Long-term Renewables Planning Methodology, Inputs and Assumptions for the 2010 Long-Term Procurement Plan Proceeding

California Public Utilities Commission
December 10-11, 2009
Scope and Purpose

- **Workshop scope:** RPS planning in the LTPP system proceeding
  - *Not* the broader LTPP system planning activities

- **Workshop purpose:**
  - LTPP Status - Discuss new developments, coordination with other planning efforts, etc.
  - 33% RPS Implementation Analysis – Review study, comments
  - RPS Planning in the 2010 LTPP – Begin refining assumptions and methodologies for an updated study
Scope and Purpose

- **Proceeding scope:** LTPP system proceeding is **not** the forum for deciding RPS procurement obligations. Rather, results from RPS analyses could serve three purposes:
  - Identify type and quantity of new system (fossil) resources needed reliably integrate renewables – Decided in LTPP system proceeding
  - Identify high-level (conceptual) transmission needs to meet renewable targets – Coordinated with ISO’s transmission planning process
  - Generate alternative RPS procurement strategies – Inform the RPS proceeding
Agenda

• **Direction of LTPP, long-term renewables planning**

• **33% RPS Implementation Analysis Preliminary Results**
  – Portfolio development
  – Illustrative timelines

• California ISO 33% RPS Operational Study

• Considering a 33% RPS in 2010 LTPP – *proposed approach*

• Considering a 33% RPS in 2010 LTPP – *proposed inputs and assumptions*

• Summary, schedule, next steps
Background

• Previous Commission Decisions
  – Since D. 05-07-039, the Commission has stated its intent to integrate long-term RPS planning into the LTPP proceeding.
  – D.07-12-052 (2006 LTPP decision) directed parties to work with Energy Division to refine a methodology for RPS resource planning and analysis

• February 14, 2008 Order Instituting Rulemaking (OIR) for the current 2008 LTPP proceeding (R.08-02-007)
  – OIR launched to integrate and refine procurement policies, including further analysis regarding the feasibility and cost of 33% renewables

• August 28, 2008 Assigned Commissioner’s Ruling (ACR) and Scoping Memo
  – Established separate track for Energy Division’s 33% RPS Implementation Analysis project

• June 2009 33% RPS Implementation Analysis: Preliminary Report
Background (cont’d)

• July 1, 2009 Amended ACR and Scoping Memo released the Energy Division Straw Proposal on LTPP Planning Standards (Staff Proposal)

• **Working Principle** – Resource plans should consider the scale of investment in transmission and flexible fossil resources to integrate and deliver new renewables
  – Commission “expect[s] the data produced out of RETI…to be utilized in the [LTPP] proceeding.” (OIR at p. A-9)
  – Transmission permitting based on TEAM decision relies on use of assumptions that are consistent with resource plans and system assumptions used in the procurement proceedings (D.06-11-018 at OP 1 and p. A-2)

• A single, statewide “**Renewables and Transmission Study**” is needed as a foundational element
December 3, 2009 ACR (cont’d)

• Suspends previously determined schedule

• Signals a split of LTPP into two separate proceedings
  – “System” proceeding – Identify CPUC-jurisdictional needs for new resources to meet system RA (driven by PRM) and local RA (driven by LCR), including long-term RPS planning and impacts of OTC mitigation
  – “Bundled” proceeding - Bundled procurement policy issues and approval of IOUs’ bundled procurement plans

• ACR does not address (1) who will be responsible for system studies, and (2) whether issues in Phase 1 of the 2008 LTPP will be resolved by Decision.
December 3, 2009 ACR (cont’d)

• Acknowledged staff’s 33% RPS Implementation Analysis
• Noted parties’ general support, in response to the Staff Proposal, for:
  – Building from the same basic methodology
  – Having staff continue to coordinate a single, statewide study
• Signaled use of an updated RPS study as a direct input into the 2010 LTPP system proceeding
Agenda

- Direction of LTPP, long-term renewables planning
  - 33% RPS Implementation Analysis Preliminary Results
    - Portfolio development
    - Illustrative timelines
  - California ISO 33% RPS Operational Study
  - Considering a 33% RPS in 2010 LTPP – proposed approach
  - Considering a 33% RPS in 2010 LTPP – proposed inputs and assumptions
- Summary, schedule, next steps
Contents

- Resource gap calculation and sources of renewable resource cost and availability data
- Renewable resource cost assumptions
- Methodology for selecting portfolios of renewable resources
- Methodology for calculating cost impacts
- Strengths and weaknesses of approach
Portfolio Development Process

1. Input: 2020 load forecast
2. Input: 2007 existing resources
3. Resource gap to meet RPS by 2020
4. Select RE resources to fill each CREZ
5. Input: energy and capacity value
6. Select CREZs to meet RPS Target
7. If needed, add CCGTs & CTs to meet load

Input: renewable resource potential and cost
RPS Resource Gap and Availability of Resources to Fill it
Resource Gap Calculation

- Start with 2020 load forecast
  - Used CEC 2007 IEPR forecast

- Calculate 2020 RPS target, equal to 33% of eligible retail sales
  - Excludes retail sales by water agencies

- Estimate quantity of renewable resources online in base year
  - Used renewable resource “claims” from CEC 2007 Net System Power Report

- RPS Resource “Gap” is the difference between the 2020 target and the 2007 renewables claims
2007 Claimed RPS Resources for California Utilities and 2020 RPS Resource Gaps

RPS Resource Gaps (TWh)

Note: Gap based on 2007 CEC load forecast minus 2007 claims from CEC Net System Power Report. No adjustments for EE or CHP that is incremental to forecast.
Four Sources of New Resources to Fill Resource Gap

1. **ED Project Database**
   - Contracted or short-listed utility projects
   - ED ratings of project viability

2. **RETI database**
   - Pre-identified and proxy projects for California and BC

3. **E3 GHG Calculator**
   - Estimates of renewable resource availability by resource class for non-California regions

4. **Original Renewable DG resource potential estimates**
CPUC ED Project Database

- Database of contracted and short-listed projects, assigned to zone by E3/Aspen

- Two options for ranking ED RPS projects:
  1. Assume cost is “sunk” (place into zone ranking at zero cost)
     - Ensures project rises to top of zone list
     - Improves ranking of zone
     - Does not guarantee selection
  2. Place into Zone ranking at generic resource cost
     - Project still rises to top of zone list
     - Does not necessarily improve zone ranking

- Projects not selected for portfolio unless Zone is selected

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<th>Zone</th>
<th>Capacity (MW)</th>
<th>Energy (GWh)</th>
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<td>South Central Nevada</td>
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<td><strong>Total</strong></td>
<td><strong>18,973</strong></td>
<td><strong>56,948</strong></td>
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Incorporating ED RPS Projects into Ranking

- Categorize projects based on status and CPUC ratings of development risk:
  - Category A: Contract approved and low or medium risk
  - Category B: Short-listed or pending approval and low or medium risk
  - Category C: All projects rated “high risk”

