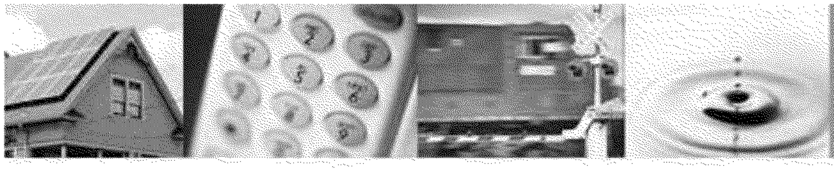
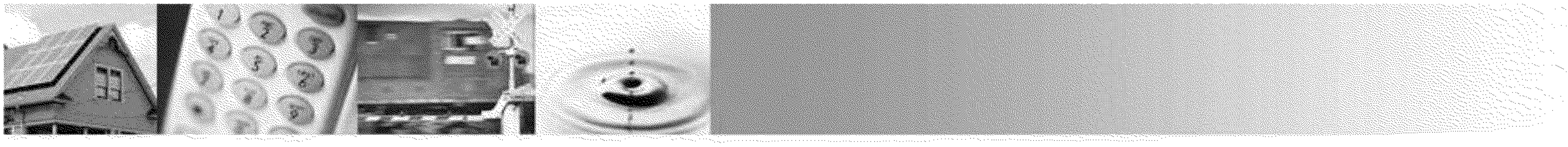


Planning Assumptions, Scenarios, and RPS Portfolios for CPUC 2014 LTPP and CAISO 2014-15 TPP

Neal Reardon, Carlos Velasquez & Patrick Young

Generation & Transmission Planning, Energy Division
California Public Utilities Commission

December 18, 2013



Remote Access

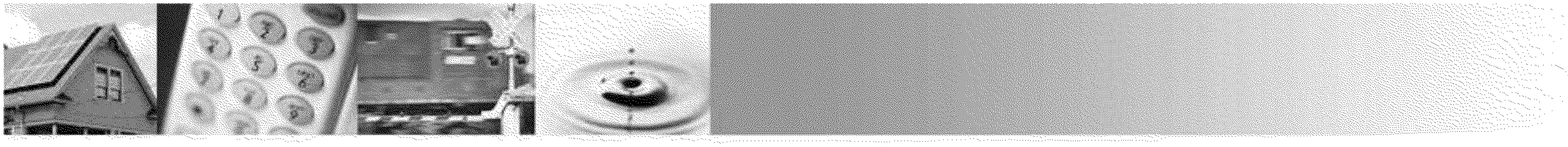
WebEx Information:

Meeting nu Redacted
Meeting pa

R
e
d
a
c
t
e
d

Redacted

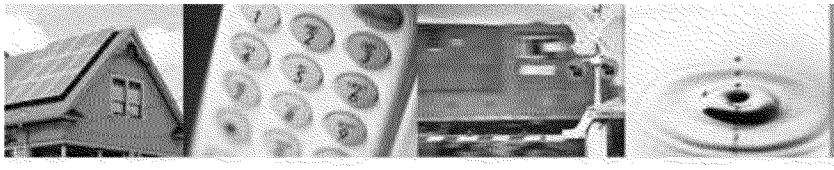
Upon entry to the call, please place yourself on mute, and remain on mute unless you are asking a question



Restrooms & Evacuation Procedure

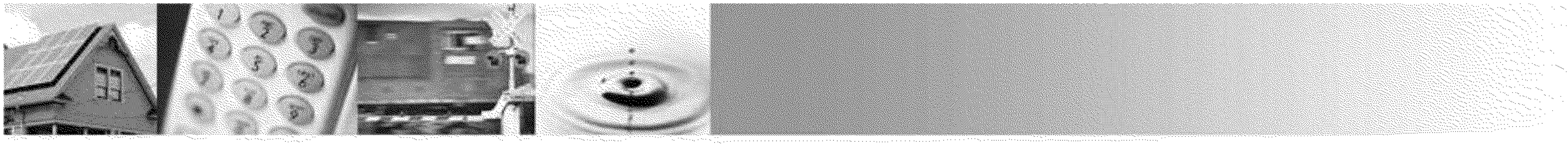
Restrooms are out the Auditorium doors and down the far end of the hallway.

