Electric Power for BC

National Averages

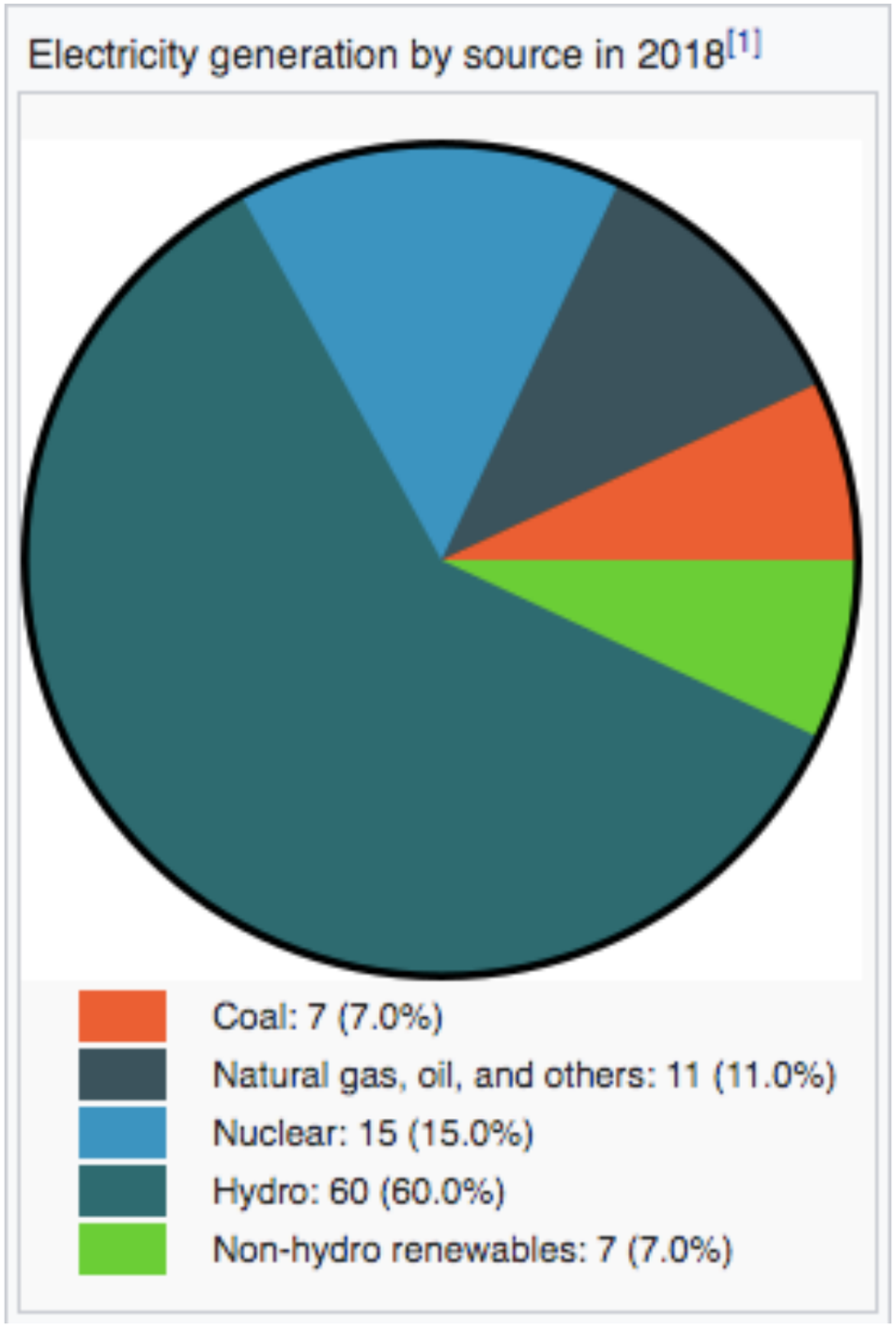
(Watts per person)