- Category A projects assumed sunk in all cases

- Disposition of Categories B & C depends on case

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<tr>
<th>Capacity (MW)</th>
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<th>Category C</th>
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<td><strong>Total</strong></td>
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<td>18,973</td>
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<td>Biogas</td>
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<td>996</td>
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<td>Hydro - Small</td>
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<td>Wind</td>
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<td>18,282</td>
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<td><strong>Total</strong></td>
<td>11,690</td>
<td>39,132</td>
<td>6,127</td>
<td>56,948</td>
</tr>
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</table>
Renewable Resource Data from RETI

- Based on Black & Veatch estimates of resource cost, availability and performance
  - Combination of “Pre-Identified” and “Proxy” projects
  - Geothermal and Biomass resources estimated as distinct projects
  - Solar thermal and wind resources estimated by area

- RETI database includes site-specific cost estimates
  - Incorporated into 33% RPS model via adjustments to a “generic” resource

- Used for California, Mexico and some BC resources
Map of RETI Zones in California
Out of State Renewable Resource Data from E3 GHG Calculator

- E3 developed renewable resource cost and performance data as part of our GHG modeling
  - Wind and solar data based on NREL GIS modeling
  - Geothermal and hydro data from EIA
  - Biomass aggregated from various sources
  - Additional resource data for BC and Alberta

- Used to seed GHG calculator with renewable resource options

- For 33% Implementation Analysis, E3 GHG data is used for US regions outside of California
E3 – B&V Estimates of DG Potential

- **Distributed generation (DG)** is small-scale generation interconnected at sub-transmission system or lower

- Rule 21 sets DG interconnection limit at 15% of peak load on a feeder
  - Relaxed to 30% based on assumption that most DG is PV

- Feeder-by-feeder analysis of rooftop PV potential matched to substation loading

- Results:
  - 6077 MW of ground-mounted or large rooftop PV in urban areas
  - 9000 MW of ground-mounted PV near rural substations (not Rule 21 compliant)

Illustrative Example of Distributed Solar PV

- 20 MW near substations
- Large commercial rooftops
- Residential rooftops
Additional Zones for Distributed and non-CREZ Resources

- Model logic selects individual resources to fill zones, then selects zones to meet RPS target
  - No ability to select individual resources
- Created “zones” for groupings of resources assumed not to need new transmission:
  - Distributed Biogas, Distributed Biomass, Distributed Geothermal, Distributed Hydro, Distributed Solar, Distributed Wind, Remote DG
  - “Out-of-State Early”: 2062 MW of ED Database biomass, geothermal, small hydro and wind projects located in other states
  - “Out-of-State Late”: 525 MW of ED Database solar thermal projects plus 1400 MW of generic wind projects located in other states
**List of Renewable Energy Zones in 33% RPS Analysis**

1. Alberta  
2. Arizona-Southern Nevada  
3. Baja  
4. Barstow  
5. British Columbia  
6. Carrizo North  
7. Carrizo South  
8. Colorado  
9. Cuyama  
10. Distributed Biogas  
11. Distributed Biomass  
12. Distributed CPUC Database  
13. Distributed Geothermal  
14. Distributed Solar  
15. Distributed Wind  
16. Fairmont  
17. Imperial East  
18. Imperial North  
19. Imperial South  
20. Inyokern  
21. Iron Mountain  
22. Kramer  
23. Lassen North  
24. Lassen South  
25. Montana  
26. Mountain Pass  
27. Needles  
28. NE Nevada  
29. New Mexico  
30. Northwest  
31. Owens Valley  
32. Out-of-State Early  
33. Out-of-State Late  
34. Palm Springs  
35. Pisgah  
36. Remote DG  
37. Reno Area/Dixie Valley  
38. Riverside East  
39. Round Mountain  
40. San Bernardino - Baker  
41. San Bernardino - Lucerne  
42. San Diego North Central  
43. San Diego South  
44. Santa Barbara  
45. Solano  
46. South Central Nevada  
47. Tehachapi  
48. Twentynine Palms  
49. Utah-Southern Idaho  
50. Victorville  
51. Wyoming
Renewable Resource Portfolio Selection Methodology
Project Ranking: Modified RETI Ranking Methodology

- **Step 1:** Rank projects within each zone
- **Step 2:** Select projects to fill fixed-size transmission line
- **Step 3:** Rank and select zones to meet RPS target
- **Projects from ED RPS Project Database** that are assumed sunk automatically float to top of ranking

**Project Ranking Formula**

\[
\text{Final project rank} = \text{Levelized cost of energy} + \text{Interconnection (gen-tie) costs} + \text{Deemed integration costs} + \text{Levelized, per-MWh incremental transmission costs} - \text{Energy value} - \text{Capacity value} - \text{T&D avoided costs} - \text{Adjustment for ED RPS Projects} \pm \text{Environmental score}
\]
Renewable Resource Capital Cost Assumptions

- Capital cost assumptions for “generic” resource based on average of RETI sites
- Retained RETI’s site-specific cost information
- Supplemented with other data sources for resources not considered by RETI

<table>
<thead>
<tr>
<th>Operating Data</th>
<th>Biogas</th>
<th>Biomass</th>
<th>Geo-thermal</th>
<th>Hydro - Small</th>
<th>Solar PV</th>
<th>Solar Thermal</th>
<th>Wind</th>
<th>Gas CCGT</th>
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<tbody>
<tr>
<td>Nominal heat rate</td>
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<td>Capacity Factor</td>
<td>85%</td>
<td>80%</td>
<td>87%</td>
<td>50%</td>
<td>24%</td>
<td>28%</td>
<td>33%</td>
<td>92%</td>
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<tr>
<td>Availability on-peak (%) of nameplate</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>65%</td>
<td>65%</td>
<td>77%</td>
<td>20-30%</td>
<td>100%</td>
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<th>Costs (California)</th>
<th>Biogas</th>
<th>Biomass</th>
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<th>Hydro - Small</th>
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<th>Solar Thermal</th>
<th>Wind</th>
<th>Gas CCGT</th>
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<tbody>
<tr>
<td>Installed Capital Costs ($/kW)</td>
<td>$ 3,205</td>
<td>$ 4,951</td>
<td>$ 4,576</td>
<td>$ 3,636</td>
<td>$ 7,065</td>
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<td>Variable O&amp;M ($/MWh)</td>
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<td>Fixed O&amp;M ($/kW-yr.)</td>
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<td>8.40</td>
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Source: E3 GHG RETI RETI E3 GHG RETI RETI RETI MPR
Financing Assumptions

- Assume IPP resource financing
  - 60% debt, 40% equity financing structure
  - 15.3% cost of equity, 7.3% cost of debt (based on 3/08 Board of Equalization study)
  - 20-year PPA at flat nominal prices

- Different financing for solar projects
  - 45% debt, 55% equity – More equity needed to maintain debt service coverage ratios above 1.5
  - 13.25% cost of equity – Lower cost of equity to reflect reduced leverage
Levelized Cost of Energy for "Generic" Resources

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<th>Resource</th>
<th>2020 Delivery, in 2008 $/MWh</th>
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<td>Wind</td>
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<td>Gas CCCT**</td>
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<td>Solar Thermal</td>
<td>$184</td>
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<tr>
<td>Solar PV</td>
<td>$306</td>
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Ratepayer Cost: Assumed $105 floor based on cost of CCGT

