

energy when everything is connected

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@arashaaz



UNIVERSAL
RIGHT

INTERNET
OF
ENERGY

kamangir 
dream • develop • do

dream.develop.do

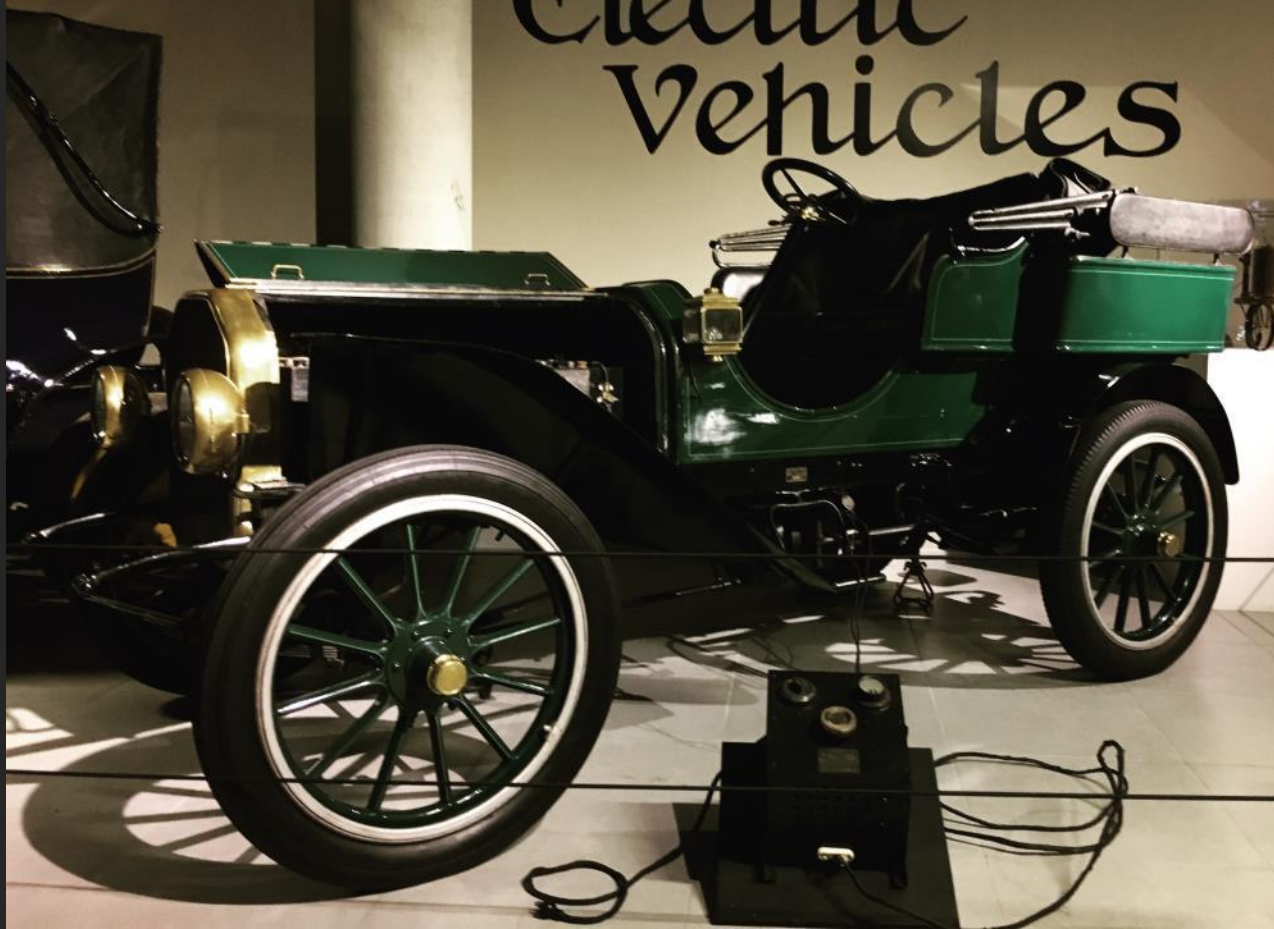
**"There cannot be a crisis next week.
My schedule is already full"**

