



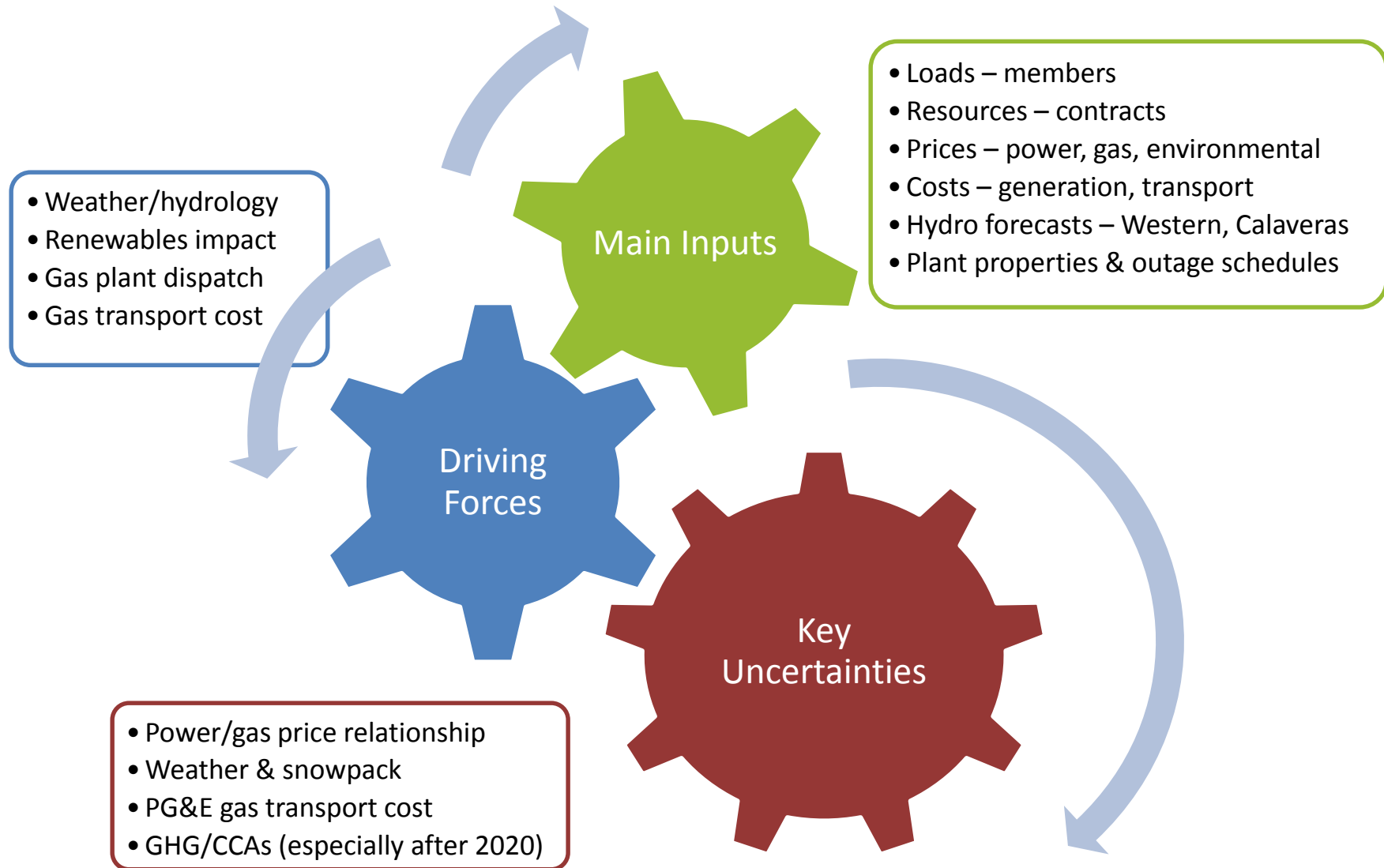
FY 2019 Power Supply Budget: **Assumptions and Preliminary Results**

Facilities Committee

12/6/2017

Jan Bonatto,
Power Market Analyst

FY 2019 Power Supply Budget: Moving Parts



FY 2019 Budget

Summary of Key M40 Input Assumptions

- **System optimization (using PLEXOS energy market simulation/optimization software)**
 - PLEXOS Version = 6.207R08 Model = NCPA **M40-MIP**
 - Optimization Run Date = **2017-11-15** (11 Calendar Years: 1/1/2018 through 12/31/2028)
- **Hourly value of resource energy is maximized/optimized against hourly market prices**
 - If generation exceeds load, then surplus generation is sold into market
 - If load exceeds generation, then generation need is purchased from market
- **Loads**
 - October 2017 **M40** hourly load forecast – Ken Goeke
 - **Key Assumptions:**
 - Average weather conditions (i.e. 1-in-2 probability of monthly heating degree days and cooling degree days)
 - Real GDP growth based on Congressional Budget Office forecast of potential GDP resulting in growth rates of **2.70%**, 2.72%, 2.74%, 2.76% and 2.79 % for 2018 through 2022 respectively. Out years' GDP growth continued at average annual rate of 2.88% through 2027.
 - Pool unemployment based on CA Department of Finance data and UCLA forecast of employment for the state. Resulting unemployment rates for the Pool were **4.66%**, 4.65%, 4.64%, 4.63% and 4.62% for years 2018-2022 respectively. The rate then remains at 4.58% through the remaining forecasted period.
 - Future energy efficiency program savings assumed to be reflected in model's regression coefficients – that is, future energy efficiency programs expected to continue at recent implementation rates.
 - Load forecasts reviewed with individual members.

M40 Input Assumptions: Geothermal and Calaveras Plants

- Geothermal Forecast:**

- Based on April 2017 Steam Field Operations Forecast Report presented **5/23/2017** (includes planned outages)

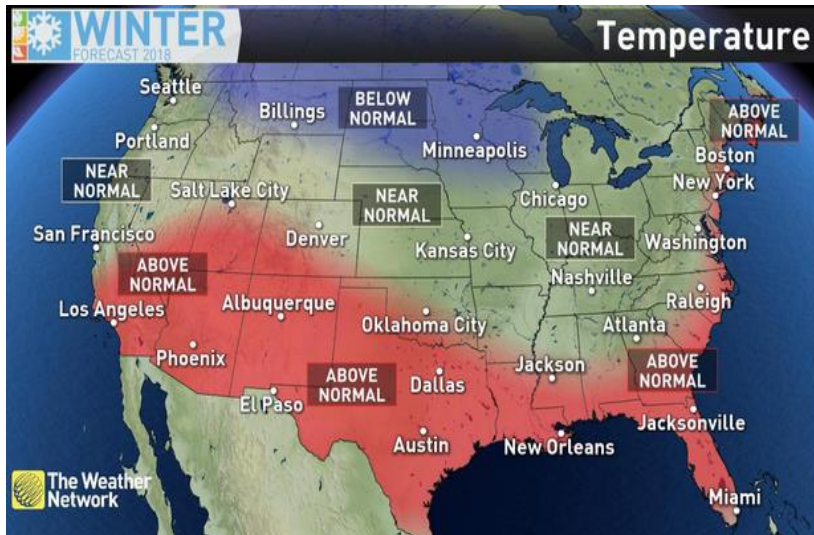
- Calaveras Forecast:**

- Utilizes constraints based on 10/25/2017 updated Calaveras forecast, below (based on current conditions)

