Thursday, August 31, 2017

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Chairman David Danner
Commissioner Ann Rendahl
Commissioner Jay Balasbas
CEO Kimberly Harrison, PSE

1. Overview
Testimony to deliver before '''PSE Rate Case Olympia Hearing: August 31, 2017''', beginning at 6 p.m., in the commission's hearing room, second floor, Richard Hemstad Building, 1300 S. Evergreen Park Dr. SW, Olympia, Washington

2. Body
It occurred to me as I was preparing for this testimony that the members of this commission are like the Federal Reserve of NW energy. Whether you bring it with you or learn it on the job, members amass a tremendous amount of technical expertise, and with this expertise you have a priveleged perch atop the ebb and flow of electric markets, sales, generation, and consumption for a region that spans multiple states and is home to millions of people. My mission here today is to bring into sharp focus two important numbers from the blizzard of statistics available on this complex and complicated topic.

To prepare for this testimony, my research project was guided by two simple questions:
* How much coal does WA have in its fuel mix?
* What portion of GHG emissions are created from buring coal?

To answer questions I visited the Energy Information Administration, an organ of the Department of Energy.

I went looking for '''net generation:'''

all sources of generation		coal		
116334	gwh	6720	gwh	
3.41E+09	btu/gwh	3.41E+09	btu/gwh	coal percentage of total net generation
396698940000000	btu	22915200000000	btu	
396.69894	tril btu	22.9152	tril btu	5.78%

I looked at '''CO2 emissions:'''

all sources	coal	
73.4	mil metr ton (all source)	
24.2	mil metr ton (electricity generation)	
7.2	mil metric ton (coal)	
29.9%	%age of co2 emissions due to coal (in electric power sector)	

I'm asking PSE and the commission to find a replacement for a minimal 16th of the state's net generation. And if you need motivation for why this should happen, consider that that minimal 16th is responsible for the maximal 3rd of pollutants. I say maximal because not only is it a disproportionately large percentage, these are the dirtiest emissions in the fuel mix by far. (See 3 below)

I want to say one more thing about pollution. The most toxic pollutant does not flow from smokestacks into the jetstream or from discharge pumps into holding ponds. The most toxic pollutant is the lesson children are learning from our inaction. We're not teaching that lesson, but kids never limit their education to topics being taught. They learn the same way scientists learn: from observation. (would be nice to cite a couple high school newspapers).

3. Endnote
Like the Federal Reserve Bank, the commission is tasked with regulating by applying

subtle pressure. Heavy-handed edicts that cause great disruption are avoided. But like The federal reserve in 2008 and 1929, the commission is facing an emergency of historic proportions. The Fed responded to 2008 by taking bold, decisive action. The planet is facing a similar crisis and the commission is faced with a choice: Be like the 2008 Fed, whose bold maneuvers kept the bottom from falling out whilst simultaneously ushering in the longest economic expansion since WWII, OR be like the 1929 Fed which sat on its hands as the Great Depression ravaged the country and brought untold suffering to millions.

4. Notes and References

1. CO2 emissions: https://www.eia.gov/environment/emissions/state/analysis/
2. Net generation
   a. https://www.eia.gov/electricity/annual/html/epa_03_07.html (all)
   b. https://www.eia.gov/electricity/annual/html/epa_03_08.html (coal)
3. You may counter my argument here and say I'm cherry-picking facts the way Climate Change Deniers do. My response is: I am not cherry-picking because I draw no conclusion from these two numbers. Others who have more expertise draw the conclusion that we must act now on climate change, and they draw them scientifically from looking at the entire body of data available to us. No, my intention here is not to cherry-pick: my intention is to highlight that the scale of the problem you are asked to address is quite small. And that problem is unusually virulent.