In the event of an emergency evacuation, please cross McAllister Street, and gather in the Opera House courtyard down Van Ness, across from City Hall.



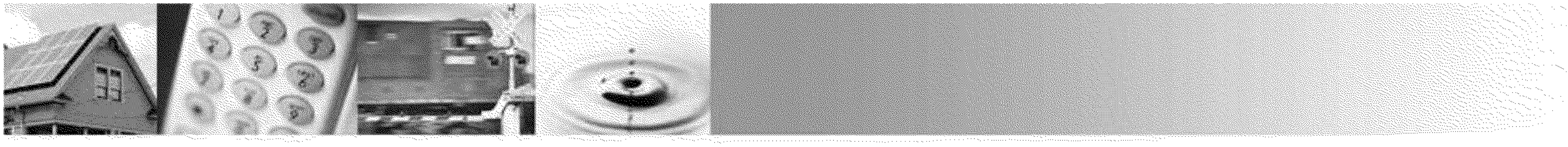
Agenda

Time	Item
10:00 – 10:15	**Introduction, Schedule** Neal Reardon, Senior Analyst, Energy Division
10:15 – 10:30	**Background, Roadmap** Patrick Young, Analyst, Energy Division
10:30 – 11:15	**Discussion of Specific Assumptions** Patrick Young, Analyst, Energy Division
11:15 – 12:00	**Presentation of RPS Calculator** Carlos Velasquez, Senior Analyst, Energy Division
12:00 – 1:00	**Break for Lunch**
1:00 – 3:00	**Presentation of LTPP/TPP Scenarios** Patrick Young, Analyst, Energy Division Jeff Billinton, Manager, Regional Transmission-North, CAISO
3:00 – 3:30	**Final Q&A, Next Steps**



Workshop Purpose

- Familiarize parties with proposed joint Planning Assumptions, Scenarios, and RPS Portfolios to facilitate comments
- These comments will inform common assumptions which the CAISO, CEC, and CPUC are tasked with developing.
  - CAISO will use these assumptions for transmission planning in the TPP
  - CPUC will use these assumptions for generation pla nning in the LTPP



Implementation Schedule

- **12/18** – Workshop on proposed joint Planning Assumptions, Scenarios, and RPS portfolios
- Shortly following the Workshop, the ALJ will issue a Ruling requesting formal comment on Workshop materials with a comment template. Commenters must be a Party to the LTPP proceeding.
- **1/8 – Comments due on ALJ Ruling**
- **1/15** – Reply comments due on ALJ Ruling
- **1/27** – CPUC, CEC, and CAISO complete final review of Planning Assumptions, Scenarios, and RPS portfolios
- **1/31** – expected Assigned Commissioner's Ruling adopting the proposal
- **2/7** – CPUC and CEC jointly submit RPS Portfolios to CAISO

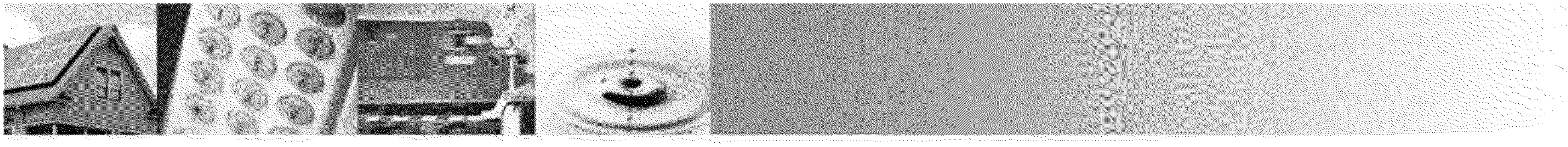
Purpose of Scenarios

- Inform policy-makers by providing information on a range of plausible futures
- Inform the transmission planning process, operating flexibility analyses, and bundled procurement plans
- Limit the range of analysis to conform with resource constraints, while striving for policy objectives

- Reliability studies using the Scenarios should help answer the following questions:
  - What new infrastructure needs to be constructed to ensure adequate reliability?
  - What mix of infrastructure achieves California's policy goals while minimizing cost to customers over the planning horizon?