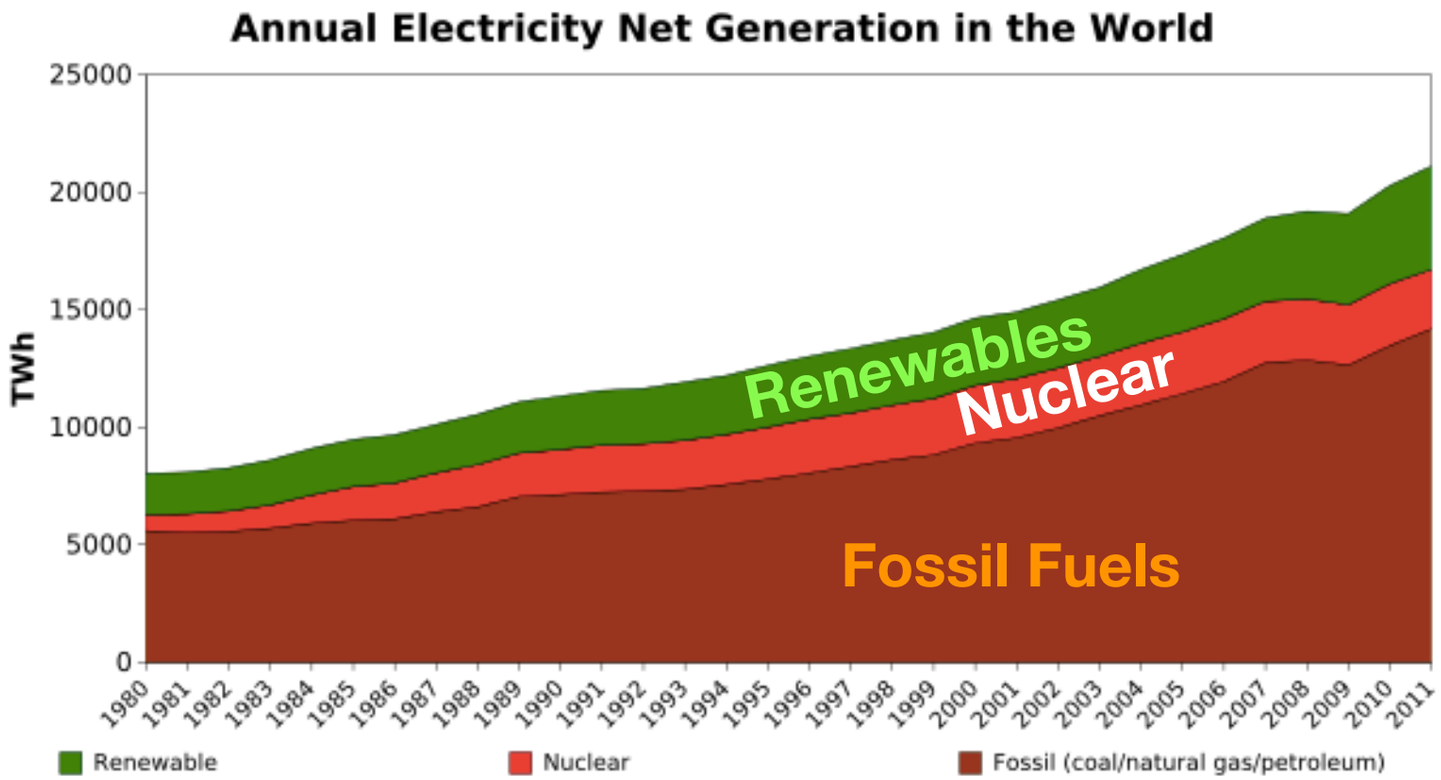
Country	Avg Watts/person	Country	Avg Watts/person
Iceland	5777	China	309
Liechtenstein	4092	India	140
Norway	2740	Bangladesh	40
Kuwait	2176	Nigeria	14
Bahrain	2069	Ethiopia	7
UAE	1848	Rwanda	4
Canada	1704	Somalia	3
Finand	1681	Gaza Strip	0.01
USA	1377	**WORLD**	**309**

