

## Hydropower Working Group February 27, 2014

Staff from the Energy Commission, California Public Utilities Commission, Department of Water Resources, State Water Resources Control Board, and the California Independent System Operator are developing tracking dashboards to monitor and assess drought impacts on hydroelectric generation, and by extension, the California electric grid overall. Monthly updates will continue or more frequently as conditions change.

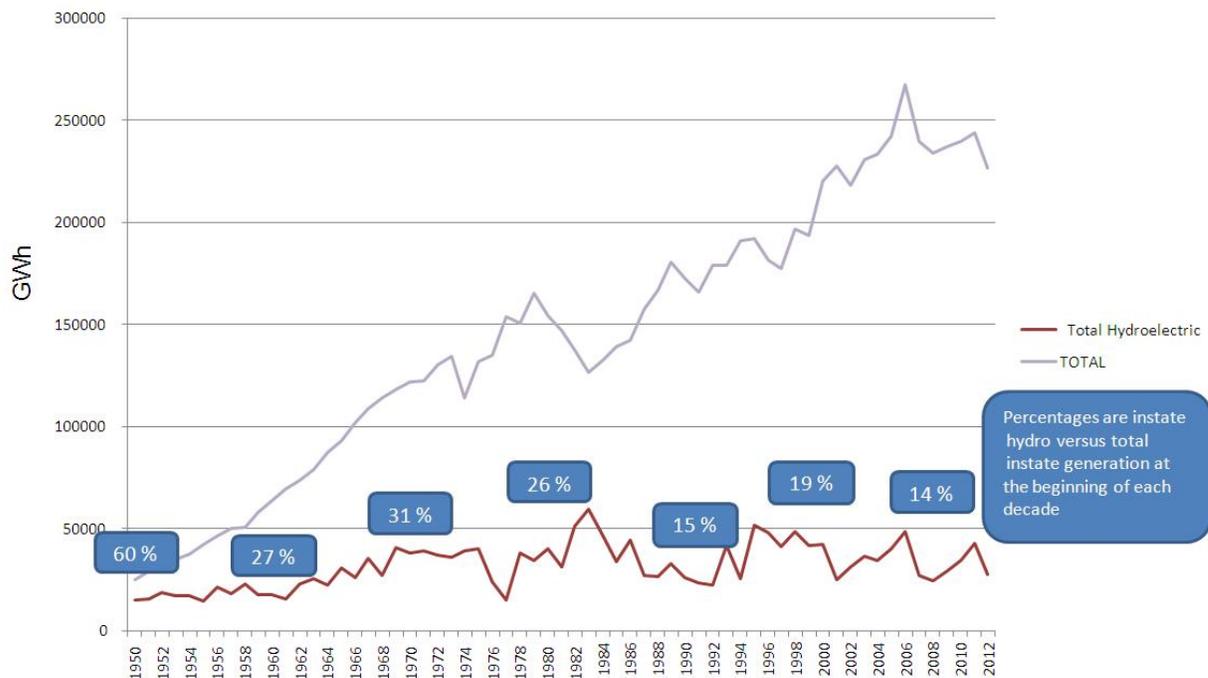
Three graphics illustrating hydropower's changing role in California generation, hydro-related watershed areas, and estimated impacts on utility hydro production follow.

### (1) HYDRO PRODUCTION'S ROLE IN CALIFORNIA GENERATION

- **Hydro production is a declining portion of California's in-state generation mix.**
- **Hydroelectric generation is now about 14% of the state's generation mix on average.**

Hydro production varies considerably from year to year. In 1992, another drought year, hydro power provided 11 percent of the state's total power. By contrast, in 1995, a wetter year, hydro power approached 28 percent.

A six-year drought ended in 1992 and the low hydro production in that year marked the end of an overall 10-year decline in hydroelectric generation. California is currently in a three-year drought period, which is part of a 15-year downward trend in hydro production.



Source: California Energy Commission, 2014

## (2) IMPACTED CALIFORNIA WATERSHED AND SNOWSHED AREAS

- Major concerns center on three snowshed regions: Northern Sierra/Trinity, Central Sierra, and Southern Sierra.
- Four watersheds within these regions have major hydro resources below 75% of recent “dry year” levels in February 2014.

Watersheds most affected by the low precipitation in the current year are listed below, organized into the three snowshed areas. All of these watershed areas contain hydroelectric generation plants, but California draws a significant portion of its hydropower from some watersheds more than others. Only those watersheds with hydroelectric generation facilities that will be individually tracked (largest 10 facilities in each of the snowshed areas) are color coded below.

The Energy Commission is using DWR’s Bulletin 120 February 1, 2014 unimpaired flow (UF) data to create an estimate of potential 2014 hydro generation. The benchmark for comparison is 1992, the most recent significantly dry year. The watersheds with the largest hydro facilities are flagged based on how the February 1 estimate compares to 1992: below 75% of 1992 generation is red, 75% to 99% is yellow, and 100% or above is green.

