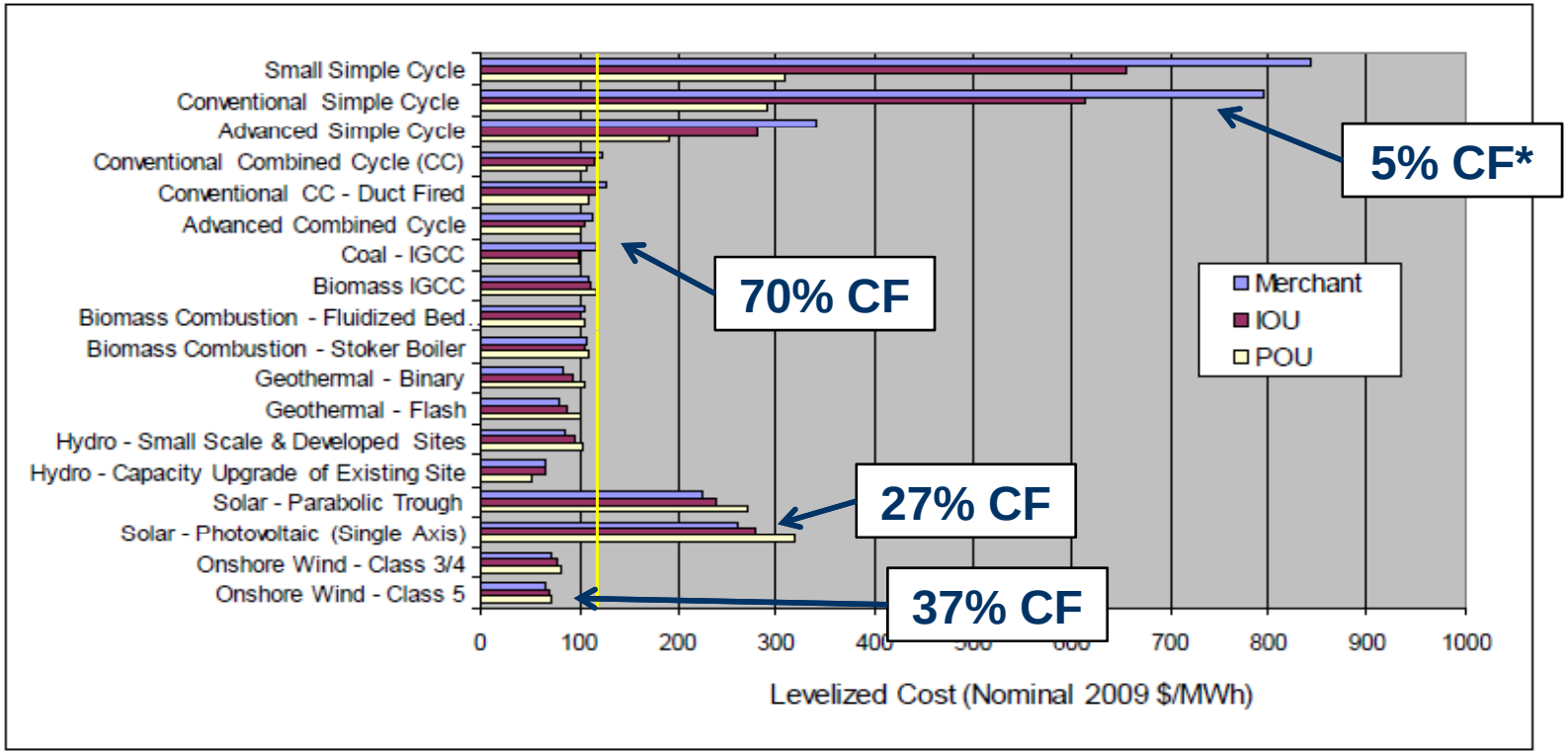
The COG report suggests that the *most* cost-effective resources are hydro and wind, and that the *least* cost-effective resources are solar and combustion turbines.

Figure 6: Summary of Average Levelized Costs—In-Service 2009



Source: Energy Commission

The existing framework makes it difficult to evaluate cost-effectiveness because:

1. Not all cost elements are included
2. Resources with differing capacity factors are compared on a $/MWh basis

* Capacity Factor

We propose five additions to the CEC's current Cost of Generation Report.