Planning Scope

- Area: Loads served by, and supply resources interconnected to the CAISO-controlled transmission grid and the associated distribution systems
- Time Period 1 (LTPP and TPP)
  - Year 1 to 10 detailed look (2014-2024)
  - Detailed assumptions to inform potential procurement
- Time Period 2 (LTPP)
  - Year 11 to 20 simplified look (2025-2034)
  - Simplified assumptions to extend understanding of future planning horizon and inform policy discussions



Assumptions Overview

Demand and the Managed Demand Forecast

CEC 2013 IEPR California Energy Demand Forecast

Additional Achievable Energy Efficiency (AA-EE) (formally Incremental Uncommitted EE): from IEPR - 5 possible scenarios

Incremental Small Photovoltaic (PV, behind the meter): based on IEPR case of low load/higher PV penetration

Incremental Combined Heat and Power (CHP, behind the meter): based on CHP potential in ICF study (low and high)

Non-dispatchable Demand Response (impacts are embedded within IEPR forecast)

Energy Storage (Distribution and customer-connected): based on D.13-10-040

Assumptions Overview

Supply

Existing Resources: based on NQC List

Conventional Additions: projects under construction listed in CEC siting cases

Incremental Combined Heat and Power (CHP, exporting): based on CHP potential in ICF study (low and high)

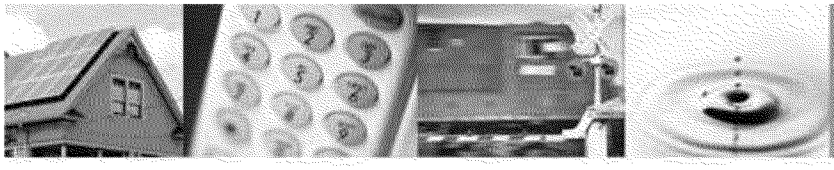
Energy Storage (Transmission-connected): based on D.13-10-040

Dispatchable Demand Response: based on Load Impact Reports

RPS Portfolios: RPS Calculator

Resource Retirements: OTC compliance, announced retirements, facility age

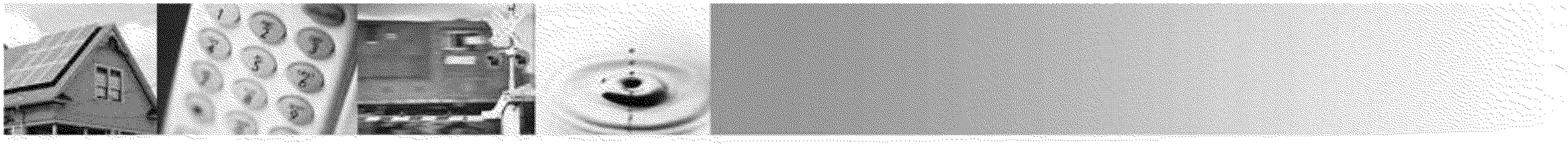
Imports: CAISO available import capability



Assumptions Overview

Planning Assumption	Case	MW in 2024	GWh in 2024
Load	Mid case	54,946	263,751
AA-EE	s2-LowMid	3,063	12,699
AA-EE	s3-MidMid	4,841	20,990
AA-EE	s5-High	8,101	33,947
Incr. small PV installed capacity		649	
Incr. selfgen-CHP installed capacity	Low	960	
Incr. selfgen-CHP installed capacity	High	2,285	
Conventional Additions		624	
RPS Additions NQC	Comm'l Int.	5,495	
Demand Response		2,087	
Incr. supply-CHP installed capacity	Low	164	
Incr. supply-CHP installed capacity	High	1,855	
Energy Storage		700	
Imports		13,396	