Watershed and Snowshed Areas - Projected Hydroelectric Generation in 2014 with Comparisons to Average and Dry Years						
Watershed Areas	Snowshed Areas	Average Annual Generation 1982 - 2012 (MWh)	CEC-Est. 2014 Generation using Feb 1 UF (MWh)	CEC-Est. 2014 Gen. as % of Avg Ann.	Dry Year (1992) Generation (MWh)	CEC-Est. 2014 Gen. as % of 1992 Gen
Feather	Northern Sierra / Trinity	6,044,765	1,727,454	29%	2,665,605	65%
Klamath	Northern Sierra / Trinity	351,599	240,277	68%	138,220	174%
Trinity	Northern Sierra / Trinity	1,412,061	721,272	51%	682,086	106%
Upper Sac	Northern Sierra / Trinity	6,905,031	3,406,846	49%	3,648,391	93%
American	Central Sierra	3,570,993	1,058,383	30%	1,514,443	70%
Kern	Central Sierra	489,127	325,167	66%	312,839	104%
Merced	Central Sierra	360,276	134,536	37%	134,300	100%
Mokelumne	Central Sierra	1,127,688	618,536	55%	708,538	87%
San Joaquin	Central Sierra	4,618,571	2,291,375	50%	2,753,051	83%
Stanislaus	Central Sierra	2,015,463	1,160,318	58%	1,014,882	114%
Tuolumne	Central Sierra	2,311,716	1,451,313	63%	1,552,864	93%
Yuba	Central Sierra	2,966,127	1,020,073	34%	1,404,282	73%
Kaweah	Southern Sierra	85,386	59,073	69%	70,883	83%
Kings	Southern Sierra	1,787,354	714,594	40%	975,710	73%
Owens	Southern Sierra	930,441	441,196	47%	588,107	75%
Tule	Southern Sierra	38,503	24,716	64%	22,798	108%
<b>Total</b>		<b>35,015,100</b>	<b>15,395,129</b>	<b>44%</b>	<b>18,186,998</b>	<b>85%</b>

Source: Energy Commission staff and CEC Analysis of Bulletin 120 Data, February 1. Earliest year of CEC annual hydro generation data is 1982.

### (3) ESTIMATED 2014 HYDROELECTRIC GENERATION IMPACTS BY UTILITY

- Utilities draw generation from a mix of watersheds.
- Some utilities rely more on hydroelectric generation than others.
- Costs of replacement power are not yet known.

The utilities shown below draw some portion of their energy from hydroelectric generation. Most have hydro resources spread through more than one watershed or showshed area. This could partially mitigate shortfalls in one watershed area if greater production is realized in another. Again, the 1992 dry year is the benchmark for flagging where the estimated February 1 2014 hydro generation levels are exceptionally low by comparison: below 75% is red, 75% and 99% is yellow, and 100% or above is green.

Utility	Average Annual Generation 1982 - 2012 (MWh)	Hydro Energy As % of Generation Portfolio	Dry Year (1992) Generation (MWh)	1992 Gen. as % of Avg. Ann. Gen.	CEC-Est. 2014 Generation using Feb 1 UF (MWh)	CEC-Est. 2014 Gen. as % of Avg Ann.	CEC-Est. 2014 Gen. as % of 1992 Gen
Pacific Gas & Electric	16,623,053	18%	8,311,320	50%	6,698,400	40%	81%
U.S. Bureau of Reclamation - Central Valley Project	4,809,925	100%	2,399,446	50%	934,638	19%	39%
Southern California Edison	4,376,313	5%	2,654,043	61%	2,250,603	51%	85%
California Department of Water Resources	2,613,220	46%	1,193,536	46%	791,537	30%	66%
Sacramento Municipal Utility District	1,937,538	21%	845,413	44%	603,223	31%	71%
Turlock Irrigation District	1,488,733	18%	1,000,036	67%	26,176	2%	3%
Los Angeles Department of Water & Power	693,179	7%	438,140	63%	328,691	47%	75%
Silicon Valley Power	579,509	27%	289,064	50%	320,899	55%	111%
Northern California Power Agency	536,189	14%	269,800	50%	307,779	57%	114%
City & County of San Francisco, Hetch Hetchy	226,211	98%	151,954	67%	142,017	63%	93%
Modesto Irrigation District	23,862	7%	16,029	67%	14,981	63%	93%
Redding	19,275	30%	9,311	48%	9,846	51%	106%
<b>Total</b>	<b>33,927,007</b>		<b>17,578,092</b>	<b>52%</b>	<b>12,428,789</b>	<b>37%</b>	<b>71%</b>

Source: Energy Commission staff and CEC Analysis of Bulletin 120 Data, February 1.

The effects of the drought and additional power replacement expenditures will not be known immediately. For the major investor-owned utilities (IOUs), power purchase costs and rates are set primarily based on forecasts; thus, the potential rate impacts of low hydro generation will not be passed on this summer. Nonetheless, retail rates for the major IOUs may increase this year due to other factors (for example, already scheduled rate increases).