2020 Delivery, in 2008 $/MWh
Sizing and Costing of New Transmission

- Model assumes new transmission required for all projects not in a “Distributed” zone
- Used simple transmission costing model to estimate cost of new transmission
  - Costs based on line miles and voltage
  - Assumed single-circuit 500 kV projects with 1500 MW incremental transfer capability for most zones
  - Double-circuit 500 kV AC projects with 3000 MW incremental transfer capability for large in-state and most out-of-state zones
  - Smaller projects for some California zones

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<th>Type</th>
<th>Cost / unit (millions)</th>
<th>Unit</th>
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<td>Dual Circuit 230 kV</td>
<td>$1.72</td>
<td>Mile</td>
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<tr>
<td>Single Circuit AC 500 kV</td>
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<td>Mile</td>
</tr>
<tr>
<td>Dual Circuit AC 500 kV</td>
<td>$3.78</td>
<td>Mile</td>
</tr>
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<td>1500 MVA DC Line</td>
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<td>Mile</td>
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<tr>
<td>1500 MVA DC Terminal</td>
<td>$308</td>
<td>Terminal</td>
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<tr>
<td>500 kV AC substations</td>
<td>$300</td>
<td>Substation</td>
</tr>
</tbody>
</table>
Energy Value

- Market value of the energy produced by the renewable resource can vary depending on gas price, CO2 price, output profile, location

- Calculate implied heat rate with respect to SP15 gas prices for each resource based on simplified output profile:
  - Geothermal, biomass: 8520 MMBtu/MWh
  - Wind: 8,396 MMBtu/MWh
  - Solar: 9,670 MMBtu/MWh

- Energy value is equal to gas price times implied heat rate
Capacity Value

- Capacity value is equal to the capacity credit times the cost of capacity purchases avoided due to renewable resource.

- Capacity credit varies by resource type (% of nameplate MW):
  - Geothermal, biomass: 100%
  - Wind: 20% for Northern California, 30% elsewhere
  - Solar PV: 51% for fixed ground-mounted, 65% for tracking
  - Solar thermal: 70-85% depending on location

- Avoided capacity cost is equal to net annual cost of new CT:
  - Gross annual cost of new CT ($182/kW-yr) minus expected market revenue ($52/kW-yr) = net cost ($130/kW-yr)
Siting Risk Scores and Integration Costs

- Permitting risk incorporated as an adjustment to project ranking:
  - **Least Risk** Projects: No adjustment to project ranking
  - **Medium Risk** Projects: Add $5/MWh to project cost for ranking
  - **Greater Risk** Projects: Add $10/MWh to project cost for ranking

- Applied scoring to projects in ED Project Database as well as RETI/E3 lists

- Intermittent renewable resource integration: assumed $7.50/MWh for wind and solar PV
Environmental Scoring Methodology
Previous environmental scoring was based on zonal scores.

Energy Division data base plus Aspen’s GIS expertise allowed project level scoring.

Aspen identified project specific factors that are often relevant for environmental analysis.

Aspen produced project specific scores for use by E3 in their portfolio composition process.
Projects selected by E3 to populate the portfolios come from two sources:

- Projects Identified in RETI Phase 1B (779 projects)
  - Grouped by those within a sub-CREZ, within a CREZ and outside a CREZ
  - PV projects not analyzed

- Projects included in Energy Division data base (280 projects)
  - Matched to RETI pre-identified projects if possible
Five Project Scoring Components

Scoring Components were supplemented based on GIS analysis that allowed for greater location specific characterization

- RETI Environmental Scoring
- Transmission footprint
- Pre-identified vs. Proxy projects
- Proximity to sensitive lands
- Projects on federal land
Use of RETI Environmental Scores

- **RETI Phase 1B scores**
  - 30 CREZs scored based on 8 criteria
  - Scores range from 2.71 (best) to 26.19 (worst)

- **RETI Scores are normalized to allow combination with other environmental factors**

- **RETI Environmental Project Score for Aspen Methodology**
  - Within a CREZ, use the RETI normalized score
  - In an un-scored sub-CREZ, use the CREZ score
  - Non-CREZ Geo & Biomass, assigned with 33 percentile score
  - Non-CREZ Solar & Wind, assigned with 50th percentile score
Remaining Score Components

- Transmission proximate to a CREZ scores better
- Pre-identified projects score better
- Proximity to sensitive lands score worse
- Projects on Federal land score worse
## Scoring Methodology Summary

### Table 2. Summary of Scoring Methodology for Different Project Types

<table>
<thead>
<tr>
<th>Project Type</th>
<th>1. EWG Total Ranking Score</th>
<th>2. EWG Transmission ROW Score</th>
<th>3. Pre-ID vs. Proxy Projects</th>
<th>4. Proximity to Sensitive Lands</th>
<th>5. Federal permitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>RETI Project in Scored CREZ</td>
<td>EWG CREZ score (normalized)</td>
<td>EWG ROW score (normalized)</td>
<td>Pre-ID = 0</td>
<td>&gt;2 miles = 0</td>
<td>In state &amp; non-federal land = 0</td>
</tr>
<tr>
<td>RETI Project outside of Scored CREZ (Non-CREZ)</td>
<td>Geothermal or Biomass = best 1/3 of EWG total score</td>
<td>Worst score = 1</td>
<td>Proxy = 1</td>
<td>&lt;2 miles = 1</td>
<td>&gt;10% on federal land = 1</td>
</tr>
<tr>
<td>RETI Proxy project</td>
<td>If in scored CREZ = EWG CREZ score</td>
<td>In scored CREZ = CREZ ROW score</td>
<td>Proxy = 1</td>
<td></td>
<td>Out of state = 1</td>
</tr>
<tr>
<td>ED Projects</td>
<td>If not, see cell above</td>
<td>If not, worst score = 1</td>
<td>Pre-ID = 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Scoring Results

- Scores Range from 1 to 5
- An Example:

Siting Risk - Example 2

- Medium Risk solar thermal project in Imperial County
  1. Has very good CREZ score (=0.09)
  2. Has very good ROW score (=0.08)
  3. Is pre-identified (=0)
  4. Is within 2 miles of sensitive lands (=1)
  5. Is located on federal land (~20% of its area)(=1)

- Total Score = 2.17
Categorization of Scores

- Evaluation of score results for all projects suggested three break points
  - Scores below 2 were deemed least risk
  - Scores between 2 and 3 were deemed projects of medium risk
  - Scores greater than 3 were deemed higher risk

- A cost penalty for potential environmental challenges was imposed as described earlier in the Portfolio Selection portion of this presentation
Opportunities for Improvement

- **Other potential scoring factors, based on Aspen’s work on proposed projects in the past year:**
  - Projects located on lands over 2,500 feet elevation may score worse (greater potential for impacts to biological resources)
  - There should be consideration of the differences among solar technologies, for example:
    - Solar trough technology requires greatest ground disturbance and uses heat transfer fluid (potentially hazardous)
    - Solar PV, power tower, and Stirling Suncatchers can be constructed with “low impact design”
    - Height of tallest project components ranges from 10 to 600 feet
Methodology for Calculating Cost Impacts
Once-Through Cooling Retirements