Henry A. Kissinger





Electric Vehicles

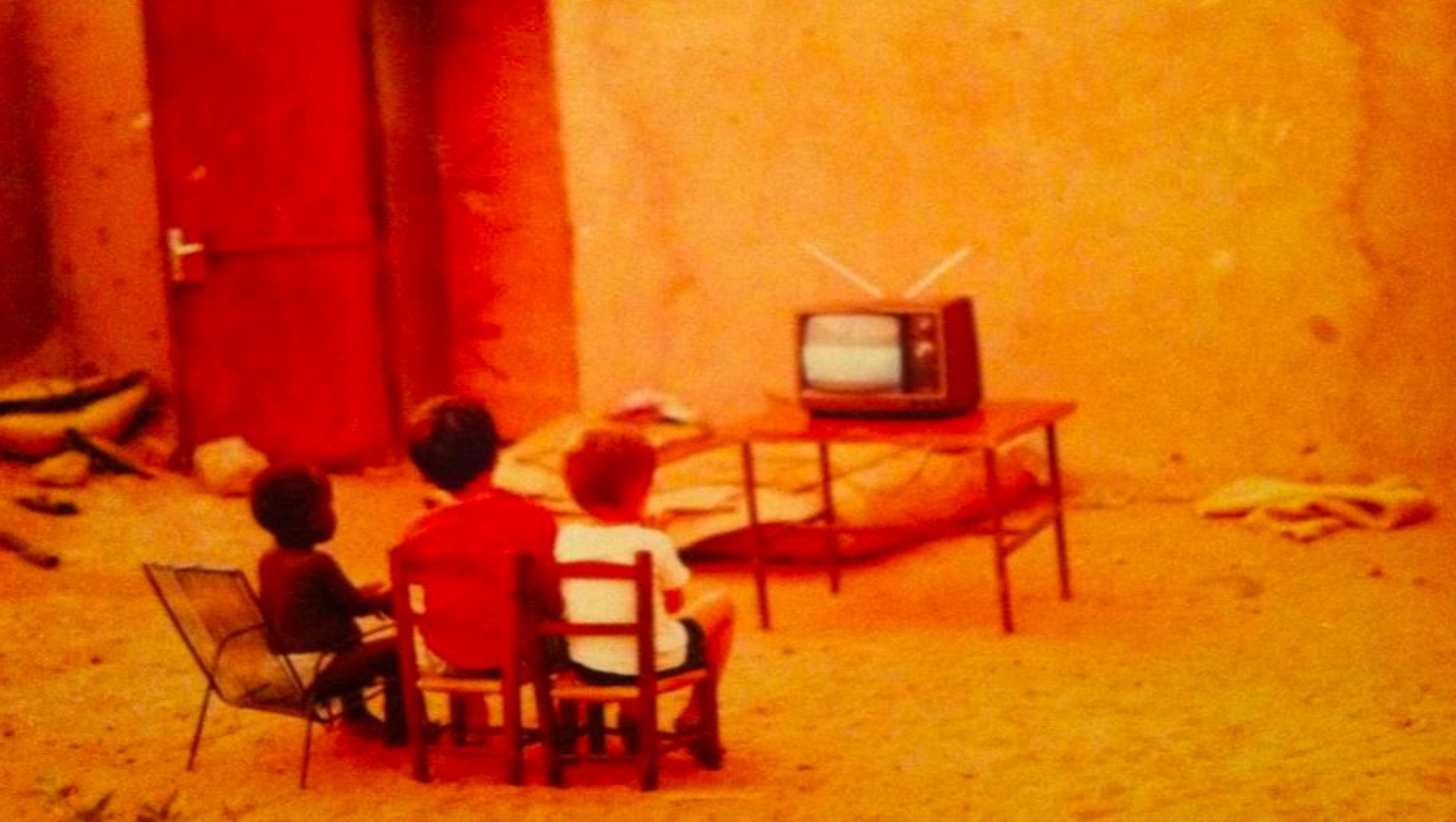






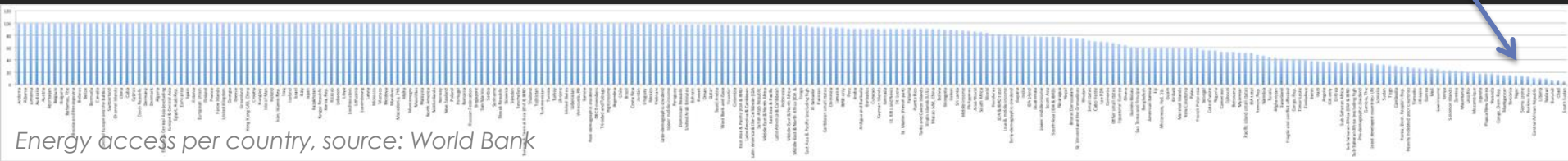






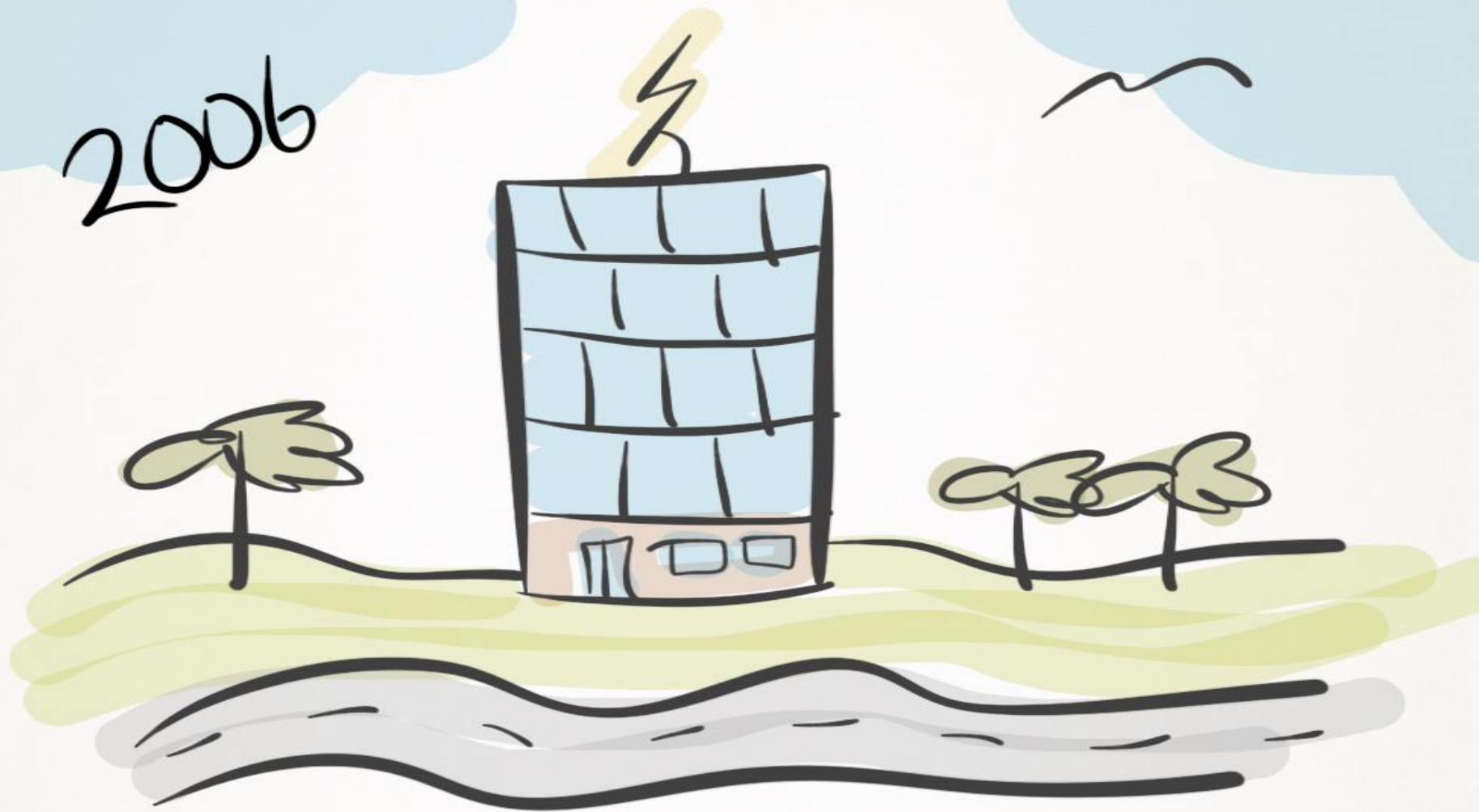
16%

(but also the 4th uranium exporter in the world)
(and the 2nd best solar potential globally)



Energy access per country, source: World Bank

2006



ehh...

uhh...

what is energy?

well...

¿que?