Regards,

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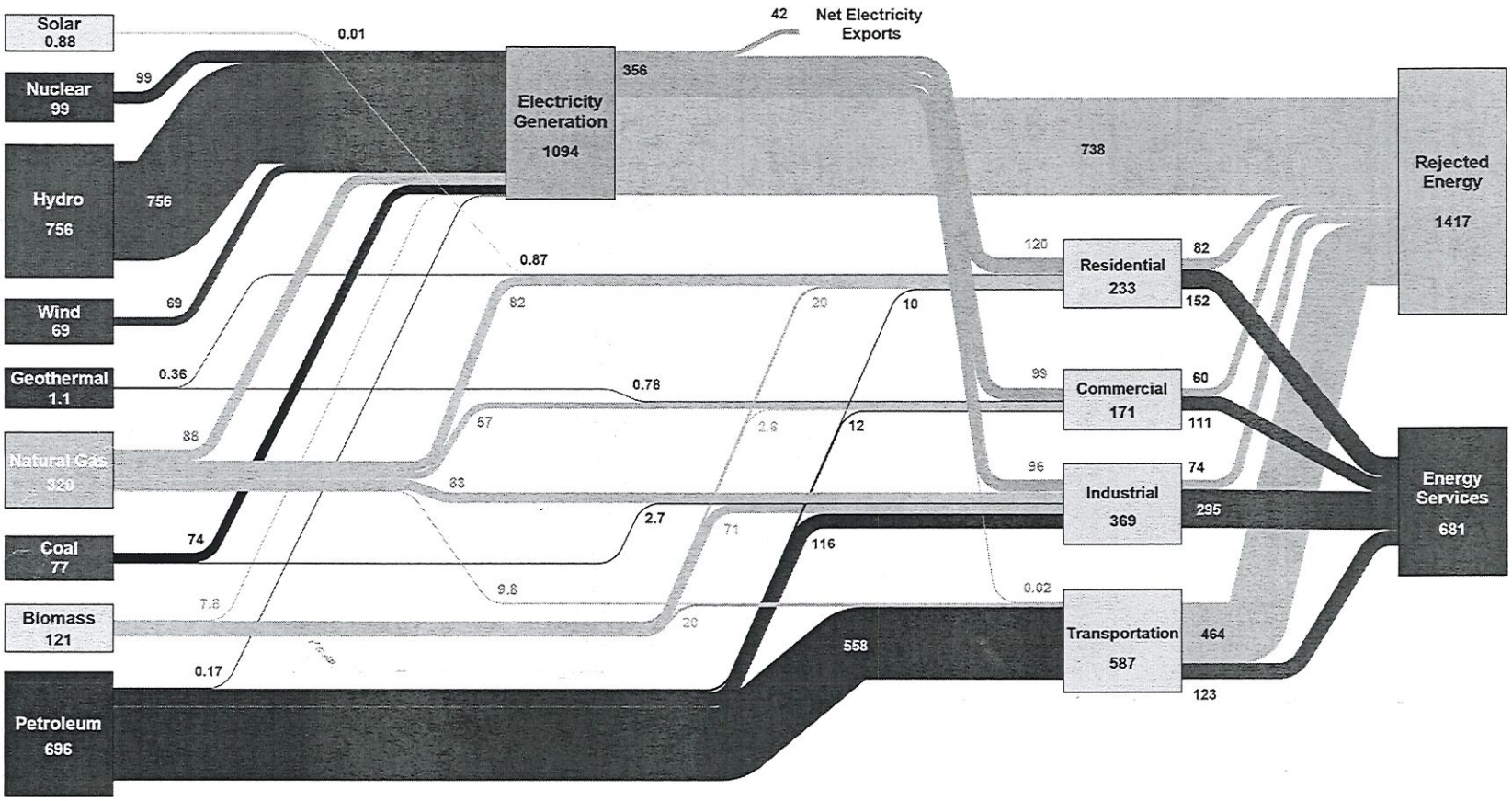
Washington Energy Consumption in 2014: ~ 2140 Trillion BTU

Lawrence Livermore National Laboratory



Source: LLNL August, 2016. Data is based on DOE/EIA SEDS (2014). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 60% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527

