GARY FISKE AND ASSOCIATES, INC.
Water Resources Planning and Management

Date: April 17, 2015
From: Gary Fiske
To: Water Supply Advisory Committee
Re: Baseline System Reliability with Revised Interim Demand Forecasts

Using the revised high, medium, and low interim demand forecasts that David Mitchell developed based in part on the updated UCSC demand estimates, I analyzed baseline system performance for the 2020 forecast year assuming DFG-5 flows under historic conditions and climate change. This memorandum reports the results.

In order not to overwhelm the committee with too much redundant information, we decided to denominate the peak-season shortage duration curves as percentages rather than volumes. We felt this was more useful since it gives a feel for how much and how often customers would have to cut back. However, we also realize that there will be times when it is important to think about shortages as volumes. The following conversion table is intended to make it easier to move back and forth between the two. For the three alternative interim demand forecasts, the table shows the approximate peak-season volumes that correspond to different shortage percentages.[1]

Committee suggestions on how to better present the results are welcome.

Table 1. Approximate Peak-Season Percentage/Volume Shortage Conversions: 2020 Demands

Peak-Season % Shortage	Peak-Season Volume Shortage (mg)		
	Hi Dem	Mid Dem	Lo Dem
5%	100	100	90
10%	200	190	180
15%	290	290	270
20%	390	380	360
25%	490	480	440
40%	780	760	710
50%	980	950	890
60%	1180	1150	1070

[1] This table would differ slightly with climate change since demands with climate change are slightly higher due to higher temperatures.

2924 NE 43RD AVENUE • PORTLAND, OR 97213
PHONE (503) 577-3003 • FAX (503) 327-8698 • EMAIL gary@fiske-assoc.com

Historic Results

We are still experimenting with different ways to express system reliability that will be most useful for committee members. Figure 1 shows the peak-season shortage duration curves for historic flow conditions. Note that the horizontal axis is expanded (i.e., it only shows the lower range of probabilities) to make the chart easier to read. Tables 2 and 3 summarize the information shown in these curves in two different ways. Table 2 shows the probabilities of exceeding designated shortages in any year. Table 3 shows the probabilities of each shortage event occurring at least once over the next 30 years. Thus, for example, under the high demand forecast, there is a 3% likelihood of a peak-season shortage greater than 25% in any year. Over the next 30 years, there is a 57% likelihood of experiencing at least one year with that size peak-season shortage.

The technical team would be grateful for feedback from the committee on the value of these alternative approaches to presenting information on system reliability.

Figure 1. Peak-Season Shortage Duration Curves: Historic DFG-5 Flows, Forecast Year 2020

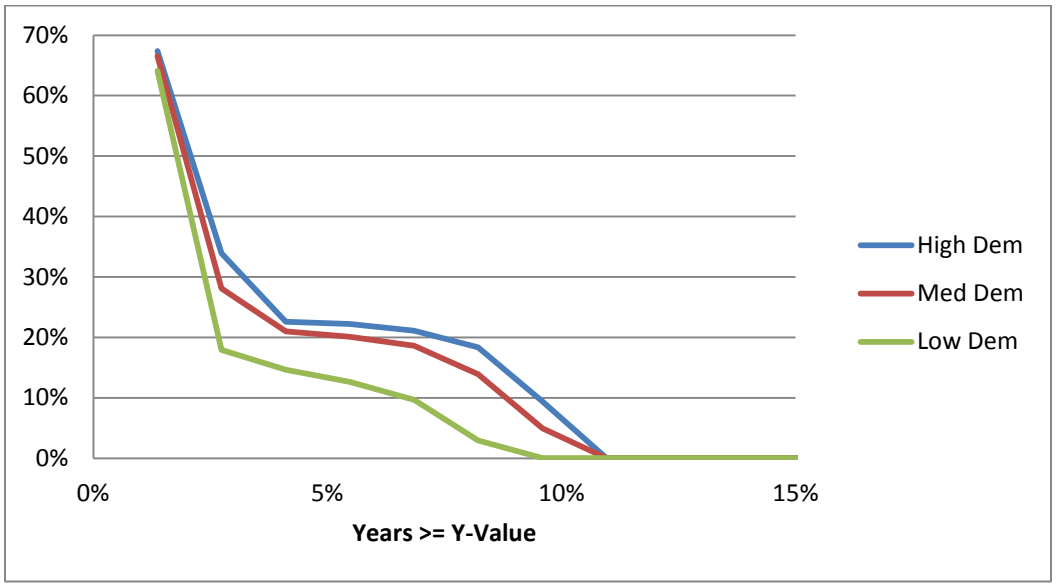

Table 2. Probabilities of Peak-Season Shortage Events in Any Year: Historic DFG-5 Flows