1. Include replacement energy and capacity costs
2. Include "firming costs" based on resource net qualifying capacity (NQC)
3. Include a non-dispatchability cost penalty for must-take resources
4. Include integration costs for intermittent resources
5. Compare resources on an equal capacity factor basis

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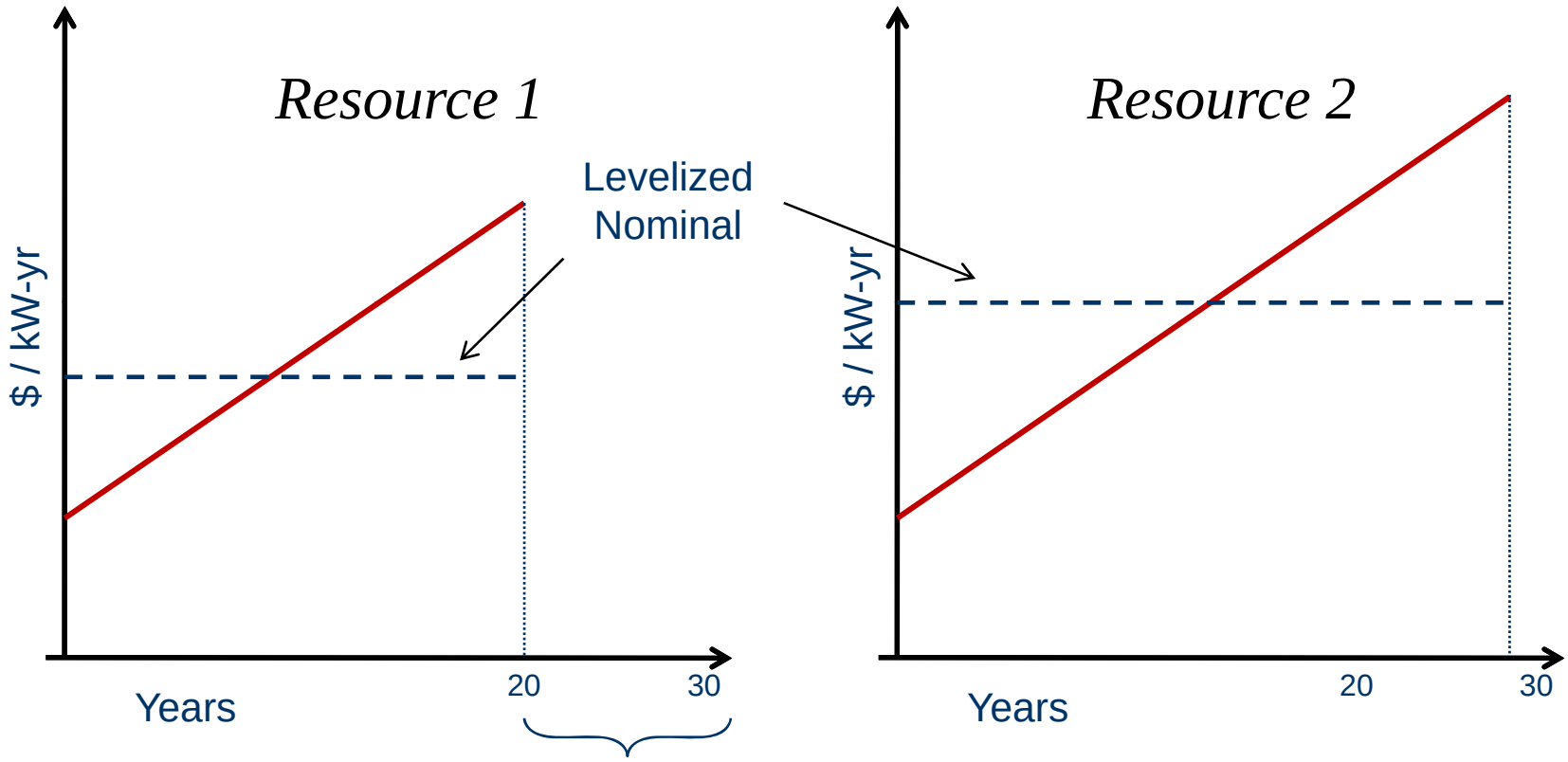
Calculating resource cost on a levelized nominal basis will distort cost comparison for resources with different lives.