Table 2. 2014 State energy-related carbon dioxide emissions by fuel

State	million metric tons of carbon dioxide Coal	Petroleum	Natural Gas	Total
District of Columbia	0.0	1.1	1.9	3.0
Vermont	0.0	5.3	0.6	5.9
Rhode Island	0.0	5.8	4.8	10.6
Delaware	1.0	6.7	5.7	13.3
New Hampshire	1.4	10.4	3.1	15.0
South Dakota	3.1	7.8	4.4	15.4
Idaho	0.7	10.9	5.0	16.6
Maine	0.2	13.1	3.3	16.6
Hawaii	1.6	16.8	0.0	18.4
Montana	16.6	11.6	4.2	32.3
Alaska	1.7	15.9	17.5	35.1
Connecticut	0.9	21.4	12.8	35.1
Nevada	7.5	15.8	13.8	37.0
Oregon	3.2	22.8	12.0	38.0
New Mexico	20.3	16.2	13.6	50.1
Nebraska	26.1	16.5	9.5	52.1
North Dakota	37.7	16.4	4.5	58.6
Maryland	19.0	31.8	10.7	61.5
Massachusetts	2.8	38.0	23.0	63.9
Mississippi	11.0	29.8	23.4	64.1
Utah	32.5	19.5	13.4	65.3
Wyoming	46.2	11.9	7.5	65.6
Arkansas	32.0	22.4	14.6	69.0
Kansas	29.9	24.6	15.4	69.8
Washington	7.2	49.2	17.0	73.4
South Carolina	28.9	33.5	12.5	74.9
Iowa	37.9	27.5	16.5	81.9
Colorado	33.1	32.2	26.3	91.6
Arizona	42.3	34.1	16.7	93.1
Minnesota	29.6	39.3	26.0	94.9
West Virginia	77.0	12.8	8.6	98.4
Wisconsin	39.4	36.4	25.4	101.1
Tennessee	40.3	46.7	16.6	103.5
Virginia	26.2	54.6	23.2	104.0
Oklahoma	31.7	37.9	35.3	105.0
New Jersey	2.9	68.3	42.3	113.5
Alabama	54.3	34.4	34.6	123.2
North Carolina	47.4	55.0	24.5	126.8
Missouri	73.7	42.5	16.0	132.2
Kentucky	86.3	39.3	13.9	139.4
Georgia	45.6	59.0	35.3	140.0
Michigan	58.3	57.6	46.6	162.5
New York	6.1	90.1	73.6	169.7
Indiana	115.0	53.5	38.5	206.9
Louisiana	19.8	118.4	80.2	218.4
Florida	52.7	109.4	66.1	228.2
Ohio	99.6	76.8	55.4	231.8
Illinois	96.0	79.4	58.7	234.0
Pennsylvania	97.7	80.9	66.7	245.3
California	3.7	226.0	128.3	358.0
Texas	149.8	279.1	212.9	641.7
Total[1]	**1,697.7**	**2,265.6**	**1,442.0**	**5,405.3**

	emissions	
	%age of el	%age of total
Washington	29.88%	9.85%

Source: U.S. Energy Information Administration (EIA), State Energy Data System and EIA calculations made for this analysis.
https://www.eia.gov/environment/emissions/state/analysis/

Note: The District of Columbia is included in the data tables, but not in the analysis as it is not a state.

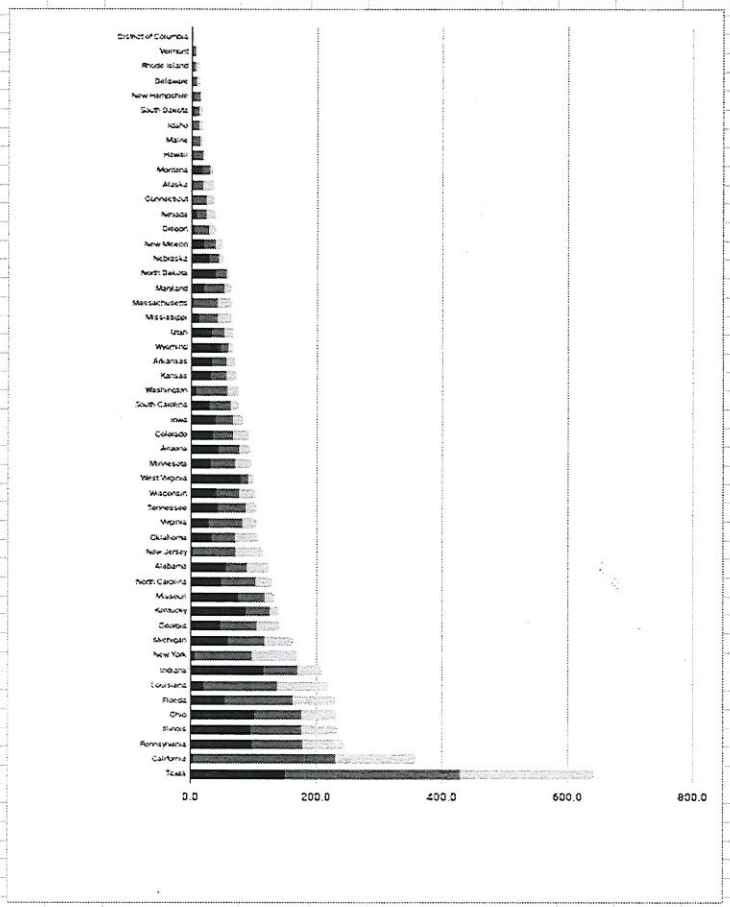
1For the United States as a whole see, EIA, *Monthly Energy Review* , Section 1