- Study assumes retirement of 6,617 MW of plants using once-through cooling
- Four plants assumed repowered or retrofit on site (2,333 MW)
  - Capital cost added to 2020 revenue requirement in all cases
- Others replaced as needed depending on load-resource balance

<table>
<thead>
<tr>
<th>Generator Name</th>
<th>Total Nameplate Capacity (MW)</th>
<th>Retired Capacity (MW)</th>
<th>Repower or Retrofit Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamitos 1&amp;2</td>
<td>350</td>
<td>350</td>
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<tr>
<td>Alamitos 3&amp;4</td>
<td>668</td>
<td>668</td>
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<tr>
<td>Alamitos 5&amp;6</td>
<td>992</td>
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<tr>
<td>Contra Costa</td>
<td>680</td>
<td>680</td>
<td>600</td>
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<tr>
<td>Encina 1-5</td>
<td>929</td>
<td>550</td>
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<tr>
<td>Humboldt Bay</td>
<td>105</td>
<td>105</td>
<td>163</td>
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<tr>
<td>Morro</td>
<td>673</td>
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<tr>
<td>Moss 1-4</td>
<td>1,020</td>
<td>1,020</td>
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<tr>
<td>Pittsburg</td>
<td>1,311</td>
<td>682</td>
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<tr>
<td>Portrero</td>
<td>207</td>
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<tr>
<td>South Bay</td>
<td>690</td>
<td>690</td>
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</tr>
<tr>
<td><strong>Total Retirements</strong></td>
<td><strong>6,617</strong></td>
<td><strong>2,333</strong></td>
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</tr>
</tbody>
</table>
Balancing Portfolio with Conventional Generation

- Total resource additions required to match growth from 2008 – 2020

- Energy balance calculated after adding renewables and OTC repowering
  - CCGTs added to meet any remaining energy demand

- Capacity balance calculated after adding CCGTs
  - CTs added to meet any remaining capacity demand
Calculating Cost Impacts

- **Cost impact of 33% RPS is equal to:**

  2020 statewide revenue requirement under the 33% RPS case

  minus

  2020 statewide revenue requirement under the 20% RPS case

---

**2020 Revenue Requirement**

+ Existing T&D cost
+ New T&D caused by organic growth
+ Fixed costs of existing Gen.
+ Variable costs of existing Gen.
+ Annualized cost of new renewables
+ Annualized cost of new transmission
+ Annualized cost of new conventional resources
+ Cost of unspecified energy (market purchases)
+ Cost of renewable integration
+ **Net cost of CO2 allowances**

= 2020 Revenue Requirement
33% RPS Cases Studied

1. **20% RPS Reference Case**: Existing state policy with 20% RPS
2. **33% RPS Reference Case**: Most likely case based on contracts signed by IOUs with project developers
3. **High Wind Case**: Mix of new resources that includes substantial quantities of wind in California and Baja
4. **Out-of-State Delivered Case**: Mix of new resources that includes wind resources in California and Wyoming and geothermal resources in Nevada
5. **High DG case**: Mix of new resources that minimizes the need for new bulk transmission, including 15,000 MW of distributed solar PV
6. **Low Load Sensitivity**: Assume mix of policy-driven resources that substantially reduces 2020 load
7. **Solar Cost Sensitivity**: Assume substantial reduction in the cost of distributed solar PV
8. **Gas and CO2 Price Sensitivities**: Assume dramatically higher and lower natural gas and CO2 prices
Cost Impacts of 33% Cases

- **Incremental cost of 33% Ref. Case in 2020:**
  - +$3.6 billion relative to 20% RPS
  - Average retail rate: 16.9¢/kWh
  - 7% increase relative to 20% RPS
  - High Wind and OOS cases slightly cheaper

- **Incremental cost of High DG Case in 2020:**
  - +$3.8 billion relative to 33% Ref Case
  - +$7.4 billion relative to 20% RPS
  - Average retail rate: 18.1¢/kWh
  - 14.6% increase relative to 20% RPS
Strengths & Weaknesses of 33% RPS Calculator Approach
Strengths of 33% RPS Calculator Approach

- Analysis conducted using publicly-available model
- Incorporates IOU solicitation/contract data
- Incorporates environmental/ permitting metric
- Identifies desirable CREZs based on a combination of contracts and theoretical economics
- Incorporates out-of-state resources
Weaknesses of 33% RPS Calculator Approach

- Did not have time or budget to conduct detailed mapping of existing projects to ED Database, TEPPC database, CEC claims database, RETI pre-ID projects, etc.
- Assumes new transmission for most projects – no ability to determine which projects could get built without a renewables trunk line
- Model selects from “bundles” of projects – cannot select individual projects outside of bundle
- Did not look at operational impacts of renewables in this quantity – integration costs based on rule of thumb
- Project viability ratings not very scientific
- Contract/project info already out-of-date; POU data lacking
- DG potential estimates very high-level
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Arne Olson, Partner (arne@ethree.com)

Aspen Environmental Group
Phone: 916-379-0350

Carl Linvill (clinvill@aspeneg.com)
Susan Lee (slee@aspeneg.com)
Agenda

✓ Direction of LTPP, long-term renewables planning

• **33% RPS Implementation Analysis Preliminary Results**
  – Portfolio development
  – *Illustrative timelines*

• California ISO 33% RPS Operational Study

• Considering a 33% RPS in 2010 LTPP – *proposed approach*

• Considering a 33% RPS in 2010 LTPP – *proposed inputs and assumptions*

• Summary, schedule, next steps
Objective of Barriers and Timelines Analysis

• Gain understanding of possible timeframe associated with achieving a 33% RPS
• Identify market and regulatory barriers to renewable development
• Identify solutions and their impacts on achievement of a 33% RPS
Standardized Timelines

- Aspen Environmental Group studied historic timelines of generation and transmission projects in California
- Reviewed CAISO, CPUC, CEC, BLM, and other approval timelines
- Identified the types of permitting processes that would apply to developing the reference case portfolios
- Developed “standardized” timelines for major transmission and each type of generation permitting
# Locally Permitted Wind Project Sample

## Table 4. Project Examples and Overall Timeframes – Wind Energy Power Plants

<table>
<thead>
<tr>
<th>Project Name (Lead Agency)</th>
<th>Wind Energy Capacity (MW)</th>
<th>Duration of Pre-Permitting Development Process (months)*</th>
<th>Duration of Environmental Review Process (months)</th>
<th>Duration of Construction to Online (months)</th>
<th>Total Duration of Project Development to Online (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AVERAGE TIME REQUIRED to Online</strong> (for Small-Local, &lt;50 MW)</td>
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<td>40</td>
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<tr>
<td><strong>AVERAGE TIME REQUIRED to Online</strong> (for Large-Local, ≥50 MW)</td>
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<td>59</td>
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<tr>
<td>Granite Wind Energy (BLM)</td>
<td>62.1 – 81 MW</td>
<td>12</td>
<td>42</td>
<td>9</td>
<td>63</td>
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<tr>
<td>Edom Hills Repower (BLM)</td>
<td>20 MW</td>
<td>12</td>
<td>7</td>
<td>12</td>
<td>31</td>
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<tr>
<td>Mountain View IV (BLM)</td>
<td>49 MW</td>
<td>12</td>
<td>30</td>
<td>14</td>
<td>56</td>
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<tr>
<td>Kumeyaay Wind (Bureau of Indian Affairs)</td>
<td>50 MW</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>28</td>
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<td>Montezuma Wind (Solano County)</td>
<td>37 MW</td>
<td>12</td>
<td>15</td>
<td>33 (expected online 2010)</td>
<td>Expected 60</td>
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<tr>
<td>Shiloh II (Solano County)</td>
<td>176 MW</td>
<td>12</td>
<td>29</td>
<td>9</td>
<td>50</td>
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<tr>
<td>Buena Vista (Contra Costa County)</td>
<td>38 MW</td>
<td>12</td>
<td>17</td>
<td>21</td>
<td>50</td>
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</table>
## Transmission Permitting Sample