Shortage Event	High Demand	Medium Demand	Low Demand
>50%	1%	1%	1%
>25%	3%	3%	1%
>15%	8%	7%	3%
>5%	10%	8%	7%

Table 3. Probabilities of Occurrence of Peak-Season Shortage Events Over 30-Year Period: Historic DFG-5 Flows

Shortage Event	High Demand	Medium Demand	Low Demand
>50%	34%	34%	34%
>25%	57%	57%	34%
>15%	92%	88%	57%
>5%	95%	92%	88%

Climate Change Results

Following are the analogous results under our climate change scenario.

Figure 2. Peak-Season Shortage Duration Curves: Climate Change DFG-5 Flows, Forecast Year 2020

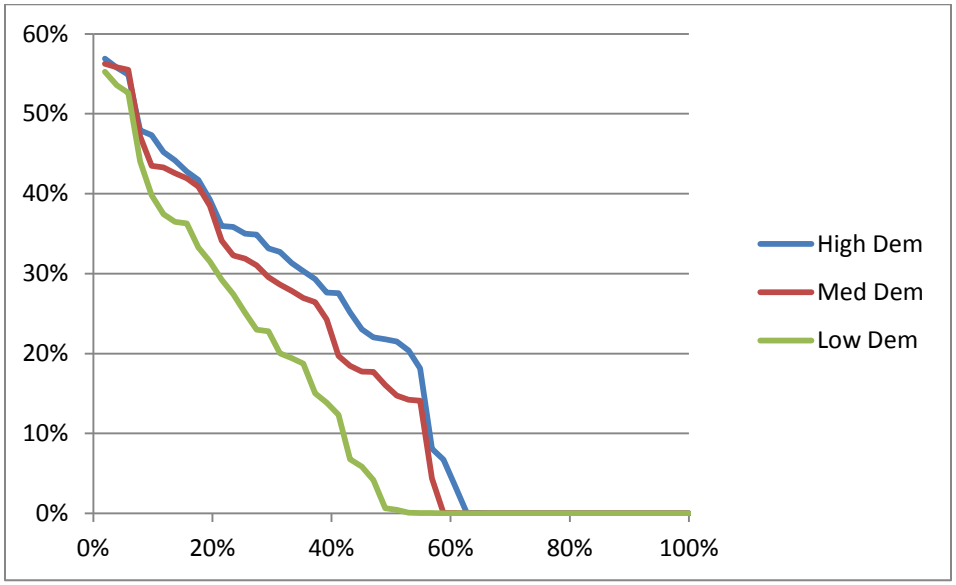

Table 4. Probabilities of Peak-Season Shortage Events in Any Year: Climate Change DFG-5 Flows

Shortage Event	High Demand	Medium Demand	Low Demand
>50%	6%	6%	6%
>25%	43%	37%	25%
>15%	55%	49%	37%
>5%	59%	55%	45%

Table 5. Probabilities of Occurrence of Peak-Season Shortage Events Over 30-Year Period: Climate Change DFG-5 Flows

Shortage Event	High Demand	Medium Demand	Low Demand
>50%	84%	84%	84%
>25%	100%	100%	100%
>15%	100%	100%	100%
>5%	100%	100%	100%

Key Conclusions

- The reliability profiles assuming climate change are considerable worse than under historic flows. For example, with climate change, there is more than an 80% likelihood of experiencing a 50% peak-season shortage over the next 30 years. A 25% shortage sometime over that period is a virtual certainty.

- The reliability profiles for the three alternative demand projections are similar, with the gap between the low and mid-range forecasts larger than the gap between the mid-range and high forecasts. This reflects the relation between the 2020 demands themselves.

- Since the demand forecasts to 2035 are fairly flat, results for a future year other than 2020 would look similar to what is described in this memo.