		PROJECT TOTAL - AVERAGE HYDROLOGY					Collierville	NSM
		HLH	LLH	HLH	LLH	total	total	total
2018							Nov-2017 AVG/11-1	
	Jan	32.8	1.8	0.7	0.5	35.8	34.57	1.21
	Feb	40.2	0.9	0.6	0.5	42.2	41.08	1.11
FCST	Mar	66.2	0.9	0.8	0.7	68.6	67.10	1.47
	Apr	78.0	1.7	0.7	0.6	81.0	79.69	1.28
	May	76.6	1.6	0.5	0.4	79.2	78.25	0.93
	Jun	42.8	5.0	1.3	1.0	50.2	47.85	2.31
	Jul	29.7	0.9	1.6	1.3	33.6	30.62	2.99
	Aug	25.0	1.8	1.5	1.3	29.6	26.82	2.80
	Sep	20.3	1.1	1.2	1.0	23.6	21.44	2.18
	Oct	22.5	1.8	1.2	1.0	26.4	24.29	2.12
	Nov	18.0	1.5	0.8	0.7	21.0	19.52	1.48
	Dec	24.2	2.1	0.6	0.5	27.4	26.33	1.09
		476.45	21.12	11.53	9.43	518.53	497.56	20.97
2019								
	Jan	32.8	1.8	0.7	0.5	35.77	34.6	1.2
	Feb	40.2	0.9	0.6	0.5	42.17	41.1	1.1
	Mar	66.2	0.9	0.8	0.7	68.55	67.1	1.4
	Apr	78.0	1.7	0.7	0.6	80.94	79.7	1.3
	May	76.6	1.6	0.5	0.4	79.16	78.2	0.9
	Jun	42.8	5.0	1.3	1.0	50.13	47.9	2.3
	Jul	29.7	0.9	1.6	1.3	33.57	30.6	2.9
	Aug	25.0	1.8	1.5	1.2	29.58	26.8	2.8
	Sep	20.3	1.1	1.2	1.0	23.59	21.4	2.2
	Oct	22.5	1.8	1.1	0.9	26.37	24.3	2.1
	Nov	18.0	1.5	0.8	0.7	20.98	19.5	1.5
	Dec	24.2	2.1	0.6	0.5	27.40	26.3	1.1
		476.45	21.12	11.36	9.29	518.21	497.56	20.65

FY 2019

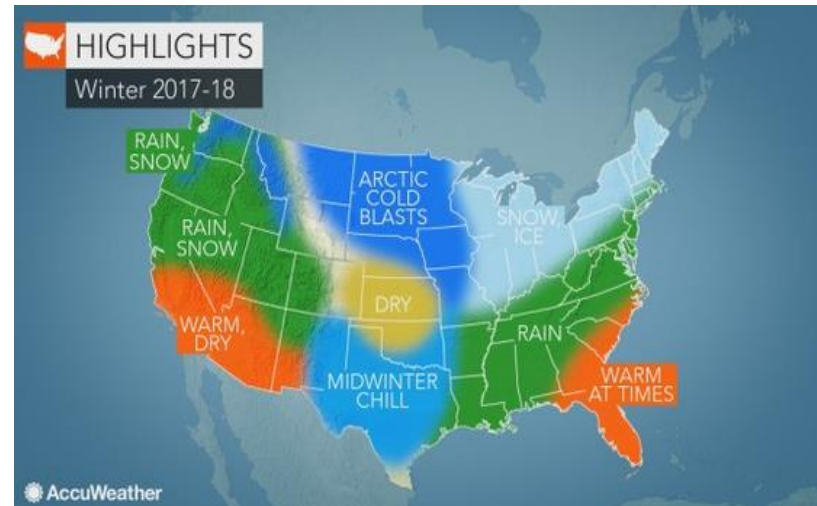
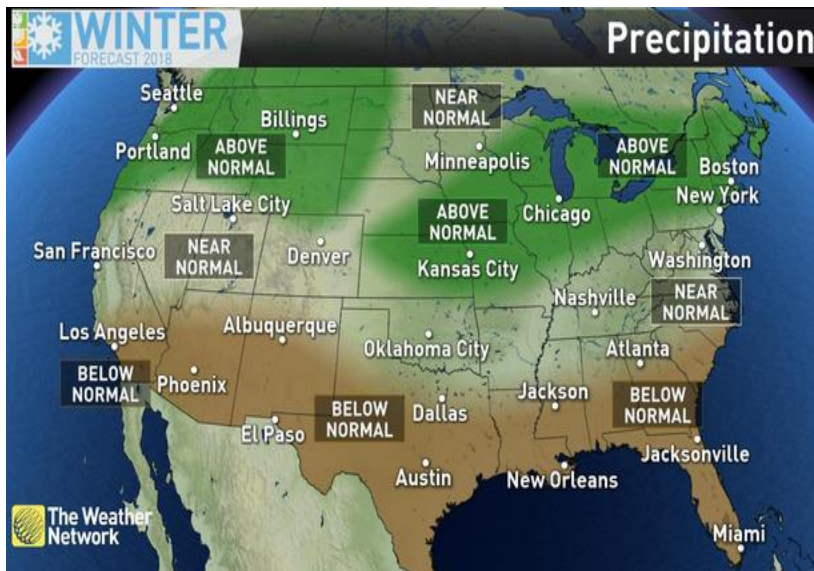
M40 Weather: La Nina shapes the next 3 months



Milder and drier weather is expected to dominate the winter season across this region, in contrast to last year which brought record breaking rain and snow to California.

However, there is still potential for a few periods of stormy weather. An active storm track is expected for northern California that at times could track further to the south.

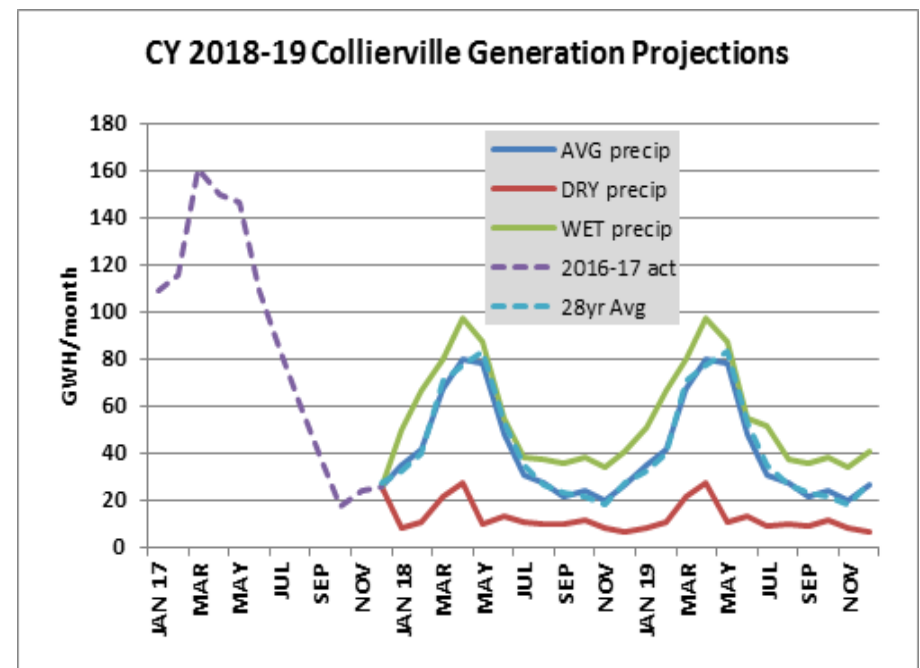
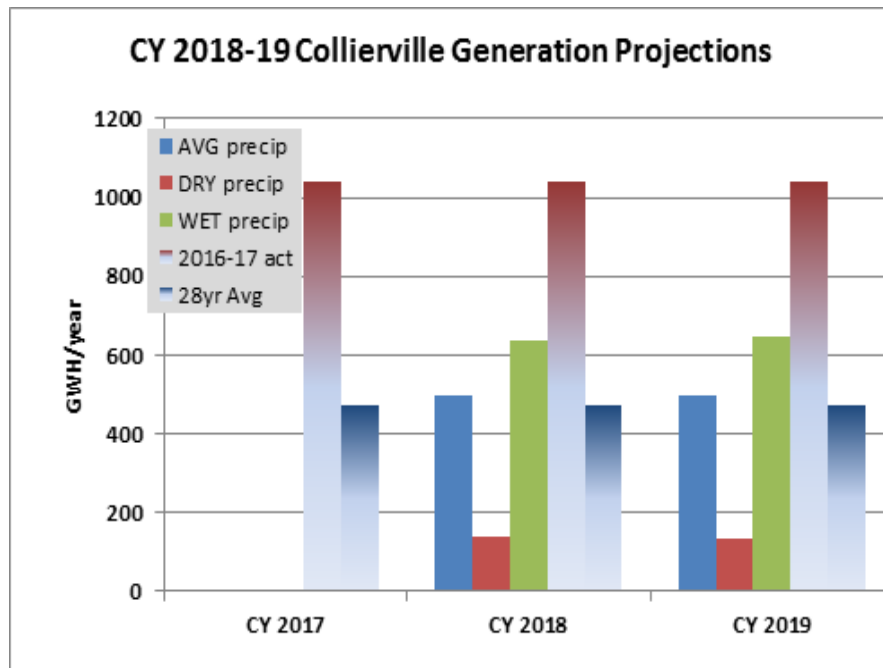
With warmer-than-normal sea surface temperatures across the subtropical Pacific ready to contribute abundant moisture to Pacific systems, the potential is there for a few higher-impact rain and mountain snow events.



