

IT, Infrastructure and the Energising of Megacities in 2050

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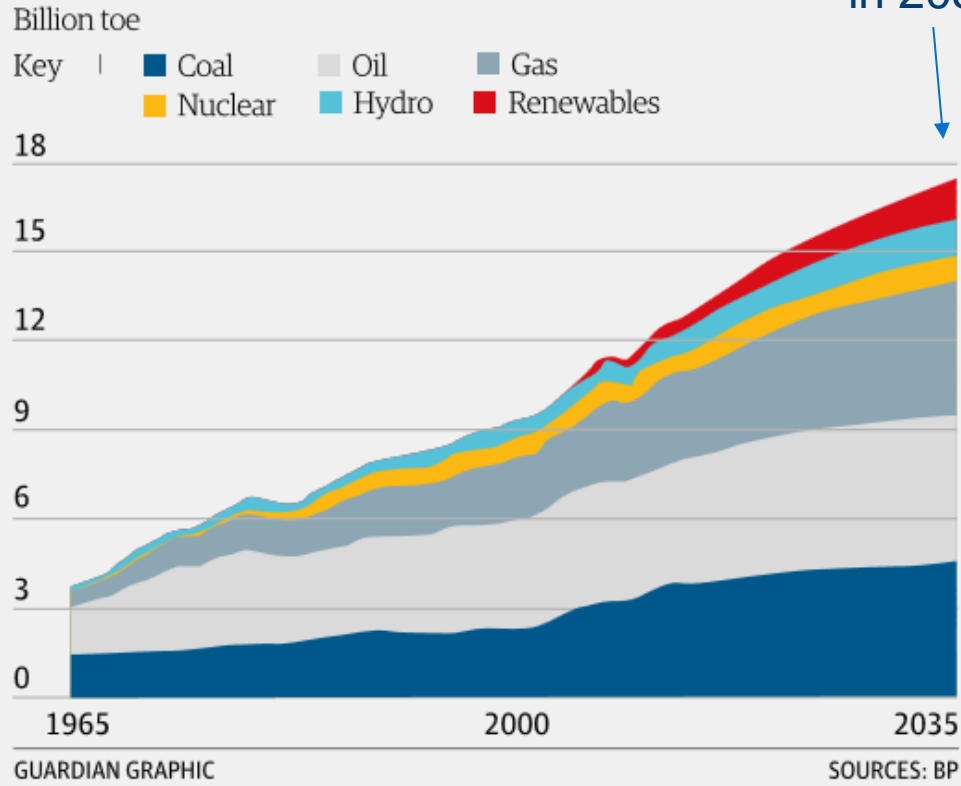
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The Stark Reality: BP2015: Total energy usage is up 40% in last 20 years, and predicted up another 40% to 2035!

BP's annual energy outlook predicted a doubling of the size of the world economy in the next 20 years, resulting in demand for energy rising by almost 40%.

Consumption by fuel



<10% renewables in 2035?

Middle class: 3B → 5.5B over next 20 years?

Global wind/solar 2015 equals German and Japanese nuclear turned off!

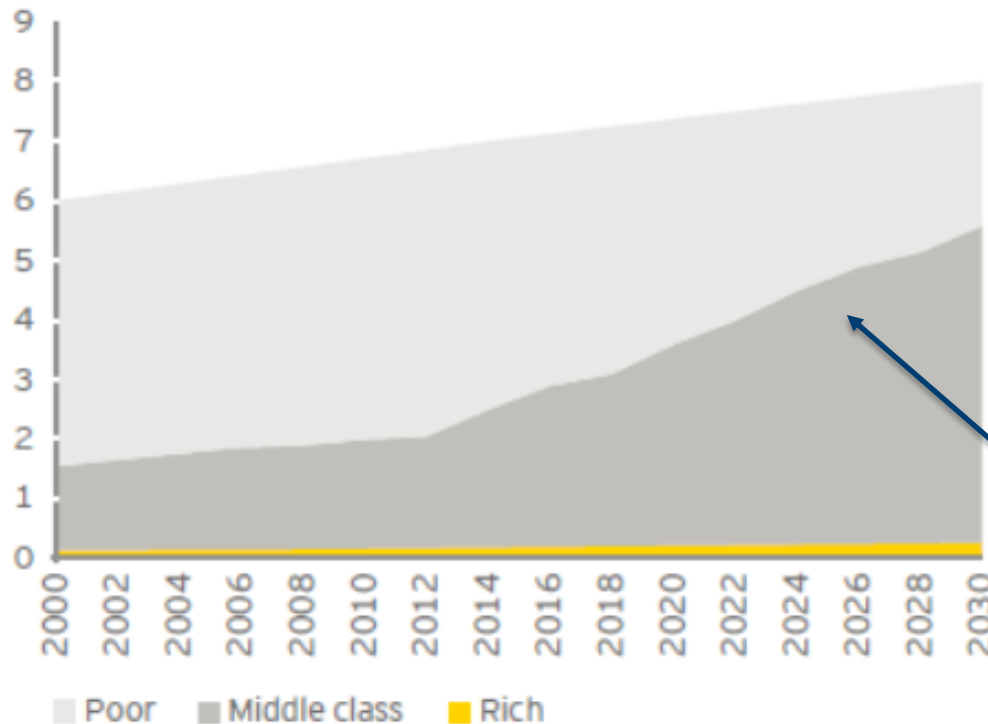
Middle class: 1.5B → 3B over last 20 years