<table>
<thead>
<tr>
<th>High Voltage Transmission</th>
<th>SCE DPV2 (500 kV)</th>
<th>SDG&amp;E Sunrise Powerlink (500/230 kV)</th>
<th>SCE TRTP Segment 1, Antelope-Pardee (500 kV)</th>
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</thead>
<tbody>
<tr>
<td>CPUC:</td>
<td>10/24/2006</td>
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<td>BLM ROD: Pending; (AZ approval:</td>
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<td>Pending)</td>
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<td>Note: SCE now proposes to</td>
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<td>Est. 24 mo</td>
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<td>construct the California</td>
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<td>Note:</td>
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<td>Est. 53 mo</td>
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<td>Est. 46 mo</td>
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<td>from CPCN submittal</td>
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</table>
33% Reference Case Generation Resources

- 20% RPS Reference Case (9,437 MW):
  - Tehachapi
  - Solano
  - Imperial North
  - Riverside East
  - distributed + out-of-state projects

- 33% RPS Reference Case (14,361 MW):
  - 20% Case – all resources
  - Mountain Pass
  - Carrizo North
  - Needles
  - Kramer
  - Fairmont
  - San Bernardino-Lucerne
  - Palm Springs
  - Baja
  - Riverside East incremental
  - distributed + out-of-state projects
Developing Overall Timelines for the 33% RPS Reference Case

Transmission & Generation Timelines

Renewable Resource Zone

Overall Timeline to Reach 33% RPS

2009, 2010, 2011...

Zone 1

Zone 2

Zone 3

Zone 4

Source: CPUC/Aspen
Sample Zone Timeline: San Bernardino-Lucerne Zone

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
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<td>TRANSMISSION Planning, Permitting &amp; Construction</td>
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<td>Transmission Planning by CAISO / POU / WECC</td>
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<td>Final Review and Approval by CPUC / POU / Feds</td>
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Concurrent permitting at one field office may challenge BLM resources.

Transmission-generation lag could adds significant time.
Key Assumptions for Zone Timelines

- Transmission development timeline is driving force in each zone timeline
- 30-month delay for full interconnection of all generation in a zone is built into timeline for each zone
- Agencies face unprecedented numbers of permits, on expedited basis
- Developers in the same region may time permit applications to coincide with timing of transmission availability, potentially swamping regional offices

Key Point:
- Although transmission timing is assumed to be most critical, resource constraints at generation permitting agencies may add delay.
33% RPS Reference Case Timelines

• **Timeline 1 (Historical experience without process reform)**
  – 33% RPS achieved in 2024
  – Assumes planning, permitting, and construction processes are almost entirely sequential.

• **Timeline 2A (Current practice with process reform & no external risks)**
  – 33% RPS achieved in 2021
  – Assumes successful implementation of reforms currently in process
  – Assumes no delays due to external risks beyond state control

• **Timeline 2B (Current practice with process reform & external risks)**
  – 33% RPS not achieved
  – Assumes state successfully implements reforms, but factors outside state control (technology failure, financing and permitting risk, and public opposition/legal challenges) cause some project delay or failure
Reforms Assumed in Timeline 2A

- Generation interconnection process reform at California Independent System Operator (ISO)
- Streamlined transmission permitting – environmental review and need determination – at CPUC
- Streamlined generation permitting
- Successful implementation of the Renewable Energy Transmission Initiative
- Planning for renewable resources in 2010 Transmission Planning process at California ISO – “Conceptual 33% RPS Master Plan” by Q1 2010
- Transmission corridor designation at California Energy Commission
**Timeline 2B: w/ Process Reform & External Risks**

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**Result:**

33% RPS Reference Case is not achieved using current procurement strategy
Strengths, Weaknesses of Timeline Analysis

• Strengths:
  – First-of-its kind attempt to identify development barriers associated with a specific set of generation and transmission projects
  – Quantified effects of reforms underway and identified need for others

• Weaknesses:
  – Performed only on 33% Reference Scenario
  – No iterations by which the Reference Scenario could be augmented with more zones or distributed generation when development in some areas was delayed or failed
Agenda

✓ Direction of LTPP, long-term renewables planning
✓ 33% RPS Implementation Analysis Preliminary Results
  ✓ Portfolio development
  ✓ Illustrative timelines

• California ISO 33% RPS Operational Study
• Considering a 33% RPS in 2010 LTPP – proposed approach
• Considering a 33% RPS in 2010 LTPP – proposed inputs and assumptions
• Summary, schedule, next steps
California ISO 33% RPS Operational Study

- Study is a crucial input to LTPP – operational impacts of a 33% RPS inform size and type of fossil need
- ISO is studying the impacts of the scenarios developed for the 33% Implementation Analysis
- CPUC anticipates using results to inform:
  - Need determination in LTPP (in scope today)
  - Consideration of bids in RPS procurement process (out of scope today)
CAISO 33% RPS Operational Study

Udi Helman, PhD
Principal, Markets and Infrastructure Division

CPUC Public Workshop:
Long-term Renewable Planning Methodologies, Inputs, and Assumptions for the 2010 Long-Term Procurement Plan Proceeding

December 10, 2009
Overview of Presentation

- Objectives of Operational Study – Phase 1 and 2
- Overview of Inputs and Study Limitations
- Status and Schedule
Overview of 33% RPS Operational Study

- Simulates the California power system in 2020 under alternative CPUC 33% RPS renewable generation scenarios
  - Reference Case
  - High Wind Case
  - High Distributed Generation Case
  - High Imports Case
  - 20% Reference Case
  - All Gas Case
- Two Phases
  - First Phase underway
    - Step 1 - Simulation of renewable integration operational requirements
    - Step 2 - Production simulation with WECC zonal transmission network model
  - Second Phase in Spring 2010
Phase 1- Step 1: Assesses Intra-Hour Operational Requirements

- Estimates added intra-hour variability under each studied renewable portfolio
- Calculate the following:
  - Regulation Up and Regulation Down capacity and ramp requirements by hour and season
  - Load-following capacity requirements by hour and season
  - Generic ramp rate requirements by hour and season
- Isolates the contribution to system variability of load, wind resources and solar resources.
- Methodology originally used in ISO 2007 study, now updated
- Required intensive development of 1-min load, wind and solar profiles
Example of changes in five minute economic dispatch/load following capacity for 33% reference case
[results are preliminary and not to be relied upon]

Maximum upward increase from 2500 MW to 5100 MW in HE 8.