M40 Input Assumptions: Calaveras (continued)

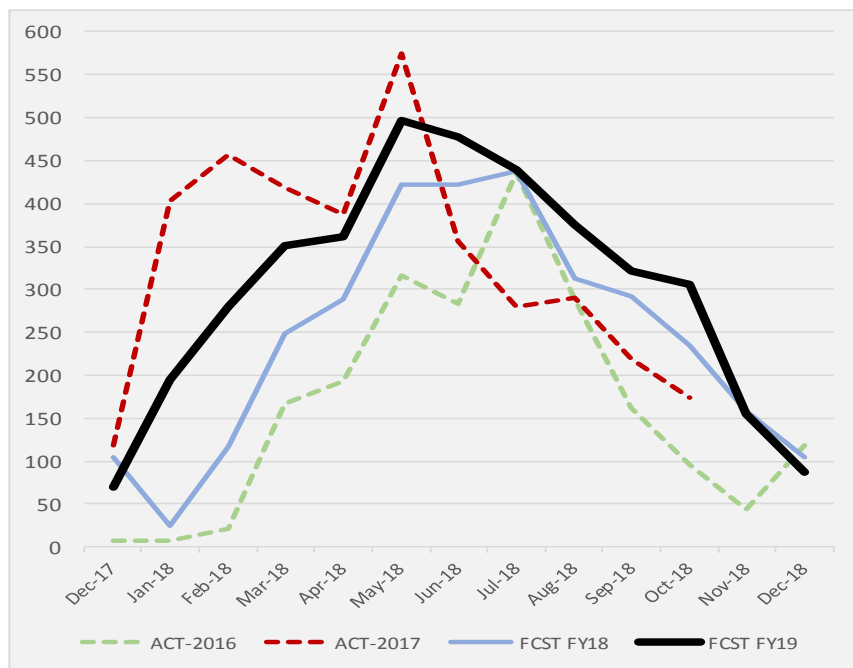
• Calaveras Forecast:

- Utilizes constraints based on 10/25/2017 updated Calaveras FULL-PROJECT AVERAGE HYDROLOGY forecast, based in turn on current conditions.



M40 Input Assumptions: Western Base Resource

- **Western's 36-month forecast** (dated October 2015, prepared by Tom Kabat) is still utilized for outer years – beginning 1/1/2019.
- **Values through October 2018** are taken from most-recent 12-Month Rolling Forecast dated 11/6/2017.
- **The next 12 months** average those values with the 36-month forecast.



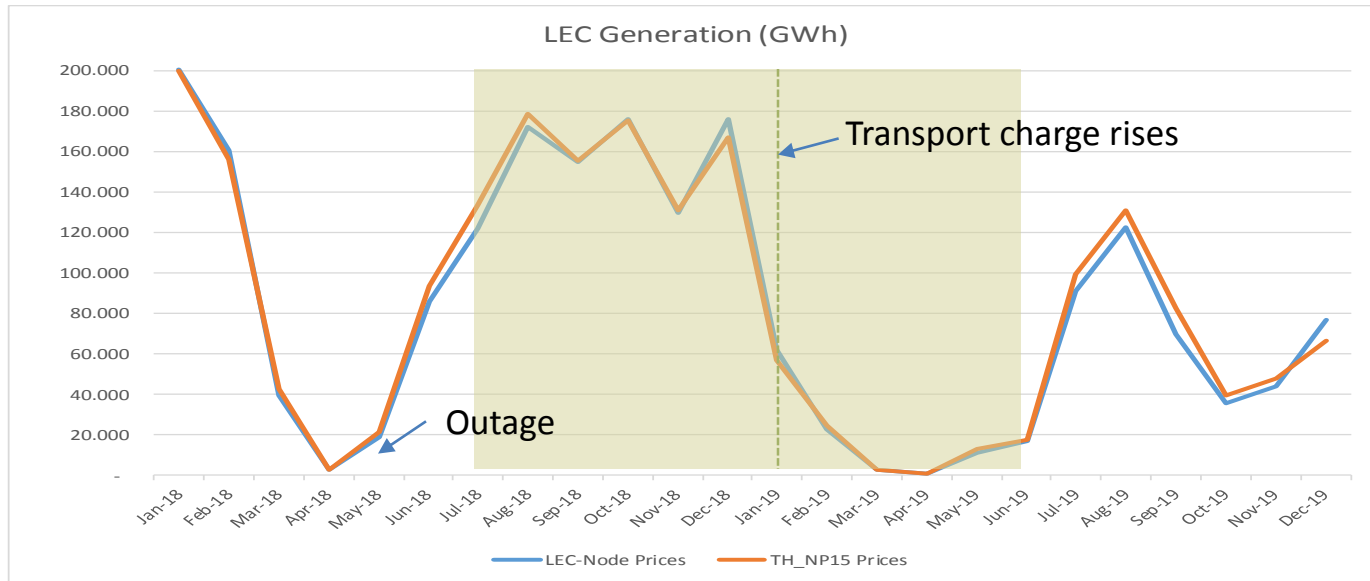
Date	BR (MWh)	HLH	LLH		
Jan-18	193,967	144,661	49,306		
Feb-18	279,968	200,569	79,399	Current Water Year	
Mar-18	350,340	188,798	161,542	Uses Current Western	
Apr-18	361,316	244,503	116,813	Rolling 12-Mo forecast	
May-18	496,134	330,574	165,560		
Jun-18	477,064	321,159	155,905		
Jul-18	439,780	294,697	145,083	FY 2018-19 Budget (Water Year 2)	
Aug-18	375,219	255,374	119,845		
Sep-18	321,849	216,991	104,858		
Oct-18	306,182	217,420	88,762		
Nov-18	153,994	108,920	45,074		Uses Rolling 12-Mo
Dec-18	86,590	60,336	26,254		Then Averages
Jan-19	108,969	81,269	27,700	then bal = 10/2015 36-month fcst values	
Feb-19	198,259	142,033	56,226		
Mar-19	299,712	161,515	138,197		
Apr-19	324,682	219,712	104,970		
May-19	458,989	305,824	153,165		
Jun-19	449,616	302,682	146,935		
Jul-19	438,749	294,006	144,743		
Aug-19	343,671	233,902	109,768	Water Year 3	
Sep-19	307,173	207,096	100,077	Uses Averages	
Oct-19	270,490	192,075	78,415		
Nov-19	158,571	112,157	46,414	then the 10/2015	
Dec-19	104,138	72,564	31,575	36-month forecast	
Jan-20	23,971	17,878	6,094	values	
Feb-20	116,550	83,496	33,054		
Mar-20	249,083	134,231	114,852		
Apr-20	288,047	194,921	93,126		
May-20	421,844	281,075	140,769		
Jun-20	422,169	284,204	137,965		

