

SYSTEMS THINKING



What is the meaning of systems thinking?

Systems thinking is a **holistic way to investigate factors and interactions that could contribute to a possible outcome**



ALTERNATIVE ENERGY SYSTEMS FOR SOCIAL CHANGE

WHAT IS THE KWH



100W LIGHT BULB CALCULATIONS



Rank ↕	Country/Region ↕	Total electricity consumption (GW-h/yr) ↕	Year of data ↕	Source ↕	Population ↕	As of ↕	Average electrical power per capita expressed in	
							kWh per year ↕	Watts ↕
—	World	23,398,000	2018 est.	EIA ^[4]	7,800,000,000	2018	3,081	350
1	 China	8,312,800	2021	ENGLISH.GOV.CN ^[5]	1,412,600,000	2021	5,885	671
2	 United States	3,989,566	2019 est.	EIA	328,200,000	2019	12,154	1,387
3	 India	1,248,086	2020 est.	CSO ^[6]	1,384,660,000	2020	1,208	107
4	 Russia	965,156	2019 est.	EIA	146,700,000	2019	6,685	763
5	 Japan	902,842	2019 est.	EIA	126,860,000	2019	7,150	816
6	 Brazil	597,234	2019 est.	EIA	210,000,000	2019	2,830	323
7	 Canada	549,263	2019 est.	EIA	37,534,000	2019	14,612	1,667
8	 Korea, South	527,035	2019 est.	EIA	51,710,000	2019	10,192	1,163
9	 Germany	524,268	2019 est.	EIA	83,695,430	2019	6,306	719
10	 France	449,422	2019 est.	EIA	66,980,000	2019	6,702	765
11	 Saudi Arabia	322,372	2018 est.	EIA	33,413,000	2019	9,407	1,073
12	 Indonesia	307,566	2021	ESDM ^[7]	273,879,750	2021	1,123	128
13	 United Kingdom	300,520	2019 est.	EIA	66,800,000	2019	4,496	513
14	 Italy	297,150	2019 est.	EIA	60,244,000	2019	4,928	562
15	 Mexico	267,910	2019 est.	EIA	127,580,000	2019	2,100	240
16	 Iran	254,724	2018 est.	EIA	82,913,910	2019	3,072	350
17	 Turkey	251,376	2019 est.	EIA	83,429,620	2019	3,013	344
18	 Spain	241,563	2019 est.	EIA	47,076,780	2019	5,131	585
19	 Australia	241,020	2019 est.	EIA	25,364,310	2019	9,502	1,084
20	 Taiwan	237,557	2019 est.	EIA	23,775,000	2019	9,992	1,140
21	 Vietnam	216,994	2018 est.	EIA	96,462,110	2019	2,250	257
22	 South Africa	210,304	2019 est.	EIA	389,558,270???	2019	3,591	410

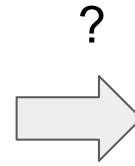
33.2 kWh / Day

PROBLEMS TO SOLVE

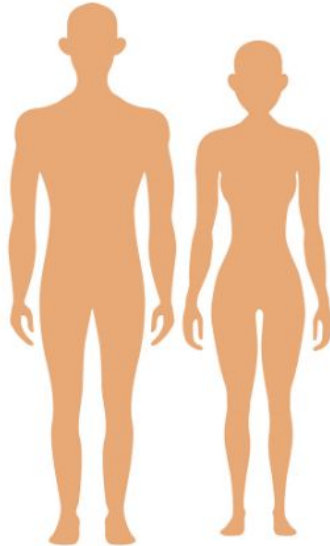
- Attracting participants
- Keeping the attention using feedback
- Liability / Safety
- Electrical overload - over Voltage
- Logistics
- Overcurrent protection
- Condition the power to fit the application
- Delivering the message