- Consider two resources with the same annualized real cost.



- To provide the same value as Resource 2, Resource 1 must reinvest in capacity and purchase replacement energy.
- Resource 2 erroneously appears more costly.

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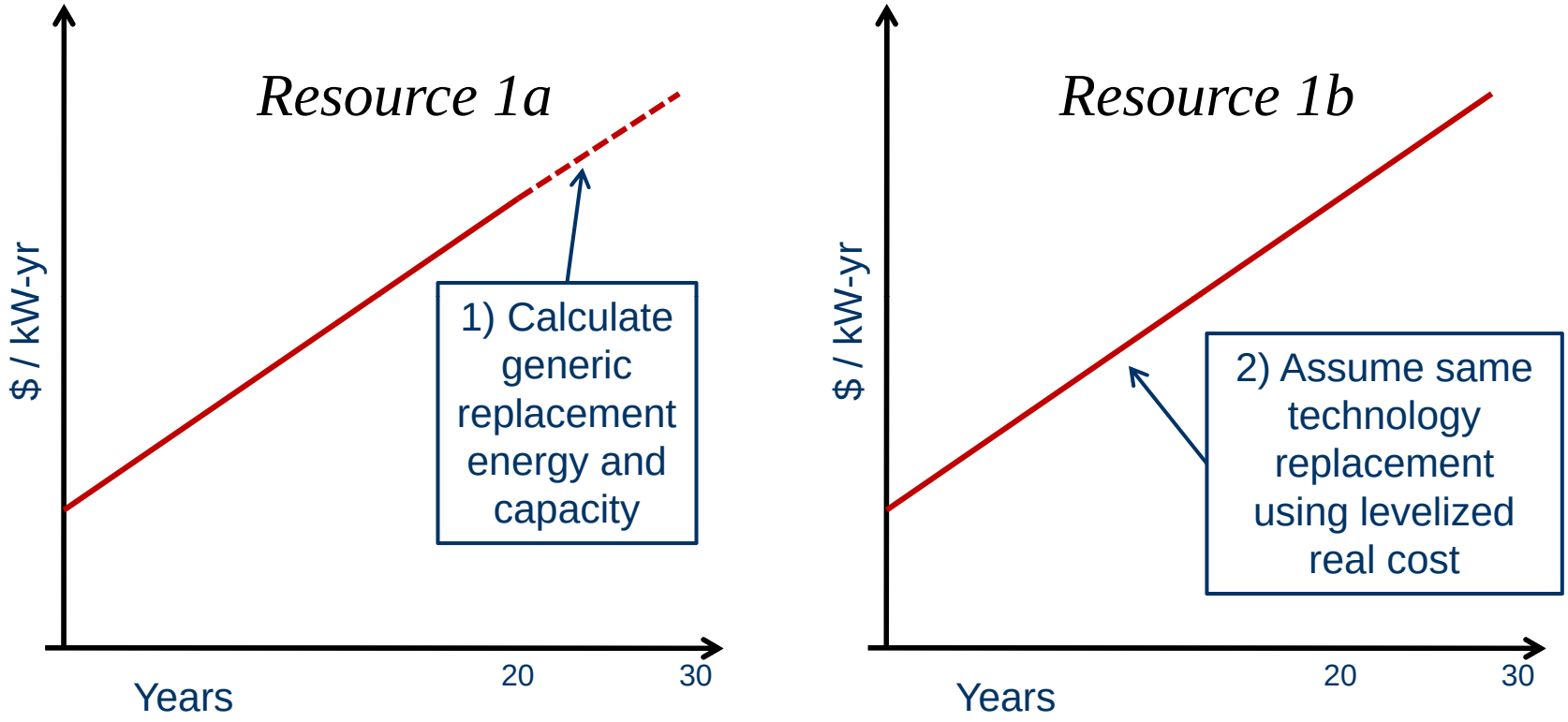
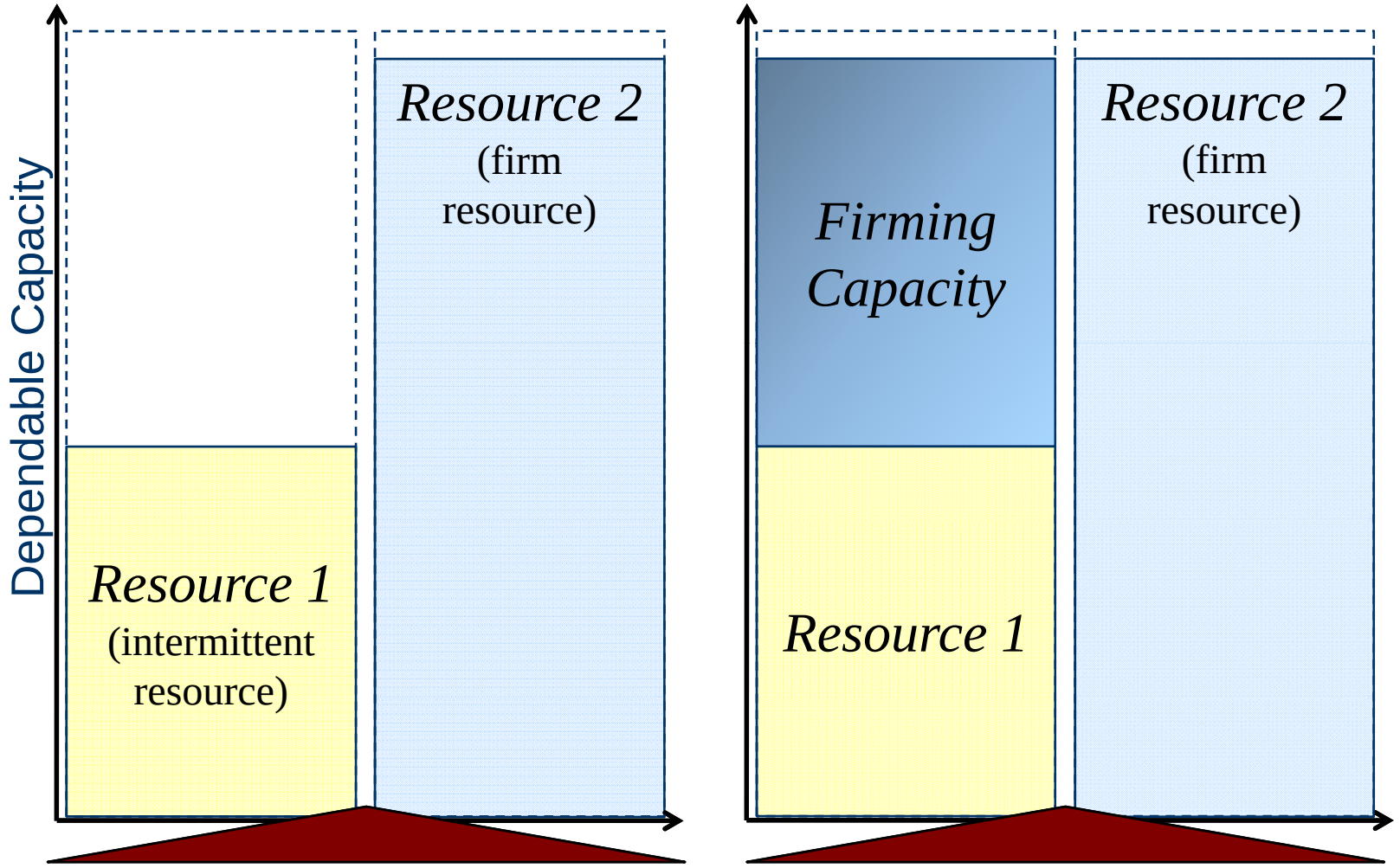
Calculating costs over an equivalent time period adjusts for differing asset lives.