Maximum downward decrease from 2100 MW to 5200 MW in HE 18.
Regulation Requirements for 33% Reference Case
[results are preliminary and not to be relied upon]

Summer Regulation Up

MW

Hour

1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24

RegUp_2020(L)
RegUp_2020(L+W)
RegUp_2020(L+S)
RegUp_2020(L+W+S)
Phase 1 – Step 2: Production Simulation

- Dynamic optimization model that simulates the power system using least-cost commitment and dispatch of resources to meet load in an hourly time-step

- For each renewable portfolio it will determine:
  - Integration costs measured in changes in production costs ($/MWh) between a benchmark scenario and alternative renewable/load scenarios
  - Fixed costs of additional conventional generation needed to integrate renewables
  - Hours of congestion for CA paths modeled (inter-bubble transmission and Path 15)
  - GHG emissions
  - Ramp and capacity constraint violations/overgeneration results by bubble, by month and day, before and after addressing violations
  - Natural Gas usage in CA for power generation for the year
Core Inputs to Model

- Supply
  - CPUC Renewable Scenarios
  - Anticipated new conventional resources
  - Additional conventional resources to achieve PRM
  - Demand Response
- Ancillary Services requirements -- Regulation (from Step 1) and Operating Reserves
- Transmission Network
- Demand (Load) – CEC September Updated High Load Case
- Environmental emissions factors (GHG)
Transmission Modeling Assumptions

- California state-wide system modeled
  - PG&E Valley
  - PG&E Bay
  - SMUD
  - SCE
  - SDG&E
  - LADWP
  - IID
  - TID
- Rest of WECC
Generation Operating Characteristics

- Generic generation data (Pmin, Pmax; Min. up- and down time; Ramp rates; Ancillary Service Ranges); checked by CAISO against confidential Master File data for consistency
- California hourly hydro generation and AS contribution is based on data obtained from IOUs
- Renewable resources assumed to be fixed output profiles (not dispatchable)
  - Second phase will modify this assumption
Constraint Violations Evaluated in Production Simulation

1. Regulation-Up
2. Regulation-Down
3. Spin
4. Non-Spin
5. Unserved Energy
6. Over-generation

* Either insufficient ramping capability or insufficient available capacity results in one of the above violations. Exact penalty costs in optimization to be determined.
This study is **not** examining a range of operational, reliability and transmission requirements and costs

- **Transmission Build-out**
  - Only minimal adjustments to transmission capacity in operational study; no calculation of realistic 33% RPS transmission costs (see, e.g., ISO regional transmission studies)

- **Operational/Transmission Planning**
  - No consideration of commitment or dispatch uncertainty, i.e., forecast error in the production cost simulation
  - No intra-hour modeling of operations
  - No evaluation of intertial requirements needed to withstand contingencies
  - No evaluation of system harmonics, transient or post-transient stability

*Consideration of these elements will tend to increase the need for integration capacity with likely increase in costs and emissions levels*
Second Phase – 33 % Operational Study

- Focuses on quantifying impacts of alternative solutions to mitigating variability and possible study refinements
  - Demand response
  - Solar defocusing
  - Feathering wind resources
  - Storage
- Will provide further insight into:
  - Changes in operational requirements
  - Changes in production costs
  - Changes in GHG emissions
  - Changes in capital costs (off-line calculation)
Study is conducted through a collaborative working group.

- Core Study Team (Phase 1) – responsible for doing the work
  - ISO – study design, assumptions and outputs
  - CPUC – study design, assumptions and outputs
  - SCE – primary modeling responsibility
  - Nexant – project management and resource profiling
- Working Group – represents a cross-section of industry and provides input on methodology, assumptions and outputs through weekly calls
  - CEC
  - PG&E
  - WPTF
  - TURN
  - Large Scale Solar Association
  - CalWEA
- Other Public forums – ISO will hold at least two “stakeholder” meetings to discuss preliminary and final results
Schedule and Status

- **Phase 1**
  - Step 1 results complete by Dec. 18\textsuperscript{th}
  - Step 2 model setup complete
  - Step 2 modeling completed by mid-January 2010
  - ISO finalizes results by early February 2010
  - ISO prepares report by Spring 2010

- **Phase 2 modeling begins in Spring 2010**
Agenda

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  • Considering a 33% RPS in 2010 LTPP – proposed approach
  • Considering a 33% RPS in 2010 LTPP – proposed inputs and assumptions
  • Summary, schedule, next steps
Proposed approach – portfolio development

• Reminder of working principle: *Resource plans should consider the scale of investment in transmission and flexible fossil resources to integrate and deliver new renewables*

• A single, statewide “**Renewables and Transmission Study**” is needed as a foundational element
Focus of today’s workshop

System Portfolios

“SYSTEM PLAN”

Metrics
- Cost/risk
- Time
- Env./GHG

Constraints
- Reliability/PRM
- AB32 caps

“Need” = Proceeding Outcome

System Portfolios

RPS Portfolios

ENERGY (GWh)

CAPACITY (MW)*

Staff-generated, with party input

IOU-generated, with party input

IOU- or Staff-generated, with party input

*While the focus of system planning is to ensure sufficient capacity, the system plan would need to assess energy as well to demonstrate consistency with RPS and GHG laws.
Tentative Stakeholder Process & Schedule (for RPS analysis only)

Timeframe for New OIR
on 2010 LTPP System Proceeding

1st Workshop
Dec 10-11, 2009

Draft Staff Report
on Proposed RPS
Inputs, Assumptions & Methods
("Draft RPS Methods Report")

2nd Workshop

Final RPS
Methods Report

Formal Comments
on Draft RPS
Methods Report

Formal
Comments

ACR/Scoping Memo
for 2010 LTPP System
“Locks Down”
Required
RPS Portfolios

Draft Staff Results
for Required* RPS Portfolios

Party Filing of
Alternative Proposals for
Required RPS Portfolios

* Required RPS portfolios are those that must be included in the 2010 LTPP system analysis, whether staff or IOUs are ultimately responsible for the complete system analysis.
Proposed Definitions

• **Scenario** – A possible future set of conditions about policy requirements, market realities or resource development choices. A set of conditions that define the supply-side resource stack.

• **Sensitivity** – A change in an input (e.g., load, PV cost) due to an alternative set of assumptions (e.g., about demand-side resource achievements - EE, CSI/DG, CHP, etc.), *within the same scenario*.