Middle class = running water and electricity in the home.

Rising global demand for energy over the next two decades is at odds with the fight against climate change, the head of BP said as he outlined the oil giant's forecasts showing unsustainable increases in carbon emissions.

The Global Middle Class

Forecasting a surge in the global middle class



Middle class:
1.5B→3B
over last 20
years

Middle class:
3B→5.5B over
next 20 years?

Chinese Belt
and Road
Initiative

Source: The World Bank, Kharas and Gertz 2010

China's CO2 Emissions on the Rise



China's CO2 emissions grew by 1.4% in 2017 after three years of staying flat or falling slightly, according to our analysis of preliminary government statistics released last month.

<https://www.carbonbrief.org/guest-post-chinas-co2-emissions-grew-less-expected-2017>

Belt and road countries could emit triple China's carbon, warns official

<http://www.climatechangenews.com/2017/12/11/belt-road-countries-emit-triple-chinas-carbon-warns-official/>

<http://www.straitstimes.com/asia/east-asia/chinese-firms-to-build-700-coal-plants>

<https://www.ft.com/content/ba4212b6-c63f-11e7-a1d2-6786f39ef675>

Fossil Fuel Fractional Use Unchanged in 40 Years

GREEN MEGA-FLOP: FOSSIL FUELS' SHARE OF TOTAL ENERGY USE UNCHANGED IN 40 YEARS

Date: 13/01/18 P Gosselin, No Tricks Zone

Quartz.com here presents an interesting chart which tells us the green energy revolution of the past 30 years has resulted in practically nothing. It's been a flop. Fossil fuels remain as wildly popular as ever.

Global fossil fuel use as a share of total energy has risen since James Hansen's 1988 testimony. Chart: Quartz.com. In the 1970s the big worry was that fossil fuels would soon run out, and so we should "use them wisely". But in the 1980s the risk changed to one of an overheating planet, and so we should not use them at all.

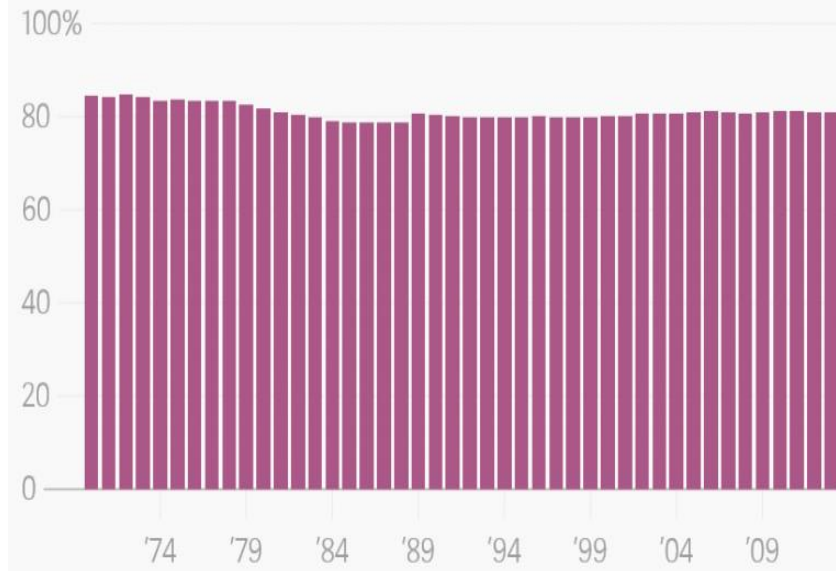
Higher than 1988, when James Hansen testified We can all recall a sweating James Hansen's 1988 stage-crafted testimony before Congress, warning that increasing atmospheric CO2 concentrations would lead to spiraling global warming. And unless action was taken urgently, the ice caps would soon melt and the earth would sizzle.