2014 LTPP Scenarios (2024, 2034 Target Years)			Demand				Supply	
#	Name	Notes	Load	AA-EE	PV	CHP	RPS Portfolio	Other Difference
1	Trajectory scenario	Proposed base assumptions for TPP and LTPP studies. The TPP may make adjustments for weather and location uncertainty as indicated below.	Mid(1in2)	TBD	IEPR	IEPR	33% Comm'l Port	None
a	Base-TPP Local Area Reliability Studies	Local area reliability studies using mid 1-in-10 weather normalized demand forecast. Due to locational uncertainty of AA-EE, DR, and Storage, a more conservative assumption is used.	Mid(1in10)	TBD	IEPR	IEPR	33% Comm'l Port (LCR version)	DR: 1-in10 weather load impacts Storage and DR: adjusted for LCR
b	Base-TPP Bulk System Reliability	For bulk system reliability studies using the mid 1 in 5 weather normalized demand forecast.	Mid(1in5)	TBD	IEPR	IEPR	33% Comm'l Port	None
c	Base-TPP Policy Studies	Policy studies using mid 1-in-5 weather normalized demand forecast. The 33% Comm'l Int and High DG RPS Ports will be assessed. Prod cost sims (zonal) and Power flow studies (busbar level)	Mid(1in5)	TBD	IEPR & IEPR+Low Inc PV	IEPR & IEPR+Low Inc CHP	33% Comm'l Port & 33% High DG	None
d	Base-TPP Economic Studies	Economic studies using mid 1-in-2 weather normalized demand forecast. The 33% Comm'l Int and High DG RPS Ports will be assessed. Prod cost sims (nodal) only.	Mid(1in2)	TBD	IEPR & IEPR+Low Inc PV	IEPR & IEPR+Low Inc CHP	33% Comm'l Port & 33% High DG	None
2	High Load	High econ/demo case for 1-in-2 weather year (higher peak and annual energy). Potential scenario for the LTPP Operational Flexibility Studies.	High(1in2)	TBD	IEPR	IEPR	33% Comm'l Port High Load	None
3	Diablo Canyon Impact	Diablo Canyon retires in 2024/25. Potential scenario for the LTPP Operational Flexibility Studies.	Mid(1in2)	TBD	IEPR	IEPR	33% Comm'l Port	DCPP retires 2024/25
4	High DG	DG may be projects < 20 MW in size but should also exclude projects located outside load pockets (e.g. in middle of desert). Potential scenario forthe LTPP Operational Flexibility Studies.	Mid(1in2)	TBD	IEPR+Low Inc PV	IEPR+Low Inc CHP	33% w DSM + High DG Port	Default
5	40% RPS in 2030	Potential scenario for the LTPP Operational Flexibility Studies.	Mid(1in2)	TBD	IEPR	IEPR	40% 2030 High DG Port	Default
6	Expanded Preferred Resources	Combination of policies to work toward AB 32 2050 GHG goals. Potential scenario for the LTPP Operational Flexibility Studies.	Mid(1in2)	High	IEPR+Low Inc PV	IEPR+High Inc CHP	40% w High DSM + High DG Port	High Inc Supply side CHP



Updates to RPS Calculator

- energy demand forecast
- existing/expected renewable projects
- utility renewable projects
- cost of solar pv
- transmission capacity
- environmental scores

Renewable Net Short Calculation (GWh) By Portfolio

	Values in this chart are in GWh		33% Traject Mid-Mid E 2024	33% Traject Mid-Low E Formula 2024	33% Traject Comm'l High 2024	33% High D + Low DSM 2024	40% High D + High DSM 2030	40% High D + Mid-Mid 2030
1	Statewide Retail Sales - Dec 2013 IEPR						300,516	300,516
2	Non RPS Deliveries (CDWR, WAPA, MWD)						9,272	9,272
3	Retail Sales for RPS	1-2 = 3	291,244		291,244		308,509	291,244
4	Additional Energy Efficiency						26,646	18,355
5	Additional Roof		-		-		-	1,080
6	Additional Combined Heat and Power						-	-
7	Adjusted Statewide Retail Sales for RPS	3-4-5-6 = 7	264,598		272,889		281,863	256,789
8	Total Renewable Energy Needed For RPS	7*33% (or 7*40%) = 8	87,317		90,053		93,015	84,740
9	Total In-State Renewable Generation						42,909	42,909
10	Total Out-of-State Renewable Generation						10,639	10,639
11	Procured DG (not handled in Calculator)						2,204	2,204
12	SB 1122 (250 MW of Bioenergy)						1,753	1,753
13	Total Existing/Expected Renewable Generation for CA RPS	9+10+11+12 = 13	57,504		57,504		57,504	57,504
14	Total Net Short to meet 33% (or 40%) RPS (GWh)	8-13 = 14	29,813		32,549		35,511	27,237
	Annual Growth Rate of Managed Load (2014-2024)							

