

## **Renewable Energy Certificates (RECs)**

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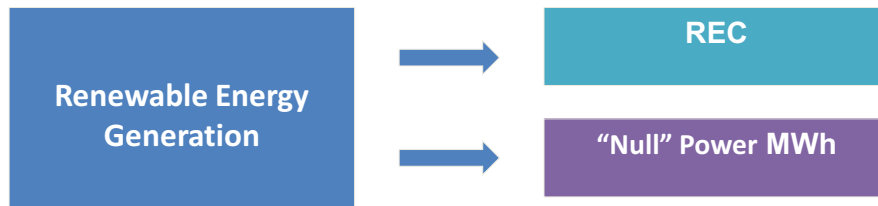
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## **Renewable Portfolio Standard (RPS) Programs**

- Motivation - stimulate renewable energy investment, create environmental benefits
- State program that uses competition among suppliers to meet a set renewable energy target at least cost – target levels increase over time
- Requires utilities /Load Serving Entities (LSEs) to serve a minimum percentage of customer load from renewable energy sources
- Can be met entirely by Renewable Energy Certificates (RECs) or require bundled purchase of electricity and RECs from a renewable facility
- RPS programs contrast with other policy approaches such as Feed-in Tariffs (FITs) where a fixed tariff price is available for all levels of investment

## What is a Renewable Energy Certificate (REC)?

- Renewable Energy Certificates (RECs) represent “environmental attributes” of renewable energy generation
- Western Renewable Energy Generation Information System (WREGIS) tracks and registers RECs in the Western Electricity Coordinating Council (WECC)
- 1 MWh generates 1 REC or 1 WREGIS Certificate



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## REC Attributes

- A REC is generated when a renewable energy resource produces energy
- Greenhouse House Gas (GHG) emission reduction benefits accrue from displacement of non renewable energy by renewable energy
- Location of renewable resource can impact what type of resource is displaced
- Variability of renewable resources can require other resources for balancing
- GHG emissions from resources needed for addressing variability of renewable resources can also vary by location (e.g. hydro in Pacific Northwest vs. older fossil resources in some other jurisdictions)
- Precise calculation of level of GHG emission reduction from a renewable resource can be complex

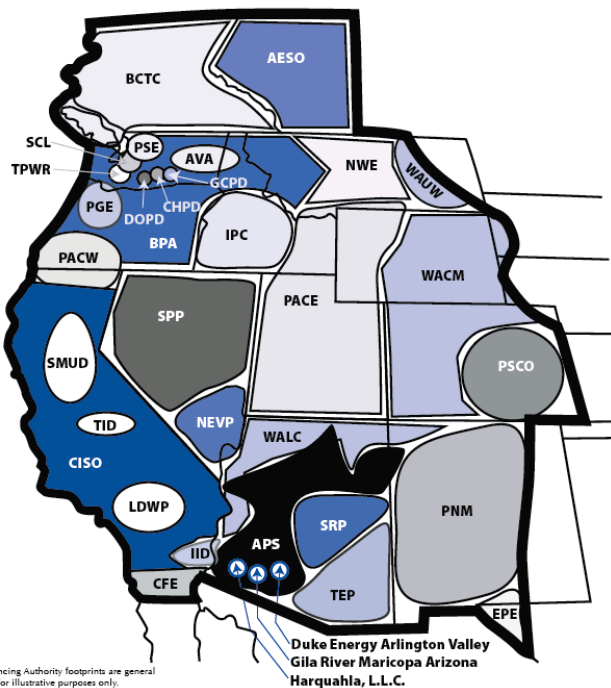
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## Delivery from Remote Renewable Resources

- Challenges
  - Variability of Renewable Resource
  - Remote Location
- Can be addressed by
  - Storage
  - Transmission or Locational Exchange
- Basis for flexible delivery structures used in CA RPS – “firming and shaping”
- Firming – Smoothing of intra-hour variability by using reserves in Source Balancing Authority (BA) – result is hourly firm product
- Shaping – Smoothing of inter-hour variability – result is fixed block of power of desired shape e.g. on-peak or off-peak

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## Balancing Authorities (BAs)