M40 Input Assumptions (continued)

Market Price Assumptions for Natural Gas and Electric Power

- PLEXOS results for the **gas plants** are price-dependent. FY 2019 prices were prepared in early November 2017 to reflect price levels consistent with the end of the natural gas supply glut (demand increasing more rapidly than production), growth in renewables, and the possibility of another “normal” hydro season.
 - Power prices reflect market price curves from ICE and EOX (and the market heat rates they imply) during early winter. They coordinate ICE/NYMEX natural gas prices for the same dates.
 - Price curves incorporate current analysis of factors including: (**PG&E Citygate gas**) the potential for increasing shale gas production counterbalanced by a rise in (export) demand, costs of regulation, and global economic factors. (**NP15 power**) expecting spot power to reflect rising renewables market penetration and a normal water year.
- After monthly price curves are developed, a SAS model (based on the previous year’s **ISO plant nodal prices**, plus hourly **load** and **Western** delivery patterns and plant **outages** for each individual day) transforms the monthly prices into unique hourly prices for each day of the 11-year PLEXOS optimization run.
- A separate set of prices were developed and utilized again this year for LEC, with the same model (M40) run with each set of hourly prices.

Nodal Prices Affect Generation and Revenue Results

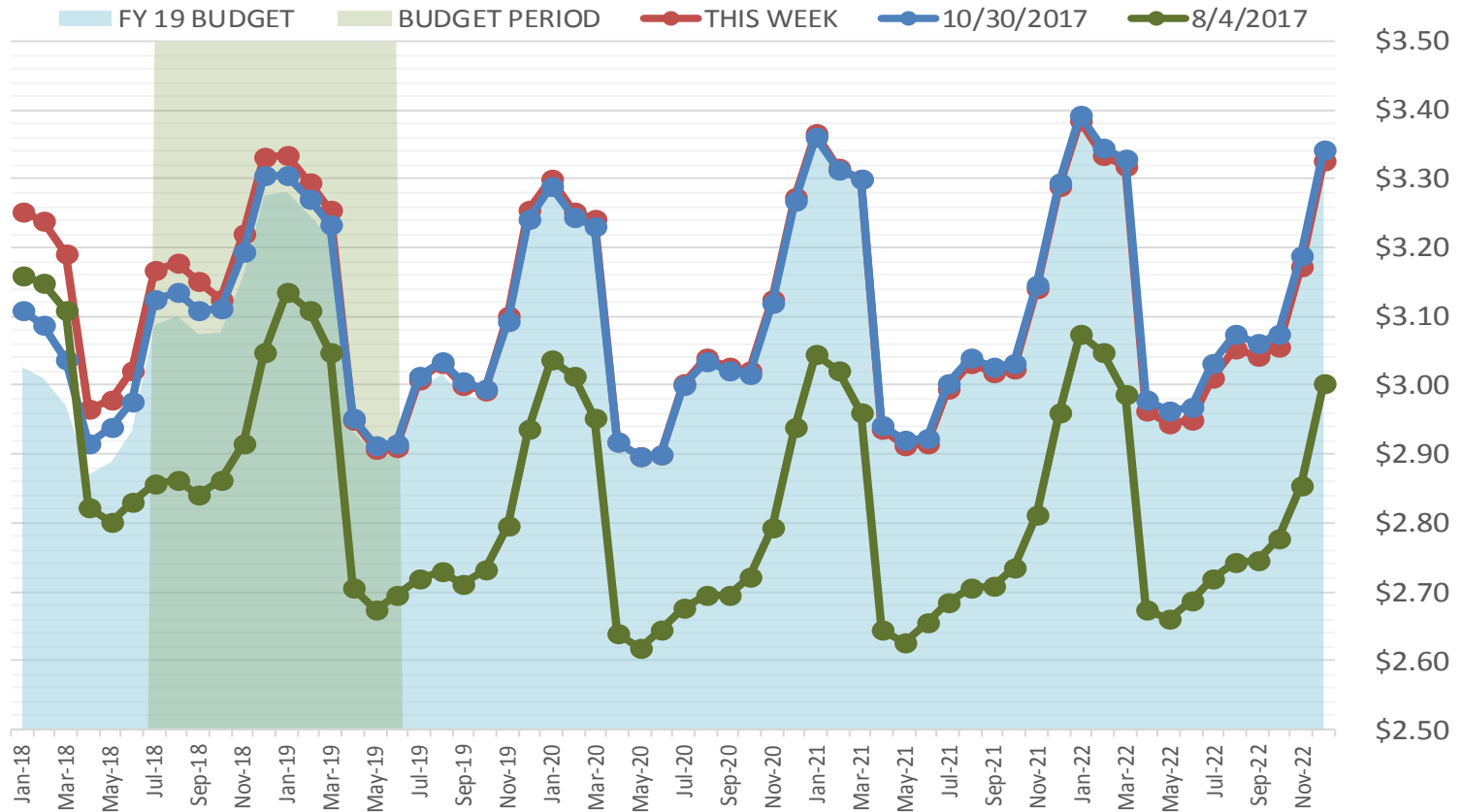


**PLEXOS monthly generation results
(aggregated hourly generation) for CY 2018-19**

Results using TH_NP15 prices to model LEC generation do not always match up with actual generation patterns. PLEXOS optimizes hourly, using hourly price curves based on the previous year's daily patterns. For that reason, we developed a separate hourly forward price forecast again this year for LEC nodal prices and utilized that data for all LEC plant-related budget generation, costs and revenues.

Gas Futures:

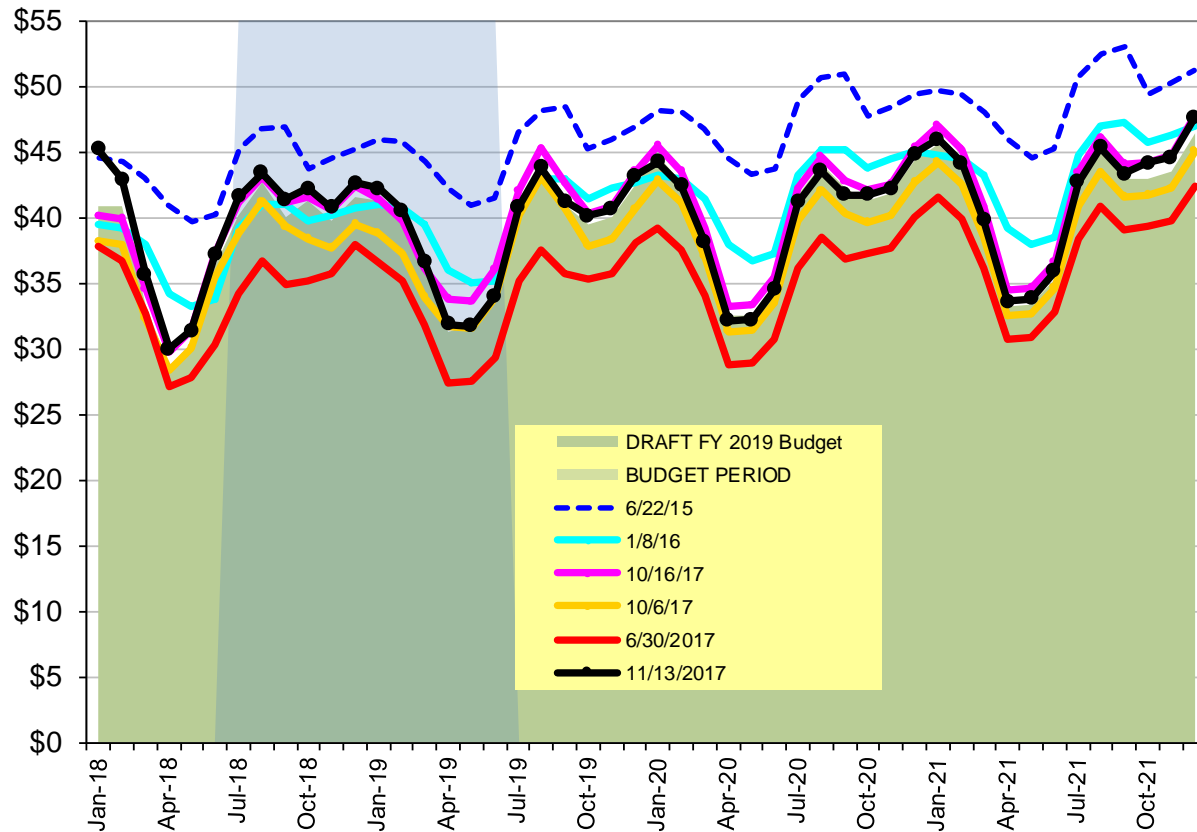
PG&E Citygate Gas - Futures Curve (5 Years)