the ability to do work

touch

use

the real economy

make

exchange



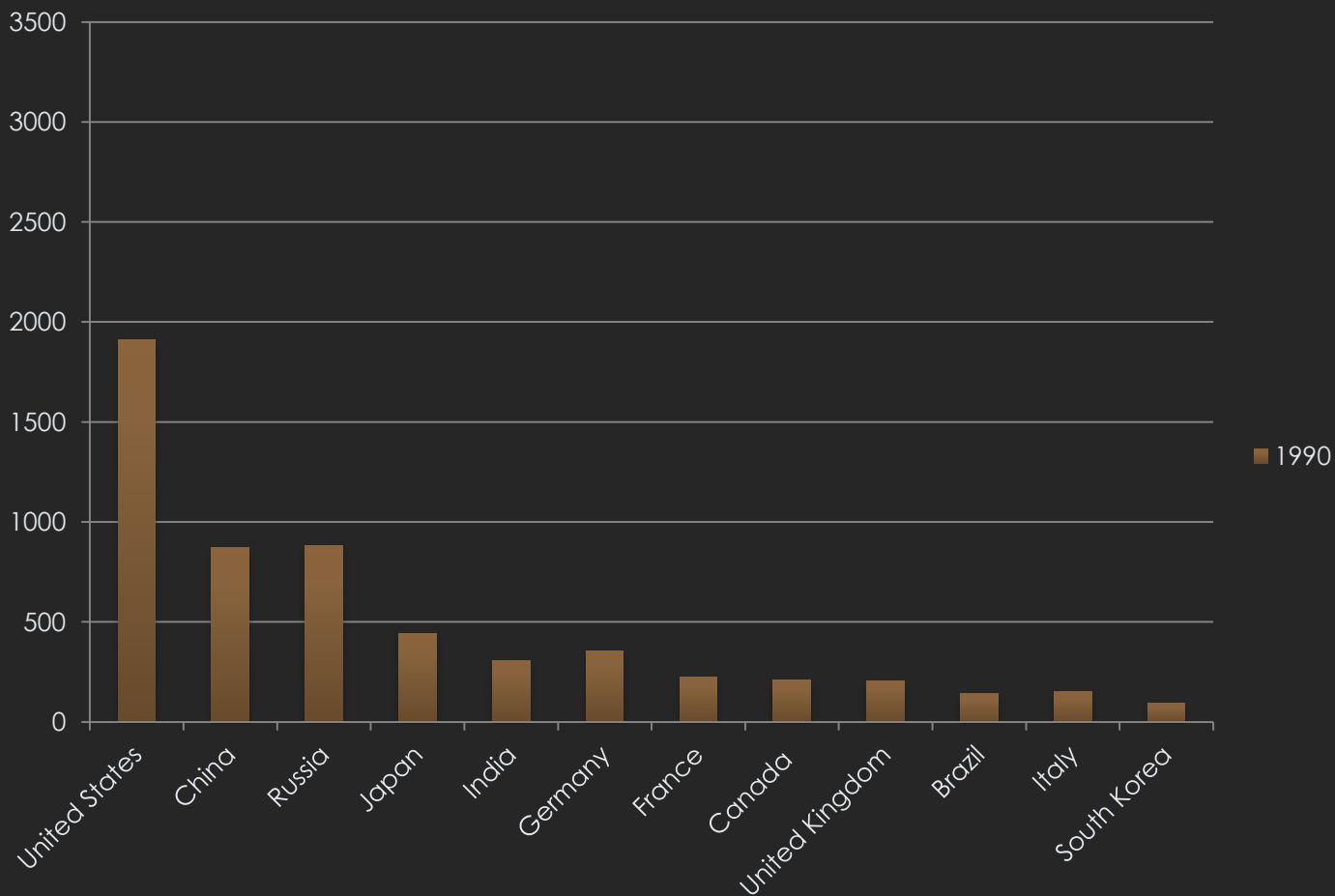
155.000 TWh/y

558.000.000.000.000.000.000.000 Joules

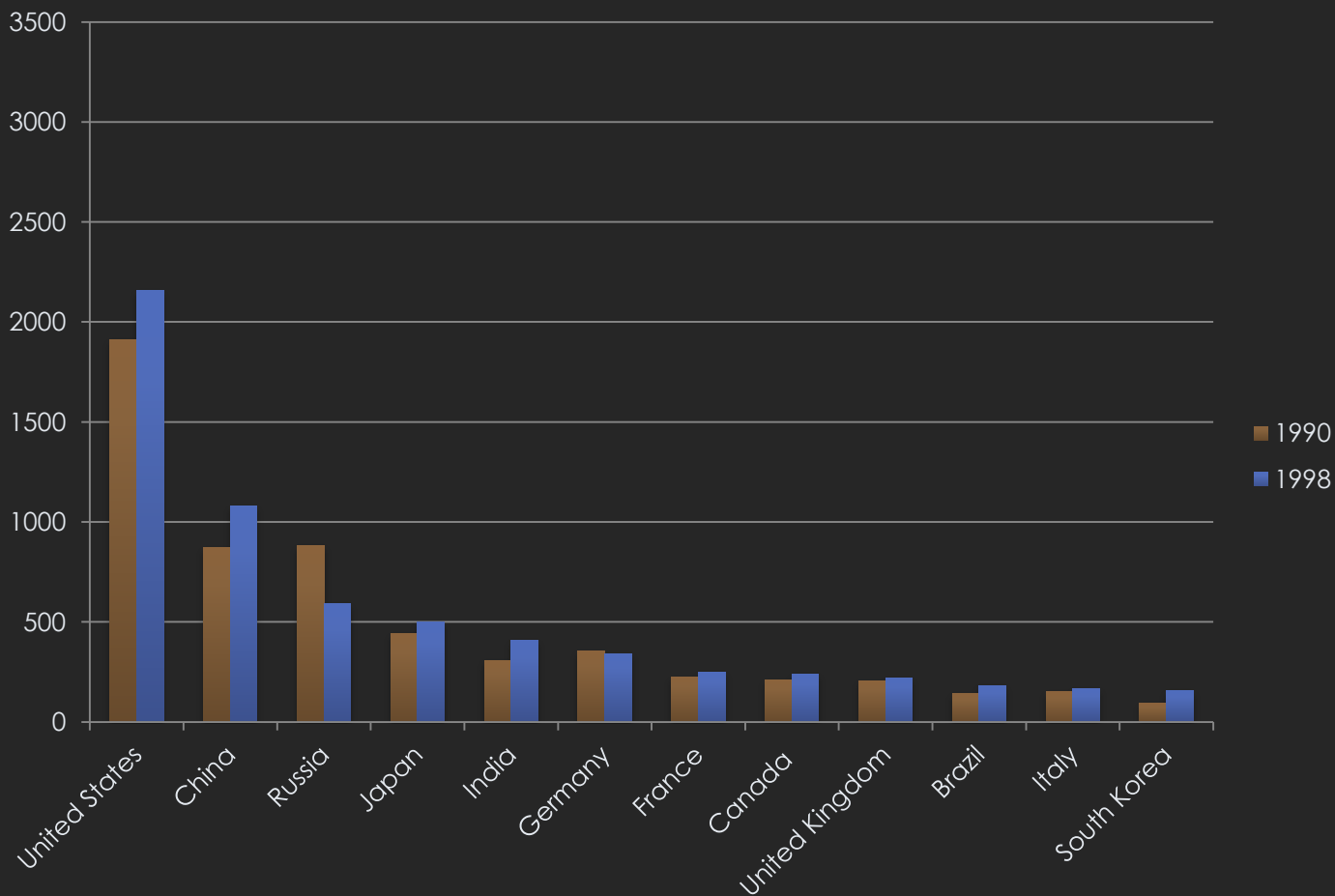