eneration

Breakout By Technology

Scenario Name	33% Trajectory Mid-Mid EE 2024	33% Trajectory Mid-Low EE 2024	33% Trajectory Comm'l High Load 2024	33% High DG + Low DSM 2024	40% High DG + High DSM 2030	40% High DG + Mid-Mid EE 2030	
32,549 Portfolio Totals (MW)	Portfolio Totals (MW)	35,511	27,237 Portfolio Totals (MW)	Portfolio Totals (	31,798 MW)	Portfolio Totals (MW)	50,388
9,173	9,208		11,732	13,738		14,614	
3,538	4,654		0	55		6,469	
12,712 MW	13,862 MW		11,732 MW	13,793 MW		21,083 MW	
20		23	20		20		23
103		103	103		103		103
493		493	171		171		493
	+497 MW	+519 MW	+171 MW	-261 MW	+429 MW	+432 MW	
Large Scale Solar PV			6,281		7,379		7,887
Small Solar PV	+18 MW	+19 MW	2,066		[illegible]		2,114
Solar Thermal			+49 MW 1,248	+255 MW	0 MW	+15 MW	1,350
Wind			1,323		1,323		1,892
Total			11,534		12,712		13,862
New Transmission Segments	Kramer - 1 Riverside East - 1		Kramer - 1 Riverside East - 1	Kramer - 1		Krame	

* MW change due to lower LCOE for solar pv

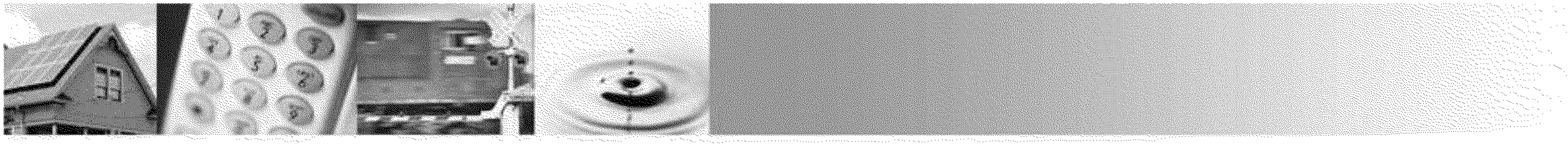
Breakout By CREZ

Scenario Name	33% Trajectory Mid-Mid EE 2024	33% Trajectory Mid-Low EE 2024	33% Trajectory Comm'l High Load 2024	33% High DG + Low DSM 2024	40% High DG + High DSM 2030	40% High DG + Mid-Mid EE 2030
Net Short (GWh)	29,813	32,549	35,511	27,237	31,798	50,388
	Portfolio Totals (MW)	Portfolio Totals (MW)	Portfolio Totals (MW)	Portfolio Totals (MW)	Portfolio Totals (MW)	Portfolio Totals (MW)
Discounted Core	9,103	9,173	9,208	11,732	13,738	14,614
Generic	2,430	3,538	4,654	0	55	6,469
Total	11,534	12,712	13,862	11,732	13,793	21,083
CREZ	MW	MW	MW	MW	MW	MW
Alberta	300	300	300	300	300	300
Arizona	400	400	400	400	400	400
Baja	100	100	100	100	100	100
Carrizo South	900	900	900	300	629	900
Distributed Solar - PG&E	984	984	984	3,449	3,630	3,630
Distributed Solar - SCE	565	565	565	1,770	2,857	3,105
Distributed Solar - SDGE / *Imperial * (-20)*	143 1,840	143 1,840	143 1,840	157 840	360 840	362 1,840
*Kramer * (-120)*	642	642	642	250	250	642
Mountain Pass	658	658	658	647	658	658
Nevada C	516	516	516	266	516	516
NonCREZ	185	185	191	133	133	457
Riverside East	2,083	3,261	3,800	1,400	1,400	3,800
San Bernardino - Lucerne	87	87	87	42	42	147
San Diego South	-	-	374	-	-	384
Solano	-	-	200	-	-	200
*Tehachapi * (-540)*	1,653	1,653	1,653	1,285	1,285	2,763
*Westlands * (+715)*	475	475	505	389	389	775
*Central Valley North * (-25)*						100
Merced	5	5	5	5	5	5
Total	11,534	12,712	13,862	11,732	13,793	21,083

*MW transmission capacity reduction or addition into the given CREZ (Competitive Renewable Energy Zone) since last LTPP/TPP update