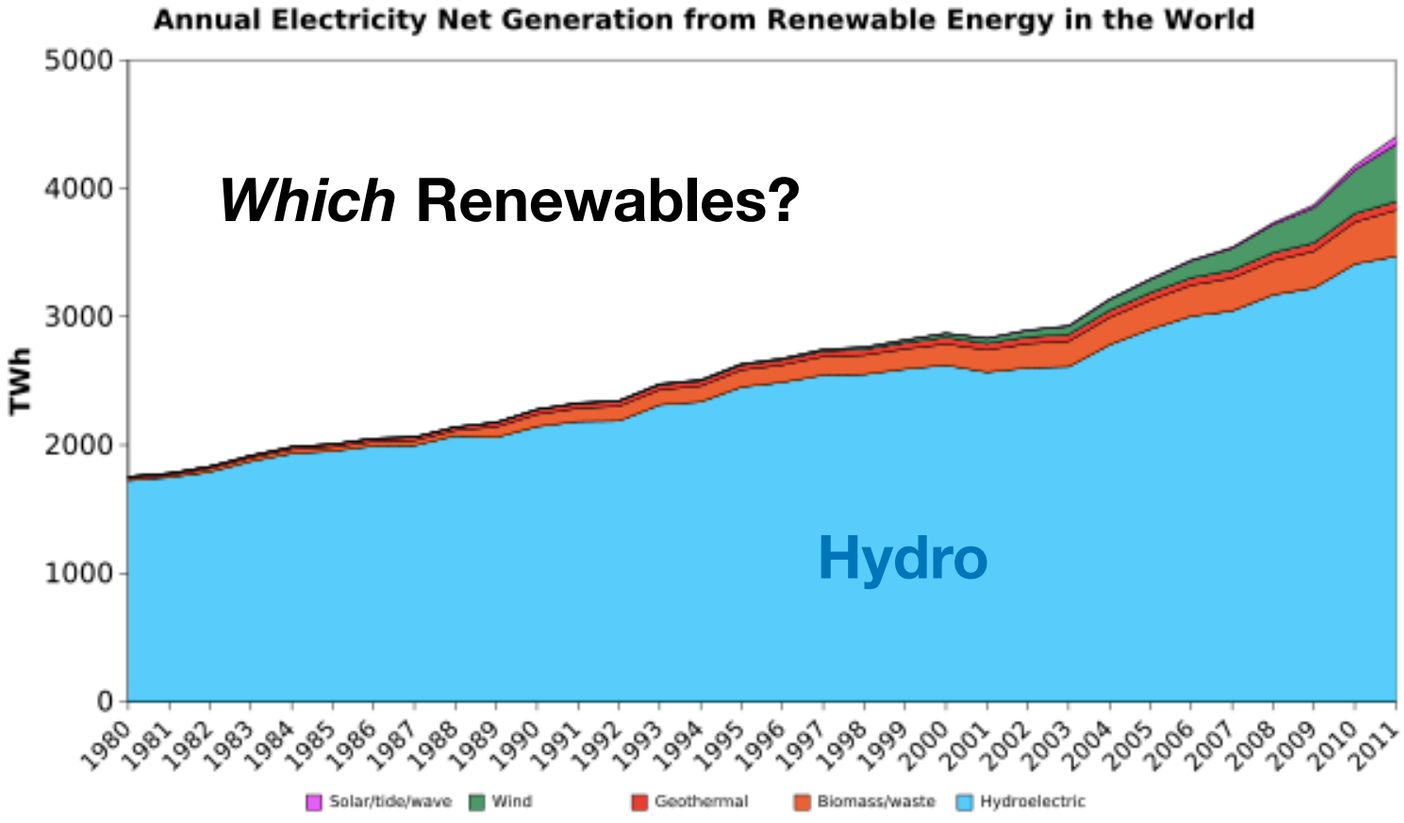
Source: Wikipedia

⇒ **2.3×10^{12}** Watts for 7.4 billion people

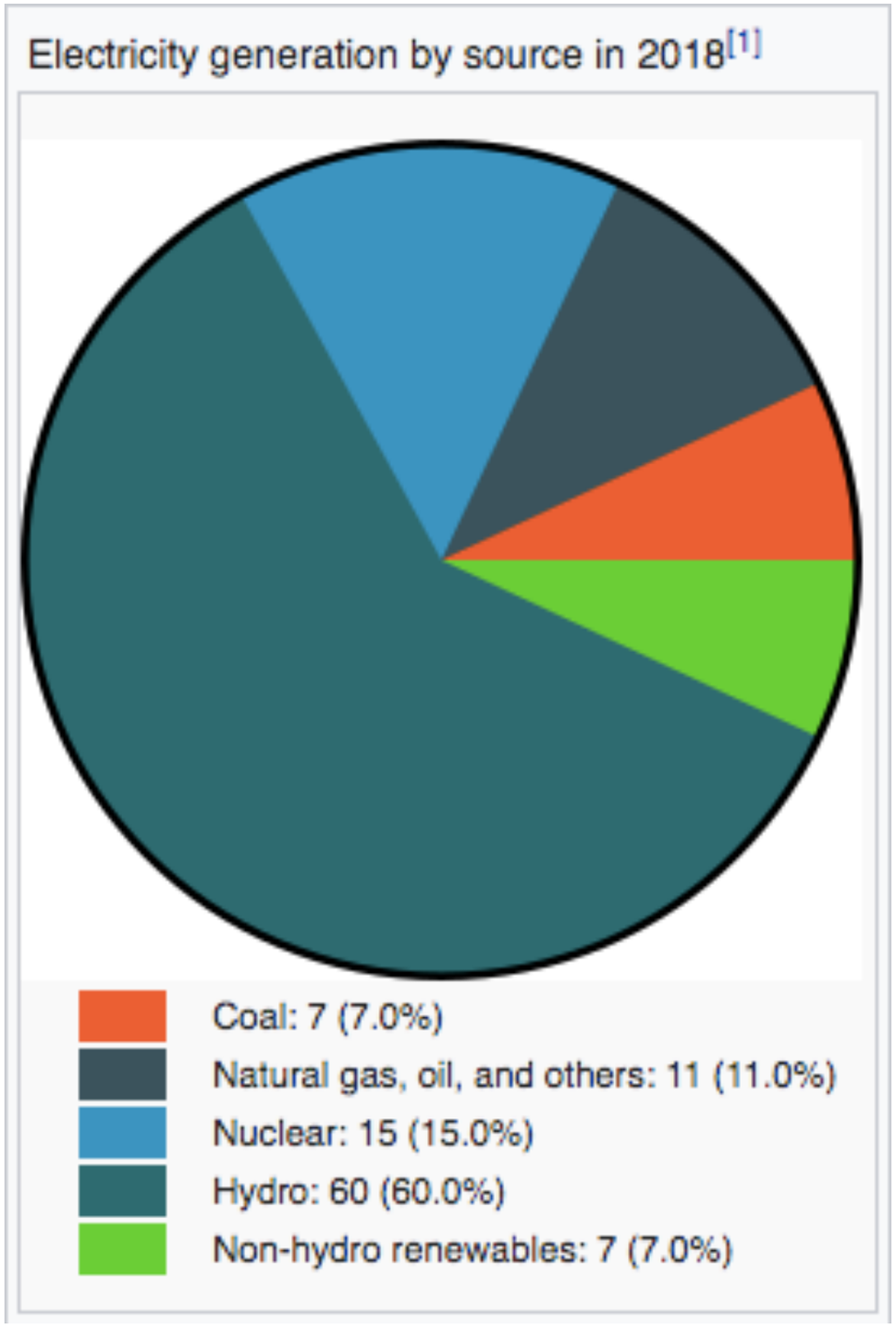
Canada *vs.* World







Canada *vs.* BC



As might be expected, given the name of the company to whom we pay our power bills, the emphasis in BC is almost exclusively on hydroelectric power.

BC Government website: "British Columbia generates nearly all of its electricity by harnessing the power of flowing water, a clean and renewable source. The rest comes from forest biomass, wind, natural gas, solar, and landfill gas."

Also "Geothermal heat—or energy that comes from heat deep under the ground—is also being explored in B.C."

But the ***Cape Scott Wind Farm*** is not mentioned anywhere.

Cape Scott Wind Farm

Cape Scott Wind Farm

From Website:

- **864 acres**, 35 km West of Port Hardy
- Uses 55 *Vestas V100* 1.8MW turbines:
- 80m high with three 49m blades, 100m dia, swept area of 7,854 m^2,
- generating **99 MW** or 290 GWh/year, enough to power 30,000 homes.
- ➠ BC Hydro's Port Hardy Substation @ 132 kV.
- Population of Port Hardy: 4,132 (2016).
- Started by *Sea Breeze Power* as "Knob Hill wind farm".
- Ownership now: 30% North America, 30% Japan, 40% France.