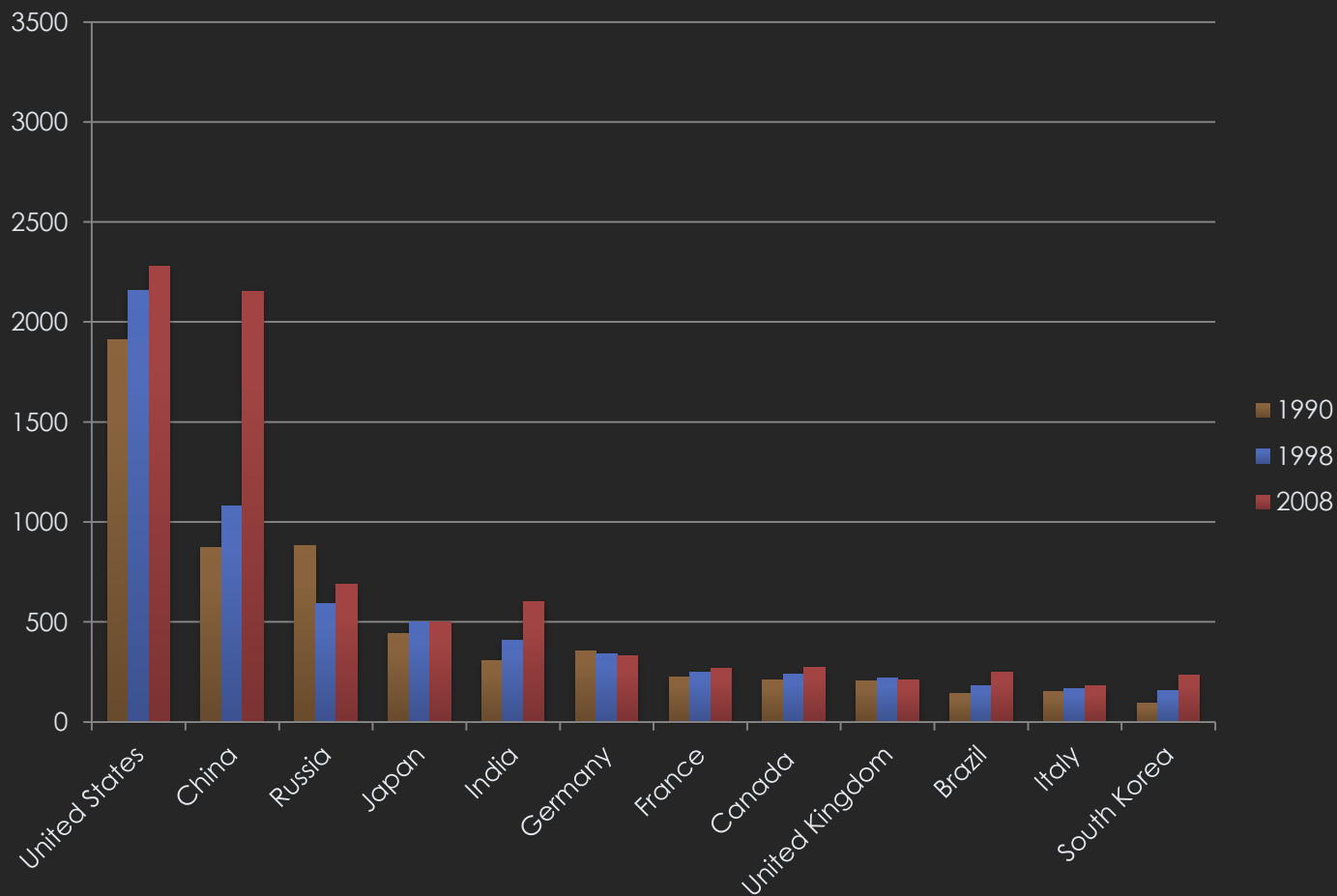
300.000.000.000 solar panels
...on 1/1000th of the earth's surface



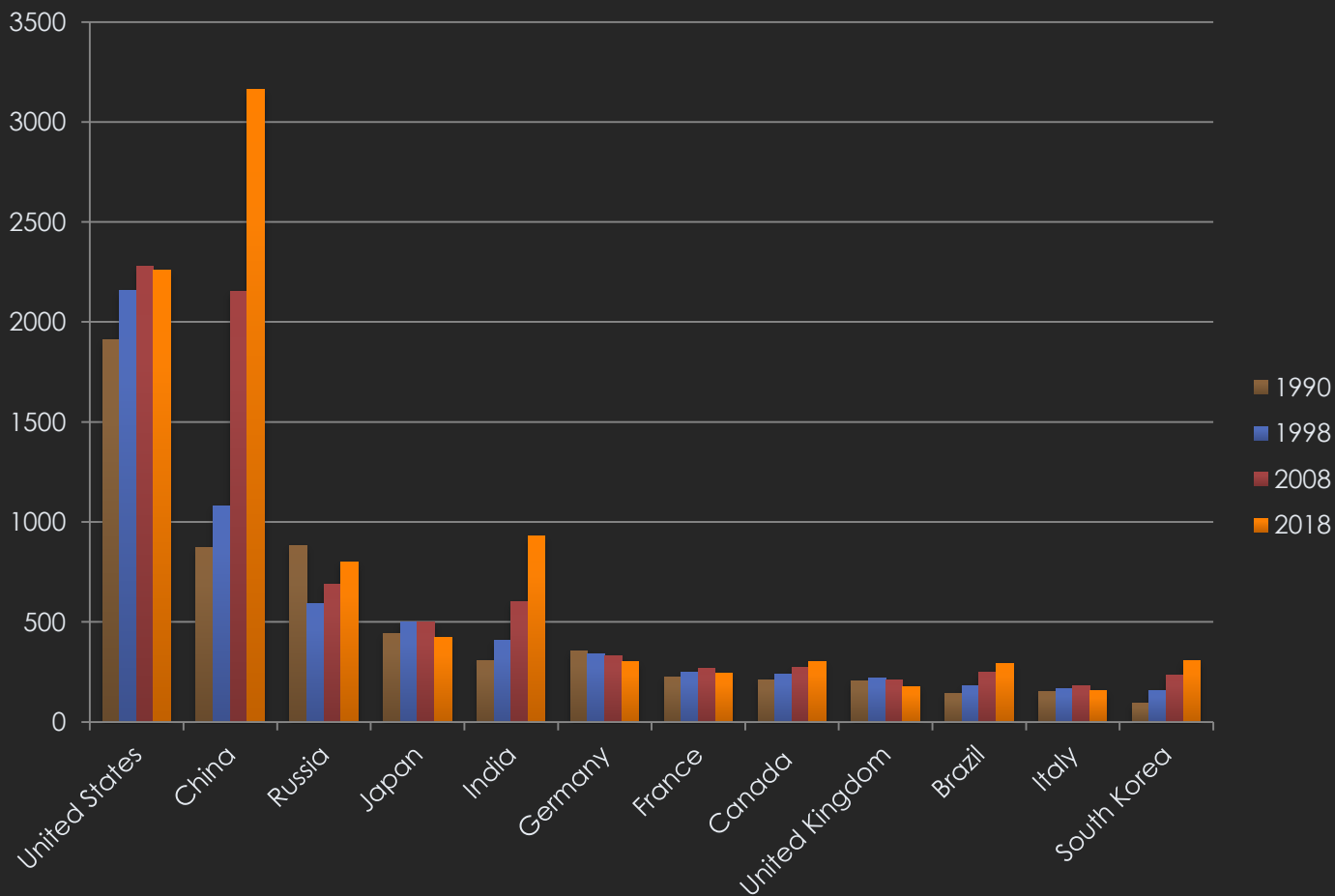
Energy consumption 1990 in Mtoe, source: Enerdata