Scenarios

2014 LTPP Scenarios (2024, 2034 Target Years)				Demand				Supply	
#		Name	Notes	Load	AA-EE	PV	CHP	RPS Portfolio	Other Difference
1		Trajectory scenario	Proposed base assumptions for TPP and LTPP studies. The TPP may make adjustments for weather and location uncertainty as indicated below.	Mid(1in2)	TBD	IEPR	IEPR	33% Comm'l Port	None
	a	Base-TPP Local Area Reliability Studies	Local area reliability studies using mid 1-in-10 weather normalized demand forecast. Due to locational uncertainty of AA-EE, DR, and Storage, a more conservative assumption is used.	Mid(1in10)	TBD	IEPR	IEPR	33% Comm'l Port (LCR version)	DR: 1-in10 weather load impacts Storage and DR: adjusted for LCR
	b	Base-TPP Bulk System Reliability	For bulk system reliability studies using the mid 1 in 5 weather normalized demand forecast.	Mid(1in5)	TBD	IEPR	IEPR	33% Comm'l Port	None
	c	Base-TPP Policy Studies	Policy studies using mid 1-in-5 weather normalized demand forecast. The 33% Comm'l Int and High DG RPS Ports will be assessed. Prod cost sims (zonal) and Power flow studies (busbar level)	Mid(1in5)	TBD	IEPR & IEPR+Low Inc PV	IEPR & IEPR+Low Inc CHP	33% Comm'l Port & 33% High DG	None
	d	Base-TPP Economic Studies	Economic studies using mid 1-in-2 weather normalized demand forecast. The 33% Comm'l Int and High DG RPS Ports will be assessed. Prod cost sims (nodal) only.	Mid(1in2)	TBD	IEPR & IEPR+Low Inc PV	IEPR & IEPR+Low Inc CHP	33% Comm'l Port & 33% High DG	None
2		High Load	High econ/demo case for 1-in-2 weather year (higher peak and annual energy). Potential scenario for the LTPP Operational Flexibility Studies.	High(1in2)	TBD	IEPR	IEPR	33% Comm'l Port High Load	None
3		Diablo Canyon Impact	Diablo Canyon retires in 2024/25. Potential scenario for the LTPP Operational Flexibility Studies.	Mid(1in2)	TBD	IEPR	IEPR	33% Comm'l Port	DCPP retires 2024/25
4		High DG	DG may be projects < 20 MW in size but should also exclude projects located outside load pockets (e.g. in middle of desert). Potential scenario forthe LTPP Operational Flexibility Studies.	Mid(1in2)	TBD	IEPR+Low Inc PV	IEPR+Low Inc CHP	33% w DSM + High DG Port	Default
5		40% RPS in 2030	Potential scenario for the LTPP Operational Flexibility Studies.	Mid(1in2)	TBD	IEPR	IEPR	40% 2030 High DG Port	Default
6		Expanded Preferred Resources	Combination of policies to work toward AB 32 2050 GHG goals. Potential scenario for the LTPP Operational Flexibility Studies.	Mid(1in2)	High	IEPR+Low Inc PV	IEPR+High Inc CHP	40% w High DSM + High DG Port	High Inc Supply side CHP

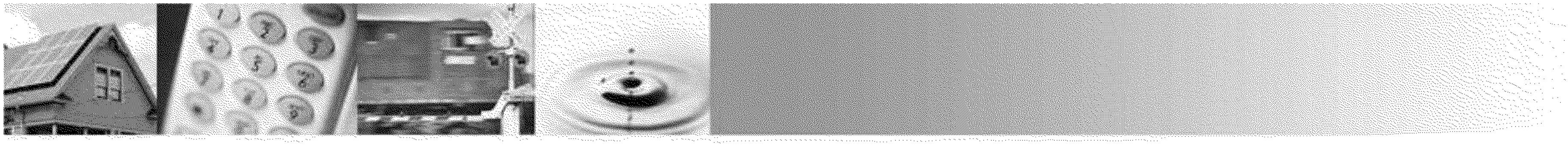


Scenario 1 - Trajectory

- The control scenario, reflects a modestly conservative future with little change from existing procurement policies or business practices
- Key Assumptions:
  - Load case and AA-EE scenario for system and local area planning will be documented in the final IEPR report expected ~Jan. 15th, 2014
  - No change from the forecast of self-generation (small PV & CHP) embedded with the IEPR demand forecast
  - Demand Response impacts as forecasted in Load Impact Reports
  - Limited impact from energy storage defined in the CPUC's Storage Target Decision
  - No net growth in supply-side CHP
  - Commercial Interest RPS Portfolio maintaining 33% RPS in 2024
  - Retirements: OTC Compliance, DCPP online, low hydro/wind/solar, mid other
  - Known conventional additions, CAISO available imports