PG&E Citygate gas (NYMEX futures + Basis) have been elevated this fall (and into winter) due to supply constraints in Southern California. Assuming those issues ease by year-end and that winter follows latest NWS patterns, summer prices should be close to the forecast.

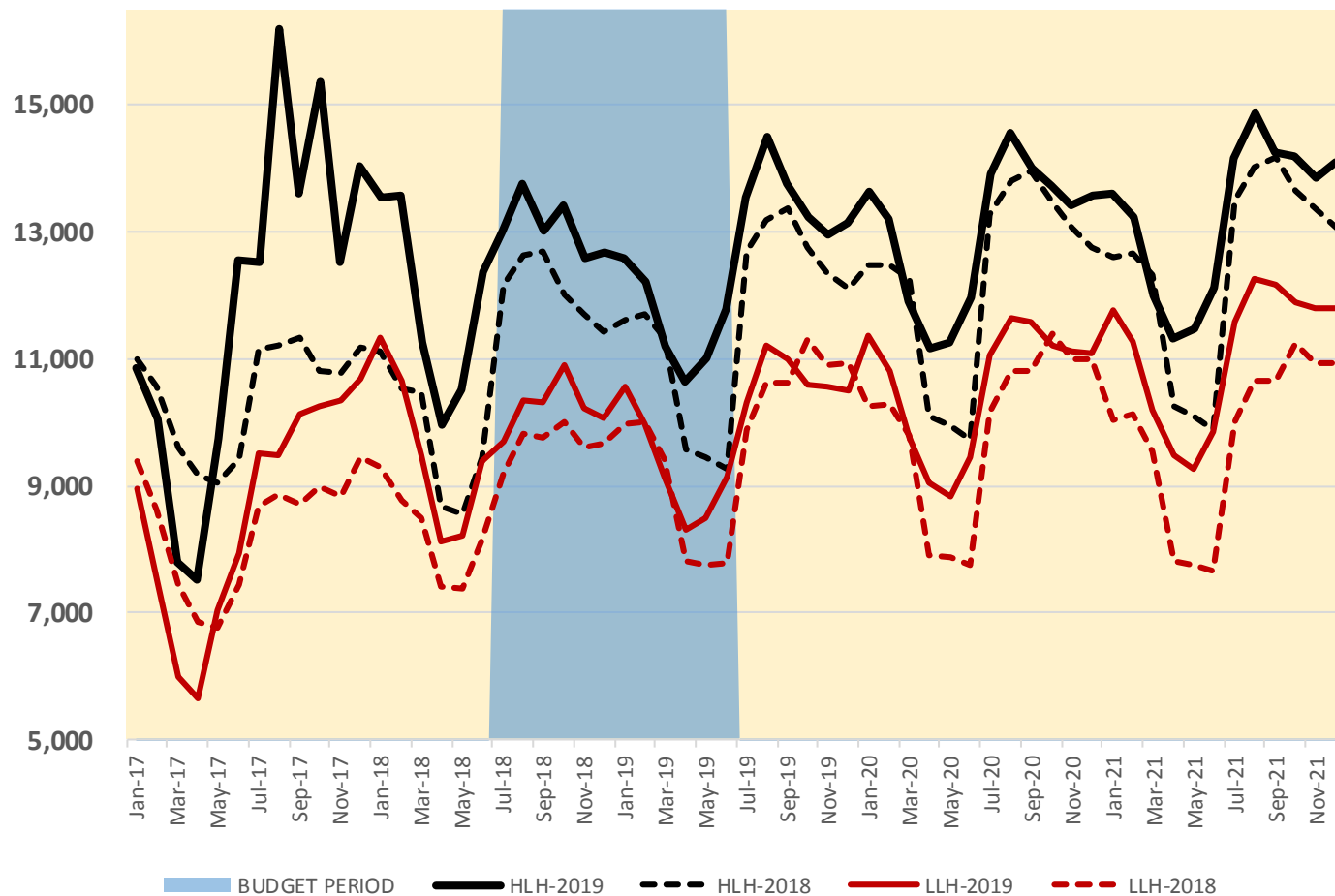
Forward Price Curves – Recent changes / Power

NP15 On-Peak Forward Prices (EOX) – sample dates



Like natural gas prices, forward power prices often rise shortly before winter (or summer) as weather forecasts fluctuate. By the time the budget period – the BLUE SHADED AREA – arrives, price volatility is significantly lower.

Implied Market Heat Rates – Using TH_NP15 prices



Low power prices last spring – and then several summer heat waves – distorted this year’s implied heat rates. Forecasts show the budget period (blue shaded area) with less volatility. For that period, low natural gas prices move on-peak and off-peak heat rates higher than last year’s forecast, potentially resulting in more gas-fired generation.

