Briefing on ISO Transmission for a 33% RPS Plan

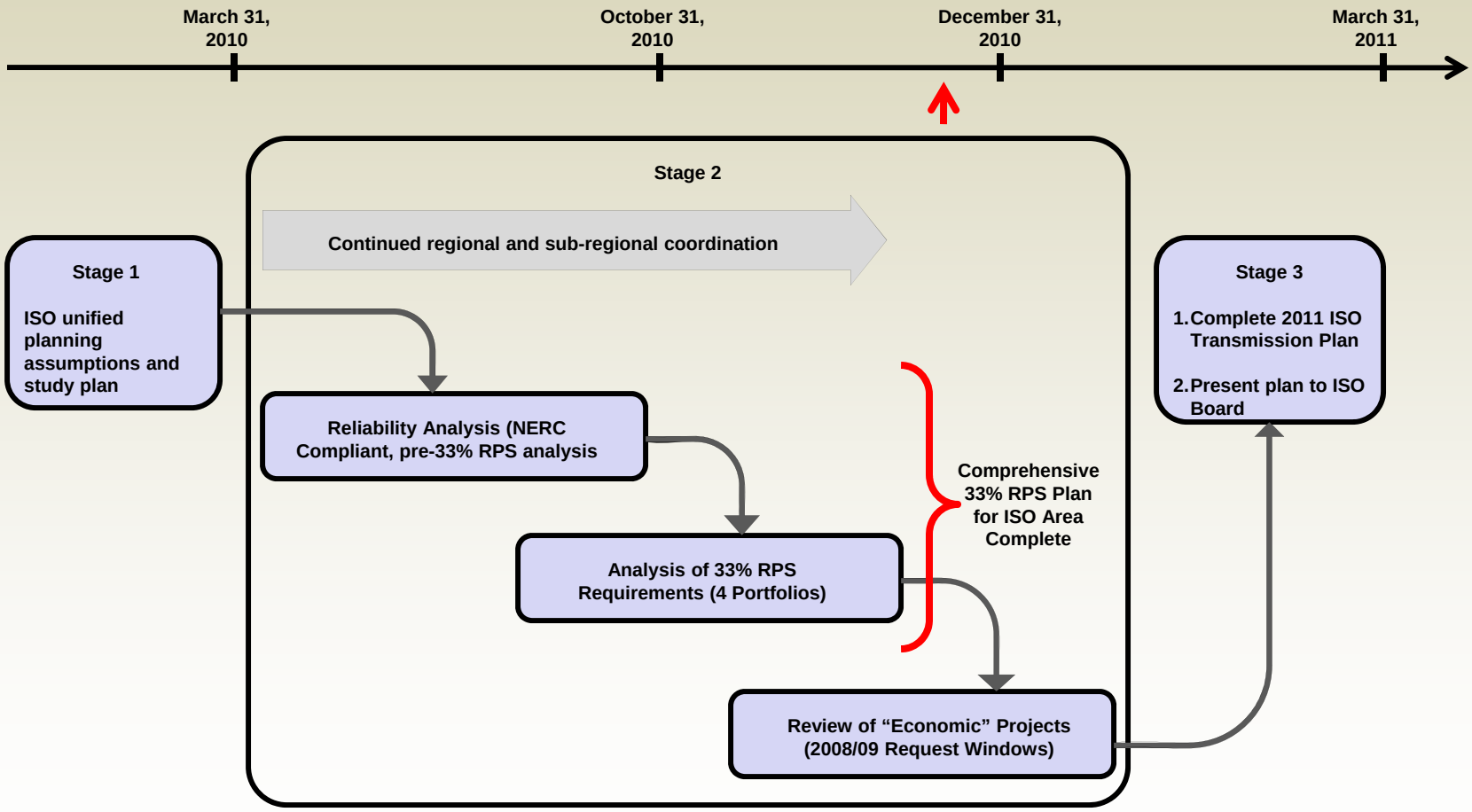
Keith E. Casey
Vice President, Market and Infrastructure Development

Board of Governors Meeting
General Session
December 15-16, 2010

Planning the ISO grid for a 33% RPS

- **Where are we and what is left?**

Development of the ISO 33% RPS Transmission Plan is a major milestone in developing the 2011 ISO Transmission Plan