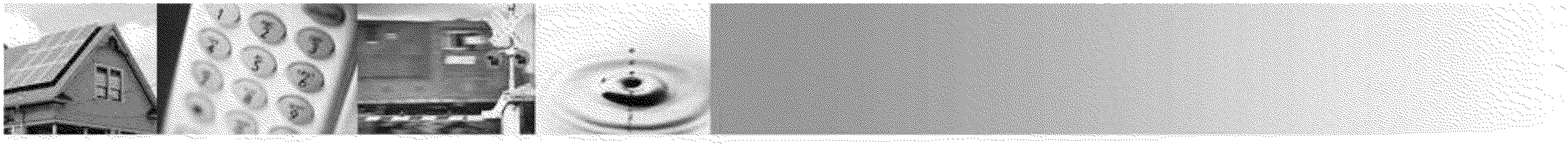
Alignment with CAISO TPP

- Assumptions consistent with Trajectory Scenario, with minor modifications, are to be incorporated into the Draft Unified Planning Assumptions & Study Plan as part of the CAISO 2014-15 Transmission Planning Process (TPP)
  - Stakeholder consultation on Study Plan will be in February 2014
- Areas of study in the TPP
  - TPP Local Area Reliability Studies
  - TPP Bulk System Reliability Studies
  - TPP Policy Studies
  - TPP Economic Studies



Trajectory 1a & 1b – For TPP Local area & bulk reliability studies

- Modify Scenario 1 to address TPP local area (1a) and bulk system reliability (1b)
- Key Assumptions:
  - Increased load to 1-in-10 weather peak (local area) and 1-in-5 weather peak (bulk system)
  - Increased load impacts for DR to 1-in-10 weather peak (local area)
  - More conservative assumptions for AA-EE, DR, and storage due to locational uncertainty (local area)
  - LCR version of Commercial RPS portfolio maintaining 33% in 2024 (local area)



Trajectory 1c – For TPP Policy studies

- Modifies Scenario 1 to integrate the renewable generation of two distinct RPS portfolios: Commercial Interest and High DG
- Produces zonal cost simulations and busbar level power flow studies
- Key Assumptions:
  - Increased load to 1-in-5 weather peak
  - Assessment of 33% RPS in 2024 commercial interest portfol io
    - Includes IEPR forecast for small PV & CHP
  - Assessment of 33% RPS in 2024 high DG portfolio
    - Includes IEPR forecast for small PV & CHP plus additional (incremental) demand side small PV & CHP

Trajectory 1d –
For TPP Economic studies

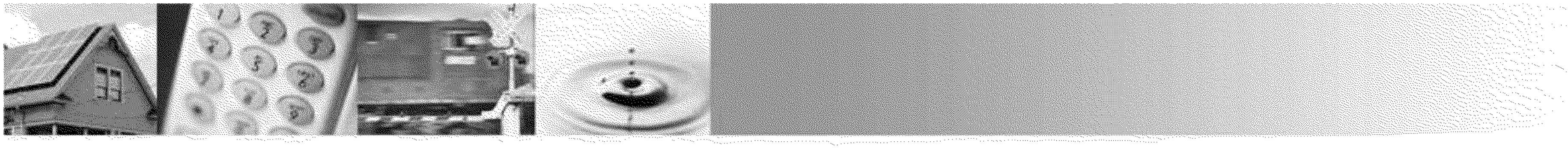
- Modifies Scenario 1 to evaluate economics of potential transmission projects. Assessment to consider two distinct portfolios: Commercial Interest and High DG
- Nodal production cost simulations
- Key Assumptions:
  - Load is 1-in-2 weather peak
  - Assessment of 33% RPS in 2024 commercial interest portfolio
    - Includes IEPR forecast for small PV & CHP
  - Assessment of 33% RPS in 2024 high DG portfolio
    - Includes IEPR forecast for small PV & CHP plus additional (incremental) demand side small PV & CHP