- A Balancing Authority (BA) refers to a reliability entity that is responsible for balancing demand and supply within the metered boundaries of its area to support interconnection frequency
- The Western Electric Coordinating Council (WECC) includes several BAs
- WECC covers an interconnected power grid
- Siting of wind and solar projects is impacted by wind/solar potential of a region
- BA boundaries do not always correspond to state boundaries

Source: NERC, FERC <http://www.ferc.gov/market-oversight/mkt-electric/wecc-balancing-authorities.pdf>

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## Scheduling between BAs

- Non-dynamic schedule – generally fixed hourly schedule from source BA to sink BA with any variation in supply in the source BA being balanced by reserve generation from the source BA. More recently there have been efforts to allow non dynamic schedules that can be adjusted over shorter timeframes e.g., 30 minutes.
- Dynamic schedule - The provision of the real-time monitoring, telemetering, computer software, hardware, communications, engineering, energy accounting (including inadvertent interchange), and administration required to electronically move all or a portion of the real energy services associated with a generator or load out of one Balancing Authority (source BA) into another (sink BA).
- Dynamic scheduling of a conventional resource transfers flexibility to the sink BA
- Dynamic scheduling of a variable renewable resource transfers the burden of addressing variability to the sink BA – in some cases this can be useful, e.g., if the sink BA has more flexible resources or if the source BA does not offer balancing services

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## Delivery Structures for Remote Renewable Resources

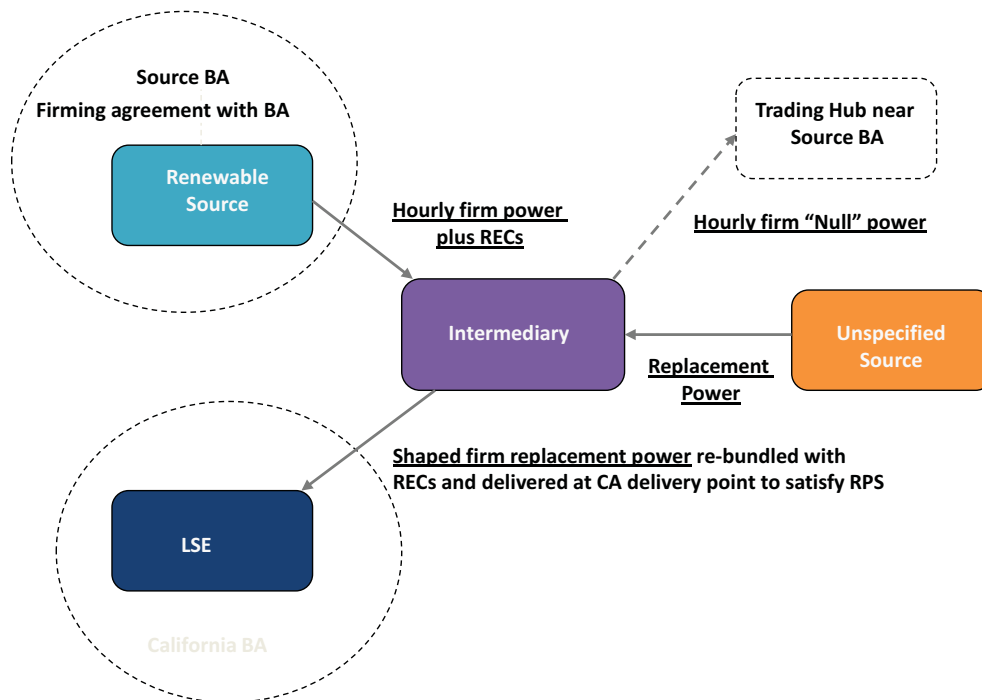
- Four categories of transactions are generally possible for remote resources in the CA RPS program
  - Dynamically Scheduled Import from renewable facility (variable output as generated)
  - Unbundled RECs
  - Hourly firm imports from renewable facility
  - Firmed and Shaped Transactions (locational energy exchange of variable energy with firm shaped energy -allows calendar year banking)

Description	Use of Substitute Resources	Intra-hour Firming Responsibility	Bundled REC and energy	CPUC TREC Decision Classification	33% RPS Classification
Dynamically scheduled import from RPS facility	None	Sink BA	Yes	Bundled	Bundled
Hourly firm import scheduled from RPS facility using a physical transmission path	Within hour	Source BA	Yes	REC-only	Bundled
<i>Firmed and shaped</i> transaction from RPS facility	Within calendar year	Source BA	Yes	REC-only	Bundled
REC-only transactions	NA	Source BA	No	REC-only	REC-only