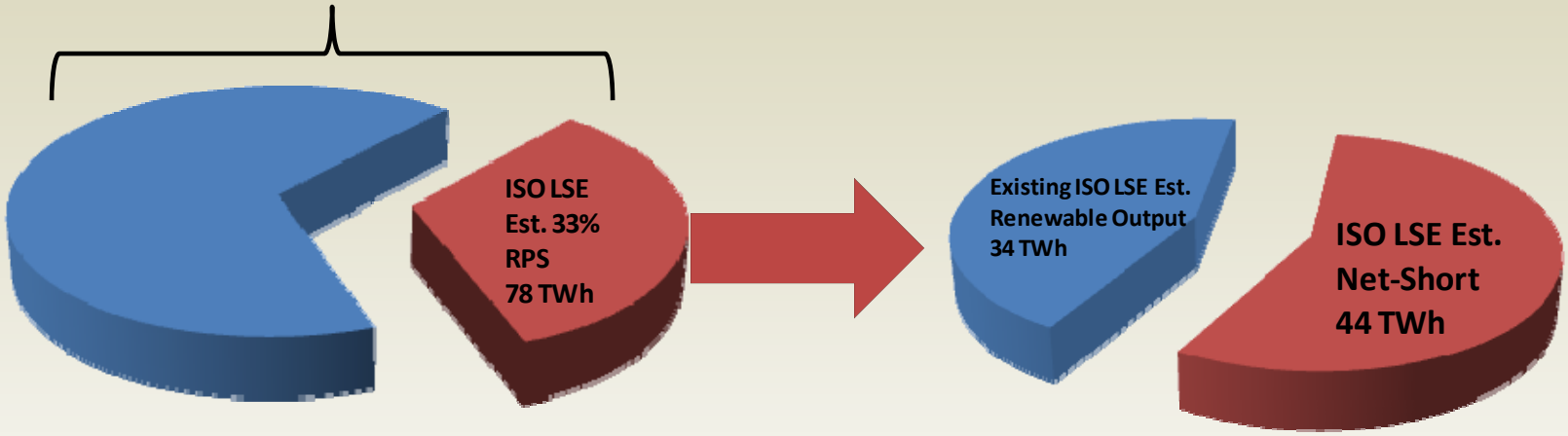


Two basic steps to developing the ISO 33% RPS Transmission Plan

1. Development of 33% RPS resource portfolios:
   - CPUC Long Term Procurement Proceeding
   - Renewable Energy Transmission Initiative (RETI)
   - Regional planning groups
   - ISO generation queue
   - Other stakeholder input
2. Assessment of the transmission needs to reliably accommodate the renewable resource portfolios
   - Production cost simulations – all hours of 2020
   - Power flow analyses – select hours of 2020

Calculating the “33% RPS Net-Short” for the ISO footprint.

Total ISO LSE Forecasted Retail Sales (2020) = 237 TWh



- Estimated ISO LSE 33% RPS Net-Short = **44 TWh**
- Numbers based on CTPG Phase 2 Study
- Assumes ISO LSE’s Net-Short obligation is proportionate to their share of statewide load (83%) => Statewide Net-Short = 53 TWh

Transmission already approved by the ISO was included in the ISO 33% RPS Transmission Plan.

	Transmission Upgrade	Aproval Status CAISO	Aproval Status CPUC	Renewable Potential MW	Renewable Potential TWh/year
1	Carrizo-Midway	Pending LGIA	Not yet filed	900	2.1
2	Sunrise Powerlink	Approved	Approved	1,700	4.1
3	Eldorado - Ivanpah	LGIA	Decision Pending	1,400	3.6
4	Pisgah-Lugo	LGIA	Not yet filed	1,750	4.1
5	Valley - Colorado River	Approved	Approved*	4,700	8.6
6	West of Devers	LGIA	Not yet filed		
7	Tehachapi	Approved	Approved	4,500	15.2
	Other - CAISO Grid Upgrades	Mixed	Mixed	2,700	7.2
	Other - Outside of CAISO Grid	N/A	N/A	3,300	8.4
	Total				**53.3**

** Petition to modify CPCN pending.*

CAISO Balancing Area Needs for 33% **44**

	Transmission Upgrade	Primary Type of Upgrade	Expected COD
1	Carrizo-Midway	Reconductor 230 kV lines	2012
2	Sunrise Powerlink	New 500 kV & 230 kV lines	2012
3	Eldorado - Ivanpah	Convert 115 kV lines to 220 kV	2013
4	Pisgah-Lugo	Convert 230 kV lines to 500 kV	2017
5	Valley - Colorado River	New 500 kV lines	2013
6	West of Devers	Reconductor 230 kV lines	2017
7	Tehachapi	New 500 kV & 220 kV lines	2015

Some additional moderate transmission upgrades to support grid reliability and generation delivery to load centers will be needed.