Transmission Losses

From Website:

Losses are lower in HV**DC** than in HV**AC** over long distances:

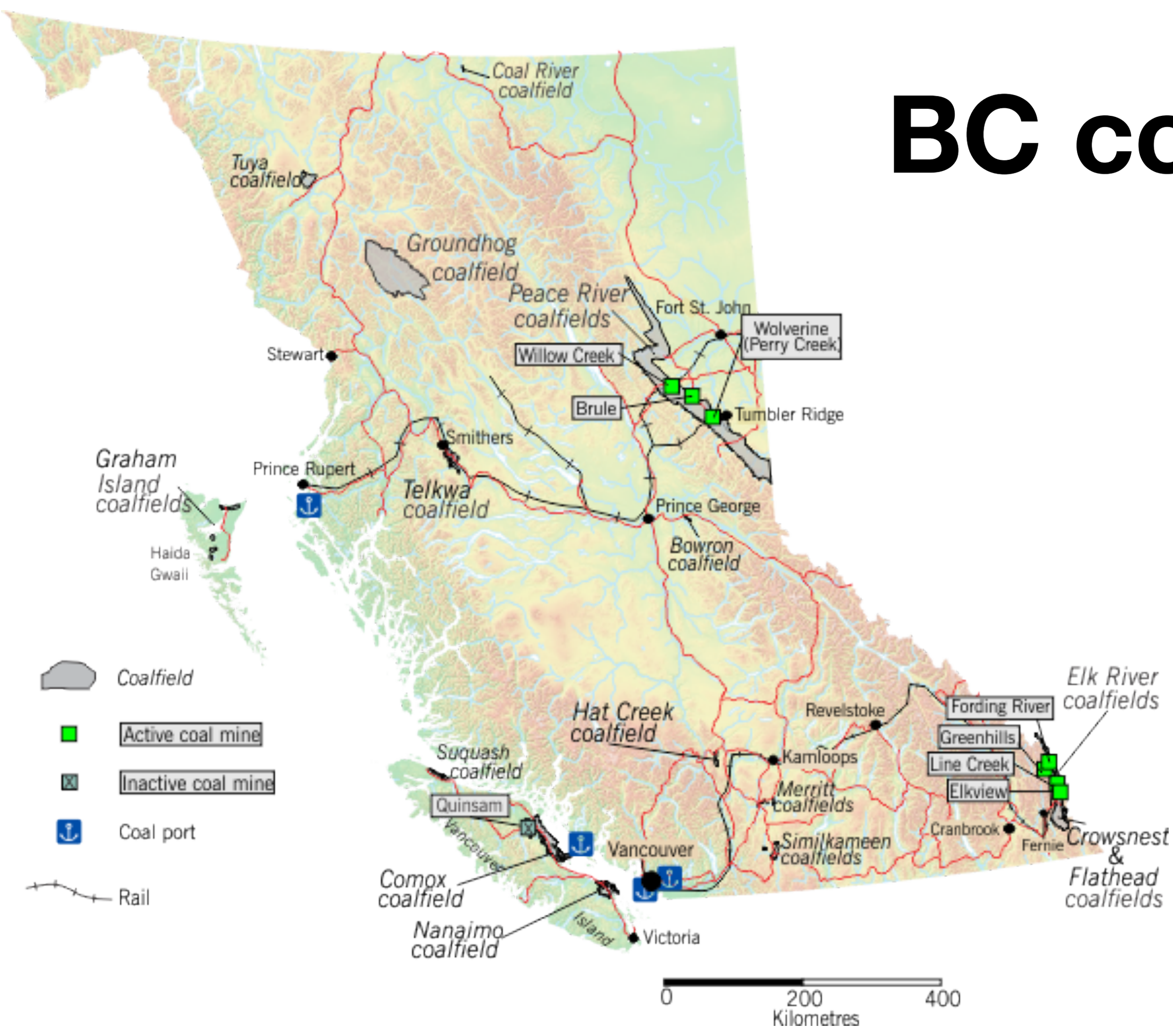
- for a ±800 kV line voltage, losses are about 3% per 1,000 km for an HVDC, while they are about 7% per 1,000 km for an HVAC line.
- For HVDC sea cables, losses are about the same, but can reach 60% per 100 km for a 750 kV HVAC sea cable.