Average Electric & Natural Gas Market Prices – v2017-11

AVERAGE MONTHLY PRICES - FORWARD NP15 POWER and PG&E NATURAL GAS: FY 2019 BUDGET v2017-11

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		<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>
HLH	2018	\$ 40.94	\$ 40.91	\$ 33.44	\$ 28.59	\$ 30.36	\$ 36.31	\$ 40.19	\$ 42.64	\$ 40.00	\$ 41.29	\$ 39.81	\$ 41.59
	2019	41.31	39.66	35.97	31.22	31.85	34.16	40.60	43.75	41.09	39.44	40.01	42.51
	2020	44.74	42.75	38.38	32.49	32.49	34.59	41.70	44.15	42.23	41.32	41.82	44.36
	2021	45.67	43.80	39.49	33.22	33.38	35.31	42.33	45.04	43.02	42.92	43.50	46.38
	2022	47.63	45.40	40.95	34.66	34.75	36.99	44.11	46.87	44.69	44.69	45.38	48.25
	2023	48.81	46.53	41.98	35.79	35.91	38.22	45.56	48.45	46.24	46.30	46.99	49.89
	2024	50.35	48.00	43.28	36.98	37.11	39.50	47.09	50.07	47.81	47.90	48.58	51.53
	2025	51.77	49.34	44.47	38.07	38.21	40.69	48.54	51.70	49.36	49.48	50.15	53.12
	2026	53.30	50.76	45.66	39.02	39.17	41.77	49.97	53.37	51.06	51.32	51.98	55.01
	2027	55.07	52.39	47.09	40.28	40.35	42.90	51.14	54.43	52.06	52.20	52.86	55.90
LLH	2018	\$ 34.25	\$ 32.04	\$ 28.17	\$ 23.29	\$ 23.68	\$ 27.58	\$ 29.96	\$ 32.06	\$ 31.70	\$ 33.55	\$ 32.26	\$ 33.03
	2019	34.64	32.41	29.39	24.41	24.60	26.50	30.90	33.86	32.81	31.53	32.61	33.98
	2020	37.35	35.02	31.43	26.39	25.54	27.33	33.13	35.29	34.98	33.74	34.61	36.14
	2021	39.47	37.27	33.58	27.79	26.99	28.72	34.66	37.19	36.71	35.95	37.06	38.77
	2022	40.96	38.45	34.62	28.82	27.90	29.95	35.82	38.34	37.92	37.27	38.37	40.08
	2023	41.88	39.32	35.41	29.69	28.77	30.86	36.91	39.55	39.15	38.52	39.64	41.35
	2024	43.38	40.72	36.66	30.80	29.85	32.03	38.31	41.03	40.64	40.02	41.15	42.88
	2025	44.79	42.04	37.82	31.84	30.87	33.14	39.65	42.55	42.14	41.51	42.66	44.39
	2026	46.24	43.37	38.94	32.72	31.72	34.11	40.93	44.04	43.70	43.17	44.33	46.10
	2027	47.77	44.76	40.15	33.78	32.68	35.03	41.89	44.92	44.56	43.91	45.09	46.84
GAS	2018	\$ 3.03	\$ 3.01	\$ 2.97	\$ 2.87	\$ 2.89	\$ 2.93	\$ 3.09	\$ 3.10	\$ 3.07	\$ 3.08	\$ 3.16	\$ 3.28
	2019	3.28	3.25	3.21	2.93	2.90	2.90	3.00	3.02	2.99	2.98	3.09	3.24
	2020	3.28	3.24	3.22	2.91	2.89	2.89	3.00	3.03	3.02	3.01	3.12	3.26
	2021	3.36	3.31	3.29	2.93	2.91	2.91	2.99	3.03	3.02	3.02	3.14	3.29
	2022	3.39	3.34	3.32	2.97	2.95	2.96	3.02	3.06	3.05	3.06	3.18	3.33
	2023	3.44	3.39	3.38	3.04	3.03	3.03	3.10	3.14	3.13	3.15	3.25	3.41
	2024	3.52	3.48	3.47	3.11	3.09	3.12	3.21	3.30	3.30	3.26	3.34	3.51
	2025	3.60	3.56	3.54	3.19	3.16	3.19	3.29	3.38	3.39	3.35	3.42	3.60
	2026	3.68	3.64	3.61	3.25	3.22	3.26	3.36	3.46	3.47	3.45	3.52	3.70
	2027	3.80	3.75	3.72	3.35	3.32	3.34	3.44	3.53	3.54	3.51	3.58	3.76

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M40 Input Assumptions: GHG Allowance Cost Forecast

2018 floor =
\$14.30 ?

<u>FY 2018</u>	<u>CURRENT ICE</u>		<u>Proposed</u>	<u>Units</u>	<u>Date From</u>
13.60	15.47	2017	14.75	\$/mT	1/1/2017
14.50	15.52	2018	15.85	\$/mT	1/1/2018
16.00	16.11	2019	16.25	\$/mT	1/1/2019
17.50	16.65	2020	16.75	\$/mT	1/1/2020
19.00		2021	18.50	\$/mT	1/1/2021
20.50		2022	20.00	\$/mT	1/1/2022
22.00		2023	22.00	\$/mT	1/1/2023
24.00		2024	24.00	\$/mT	1/1/2024
26.00		2025	26.00	\$/mT	1/1/2025
28.00		2026	28.00	\$/mT	1/1/2026
30.00		2027	30.00	\$/mT	1/1/2027
32.50		2028	32.50	\$/mT	1/1/2028

GHG allowance prices jumped substantially after swift passage in July of legislation extending California’s program and again following announcement of 8/15 auction results, as all 2017 allowances sold above the reserve price.

Model **M40** is based on **ICE futures** through calendar **2020**, after which we estimate prices to coordinate with market power and gas prices.

Gas Transport Rate Case Update

- The current PG&E rate case was approved by CPUC in June 2016 and covers rates through 2018.
- As of 8/1/2016 the LT rate for EG customers was raised to **\$1.11** per MMBtu, an unprecedented increase from the prior rate of **\$0.36/MMBtu**.
- On 12/1/2016 the CPUC adopted a decision to allocate a portion of the \$850M penalty related to the San Bruno tragedy back to PG&E gas customers, bringing the rate down to **\$1.04/MMBtu**.
- Effective 9/2017 a negotiated settlement led to a major cost reduction for the LEC plant. The outcome of the settlement will be in effect through 2018 and is reflected in LEC modeling assumptions.
- The next rate case was filed on 11/17/2017 and requests recovery of **\$1.59 billion** in costs related to natural gas transmission for 2019 and a rate base of **\$4.66 billion**, up from 2018's **\$3.71 billion**.

FY 2019 Generation – by resource by month

		<u>Jan-18</u>	<u>Feb-18</u>	<u>Mar-18</u>	<u>Apr-18</u>	<u>May-18</u>	<u>Jun-18</u>	<u>Jul-18</u>	<u>Aug-18</u>	<u>Sep-18</u>	<u>Oct-18</u>	<u>Nov-18</u>	<u>Dec-18</u>	<u>TOTAL</u>
2018	COLVIL_7_PL1X2	34.570	41.080	67.100	77.012	78.250	47.860	30.620	26.820	21.440	24.290	19.520	22.898	491.459
	SPICER_1_UNITS	1.210	1.110	1.470	1.270	0.930	2.310	2.980	2.746	2.180	2.120	1.490	1.090	20.906
	NCPA_7_GP1	38.242	34.474	38.065	33.696	38.018	36.792	37.944	37.870	36.648	37.795	36.504	37.721	443.768
	NCPA_7_GP2	30.281	27.283	27.528	29.160	30.058	29.016	29.909	29.834	28.800	29.686	28.728	29.611	349.894
	LODIEC_2_PL1X2	201.004	160.585	39.621	3.149	18.664	86.222	122.461	172.206	155.200	176.302	130.198	176.585	1,442.197
	STIGCT_2_LODI	0.554	0.340	-	-	0.328	0.699	0.604	1.148	0.549	0.898	0.554	0.554	6.228
	ALMEGT_1_UNIT 1	0.468	0.031	-	-	-	0.655	0.421	0.959	0.491	0.702	-	-	3.728
	ALMEGT_1_UNIT 2	-	-	-	-	-	0.541	0.376	0.870	0.329	0.376	-	-	2.491
	LODI25_2_UNIT 1	-	-	-	-	-	0.571	0.428	0.881	0.333	-	-	-	2.213
		<u>Jan-19</u>	<u>Feb-19</u>	<u>Mar-19</u>	<u>Apr-19</u>	<u>May-19</u>	<u>Jun-19</u>	<u>Jul-19</u>	<u>Aug-19</u>	<u>Sep-19</u>	<u>Oct-19</u>	<u>Nov-19</u>	<u>Dec-19</u>	<u>TOTAL</u>
2019	COLVIL_7_PL1X2	34.570	41.080	62.080	79.543	77.365	45.176	30.620	26.820	21.440	24.290	19.520	26.330	488.833
	SPICER_1_UNITS	1.210	1.110	1.470	1.270	0.930	2.310	2.980	2.746	2.180	2.120	1.469	1.090	20.885
	NCPA_7_GP1	37.646	33.936	-	33.192	37.498	36.216	37.349	37.349	36.072	37.200	36.000	37.126	399.583
	NCPA_7_GP2	29.537	26.611	26.808	28.368	29.314	28.296	29.165	29.090	28.080	28.942	28.008	28.867	341.085
	LODIEC_2_PL1X2	62.303	23.001	2.835	0.755	11.537	17.154	91.427	122.878	69.727	35.554	44.133	77.054	558.358
	STIGCT_2_LODI	0.144	-	-	-	0.328	0.449	0.604	1.348	0.649	0.798	0.369	0.554	5.244
	ALMEGT_1_UNIT 1	0.215	0.211	0.164	-	-	0.398	0.421	0.936	0.445	0.374	-	-	3.163
	ALMEGT_1_UNIT 2	-	-	-	-	-	0.188	0.282	0.870	0.259	0.259	-	-	1.857
	LODI25_2_UNIT 1	-	-	-	-	-	0.190	0.333	0.881	0.357	-	-	-	1.761