Countries as a result mobilized 100s of billions of dollars to eliminate the use of these "dangerous, climate-killing" fossil fuels.

Today for all that money you'd think that tremendous progress in reducing fossil fuels would be the result. You couldn't be more wrong.

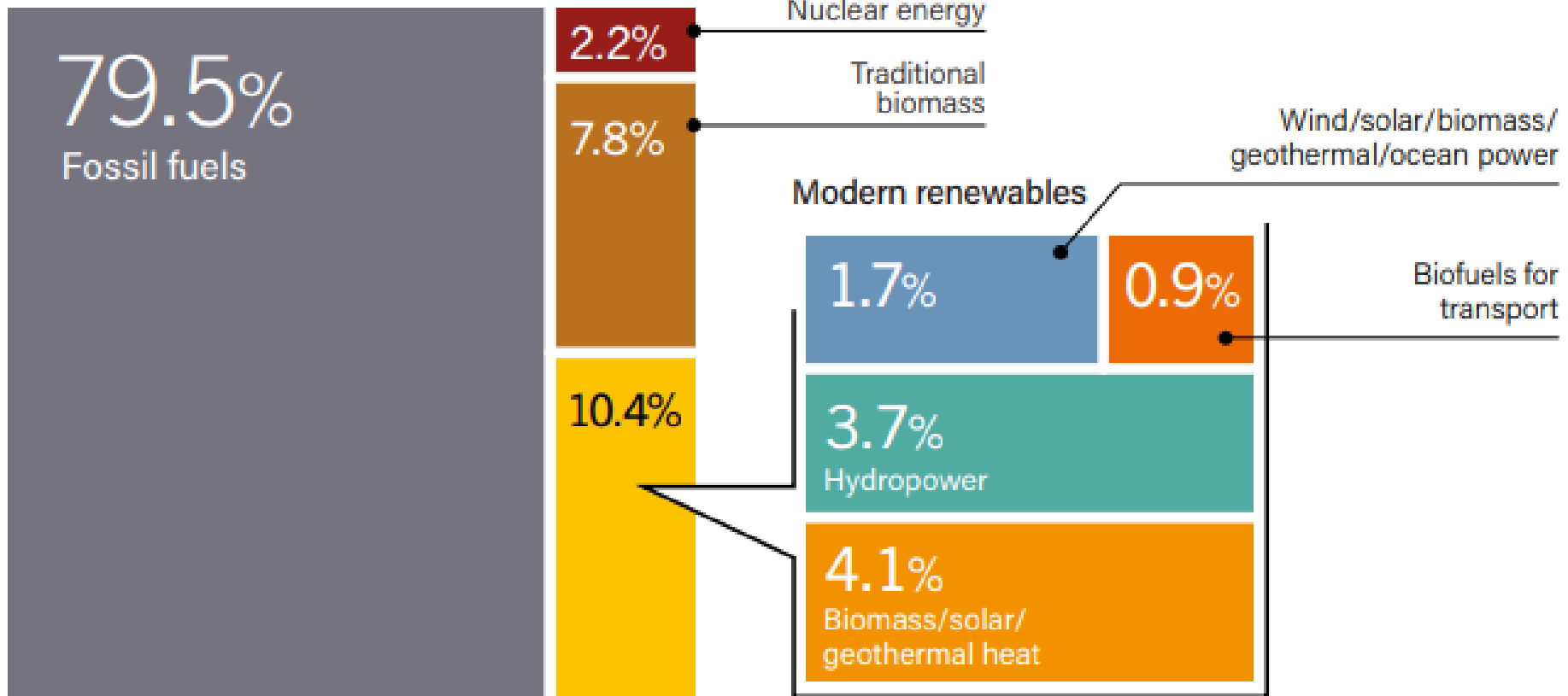
<https://www.thegwpf.com/green-mega-flop-fossil-fuels-share-of-total-energy-use-unchanged-in-40-years/>

Global fossil-fuel energy use, as a share of total energy use



Modern Renewables = 1.7% of Energy Mix

ESTIMATED RENEWABLE ENERGY SHARE OF TOTAL FINAL ENERGY CONSUMPTION, 2016



http://www.ren21.net/wp-content/uploads/2017/06/GSR2017_Highlights_FINAL.pdf

Fuel Energy Density: Millions and Trillions

Table 1. Energy densities of different fuels.

