THEN AND NOW

• Then
  • Black & Veatch supported the Renewable Energy Transmission Initiative ( RETI) from 2008-2010
  • Goal was to identify most economic and least impact generation and transmission to meet 33% RPS

• Now
  • Black & Veatch has recently updated its California resource dataset for the CPUC
  • RPS scenarios up to 50%
  • Version 6 of RPS Calculator:
    http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/RPS+Calculator+Home.htm
WHAT HAS CHANGED SINCE 2008?

- 33% RPS goal seems readily within grasp
- Renewable resources have improved significantly in performance and cost -- much greater siting flexibility
- Development throughout state, rather than just Southern California
- Several major transmission projects under way
- Distributed generation (especially PV) has grown rapidly
2010 RETI PHASE 2B COMPETITIVE RENEWABLE ENERGY ZONES (CREZ)
UPDATED RENEWABLE RESOURCE ASSESSMENT (NON-PV) – MUCH MORE WIND

Wind

Biomass

Solar Thermal

Geothermal

CREZ not shown
SOLAR PV COST AND POTENTIAL HAS CHANGED OVER TIME

All PV CREZ
$196-232/MWh (2008)
$144-185/MWh (2010)

2013 Resource Update

2015 costs even lower
ACHIEVING 40 OR 50% RPS WILL INCREASE NEED FOR SYSTEM FLEXIBILITY

- All electric systems include flexibility to balance load and generation in order to maintain reliability of supply
- Solar and wind variability increases the need for system flexibility to help maintain reliability
  - Sustain upward and downward ramp
  - Respond for a defined period of time
  - Change ramp directions quickly
  - React quickly to meet unexpected operating levels

Flexibility needs depend on the unique electric system
VARIETY OF OPTIONS AVAILABLE TO PROVIDE FLEXIBILITY

• Black & Veatch’s latest survey of utility executives reported that
  • Almost two-thirds believe energy storage will be the most important factor facilitating integration of wind and solar
  • The second and third most important factors are “transmission upgrades” and “new flexible conventional power plants”

• Lower cost flexibility options may be available (market rules, demand response, etc.)

• At the distributed level, understanding and shaping customer behavior will be essential
COMMERCIAL AND INDUSTRIAL DISTRIBUTED GENERATION POTENTIAL IN ORANGE COUNTY
AREA NEAR JOHN WAYNE AIRPORT

Technical Potential Capacity, MWdc

0.25

> 3
In addition to technical potential, cost of energy calculated for rooftop and parking applications for each parcel. Only larger potential sites shown here.
The cost of achieving higher RPS targets is much lower

Technology has enabled many possible pathways with similar costs

Flexibility in options is freeing, but can make planning more nuanced

Achieving higher RPS targets will require new technologies, new flexibility approaches, and new regulatory and policy directions
THANK YOU

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