• **Case** – Any single combination of scenario and sensitivity (e.g. 33% Reference Scenario/High Load Sensitivity)

• **Portfolio** – A specific set of resources to meet the requirements of a case.
### Proposed Definitions - Example

#### Sensitivity

- **Scenario**
  - 33% Reference
  - 33% High DG
  - 33% OOS

<table>
<thead>
<tr>
<th>Load</th>
<th>High</th>
<th>Mid</th>
<th>Low</th>
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#### Portfolio: (2020)

- Biogas – 280 MW
- Biomass – 390 MW
- Geothermal – 1440 MW
- Hydro, Sm. – 25 MW
- Solar PV – 3235 MW
- Solar Thermal – 6764 MW
- Wind – 7573 MW
Proposed Guiding Principles for RPS Planning

Inputs, Assumptions and Methodology

1. Assumptions should reflect the behavior of market participants, to the extent possible

2. Methodology should be consistent with previous regulatory decisions, to the extent applicable

3. Any proposal should explain the policy basis for the proposal

4. Any proposal must include supporting documentation
Proposed Guiding Principles for RPS Planning

**RPS Scenarios**

5. RPS scenarios should be reasonably feasible and reflect plausible procurement strategies with associated (conceptual) transmission.

6. RPS scenarios should represent substantially unique procurement strategies resulting in material changes to corresponding (fossil) procurement needs and/or required (conceptual) transmission.

7. RPS scenarios should be limited to 3-5
Proposed Approach to Portfolio Development

- RPS generation contracted and under negotiation
- Trajectory Scenario
- High DG Scenario
- High Out-of-State Scenario
- Environmentally Preferred Scenario
- Balanced Scenario

Re-DEC
Renewable Distributed Energy Collaborative

Re-DEC is a statewide stakeholder effort to better understand the challenges and identify solutions to integrate increasing levels of renewable energy into the grid.

- System-side renewable distributed generation (DG) that is dispersed throughout the grid is playing an increasing role in meeting CA’s renewable energy goals

- New and proposed system-side renewable DG programs include:
  - Existing feed-in tariff (FIT) program, recently amended by SB 32
  - Utility solar programs/proposals
  - Consideration of an expanded FIT program in R.08-08-009

- Stakeholders have identified a number of challenges that impact both project developers and grid operators as increasing volumes of renewable DG attempt to interconnect to the distribution grid
Purpose of Re-DEC

- Re-DEC will inform an implementation analysis of a High DG scenario
  - Data collection, analysis, and stakeholder feedback from Re-DEC will be used to identify implementation steps and timing for the High DG Case

- Kick-off meeting held on December 9
  - Stakeholders identified challenges with interconnection of distributed renewable generation
  - Challenges categorized by:
    - Implementation timeframe (near-term versus long-term)
    - Implementation effort (easy versus difficult)
  - Stakeholders discussed potential solutions
Agenda

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  • Considering a 33% RPS in 2010 LTPP – proposed inputs and assumptions
  • Summary, schedule, next steps
New Inputs: Time and Risk

• 33% RPS Implementation Analysis Preliminary Results considered relative cost of scenarios, but only Reference Case was assessed for risk and development timing

• Balanced consideration of cost, risk and time is crucial to effective long-term planning
  – Develop effective, balanced, least-cost, best-fit portfolios
  – Identify barriers, risks, and implications early, in time to work on solutions

• Black & Veatch is developing a tool to evaluate the risk and timing associated with individual projects, as an input into portfolio development and as a means for assessing overall portfolios
Timeline and Risk Analysis Tool

CPUC LTPP/RPS Workshop

December 11, 2009
Previous work

Renewable energy portfolios developed for several cases:

- 20% base case
- 33% cases - CPUC approved contracts AND 39 TWh from:
  - Base case – CPUC pending and shortlisted
  - High distributed generation – local DG projects
  - High out-of-state delivered – out of state wind
  - High wind – California and Mexico wind

Timelines were developed for the 20% and 33% base case only, including barriers and reforms
Timelines Developed for the Base Case

1. Base timeline - business as usual, no reforms/risks
2. Reforms only
3. Reforms + External Risks
Black & Veatch’s Current Scope of Work

- Previous work concludes that under base case assumptions, it is unlikely that California will meet RPS goals.
- We are currently examining the three alternative cases:
  - High distributed generation
  - High out-of-state delivered
  - High wind
- For each case, we are considering:
  - Business as usual
  - Barriers, constraints, external risks
  - Opportunities for reform
Timeline Tool Purpose

- Analyze the Timing and Risk in reaching California’s 33% RPS Goal
Timeline Tool - Data

- **Defined Portfolios** = Approved Contracts + Proxy Projects
  - **Approved Contracts** - Project Development Status Reports (PDSR)
  - **Proxy projects** - Projects from E3, scheduling factors from Black & Veatch

- Generic scheduling factors based on
  - Technology
  - Project size
  - Land type
  - Location
Timeline Tool - Features

- Dynamically generated
- Aggregated portfolios for alternative cases presented with summary timelines and yearly generation charts
- Timelines for individual projects available for review
- Project development (permitting/interconnection) and construction are broken out

Example Only
Timeline Tool - Modifiers

- Research is being performed on potential barriers, constraints, reforms and their scheduling impacts

- Timelines able to be dynamically modified by the user based on:
  - Barriers, constraints
  - Reforms
  - Transmission development
  - Project viability
Project Viability

- Planned projects are **scored** for risk based on:
  - Company/development team
  - Technology and resource quality
  - Development milestones
    - Site control
    - Permitting
    - Financing
    - Transmission
    - Interconnection
Implementing Project Viability Into Timelines

- Project viability scores for planned projects will be imported into the timeline tool

- Multiple potential applications
  - Exclude projects below a certain viability score
  - Delay projects on viability characteristics
  - Visualize timeline data by viability
Example Visualization

- Yearly generation charts can be broken out by viability class – high, medium, and low viability.
A Major Outcome of the Timelines Tool

- Visualize Timelines
- Identify Barriers
- Propose Solutions/Reforms
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<th>Barrier</th>
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<tr>
<td>High volume of projects may congest regulatory agencies &amp; other organizations</td>
<td>General</td>
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<td>PV Systems affect grid voltage, potentially negatively affecting grid operation</td>
<td>High DG</td>
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<td>Cost recovery/allocation for distribution upgrades may not be adequately defined</td>
<td>High DG</td>
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<td>Environmental opposition to new transmission prolongs development</td>
<td>High OOS/Wind</td>
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<tr>
<td>Unknown integration impacts and opposition to curtailment constraints development</td>
<td>High OOS/Wind</td>
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# Reforms - Examples

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<th>Reforms</th>
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<td>Streamline approval processes for permitting, interconnection &amp; transmission</td>
<td>General</td>
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<td>New policy makes storage viable, reducing integration issues</td>
<td>General</td>
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<tr>
<td>Information sharing between utilities &amp; developers to help site projects</td>
<td>High DG</td>
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<tr>
<td>Update standards to reduce issues with integration</td>
<td>High DG</td>
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<tr>
<td>Risk of long distance transmission development reduced by federal gov.</td>
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Questions?
Comments on the 33% RPS Implementation Analysis: Preliminary Results

and

Staff Recommendations for 2010 LTPP
Comment Topics

• A number of other topics were raised
• All ideas were considered
• Some comments not addressed here since:
  – Previously addressed
  – Out of scope
  – Not relevant to LTTP
Conceptual Overview of RPS in the 2010 LTPP System Analysis

Focus of today’s workshop

SYSTEM PLAN

System Portfolios

Metrics
- Cost/risk
- Time
- Env./GHG

Constraints
- Reliability/PRM
- AB32 caps

“Need” = Proceeding Outcome

“SYSTEM PLAN”