Power Plants in BC

- **Hydro**: BC Hydro (11,702.8 MW) + other (4,195.6 MW) = **15,898.4** MW
- **Wind**: Cape Scott (≤ 99 MW) + 9 others = ≤ **703.9** MW
- **Solar**: Kimberley (≤ 1.05 MW) + Hanceville (≤ 0.99 MW) = ≤ **2.04** MW
- **Geothermal**: "None yet, but lots of potential!"
- **Biomass**, **Biogas** & **Waste Heat**: dozens, totalling **837.5** MW
- **Natural Gas**: 5 plants totalling **507.8** MW
- **Nuclear**: *none*. Even prospecting for uranium forbidden by law.
- **Coal**: very little used to generate electricity, but…

Coal production currently represents over half of the total mineral production revenues in the province. Over 95 per cent of coal currently produced in BC is *metallurgical* coal, which is used in the production of steel from iron ore. BC has 3 of the 5 biggest coal mines in Canada. Just because we don't burn much at home doesn't mean we aren't a big contributor to pollution and global warming.

BC coal


Coal River coalfield
Tuya coalfield
Groundhog coalfield
Peace River coalfields
Fort St. John
Wolverine (Perry Creek)
Willow Creek
Brule
Tumbler Ridge
Stewart
Smithers
Graham Island coalfields
Prince Rupert
Telkwa coalfield
Prince George
Bowron coalfield
Haida Gwaii
Hat Creek coalfield
Revelstoke
Fording River
Greenhills
Line Creek
Elkview
Elk River coalfields
Kamloops
Suquash coalfield
Quinsam
Merritt coalfields
Cranbrook
Fernie
Crowsnest & Flathead coalfields
Similkameen coalfields
Vancouver
Comox coalfield
Nanaimo coalfield
Victoria
Island
Coalfield
Active coal mine
Inactive coal mine
Coal port
Rail
0
200
400
Kilometres

How much of the electricity **you** use comes from **coal**, **gas**, **nuclear** or **hydro**?

What's your guess?

Your guess is as good as any
because ***there's no way to know!***

BC Hydro constantly buys and sells power from/to the North American grid. It is inefficient to move power over continental distances, but in order to keep the grid powered everywhere (except Texas) no firm regional restrictions are imposed (as far as I know).

So self-righteous antinuclear activists bragging that BC "*gets **all*** of its electricity from renewable sources, mostly **hydro**" don't know what they are talking about!

False Polychotomies:

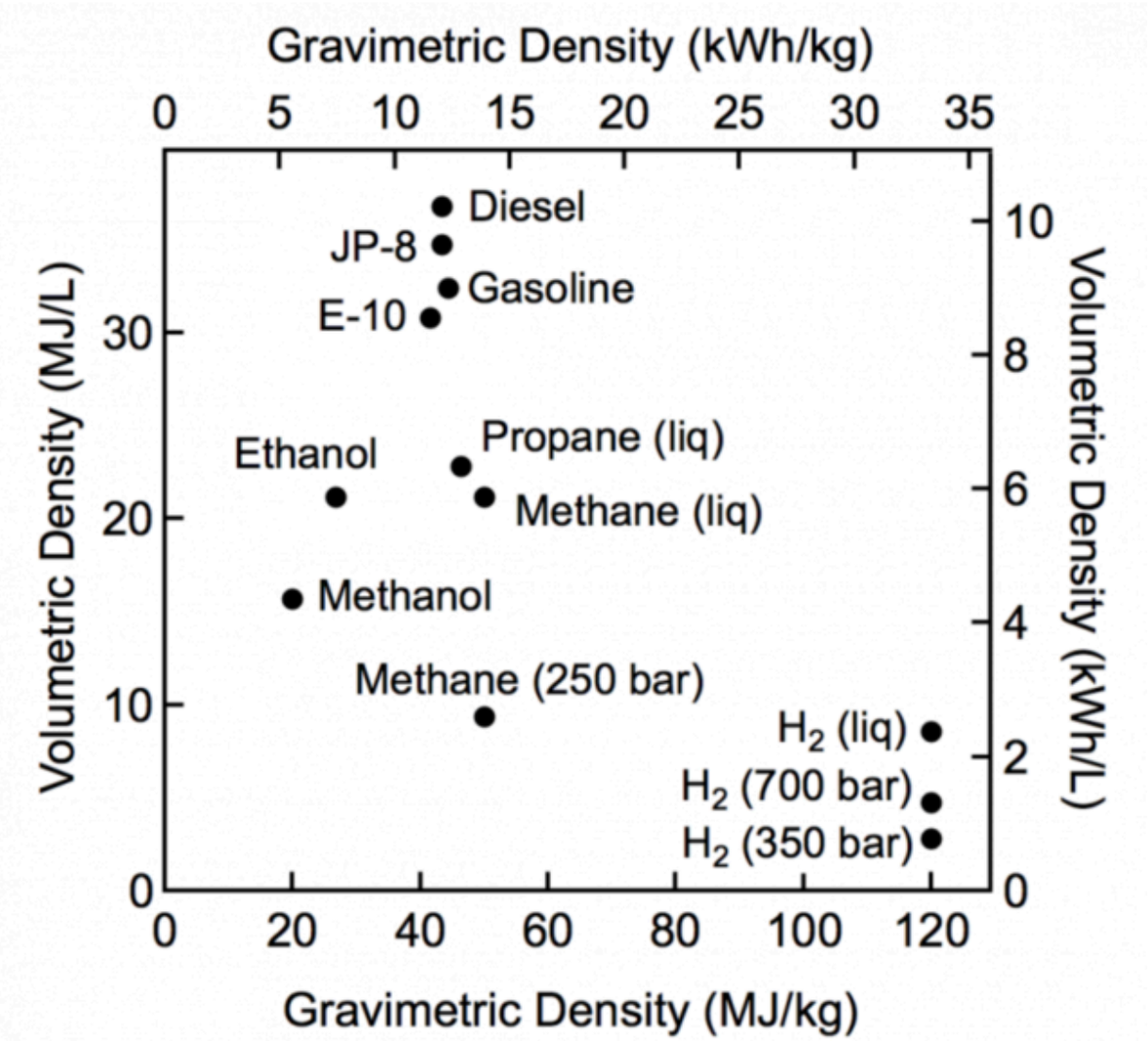
Should we focus our efforts on…

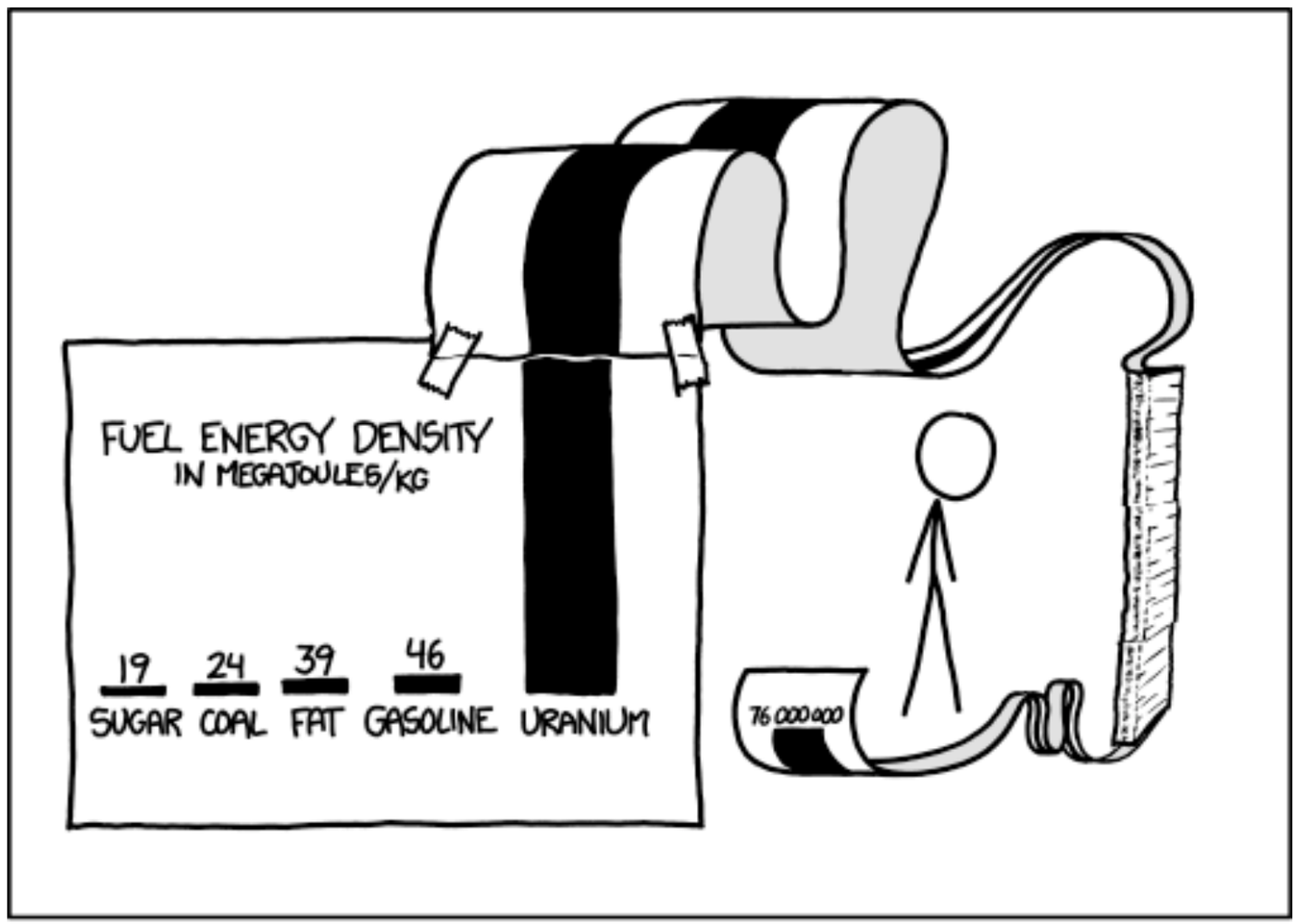
- Ending Use of Fossil Fuels,
- Developing More/Better Renewable Power,
- Developing More/Better Nuclear Power,
- Improving the Efficiency of Appliances, ***or***
- Learning to “Get By With Less” ***?***