- Monthly generation forecast (GWh) by plant for calendar 2018 and 2019.
- Budget period highlighted in orange.
- LODIEC_2_PL1X2 optimized using LEC-node prices; other resources use TH_NP15 prices.

FY 2019 Generation – Contracts by month

	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	TOTAL
Western BR	185.913	157.306	134.734	128.788	65.281	36.749	46.246	84.140	127.162	137.793	194.224	188.666	1,487.003
GRAEAGLE	0.139	0.079	0.052	0.059	0.099	0.112	0.184	0.166	0.238	0.301	0.312	0.263	2.004
GRIDLEY MAIN ONE	0.257	0.249	0.205	0.119	0.071	0.079	0.066	0.080	0.141	0.179	0.259	0.231	1.936
GRIDLY_6_SOLAR	0.571	0.509	0.436	0.332	0.186	0.163	0.129	0.227	0.336	0.465	0.507	0.535	4.395
PALALT_7_COBUG	0.002	0.002	0.002	0.001	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.020
PLMSSR_6_HISIER	4.003	4.098	3.460	3.894	2.159	2.231	3.387	3.071	3.316	3.191	3.305	3.269	39.382
SCL_EXCHANGE	-	-	-	-	-	-	-	-	-	-	-	-	-
UKIAH_7_LAKEMN	0.700	0.530	0.390	0.370	0.330	0.300	0.398	0.500	0.530	0.630	0.700	0.690	6.068
1000000 AL_SVP-Renewables	-	-	-	9.672	9.360	9.672	9.672	8.736	-	-	-	-	47.112
1008746 AL-PA_High Winds	12.081	11.634	9.468	6.699	2.739	3.131	2.985	3.189	6.219	7.911	10.180	10.806	87.043
1011074 AL_Richmond_LFG	0.298	0.298	0.288	0.298	0.288	0.298	0.223	0.202	0.223	0.216	0.223	0.216	3.069
1011826 PA_Shiloh Wind	11.724	10.224	7.926	5.394	2.697	2.610	2.610	2.682	4.270	6.672	8.736	9.723	75.268
1012236 AL-PA_SantaCruz_LFG	1.637	1.637	1.584	1.637	1.584	1.637	1.637	1.478	1.635	1.584	1.637	1.584	19.270
1021782 AL-PA_Oxmtn_LFG	7.901	7.901	7.646	7.901	7.646	7.901	7.901	7.137	7.891	7.646	7.901	7.646	93.021
1021785 AL-PA_KellerCanyon_LFG	2.381	2.381	2.304	2.381	2.304	2.381	2.381	2.150	2.378	2.304	2.381	2.304	28.029
1027008 AL_Butte_LFG	1.414	1.414	1.368	1.414	1.368	1.414	1.414	1.277	1.412	1.368	1.414	1.368	16.642
1027538 PA_JohnsonCyn_LFG	0.969	0.969	0.938	0.969	0.938	0.969	0.969	0.876	0.968	0.938	0.969	0.938	11.413
1027602 PO EBMUD 1MW 7x24 11/12-10/22	0.893	0.893	0.864	0.893	0.864	0.893	0.893	0.806	0.892	0.864	0.893	0.864	10.511
1028687 PA-Elevation Solar 40 MW	12.284	10.941	9.711	7.466	4.187	3.665	2.905	5.134	7.355	10.200	10.801	11.442	96.092
1028688 PA-Blue Sky Ranch Solar 20 MW	6.166	5.495	4.877	3.752	2.104	1.842	1.452	2.567	3.678	5.100	5.401	5.721	48.155
1028689 PA-Crow Creek Solar 20 MW	6.109	5.674	4.651	3.634	2.216	1.840	1.459	2.578	4.366	5.251	5.839	6.105	49.722
1029610 PA_San_Joaquin_LFG	3.026	3.026	2.928	3.026	2.928	3.026	2.733	3.022	2.928	2.928	3.026	2.928	35.623
1030034 PA-Hayworth Solar 25 MW	7.328	6.501	5.774	4.407	2.471	2.163	1.715	3.031	4.385	6.062	6.497	6.839	57.172
1030061 PA-Kettleman Solar 20 MW	6.115	5.891	4.850	3.959	2.431	1.744	1.570	2.651	3.998	5.271	5.559	5.901	49.939
2000257 LD-ASTORA_2_SOLAR1 10 MW	3.204	3.053	2.792	2.348	1.753	1.536	1.686	1.769	2.522	2.758	3.101	3.223	29.745
3000000 Antelope1B Solar 17 MW	-	-	-	-	-	-	-	-	-	-	-	-	-
1030753 NCPA MPP-Shell 5MW HLH CY2018	2.000	2.160	1.920	2.160	2.000	2.000	-	-	-	-	-	-	12.240
1030760 NCPA MPP-Shell 9MW LLH CY2018	3.096	2.808	3.024	2.808	2.880	3.096	-	-	-	-	-	-	17.712
1030947 PO Shell 2MW 7x24 CY2017-18	1.488	1.488	1.440	1.488	1.440	1.488	-	-	-	-	-	-	8.832
1031927 PO Shell 2MW 7x24 CY2018	1.488	1.488	1.440	1.488	1.440	1.488	-	-	-	-	-	-	8.832
2000203 PO EBMUD 1MW 7x24 5/16-10/22	0.893	0.893	0.864	0.893	0.864	0.893	0.893	0.806	0.892	0.864	0.893	0.864	10.511
2000229 PO Shell 1MW 7x24 CY2018	0.744	0.744	0.720	0.744	0.720	0.744	-	-	-	-	-	-	4.416
2000230 PO Shell 2MW 7x24 CY2019	-	-	-	-	-	-	1.488	1.344	1.486	1.440	1.488	1.440	8.686
2000654 PO Shell 2MW 7x24 CY2019	-	-	-	-	-	-	1.488	1.344	1.486	1.440	1.488	1.440	8.686
2000815 PS UAMPS 3MW 7x24 Q1-18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000817 PS NextEra 3MW 7x24 Q4-18	-	-	-	2.232	2.160	2.232	-	-	-	-	-	-	6.624
2000826 NCPA MPP-Shell-LD 20/9MW Dec17-Jan18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000862 NCPA MPP-EDF-LD 4MW HLH Feb18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000864 NCPA MPP-EDF-LD 19MW LLH Jan18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000865 NCPA MPP-EDF-LD 18MW LLH Feb18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000866 NCPA MPP-EDF-LD 18MW LLH Mar18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000954b NCPA MPP-Powerex- 2MW LLH Jan-18	-	-	-	-	-	-	-	-	-	-	-	-	-
2000954c NCPA MPP-Powerex- 1MW LLH Feb-18	-	-	-	-	-	-	-	-	-	-	-	-	-
2001176 NCPA MPP-EDF-LD Aug17-Dec18	3.200	3.456	3.072	0.624	0.640	0.688	-	-	-	-	-	-	11.680
2001180b NCPA MPP-Powerex LLH Jan18	-	-	-	-	-	-	-	-	-	-	-	-	-
2001184a NCPA MPP-Shell LLH Feb18	-	-	-	-	-	-	-	-	-	-	-	-	-
2001184b NCPA MPP-Shell LLH Jan19	-	-	-	-	-	-	1.640	-	-	-	-	-	1.640
2001184c NCPA MPP-Shell LLH Feb-Mar19	-	-	-	-	-	-	-	1.152	1.635	-	-	-	2.787
2001185a NCPA MPP-Shell HLH Jan19	-	-	-	-	-	-	0.832	-	-	-	-	-	0.832
2001185b NCPA MPP-Shell HLH Feb-Mar19	-	-	-	-	-	-	-	0.384	0.416	-	-	-	0.800
2001325 NCPA MPP-EDF-LD LLH Oct17,HLHNov-Mar18	-	-	-	-	-	-	-	-	-	-	-	-	-
3000000 NCPA MPP-LD 7-part purchase 9-1-17	-	-	-	-	-	-	-	-	-	-	-	-	-
BRT1_00001 NCPA BART-Avangrid	26.003	29.402	27.305	29.576	27.642	26.647	-	-	-	-	-	-	166.575
BRT1_00014_7_QFUNTS	2.180	1.949	1.030	0.677	0.493	0.246	0.379	0.235	1.062	1.462	1.339	1.915	12.967