System Portfolios

RPS Portfolios

RPS Portfolios

ENERGY (GWh) | CAPACITY (MW)*

Clean Fossil

EE

CHP

CSI/DG

DR

Staff-generated, with party input

IOU-generated, with party input

IOU- or Staff-generated, with party input

*While the focus of system planning is to ensure sufficient capacity, the system plan would need to assess energy as well to demonstrate consistency with RPS and GHG laws.
Comments outside the RPS context

• Feedback on Fossil
  – Issues with fossil capacity factors, units included, and types of units (SCE)

• Feedback on Demand Response (DR)
  – Should include more DR (CLECA)

• Staff proposal
  – Address in future vetting of LTTP assumptions
Load Forecast

• Feedback
  – Updated load forecast should be used
    (Attorney General, Joint Renewable Parties)
  – Impact of economic downturn should be reflected
    (Attorney General)

• Staff proposal
  – Incorporate 2009 CEC Load Forecast
CARB Assembly Bill (AB) 32 Scoping Plan

• Feedback
  – CARB AB 32 Scoping Plan should be incorporated into analysis (Attorney General, CAC/EPUC)

• Staff proposal
  – Include CARB AB 32 Scoping Plan measures as a “sensitivity”

http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm
Renewable Baseline

• Feedback
  – 2007 data is not sufficient (PG&E, SDG&E, Attorney General, DRA, Joint Renewable Parties)

• Staff proposal
  – Incorporate 2008 CEC Net System Report data
  – Include updated ED database projects

Once-Through Cooling (OTC)

• Feedback
  – More detail is needed on incorporating OTC retirements (Attorney General, CLECA)

• Staff Proposal
  – Update OTC retirements to include the results of the May 19, 2009 joint energy agency proposal, *Implementation of OTC Mitigation Through Energy Infrastructure Planning and Procurement Changes*

Cost of Generation

• Feedback
  – Wind and/or solar costs are too high (Attorney General, GreenVolts, Joint Renewable Parties, UCS)
  – Likely underestimate rate impacts (PG&E)
  – Should use CEC *COMPARATIVE COSTS OF CALIFORNIA CENTRAL STATION ELECTRICITY GENERATION* supplemented by RETI (UCS)

• Staff proposal
  – Update costs for LTTP using revised RETI cost of generation inputs

Overlap Between RETI and ED Database

• Feedback
  – Concern over potential double counting of projects in both ED Database and projects identified by RETI (PG&E)

• Staff proposal
  – Remove any duplication of projects in analysis
Storage

• Feedback
  – Storage should be included in the analysis (MegaWatt, Attorney General)

• Staff proposal
  – Storage will be included in Phase II of the CAISO 33% RPS Integration Study
Overgeneration

• Feedback
  – Overgeneration should be considered in the analysis (MegaWatt)

• Staff proposal
  – CAISO 33% RPS Integration Study includes analysis of overgeneration
High Distributed Generation (DG) Case

• Feedback
  – Concern over technical feasibility (PG&E, SCE)
  – Concern over economic feasibility (SCE, SDG&E)
  – Assumptions on DG potential are not sufficiently aggressive (RightCycle, Attorney General)
  – High DG case is plausible (DRA, CEERT, UCS)

• Staff proposal
  – Renewable Distributed Energy Collaborative (Re-DEC) to investigate the technical feasibility
  – CAISO 33% RPS Integration Study to include High DG Case
Amount of Photovoltaic (PV) Capacity

• Feedback
  – 15 GW of PV in High DG case is not feasible (PG&E, CLECA, SCE)
  – Amount of PV in High DG case is feasible (RightCycle, CEERT, DRA, GPI, CARE, UCS)

• Staff proposal
  – Implementation analysis of High DG case
  – Re-DEC to provide guidance and analysis
Amount of Solar Thermal

• Feedback
  – 7,200 MW of solar thermal is feasible by 2020 (SCE, PG&E, SDG&E, CEERT)
  – Amount of solar thermal in 33% RPS reference case is not feasible (RightCycle, CARE, DRA)

• Staff proposal
  – Create a new more realistic balanced scenario
  – Incorporate input from the Desert Renewable Energy Conservation Plan (DRECP)
Scenarios

• Feedback
  – Should include different and/or more realistic scenarios (GreenVolts, RightCycle, DRA, SCE)

• Staff proposal
  – Include a new scenario that is more feasible
  – All scenarios will be revised to be more realistic
  – Plan to include Energy Division (ED) database projects as core of each portfolio
Net Qualifying Capacity (NQC)

• Feedback
  – Updated Resource Adequacy (RA) values should be used (SCE)

• Staff proposal
  – Incorporate current NQC approach from ’09 RA Decision (D.09-06-028)

http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/102755.htm
Project Viability

• Feedback
  – Project viability should be updated based on latest information from IOUs (PG&E)

• Staff proposal
  – Include updated project viability information in analysis
Out-of-State Resources

• Feedback
  – High Out-of-State Delivered case is feasible (SCE, SDG&E, PG&E, CEERT)
  – High Out-of-State Delivered case requires further analysis (CLECA, GPI, RightCycle, CARE, DRA)

• Staff proposal
  – 2010 LTTP will include implementation analysis of all required RPS scenarios
Unbundled Renewable Energy Credits (RECs)

- Feedback
  - Unbundled RECs should be analyzed (SCE)

- Staff proposal
  - Analyze unbundled RECs if they become legal in California
  - Amount and price are highly uncertain
Timelines

• Feedback
  – Timelines need to be updated (SDG&E)

• Staff proposal
  – Compile timelines for the new portfolios
Additional Updates

• Update projects expected to come online based on the following sources:
  – POU procurement plan information from the CEC
  – 2009 IOU solicitations
  – DRECP
  – RETI
Transmission Costs

• Feedback
  – Transmission costs are too high (Joint Renewable Parties, UCS, Attorney General)

• Staff proposal
  – Update transmission costs based on RETI, ISO and CTPG studies, other sources
Existing Transmission Capacity

• Feedback
  – Capability of existing transmission to incorporate new renewable generation should be analyzed (SCE, CARE, SDG&E, CEERT, CLECA, RightCycle, DRA, UCS)
  – Analysis part of existing transmission planning and permitting processes (PG&E)

• Staff proposal
  – Use information from CAISO, CTPG as available to inform assessment of available capacity on existing transmission
Need for New Transmission

• Feedback
  – New transmission is needed (SCE, PG&E, SDG&E, CEERT, CLECA, GPI, DRA)
  – New transmission is not needed (RightCycle, CARE)

• Staff proposal
  – Re-DEC will assess viability of High-DG case with little need for new transmission
  – CAISO, RETI, CTPG will inform assumptions about transmission needed for utility-scale generation
Agenda

✓ Direction of LTPP, long-term renewables planning
✓ 33% RPS Implementation Analysis Preliminary Results
  ✓ Portfolio development
  ✓ Illustrative timelines
✓ California ISO 33% RPS Operational Study
✓ Considering a 33% RPS in 2010 LTPP – proposed approach
✓ Considering a 33% RPS in 2010 LTPP – proposed inputs and assumptions

• Summary, schedule, next steps