As usual, the answer is “*YES*!”

Stored *Chemical* Energy

- Some materials store more energy than others!





SCIENCE TIP: LOG SCALES ARE FOR QUITTERS WHO CAN'T FIND ENOUGH PAPER TO MAKE THEIR POINT *PROPERLY.*

John Tosney's Notes

I said I would offer some thoughts in support of your work on the captioned topic. These are general in nature but indicative of what I think are the options for electrical power generation. For context Canada produces less than 2.0% of Greenhouse Gases* yet has the world's 10th largest economy and human development index and the 6th largest industrial output. We live in a large, cold, efficient and energy intensive country! A conversation looking at the pros and cons of the basic options could include the below. (cost estimates are leveled all in capital and operating in very general cents per kWh).

- **COAL** 9 ¢/kWh. Readily available, proven technology, moderate to license. Requires rigorous attention to mining safety and highest contribution to GHG.
- **GAS** 5 ¢/kWh. Readily available, proven technology, easy to license. Gas production safe. 2nd highest GHG emitter.
- ADV **NUCLEAR** 10 ¢/kWh. World focus on small modular reactors with enhanced fail safe design. Likely least contributor to GHG and cost competitive. Initial units subject to lengthy regulatory review including for waste management. (Canada 6-8 years, China 2-3 years?)
- **WIND** on shore 5 ¢/kWh. Competitive cost and very low GHG. Operates at say 55% availability. Requires backup capacity, has large footprint and aesthetically challenging. Kills migratory species. Moderate licensing.
- **WIND** off shore 14 ¢/kWh. As for on shore except costs and impact marine species.
- **SOLAR** 4 ¢/kWh Readily available, becoming more efficient with experience, easy to license and install. Operates at 45% availability Large footprint for industrial applications and sterilizes farm land; decommissioning and waste disposal issues.
- **BATTERY** 15 ¢/kWh. Temporary power storage only often in support of Wind and Solar. Continuously improving technology, significant GHG to produce units. Contains heavy/toxic metals, not all recyclable.
- **HYDRO** 6 ¢/kWh. Low cost, proven technology, very low GHG, recreational uses. Large footprint, land habitat loss, sedimentation and seismic vulnerability.

I have left out **Geothermal** and **Biomass** production although the former has successful application.