Cost/Revenue Projections – LEC

11/2017

REVENUE (Expected value of Generation - forecasted LEC Node Prices)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2018	\$ 7,834,451	\$ 6,129,510	\$ 1,647,875	\$ 159,562	\$ 920,404	\$ 3,500,701	\$ 5,188,467	\$ 7,062,710	\$ 6,027,689	\$ 6,843,806	\$ 5,023,300	\$ 7,004,041	\$ 57,342,517
2019	2,942,749	1,185,294	151,370	45,811	654,725	956,416	4,136,015	5,587,034	3,197,443	1,762,520	2,090,792	3,632,687	26,342,855
2020	6,597,462	3,016,112	791,936	264,058	326,631	1,007,379	4,945,226	6,388,355	4,249,090	2,732,012	3,533,276	6,073,410	39,924,949
2021	7,702,980	3,667,312	718,317	358,233	626,247	1,011,431	5,161,339	7,617,701	5,788,492	3,724,584	4,848,107	7,879,971	49,104,716
2022	8,187,020	3,992,595	204,215	48,340	687,011	1,062,879	5,968,574	8,030,707	6,907,889	4,636,133	6,140,776	8,500,252	54,366,391
TOTAL (Variable) GENERATION COST (\$)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2018	\$ 6,616,213	\$ 5,303,400	\$ 1,495,791	\$ 144,115	\$ 738,804	\$ 3,043,013	\$ 4,406,212	\$ 5,813,349	\$ 5,206,072	\$ 5,878,276	\$ 4,453,850	\$ 6,150,389	\$ 49,249,484
2019	2,668,789	1,051,661	141,626	38,480	515,999	719,257	3,696,580	4,828,363	2,783,708	1,492,050	1,883,602	3,273,061	23,093,177
2020	5,943,037	2,759,789	695,000	231,612	256,883	765,722	4,390,821	5,572,751	3,704,956	2,405,453	3,237,942	5,511,494	35,475,459
2021	7,012,619	3,379,281	618,309	314,204	485,511	771,063	4,610,644	6,637,928	5,150,727	3,337,764	4,404,481	7,050,994	43,773,527
2022	7,353,256	3,660,226	195,931	39,983	540,535	811,213	5,333,236	6,914,104	6,161,843	4,168,504	5,579,475	7,570,108	48,328,415
NET REVENUE (Value of Generation LESS Total Generation Cost)**													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2018	\$ 1,218,239	\$ 826,111	\$ 152,084	\$ 15,447	\$ 181,600	\$ 457,689	\$ 782,255	\$ 1,249,361	\$ 821,616	\$ 965,530	\$ 569,450	\$ 853,652	\$ 8,093,033
2019	273,959	133,634	9,744	7,331	138,726	237,159	439,435	758,671	413,734	270,469	207,190	359,626	3,249,678
2020	654,426	256,323	96,936	32,446	69,749	241,657	554,405	815,604	544,134	326,560	295,334	561,916	4,449,490
2021	690,361	288,031	100,008	44,029	140,736	240,367	550,695	979,773	637,766	386,819	443,626	828,978	5,331,189
2022	833,764	332,369	8,284	8,358	146,476	251,666	635,338	1,116,604	746,046	467,629	561,300	930,144	6,037,976
** (A/S revenue is added separately, after generation inputs are finalized)													

Total Generation Cost_{PLEXOS} = Fuel Cost + VO&M + Startup Costs + Emissions Cost
 Where Fuel Cost includes gas transport rate

FY 2019 – A/S revenues & costs by month

Lodi Energy Center Ancillary Services Quantities and Amounts											FY 2019	
Year	Month	Spin DA CAP MWh	Spin DA CAP Revenue	RegUp DA CAP MWh	RegUp DA CAP Revenue	RegUp Called MWh	RegUp Called Revenue	RegDn DA CAP MWh	RegDn DA CAP Revenue	RegDn Called MWh	RegDn Called Cost	
2018	7	3,778	\$ 26,514	2,361	\$ 20,019	189	\$ 7,614	40,232	\$ 104,544	7,242	\$ 313,280	
2018	8	3,330	\$ 26,366	1,634	\$ 15,659	131	\$ 5,516	48,316	\$ 124,746	8,697	\$ 380,374	
2018	9	2,794	\$ 18,459	1,460	\$ 11,618	117	\$ 4,575	41,830	\$ 111,120	7,529	\$ 312,312	
2018	10	691	\$ 3,965	23	\$ 137	2	\$ 67	47,658	\$ 127,458	8,578	\$ 350,293	
2018	11	9	\$ 39	0	\$ -	0	\$ -	28,576	\$ 75,236	5,144	\$ 217,179	
2018	12	0	\$ -	0	\$ -	0	\$ -	42,864	\$ 112,738	7,716	\$ 325,274	
2019	1	0	\$ -	0	\$ -	0	\$ -	17,108	\$ 41,769	3,079	\$ 150,980	
2019	2	0	\$ -	0	\$ -	0	\$ -	7,238	\$ 17,296	1,303	\$ 67,756	
2019	3	0	\$ -	0	\$ -	0	\$ -	846	\$ 1,973	152	\$ 8,354	
2019	4	0	\$ -	0	\$ -	0	\$ -	188	\$ 395	34	\$ 2,336	
2019	5	67	\$ 903	0	\$ -	0	\$ -	3,666	\$ 8,356	660	\$ 38,240	
2019	6	326	\$ 4,955	128	\$ 2,044	10	\$ 529	5,640	\$ 12,926	1,015	\$ 57,682	

Budget Schedule

Next steps:

- Re-run optimization with updated Calaveras and Western forecasts – **if necessary - plus any changes to price curves** - then organize results in Appendix G format (**by 1/16/2018**).
- Allocate generation and variable costs to members, calculating monthly surplus/deficits shortly thereafter.

1/5/2018	Preliminary FY 2019 load-resource balances out to Members
1/12/2018	Final budget input due to Accounting/Finance
1/??/2018	FY 2019 Power Supply Models due to Members (" Load - Resource Balances")

(Most deadlines/checkpoints have been moved forward)

Questions??