Source: SB 2 (1X), CPUC Decision 11-01-025

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## Firming and Shaping – Standard Structure



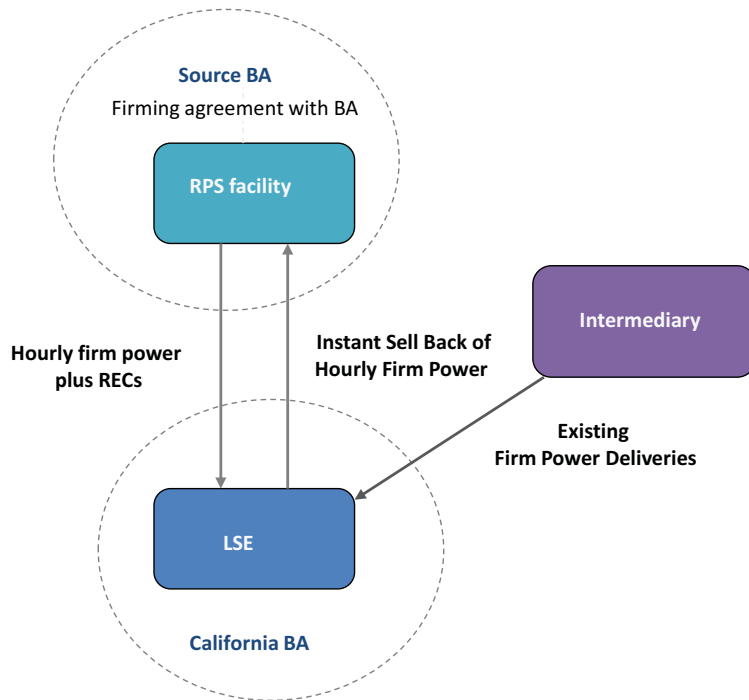
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## Firmed and Shaped Transactions

- Firming and Shaping (F&S) is a CEC authorized delivery structure for redelivery of renewable energy at a different location at a different point in time within a calendar year
- Key element is a Locational Energy Exchange where Variable Energy at Source is Exchanged for Firm Shaped Energy at sink (a CA Delivery Point) – delivery can occur anytime within a calendar year as long as it matches volume of RECs generated
- Source Balancing Authority (BA) provides *intra-hour* firming for Variable Energy Resource (VER)
- Intermediary purchases VER output and RECs at source and unbundles the RECs
- Intermediary rebundles the RECs with firm shaped power delivered to CA Load Serving Entity (LSE) at a CA delivery point
- RECs delivered to CA LSE must equal actual RPS eligible MWh generated by facility within a calendar year
- RECs are tracked in WECC-wide WREGIS database
- Several variations of contract structure possible
- CA customers receive REC bundled with firm, shaped energy

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## REC-only Transactions (no incremental energy delivered to sink BA)



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## 33 percent RPS legislation - SB 2 (1X)

- Signed by Gov Brown on Apr 12, 2011
- Establishes a 33 percent target by 2020 and moves current target of 20 percent to 2013
- Includes Investor Owned Utilities (IOUs) and Publicly Owned Utilities (POUs)
- Establishes limits on out-of-state procurement that become stricter over time
- Banking of Renewable Energy Credits (RECs) allowed for contracts of ten years or longer
- Implementation details being worked out at CPUC and CEC

Compliance Period	RPS Target (%)	In-state requirement (%)
2011-13	20	50
2014-16	25	65
2017-20	33	75

Source: SB 2 (1X)

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## 33 percent RPS Legislation - SB 2 (1X)

- Three categories of transactions
  - in-state resources (“bucket 1”)
  - firm and shaped with incremental energy (“bucket 2”)
  - unbundled RECs (“bucket 3”)
- Contracts signed prior to June 1, 2010 are grandfathered