HUMAN CAPACITY TO GENERATE POWER

1 Calorie (International Table) per Second: Approximately **4 Watts**

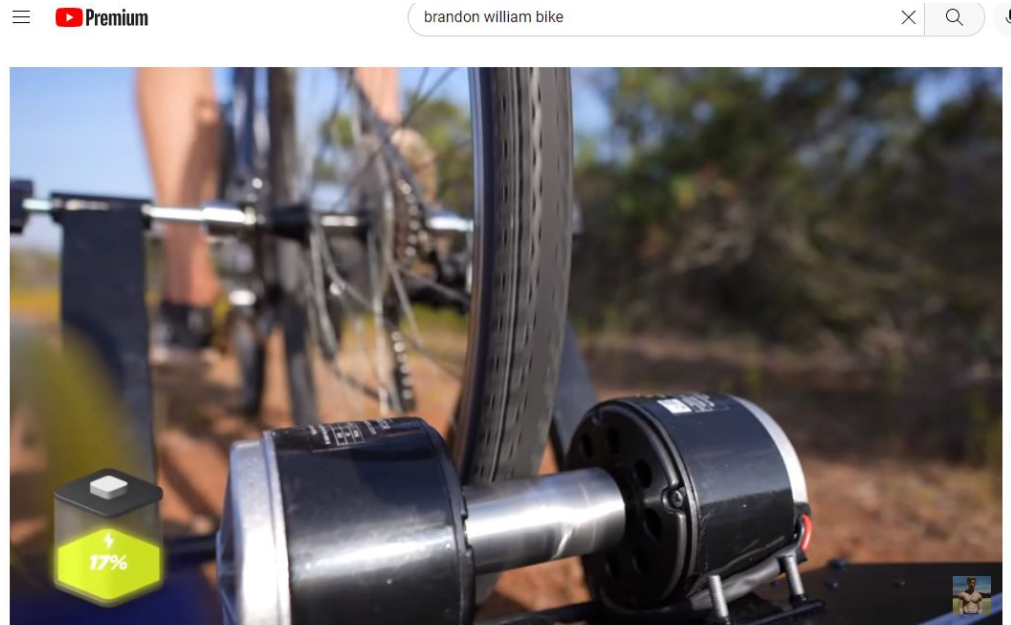
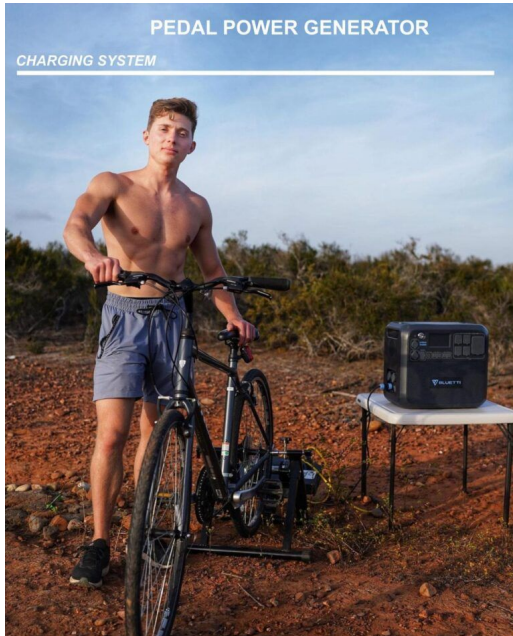


