

Power Generation and Flows

1. Condit Dam has a rated capacity of 14.7 megawatts (MW). How much does it actually produce?

On average, approximately 10 MW, or less than 0.1% of PacifiCorp's power generation capacity, which totals 10,400 MW (per 'Company Facts' at <http://www.pacificorp.com>).

2. Why doesn't the dam produce at rated capacity?

No dams generate at maximum capacity all of the time, due to efficiency curves and flow availability. To produce 14.7 MW constantly, the two horizontal turbines require 1,400 cubic feet per second (cfs) through the generators (WesCorp Study, 2005). This "hydraulic capacity" is usually greater than White Salmon inflow, although during the wet season, the dam diverts its full hydraulic capacity and any additional inflow passes as spill over the dam.

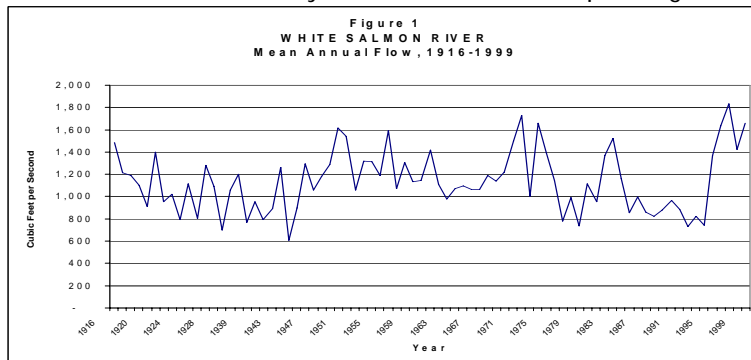
PacifiCorp is currently required to release a minimum of 15 cfs into the Narrows reach below the dam and above the powerhouse, pursuant to its 1993 license. This release is met through dam leakage.

3. What historical data are there for annual power production at Condit Dam?

There is PacifiCorp's generation report for the single year ending 30 Sept 2006, the 2002 CH2M Hill Study's "Current Average Annual Energy" (which used flow volumes from 1916 to 1999) and the 1996 FERC Final Environmental Impact Study (FEIS) "Historical Average Annual Energy" (no indication of years included). The annual totals are, respectively, 86,442 MWh, 79,700 MWh and 77,850 MWh. Divide these sums by 8760 hours/year and you get an average output close to 10 MW: for PacifiCorp 2006 it's 9.9 MW; for the CH2M Hill Study it's 9.1 MW; and for the 1996 FEIS it's 8.8 MW.

4. Why does the mean flow rate vary so much from year to year?

The amount and distribution of rain, snowfall and snowmelt differ from year to year. Figure 1 from the 2002 CH2M Hill Study on Condit Dam shows the year-to-year average annual flow in the White Salmon River between 1916 and 1999. The significant year-to-year variations in the flow directly affect the amount of power generated.



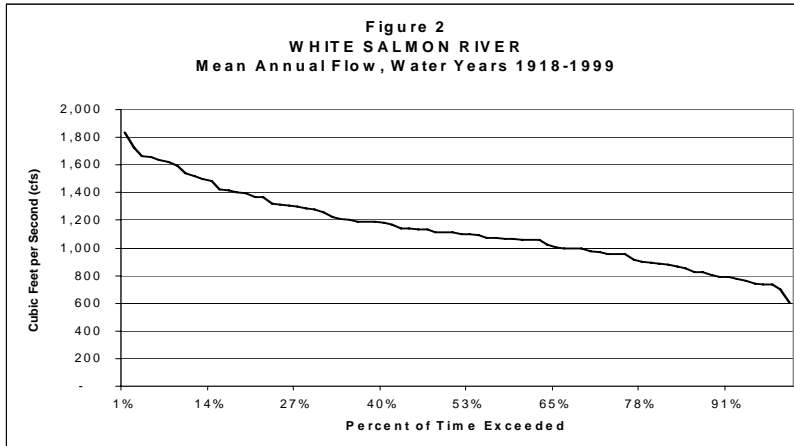
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5. What's the best way to estimate a dam's capacity?

The power industry uses several estimates of generating capacity. Rated capacity (also called peak capacity) is the maximum power that can be produced. Dependable capacity is more meaningful; it is the average annual energy produced by actual average flow rates. Operators balance multiple power sources and must know what a dam can be depended upon to provide at any time. Hence, the power industry uses firm capacity, which is the energy expected at low water (e.g., 800 cfs at Condit).

6. What is a typical annual flow for the White Salmon River?

Figure 2 (also from the 2002 CH2M Hill Study) shows the average annual flow (in cfs) for the White Salmon River for the period 1916 through 1999, arranged from the highest to the lowest. This data shows that about half of the time, the mean annual flow exceeds 1,098 cfs. For the record, when the river runs at 1,100 cfs and 150 cfs is going "over the dam," the 950 cfs passing through the turbines produces 9.98 MW.



7. Why doesn't PacifiCorp store water when the river is high for times when the flows are lower?

The tabulated data on the right (from FERC's 1996 FEIS) show that flows often exceed the turbines' hydraulic capacity. The reservoir has no reserve or "buffering" capacity, so power generation follows the "run-of-the-river." The reservoir contains at least 65% silt, and water for power generation is only collected in the top 12 feet of the reservoir's vertical profile.

Mean, minimum and maximum flows (cfs) for the White Salmon River at Underwood for water years 1982 through 1991.			
Month	Mean	Minimum	Maximum
January	1,154	476	5,460
February	1,553	555	9,300
March	1,571	743	5,000
April	1,507	1,058	3,140
May	1,325	884	1,940
June	1,079	607	2,580
July	757	473	1,310
August	607	405	1,000
September	551	412	900
October	545	400	980
November	768	398	3,020
December	979	475	8,200

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