- SCE recommends either of two solutions.



Resource 1 and Resource 2 costs can now be accurately compared.

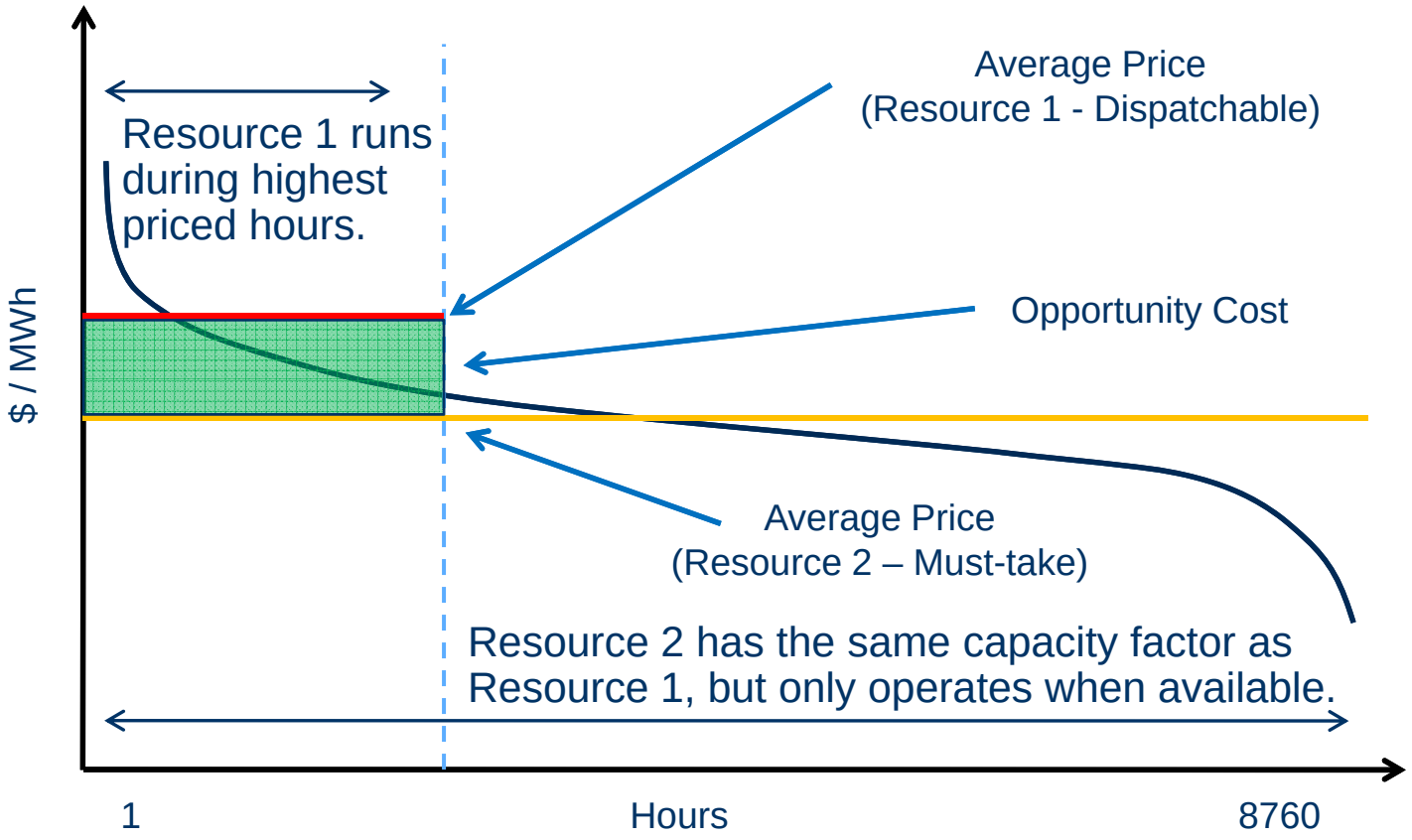
Including the cost of procuring additional capacity compares resources on an equal capacity value basis.



Two resources with the same nameplate capacity may have different dependable capacities.

We propose assigning an additional capacity cost to Resource 1.

Capturing differences in time-of-delivery can account for the opportunity cost of a must-take, variable generation profile.



- Dispatchable resources can optimize generation to maximize revenue throughout the year.
- We propose including this opportunity cost in the analysis of Resource 2.