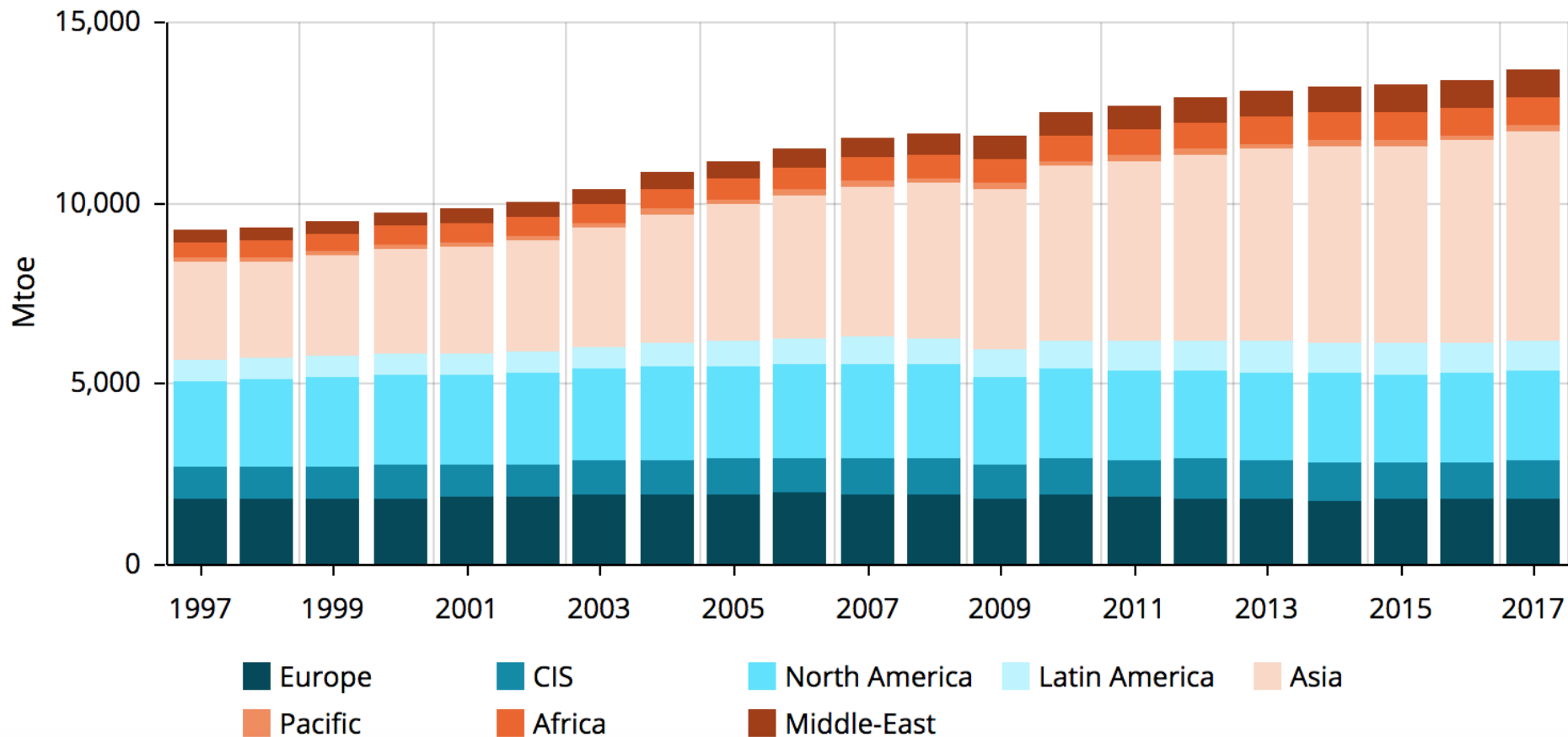
Energy consumption 1990-1998 in Mtoe, source: Enerdata



Energy consumption 1990-2008 in Mtoe, source: Enerdata



Energy consumption 1990-2018 in Mtoe, source: Enerdata



Global energy consumption grew 47,7% from 1997-2017. Unit: Mtoe - source: Enerdata

2018 GLOBAL PEACE INDEX

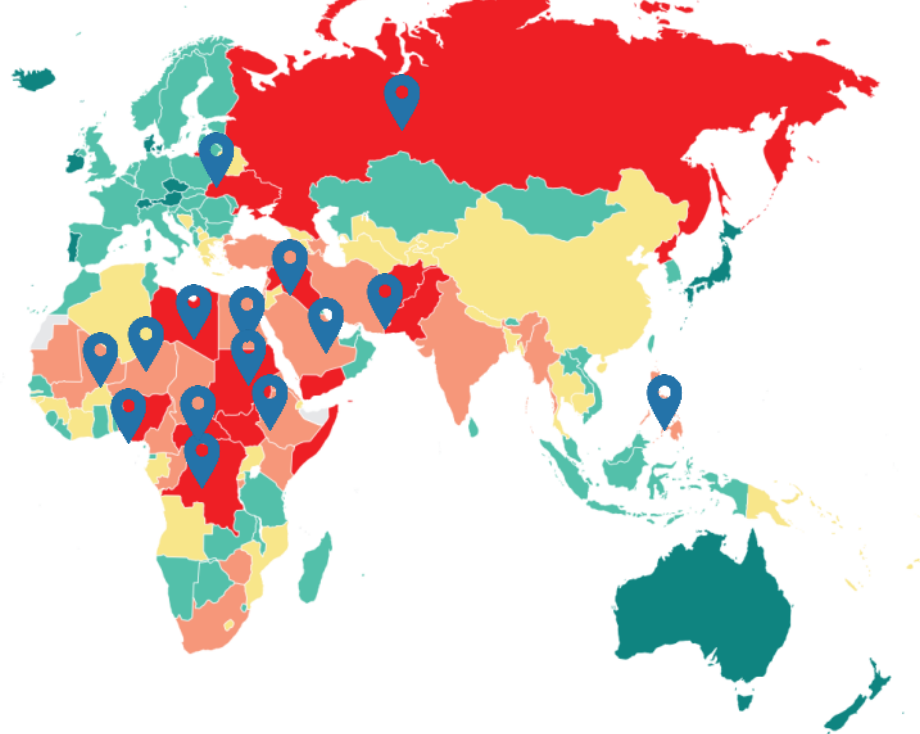
A SNAPSHOT OF THE
GLOBAL STATE OF PEACE

THE STATE OF PEACE



The Global Peace Index, produced by the Institute for Economics & Peace (IEP), ranks 163 countries (99.7% of the world's population) according to 23 qualitative and quantitative indicators of peace.

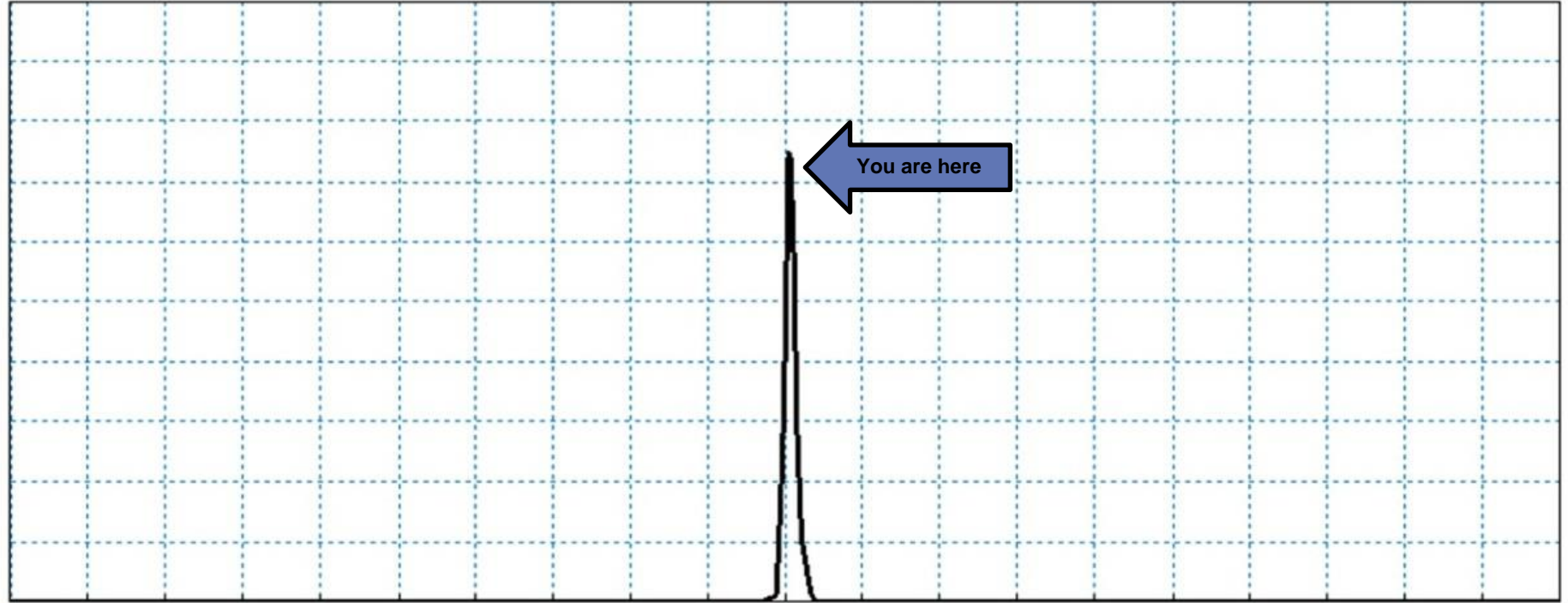
See the full list of rankings and explore the data on the interactive map at visionofhumanity.org. Click on a country to see the levels of peacefulness, compare two or more countries and use the timeline to see the changes in levels of peacefulness since 2008.