kWh



BITTER REALITY

<https://youtu.be/JygxNvr43TQ>



I Survived on Bike Powered Electricity for 24 Hours

CELL PHONE CHARGING STATIONS COACHELLA 2008



HUMAN HAMSTER WHEELS POWERED DJ

<https://www.youtube.com/watch?v=4KFHzxoNgrs>



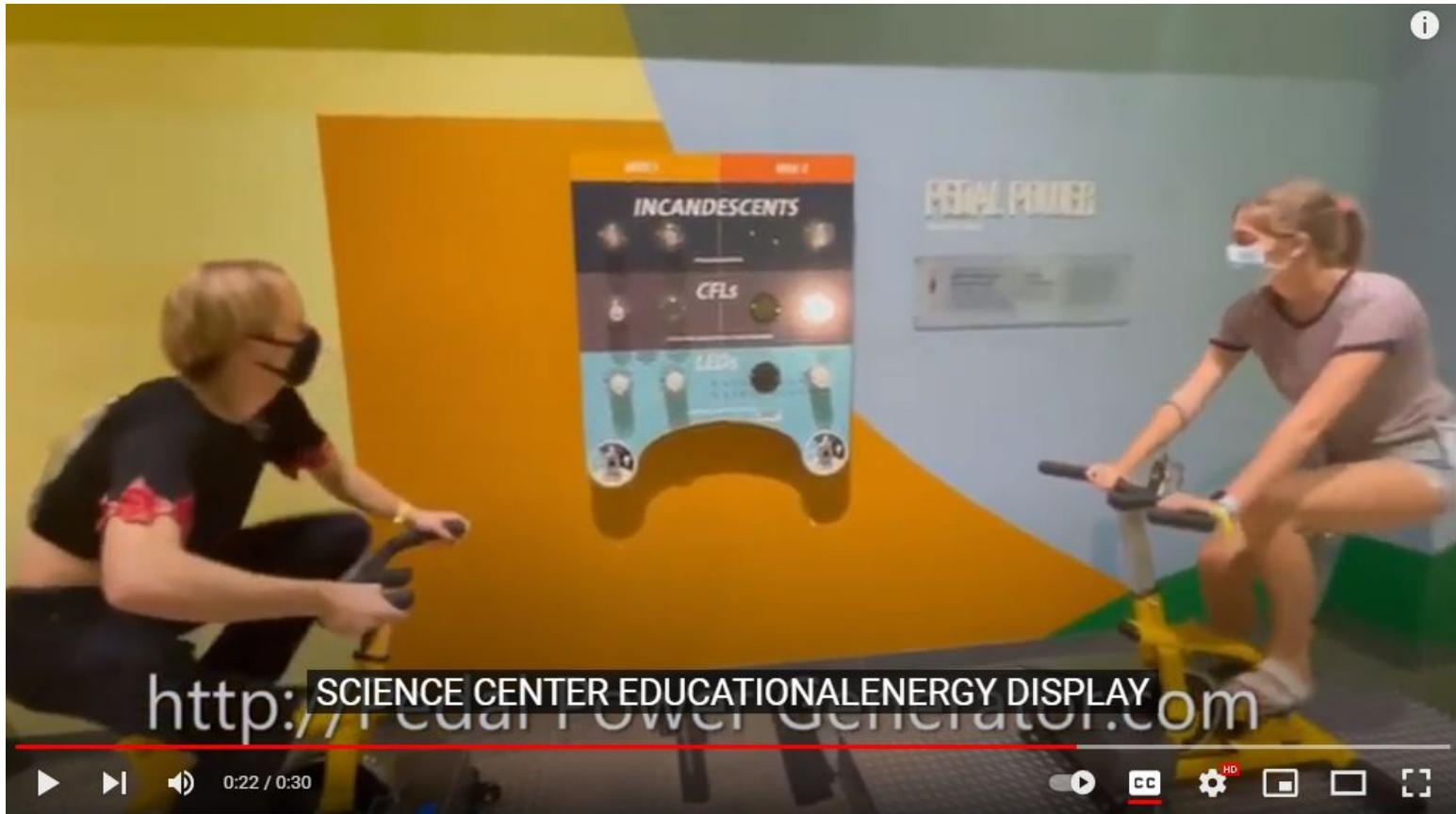
LIGHT BULB COMPARISON INTERACTIVE DISPLAY

<https://www.youtube.com/watch?v=KmJoXPHkH9I>



LIGHT BULB COMPARISON INTERACTIVE DISPLAY

<https://www.youtube.com/watch?v=-d7hhNgoXuo>





OREGON HIGH DESERT MUSEUM

ARDUINO BASED SYSTEM