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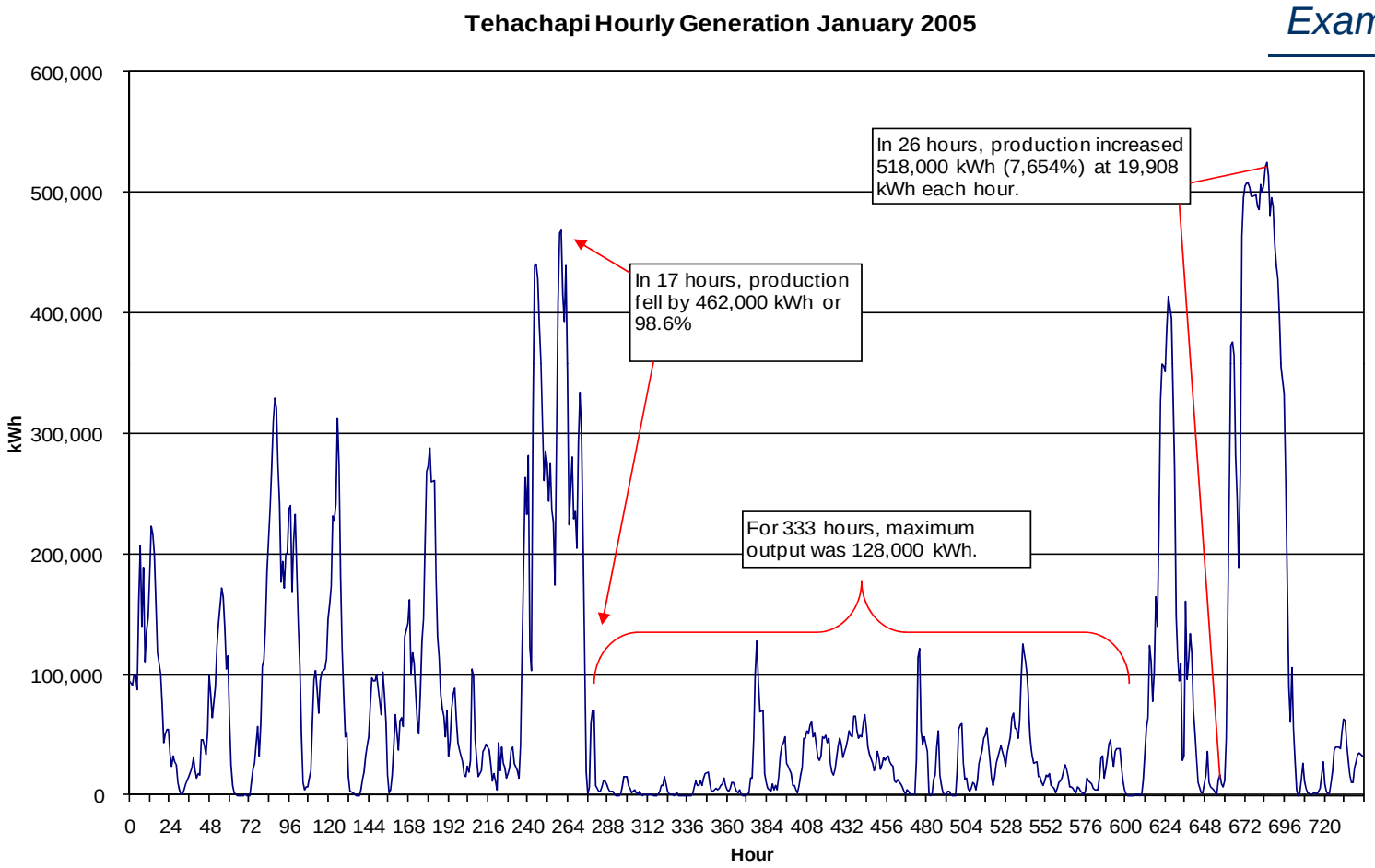
Intermittent generation imposes additional procurement costs on the electricity system.

Example



Intermittent generation requires additional regulation, day ahead, and load following resources for integration. We recommend $15/MWh as an interim estimate.