The GTI is developed by the Institute for Economics & Peace, an independent, non-partisan, non-profit think tank dedicated to shifting the world's focus to peace as a positive, achievable and tangible measure of human wellbeing and progress.

IEP is headquartered in Sydney, with offices in New York, The Hague, Mexico City and Brussels. It works with a wide range of partners internationally and collaborates with intergovernmental organisations on measuring and communicating the economic value of peace.

**INSTITUTE FOR
ECONOMICS
& PEACE**



Fossil fuel consumption (8000BC to 12000AD)

we burn
500 million years worth of fossil fuels
in 500 years, which means we need to cut

99,9999%

off our consumption to match our use with the earth's
replenishment

Buuuuurn in
the...

A billboard advertisement for South Louisiana Community College (SLCC) featuring a smiling man in a tan work shirt and a black beanie. The text on the billboard reads: "Learn. Burn. Earn. Become a welder." followed by "Gulf Area Campus | GoAbbeville.com" and the SLCC logo. A small disclaimer at the bottom states: "Sponsored by Carl D. Perkins, South Louisiana Community College does not discriminate on the basis of race, national origin, sex, disability, or age in its programs and activities. The following person has been designated to handle inquiries regarding the nondiscrimination policy: Ms. Counselor Kimberly Lachry, 1101 Bertrand St., Lafayette, LA 70506." The billboard is mounted on a metal structure with a "LAMAR" sign on the left side.

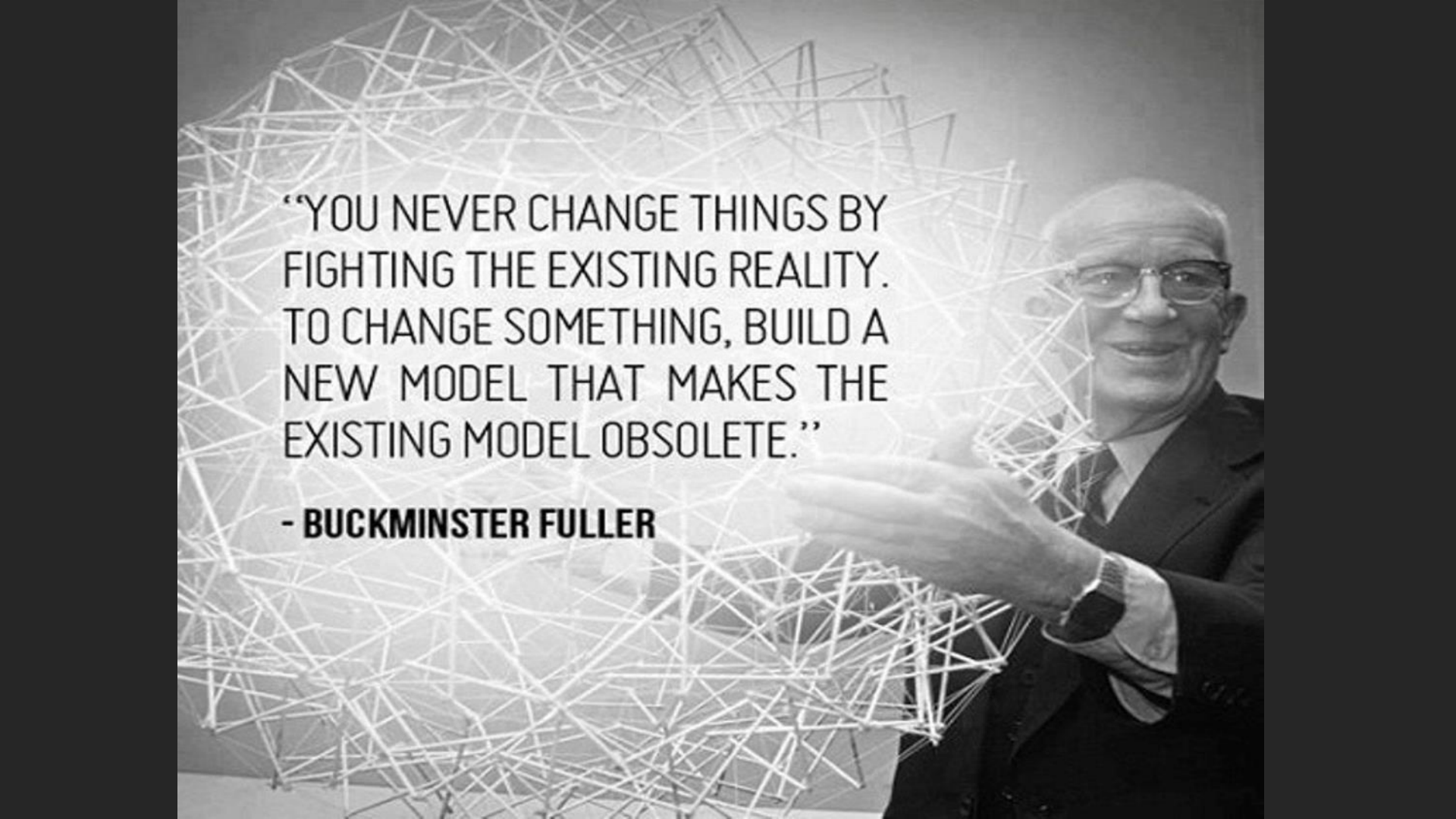
Learn. Burn. Earn.
Become a welder.

Gulf Area Campus | GoAbbeville.com

SLCC
SOUTH LOUISIANA COMMUNITY COLLEGE

Sponsored by Carl D. Perkins, South Louisiana Community College does not discriminate on the basis of race, national origin, sex, disability, or age in its programs and activities. The following person has been designated to handle inquiries regarding the nondiscrimination policy: Ms. Counselor Kimberly Lachry, 1101 Bertrand St., Lafayette, LA 70506.

LAMAR



“YOU NEVER CHANGE THINGS BY
FIGHTING THE EXISTING REALITY.
TO CHANGE SOMETHING, BUILD A
NEW MODEL THAT MAKES THE
EXISTING MODEL OBSOLETE.”