Category	Description	Requirement
"In-state" resources	RPS resource directly connected to a California Balancing Authority (CBA) or dynamically scheduled into CBA or scheduled into CBA without substitution	≥ 50% (2011-13), ≥ 65% (2014-16), ≥ 75% (2017-20)
Firmed and shaped	Bundled energy and REC transactions, must provide incremental energy	
Unbundled RECs	REC-only transactions	≤ 25% (2011-13), ≤ 15% (2014-16), ≤ 10% (2-17-20)

Source: SB 2 (1X)

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### Bucket 1

- Language in statute – *“Have a first point of interconnection with a California balancing authority area, have a first point of interconnection with distribution facilities used to serve end users within a California balancing authority area or scheduled from the eligible renewable energy source into a California balancing authority without substituting electricity from another source. The use of another source to provide real-time ancillary services required to maintain an hourly or sub-hourly import schedule into a California balancing authority shall be permitted, but only the fraction of the schedule actually generated by the eligible renewable energy resource shall count toward this portfolio content category.” OR “Have an agreement to dynamically transfer electricity to a California balancing authority”*
- Example – If a 50 MWh import is scheduled from a renewable facility as hourly firm and only 30 MWh is generated (rest being firmed by operating reserves) then only 30 RECs are generated and credited in bucket 1. If a 50 MWh import is scheduled and the renewable facility generates 70 MWh then 70 RECs are generated but only 50 RECs will be credited as bucket 1. If accounting is not done on an hourly basis but over a longer period such as a month then all 100 RECs could be counted as bucket 1.

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## Bucket 1 (continued)

- Should accounting for bucket 1 be done on an hourly or monthly basis?
- Can unbundled RECs be included in Bucket 1?
- What happens if a California Balancing Authority (CBA) such as the CAISO expands to include other regions in WECC?
- Dynamic scheduling imports responsibility of addressing variability into CBA - variable product has higher value than firm product linked to same resource in bucket 2

## Bucket 2

- Bucket 2- *“Firmed and shaped eligible renewable energy resource electricity products providing incremental electricity into a California balancing authority”*
- One interpretation of above language would be that it refers to existing CEC definition of “firmed and shaped” with one additional requirement that RECs be bundled with incremental electricity
- Another interpretation would be then “firmed and shaped” is not defined in the statute and requires new definition
- Some suggestions to date for redefinition of “firmed and shaped” include –
  - Renewable facility and source of replacement power be located in same Balancing Authority
  - Contracts must be of five years or longer
  - Contracts must include fixed price energy
- Issue – What definition of bucket 2 would distinguish it from bucket 3?



## Bucket 3

- Bucket 3 – *“Eligible renewable energy resource electricity products, or any fraction of the electricity generated, including unbundled renewable energy credits, that do not qualify under the criteria of bucket 1 or bucket 2.”*
- Issue – Is distributed generation in California bucket 3 or bucket 1?

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## CAISO MSC on Dynamic Transfers of Variable Energy Resources

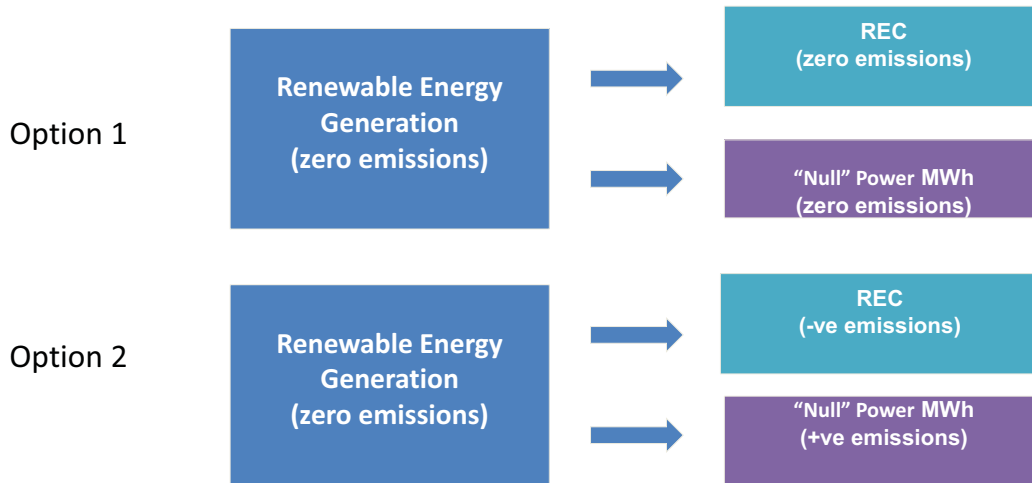
- “There is no obvious reason why California should be better able to manage the uncertainty from all the renewable resources that are stimulated by California’s RPS that will be coming on-line in neighboring control areas. If it is more efficient to manage the intermittency locally, then there is a strong need to develop a set of markets and policies that are consistent enough across control areas that allow that to happen. If this imposes extra costs on neighboring areas, a transparent balancing mechanism can allow for the proper compensation and cost allocation. Then there is no need to expand mechanisms, such as dynamic imports, that perpetuate a fiction about the location of the resources and possibly result in inefficiencies in the provision of balancing services and use of scarce import capacity.”
- “For example SB 722 language (still under development) would specifically allow Dynamic Transfer scheduled resources to qualify as “in-State” resources, regardless of the cost or efficiency benefits that may (or may not) accrue from a Dynamic Transfer schedule for that resource. This could have a perverse effect of giving the procurement of Dynamic Transfer resources by California load serving entities higher priority than imported energy from intermittent sources that is firmed up by balancing resources in the exporting region.”