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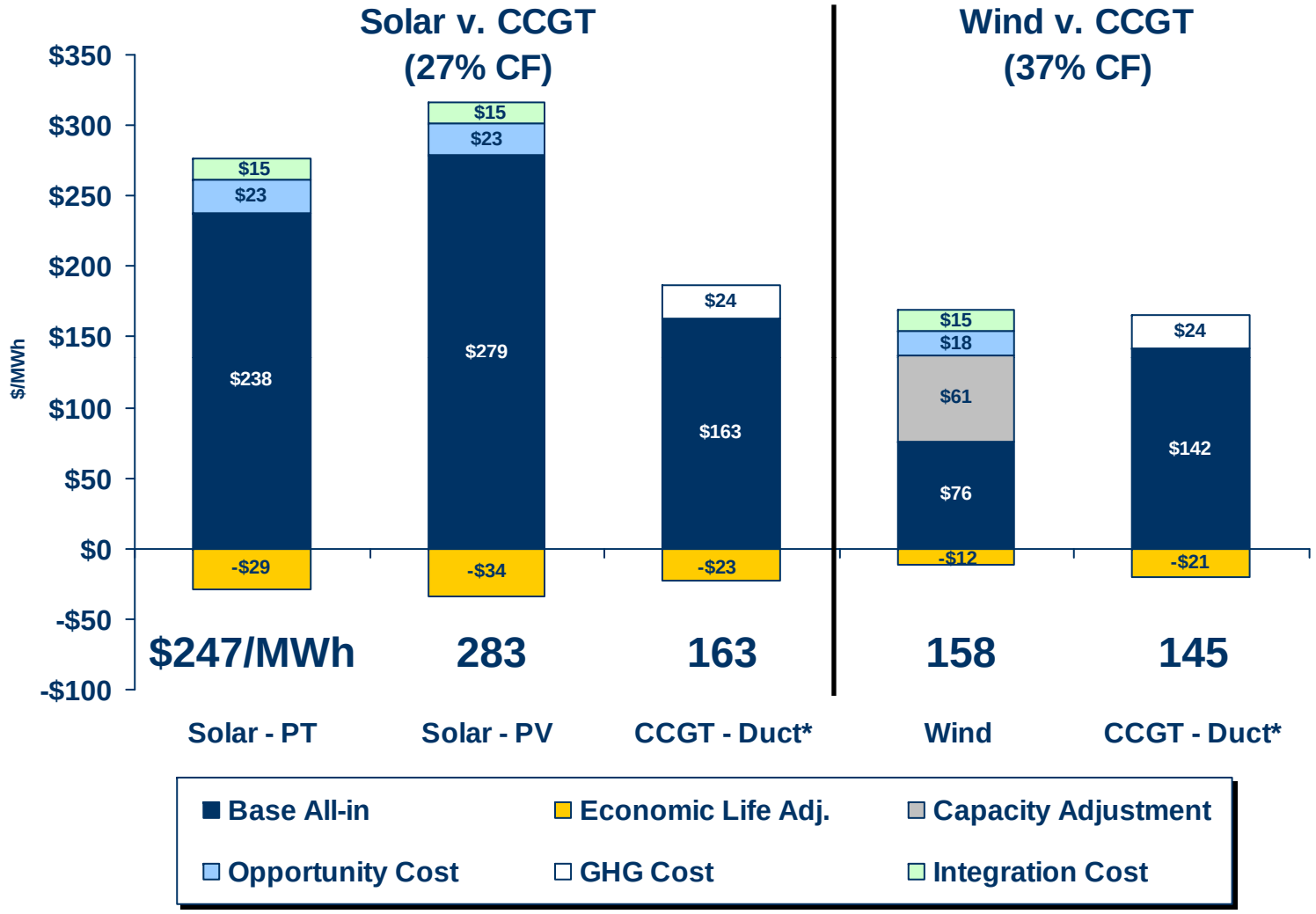
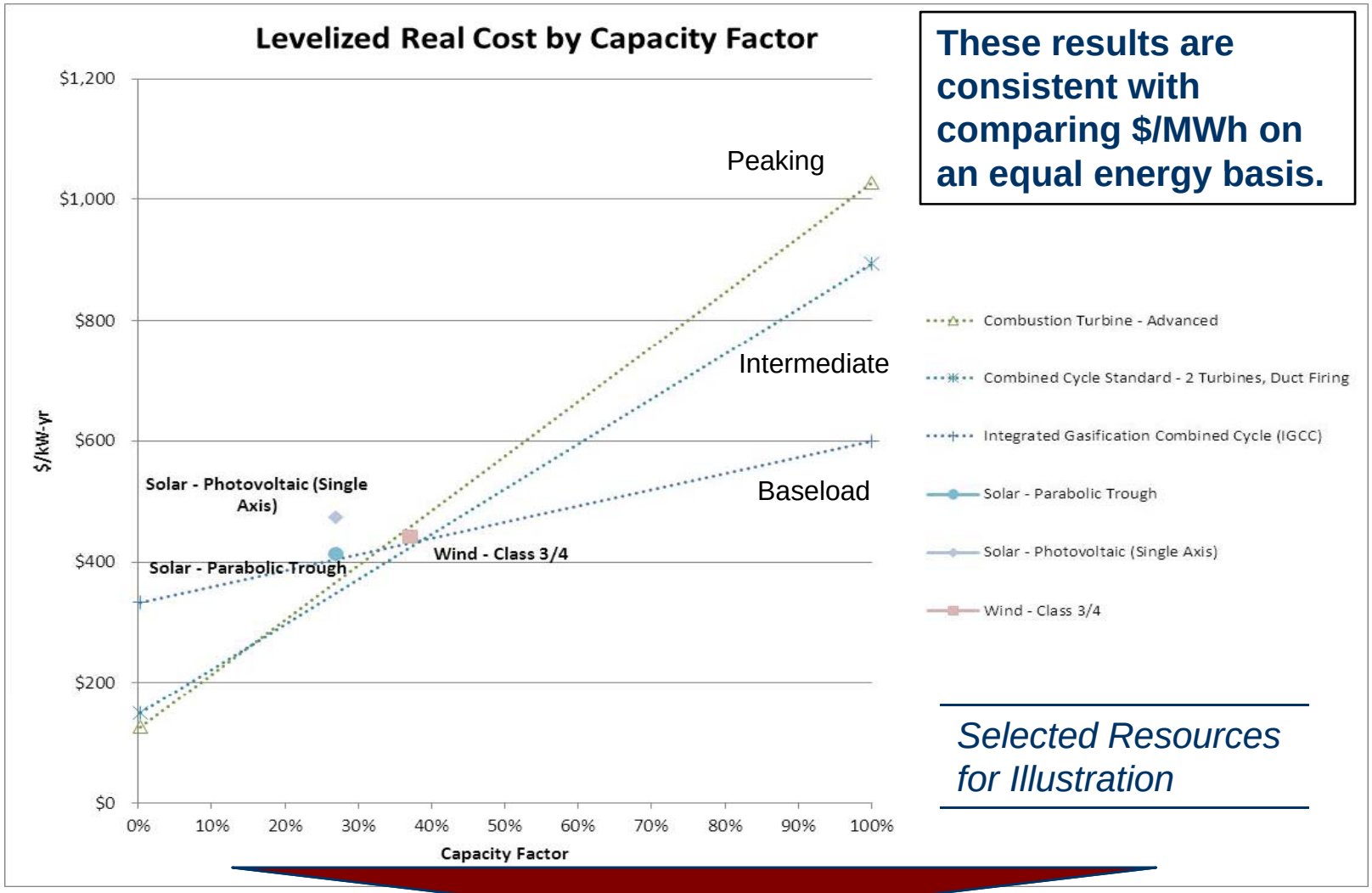
After the proposed adjustments are made, the Cost of Generation Model produces results consistent with SCE's expectations.



These adjustments can all be implemented within the COG spreadsheet model – a market price curve is needed to assess dispatchability opportunity cost.

* Based on the CEC's assumed 20-year life. SCE recommends a 30-year life reflecting industry norms.

SCE also recommends comparing must-take resources to a "screening curve" of least-cost thermal resources.



These results are consistent with comparing $/MWh on an equal energy basis.

Selected Resources for Illustration

Displaying the data this way makes explicit the underlying economics of resource selection.

SCE recommends incorporating the following changes to the Cost of Generation Report and Model.

Summary of Recommendations

1. Equalize dependable capacity across resources.
2. Incorporate the value of dispatchability.
3. Incorporate an estimate of integration costs.
4. Compare resources across equivalent time frames.
5. Compare resources using a screening curve.

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