- **BUCKMINSTER FULLER**

Volume to Value

Assets to Access

4 movements shaping the next
economy
all driven by digitalization

Scarcity to Abundance

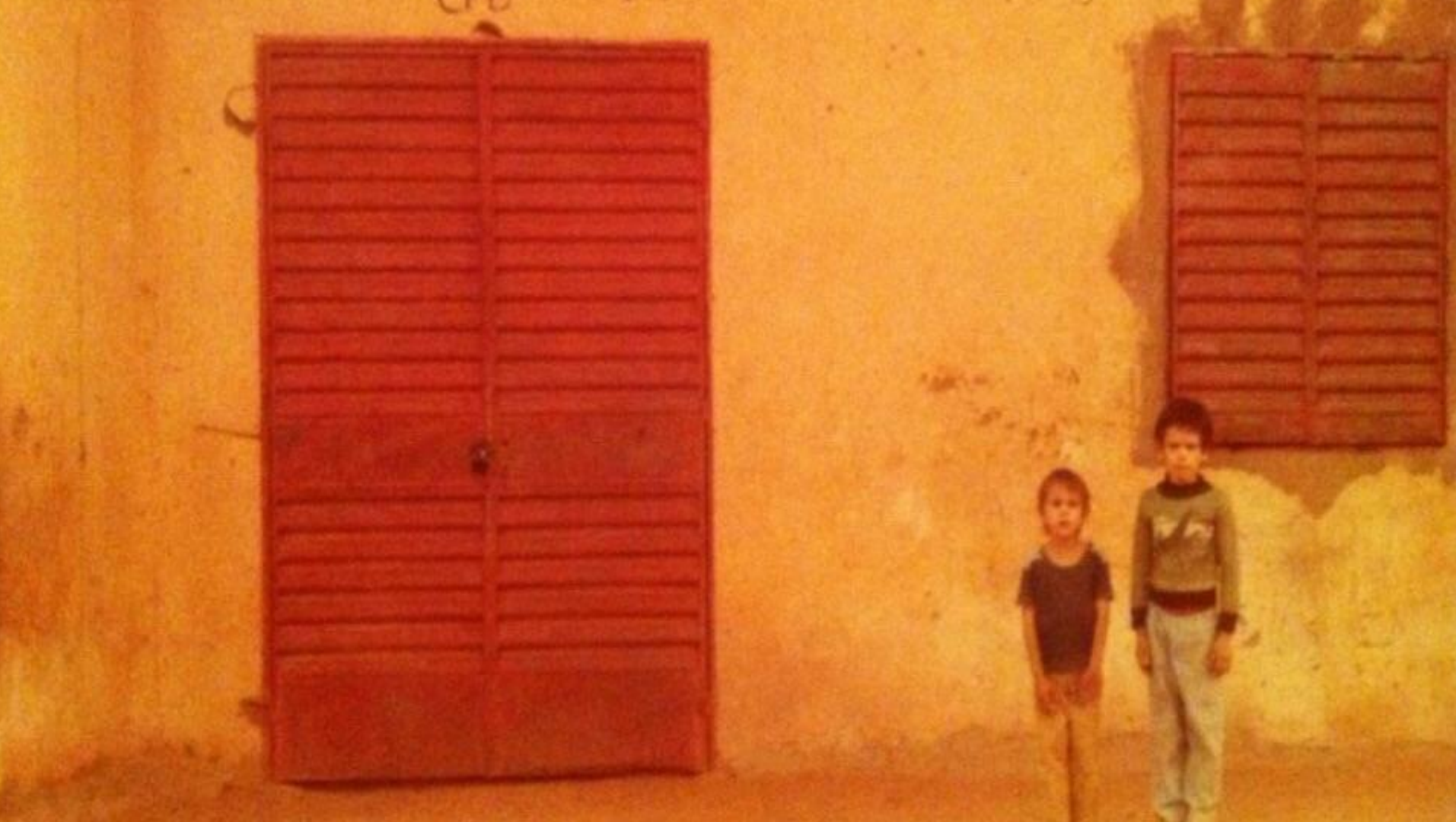
Consumer to Prosumer

A photograph showing a black and red motorcycle parked on reddish-brown soil. Behind the motorcycle are two large, rectangular solar panels with a grid pattern, leaning against a wall made of thick, brown thatch. The text "how Africa leads the way" is overlaid in white, sans-serif font across the middle of the image.