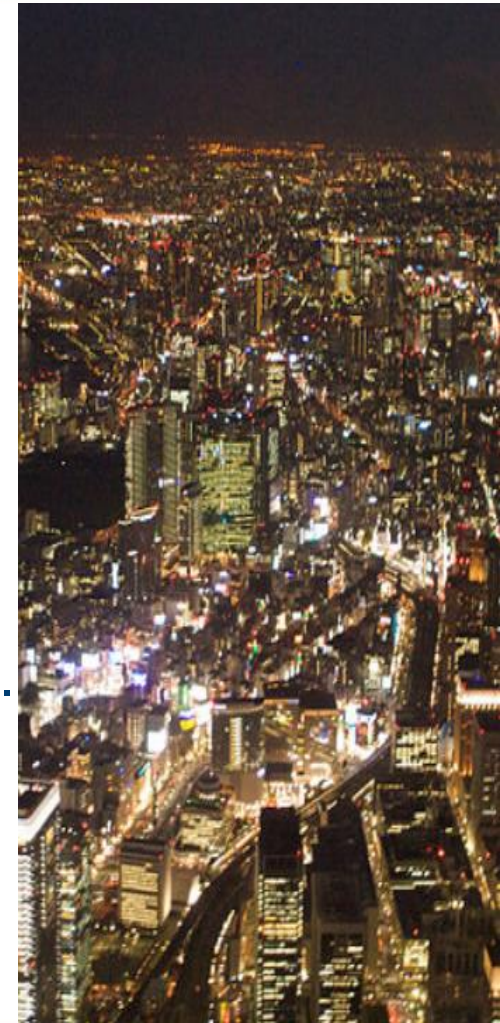
Fuel type	Energy density MJ/kg
Wind	0.00006
Battery	0.001
Hydro	0.72
TNT	4.6
Wood	5.0
Petrol	50
Hydrogen	143
Nuclear fission	88250000
Nuclear fusion	645000000

Contrast: petrol versus battery for automobiles

Factors of ten make or break engineering projects, let alone millions!

4. Tackle megacities first

- >50% of 9B world population in 2050 will live in cities/megacities.
- Areal density of energy capture all important.
- Shanghai: 22M and 6000km² needs >X4 area for wind, solar and biofuels for electricity, and >X20 area for renewables for all energy, but that land feeds Shanghai!
- The challenge is to power Hong Kong, Singapore, etc in 2050, also Beijing, Calcutta, Rio, Moscow, London ...
- Only nuclear and fossil fuels will actually energise 2050 megacities. A science breakthrough tomorrow is too late.
- CCS: Only 20MtCO₂ sequestered out of 51000MtCO₂ produced yearly. Thermodynamic penalty >16% drop in plant efficiency. CCS unproven at scale, progress stalled.



Megacities – self sufficient in food by 2050!



AeroFarms, an aeroponics company that was started in 2004, is bringing what is soon to be the world's largest vertical farm to a former steel factory in Newark, New Jersey's Ironbound community. The vertical farm will manufacture short, leafy green vegetables grown in vertically stacked trays that will fill 69,000 square feet of the former Newark factory. Aeroponics is the process of using air or mist to grow plants without soil and sunlight. Instead plant growth is fostered using LED lights and a nutrient-rich mist. It uses less water and fewer nutrients than hydroponics, the process of growing plants with hyper-nutrient water without soil. Though the vertical aeroponics farm is highly efficient — AeroFarms Chief Marketing Officer Marc Oshima told Vice that the company is 75 times more productive per square foot annually than traditional field farming and 10 times more productive than a hydroponic farm — AeroFarms has a larger goal in mind for Newark's aeroponics farm.

http://www.philly.com/philly/blogs/home_and_design/Newark-NJ-to-get-worlds-largest-indoor-vertical-farm.html

Same for animal protein!

<http://sitn.hms.harvard.edu/flash/2018/making-steak-spinach-bioengineering-change-meat-production/>

Renewable Energy Progress

Renewables 1800-2040

Last centuries spent getting off renewables