California ISO
Your Link to Power

Renewable generation development (commercial interest) is highly aligned with ISO approved transmission.

	Transmission Upgrade	Renewable Region Relying on Upgrade	Renewable Generation Capacity (MW) under Contract* and/or in ISO Interconnection Queue Relying on Upgrade
1	Carrizo-Midway	Carrizo South, Santa Barbara	972
2	Sunrise Powerlink	Imperial North, Imperial South, San Diego South, Arizona	5318
3	Eldorado - Ivanpah	Mountain Pass (west of Eldorado)	1275
4	Pisgah-Lugo	Mountain Pass, Pisgah, NV	6093
5	Valley - Colorado River	Riverside East, Palm Springs, Twentynine Palms Imperial North	6135
6	West of Devers		
7	Tehachapi	Tehachapi, Fairmont	10512

** Includes only contracts counted in CPUC Discounted Core*

Adding to these large projects risks costly over-commitments in light of uncertainties such as:

- Distributed vs. large scale renewable projects
- Environmental concerns
- Technology uncertainty

ISO evaluated the adequacy of approved transmission under four 33% RPS portfolios.

- Base case – hybrid portfolio
  - Out-of-state renewable imports
  - Distributed generation
  - Large-scale in-state renewable resources
- Alternatives to base case include:
  - High out-of-state portfolio
  - High distributed generation portfolio
  - High large-scale in-state renewable portfolio (i.e., Commercial Interest Case)
- For each portfolio a range of operating conditions or "scenarios" were studied.

Sensitivity scenarios examined for each portfolio.

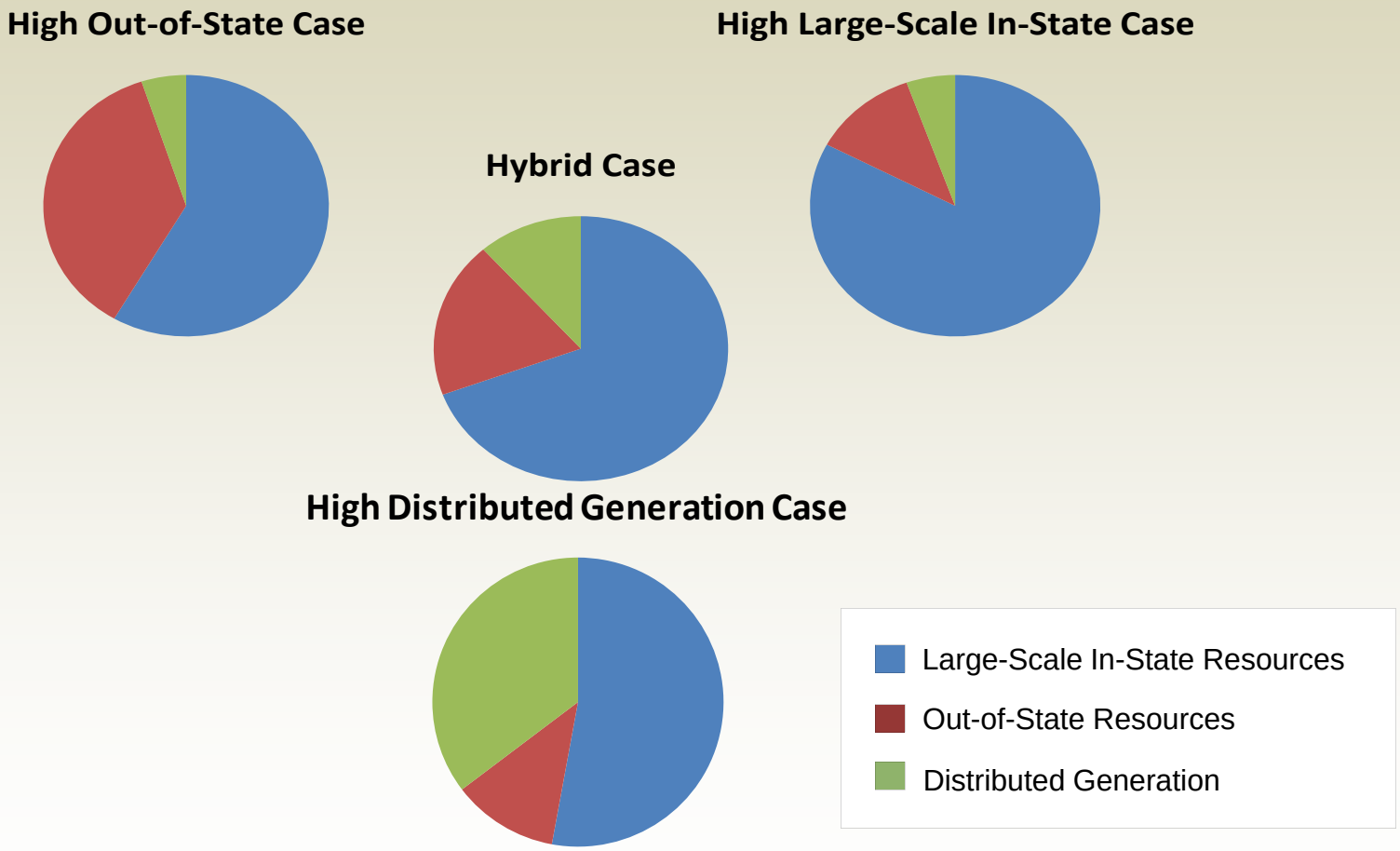
- Each portfolio sets out the type and amount of installed generation.
- Scenarios for each portfolio reflect different system conditions and customer load levels:
  - High load levels versus low load levels
  - Renewable resource output levels
  - Helms pumping capability to integrate renewable energy