Scenario 2 – High Load

- Increased peak and annual energy demand based on robust economic development
- Potential scenario for LTPP Operational Flexibility Studies
- Key Assumptions:
  - High load case, 1-in-2 weather peak
  - Commercial Interest RPS Portfolio maintaining 33% RPS in 2024, filling renewable net short based on high load

Scenario 3 – Diablo Canyon

- Explores the potential loss of about 2,240 MW of baseload capacity from PG&E's Diablo Canyon Power Plant
- Potential scenario for LTPP Operational Flexibility Studies
- Key Assumptions:
  - Retirements: Diablo Canyon in 2024 (Unit 1) & 2025 (Unit 2)

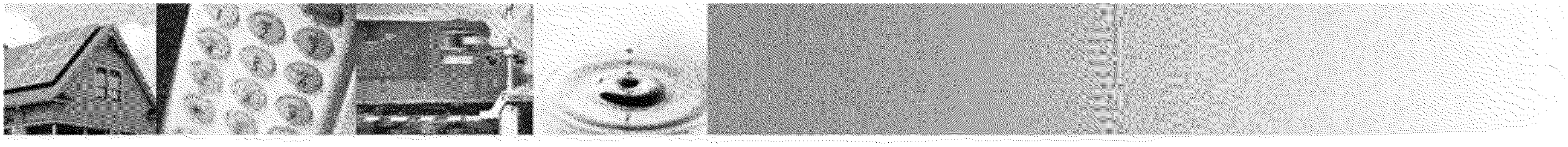


Scenario 4 – High DG

- Explores the implications of promoting high DG via customer programs and RPS procurement
  - DG includes projects < 20 MW in size, and excludes projects outside of load pockets (e.g. in remote areas)
- Potential scenario for LTPP Operational Flexibility Studies
- Key Assumptions:
  - Includes IEPR forecast for small PV & CHP plus additional (incremental) demand side small PV & CHP
  - 33% RPS in 2024 with portfolio with higher contribution from DG, filling renewable net short based on reduced managed load

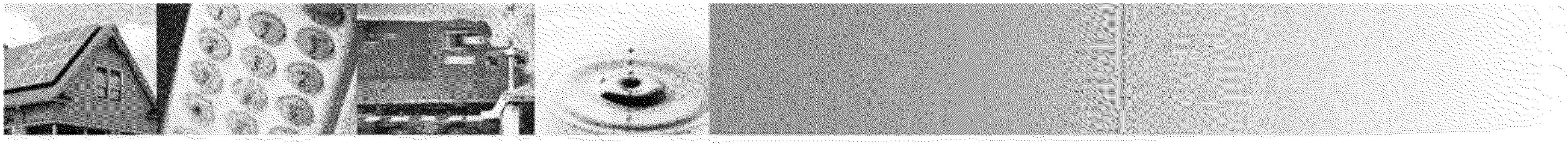
Scenario 5 – 40% RPS in 2030

- Evaluates operational impact of a portfolio for a higher Renewable Portfolio Standard
- Potential scenario for LTPP Operational Flexibility Studies
- Key Assumptions:
  - 40% RPS by 2030 with a portfolio with higher contri bution from DG



Scenario 6 – Expanded Preferred Resources

- Combination of policies to accelerate progress towards AB 32's 2050 GHG goals
- Potential scenario for LTPP Operational Flexibility Studies
- Key Assumptions:
  - AA-EE "High" scenario
  - Includes IEPR forecast for small PV & CHP plus additional (incremental) demand side small PV & CHP (using high CHP forecast)
  - Additional new supply side CHP (high forecast)
  - 40% RPS in 2030 with a portfolio with higher contribution from DG, filling renewable net short based on reduced managed load



Wrap Up / Next Steps

Key dates – recap

- **1/8 – Comments due on ALJ Ruling**
- **1/15** – Reply comments due on ALJ Ruling
- **1/31** – expected Assigned Commissioner's Ruling adopting the proposal
- **2/7** – CPUC and CEC jointly submit RPS Portfolios to CAIS O

Thank you!
For Additional Information:

www.cpuc.ca.gov