Source: CAISO MSC, <http://www.caiso.com/27e9/27e9d6297bf0.pdf>

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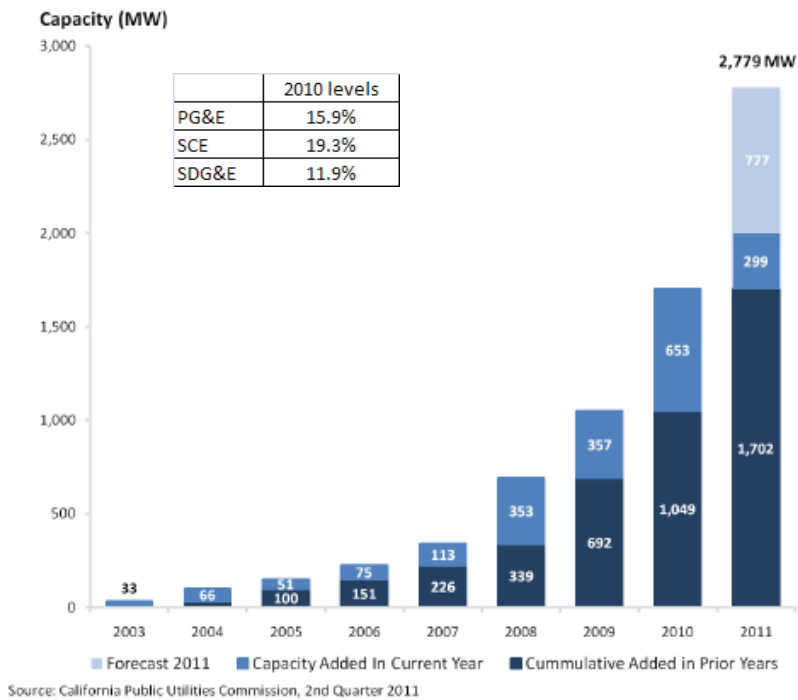
## Treatment of RPS Transactions under AB32

- Are all RPS transactions considered to be zero GHG emissions?
- Two options for GHG emission attributes of RECs and null power



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## RPS Capacity



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## Developments in the Source BA

- Wind integration charges have increased with the growth of variable energy resources
- Several initiatives underway to improve operational flexibility
  - Self-supply of Reserves
  - Third-party supply of Reserves
  - Intra-hour scheduling (can lower the level of reserves required)
  - Dynamic transfers
- Curtailment Protocols for wind exports (BPA DSO 216)
  - Firm-contingent designation - Are wind exports subject to DSO 216 firm or non-firm? How does sink BA interpret the new designation?
  - Is wind variability a contingency that allows dispatch of *contingency reserves*?
  - Are wind exports as firm as exports from conventional resources if they are firmed by different categories of reserves?
- “Environmental redispatch” to address high hydro, high wind conditions

## Developments in the Sink BA

- Assignment of Integration costs
- Dynamic transfers
- Operational requirements for CAISO (Load following, regulation, new products)
- Long term procurement proceeding

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