Hybrid case: Statewide net-short could be met with less in-state large scale generation and more DG and out-of-state.

Plausible Hybrid Case – Less large scale in-state generation and plausible amounts of additional out-of-state and DG.

Portfolio		Hybrid Case	High Large Scale In-state Resources	High Out-of-State	High Distributed Generation
LGIP Projects	MW	12,909	15,730	10,314	9,282
	GWh	36,599	43,660	30,812	27,909
Out-of-State (OOS)	MW	3,842	2,292	7,458	2,292
	GWh	10,085	6,240	19,281	6,240
Distributed Generation (DG)	MW	2,930	1,303	1,223	9,248
	GWh	6,080	2,864	2,671	18,615
Total	**MW**	**19,680**	**19,325**	**18,995**	**20,822**
	GWh	**52,763**	**52,764**	**52,764**	**52,764**

Hybrid portfolio represents a balanced approach to meeting the 33% RPS.



Transmission approved to date largely supports the study scenarios in meeting the 33% RPS

- Base case (hybrid) & commercial interest case
  - No new major in-state transmission required
  - Some incremental upgrades
- High distributed generation case
  - No new major in-state transmission required given distributed generation modeling assumptions
- High out-of-state case
  - New 500 kV line from Oregon border to central CA
  - Some incremental upgrades

Estimated costs of incremental transmission

	Cost ($M)		
	Base Case (Hybrid)	**Commercial Interest Case**	**High Out-of-State Case**
Substation equipment and reactive support	$340	$290	$255
Line reconductoring	$80	$90	$100
Subtotal	$420	$380	$355
New Transmission Line for high OOS case	*$0*	*$0*	*$1,000*
Total	$420	$380	$1,355

- Transmission upgrades and a new transmission line ($1.2 Billion) were identified for full utilization of Helms pumping during off-peak load conditions which are not included in this table. These upgrades will depend on the need for Helms pumping for renewable energy integration, and are independent of the location of renewable generation.

Conclusions

- ISO supports a west-wide procurement approach to meeting California RPS goals.
- ISO-approved transmission for renewable resources within our footprint is adequate for now.
  - Accommodates a diverse range of resource portfolios (OOS, DG, In-state)
  - Existing inter-state transmission will have capacity made available due to renewable resources displacing energy from traditional resources
  - Approving more now would increase risk of stranded costs
  - As things change, the ISO will reassess
- Justification for additional transmission to support out-of-state procurement (location, type, economics) needs to come from CPUC.
- Focus now should be on
  - Obtaining CPUC approvals for identified transmission
  - Renewable energy procurement (west-wide & in-state)

Next Steps

- January 2011 – Draft report issued
- December – March 2010 – Assessment of Economic Projects submitted in the 2008 & 2009 request window.
- March 2010
  - Complete 2011 Annual Transmission Plan
  - Present to ISO Board