net generation

https://www.eia.gov/electricity/annual/html/epa_03_07.html

all		coal		
116334	gwh	6720	gwh	
3.41E+09	btu/gwh	3.41E+09	btu/gwh	coal percentage of total
3.97E+14	btu	2.29E+13	btu	
3.97E+02	tril btu	2.29E+01	tril btu	5.78%

https://www.eia.gov/electricity/annual/html/epa_03_08.html



NY	us	188.63	3,724.5	19,745,289	4.3	column C, D: https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_sum/html/sum_btu_1.html&sid=US
RI	us	191.87	202.7	1,056,426	4.4	Column E: https://en.wikipedia.org/wiki/List_of_U.S._states_and_territories_by_population
CA	us	195.57	7,676.3	39,250,017	4.5	Column F: author's calculation assuming gallon of gasoline = 120,000 btu
HI	us	197.68	282.4	1,428,557	4.5	
FL	us	205.78	4,241.7	20,612,439	4.7	
AZ	us	207.75	1,439.9	6,931,071	4.7	
CN	us	210.15	751.6	3,576,452	4.8	
VT	us	211.34	132.0	624,594	4.8	
MA	us	212.12	1,444.9	6,811,779	4.8	
NV	us	220.91	649.5	2,940,058	5.0	
NH	us	228.65	305.2	1,334,795	5.2	
MD	us	232.61	1,399.5	6,016,447	5.3	
OR	us	233.71	956.7	4,093,465	5.3	
NC	us	248.72	2,523.7	10,146,788	5.7	
NJ	us	255.77	2,287.7	8,944,469	5.8	
UT	us	259.24	791.0	3,051,217	5.9	
DC	us	262.49	178.8	681,170	6.0	
CO	us	267.16	1,480.2	5,540,545	6.1	
WASH	**us**	**272.83**	**1,988.4**	**7,288,000**	**6.2**	
GA	us	276.54	2,851.2	10,310,371	6.3	
MI	us	278.73	2,767.3	9,928,301	6.4	
VA	us	281.47	2,367.7	8,411,808	6.4	
DE	us	292.00	278.0	952,065	6.7	
MO	us	299.82	1,826.8	6,093,000	6.8	
PA	us	303.61	3,881.4	12,784,227	6.9	
ME	us	304.62	405.6	1,331,479	7.0	
WI	us	307.37	1,776.2	5,778,708	7.0	
IL	us	307.99	3,942.7	12,801,539	7.0	
ID	us	311.56	524.4	1,683,140	7.1	
MN	us	320.64	1,769.9	5,519,952	7.3	
Ohio	us	321.20	3,740.8	11,646,273	7.3	
NM	us	324.65	675.6	2,081,015	7.4	
TN	us	325.88	2,167.5	6,651,194	7.4	
SC	us	332.28	1,648.5	4,961,119	7.6	
AR	us	353.22	1,055.5	2,988,248	8.1	
KS	us	372.37	1,082.6	2,907,289	8.5	
MT	us	375.44	391.4	1,042,520	8.6	
MS	us	378.99	1,132.7	2,988,726	8.7	
KY	us	388.89	1,725.5	4,436,974	8.9	
AL	us	392.66	1,909.6	4,863,300	9.0	
OK	us	415.67	1,630.9	3,923,561	9.5	
WV	us	423.19	774.9	1,831,102	9.7	
IN	us	429.12	2,846.4	6,633,053	9.8	
SD	us	443.12	383.5	865,454	10.1	
NE	us	447.32	853.1	1,907,116	10.2	
TX	us	462.90	12,897.6	27,862,596	10.6	
IA	us	476.86	1,494.8	3,134,693	10.9	
ND	us	801.63	607.6	757,952	18.3	
AK	us	835.56	619.9	741,894	19.1	
WY	us	894.62	523.8	585,501	20.4	
LA	us	909.70	4,258.9	4,681,666	20.8	
		mil btu / capita	**tril btu**	population	gal gas / day equiv