how Africa leads the way

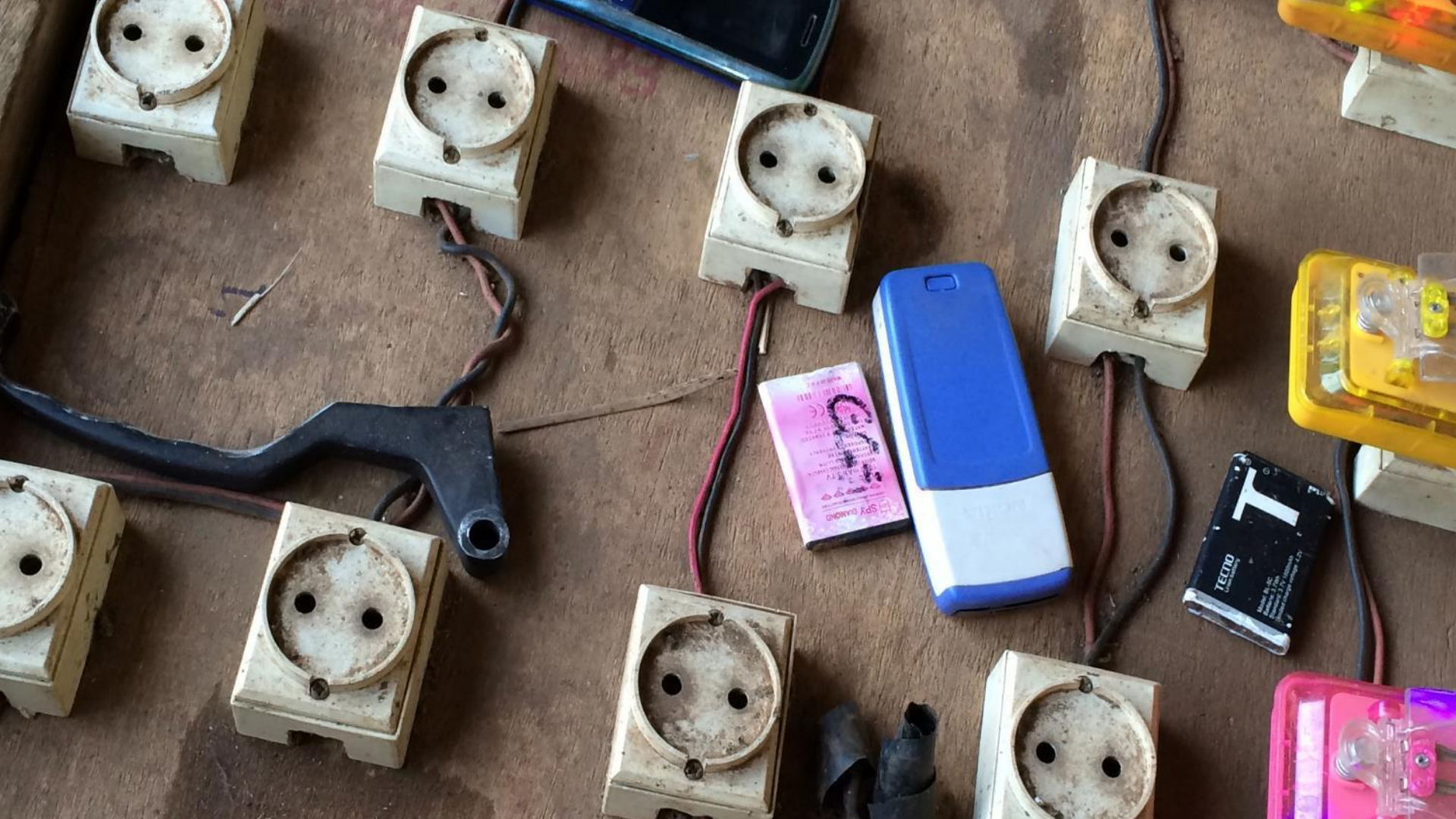


TENDERBOM













GS COMMUNICATIONS LTD NYANDO RADIO/TV REPAIR

mPESA

n

PESA

NYANDO
ELECTRONICS

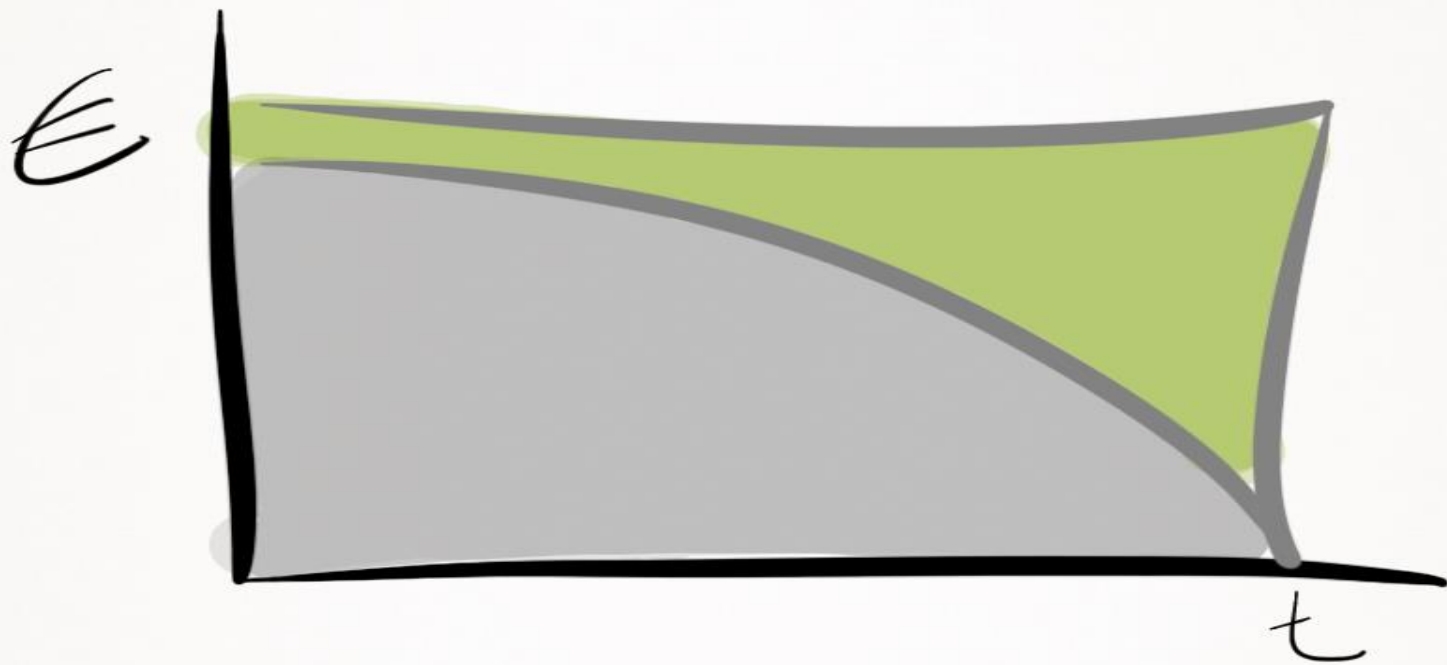
RADIO, TV AMP, &
0723-

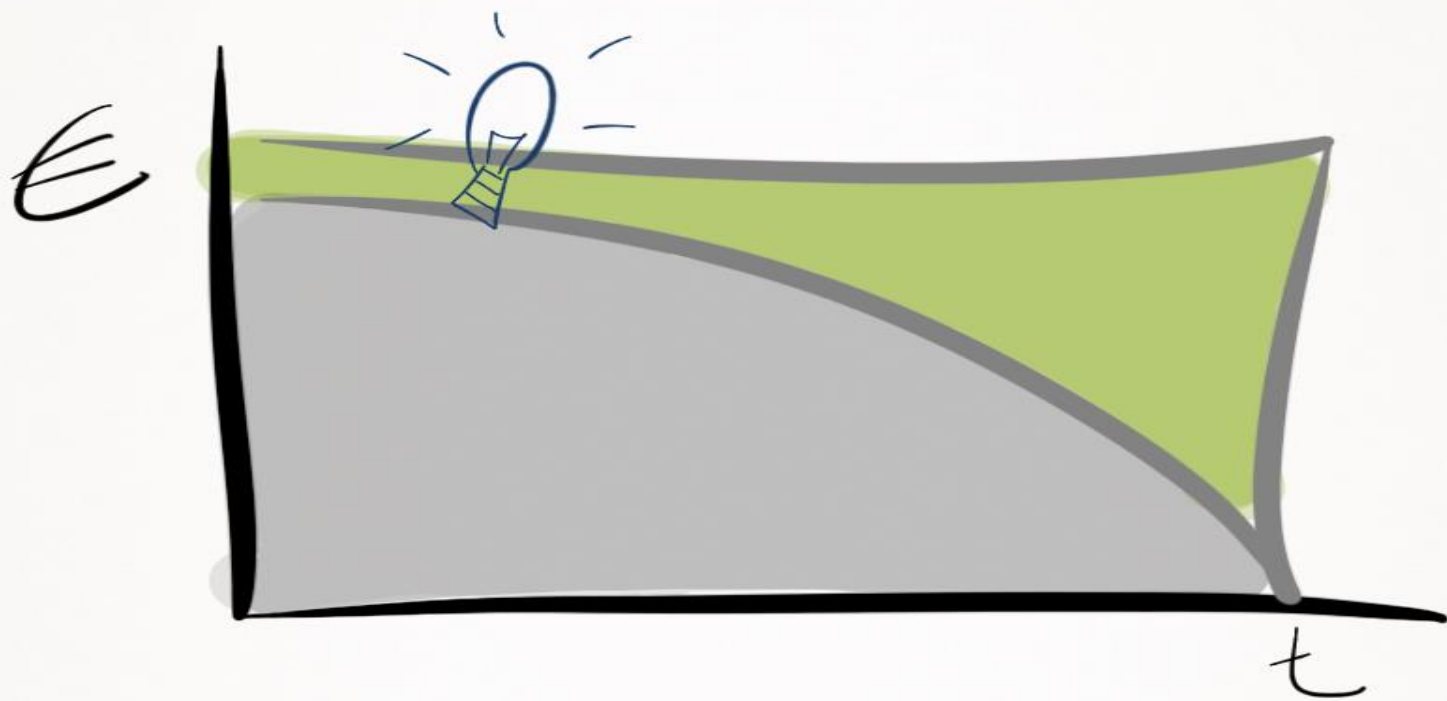
WATCH C
PLACEM
CHARGE
AVAILABLE

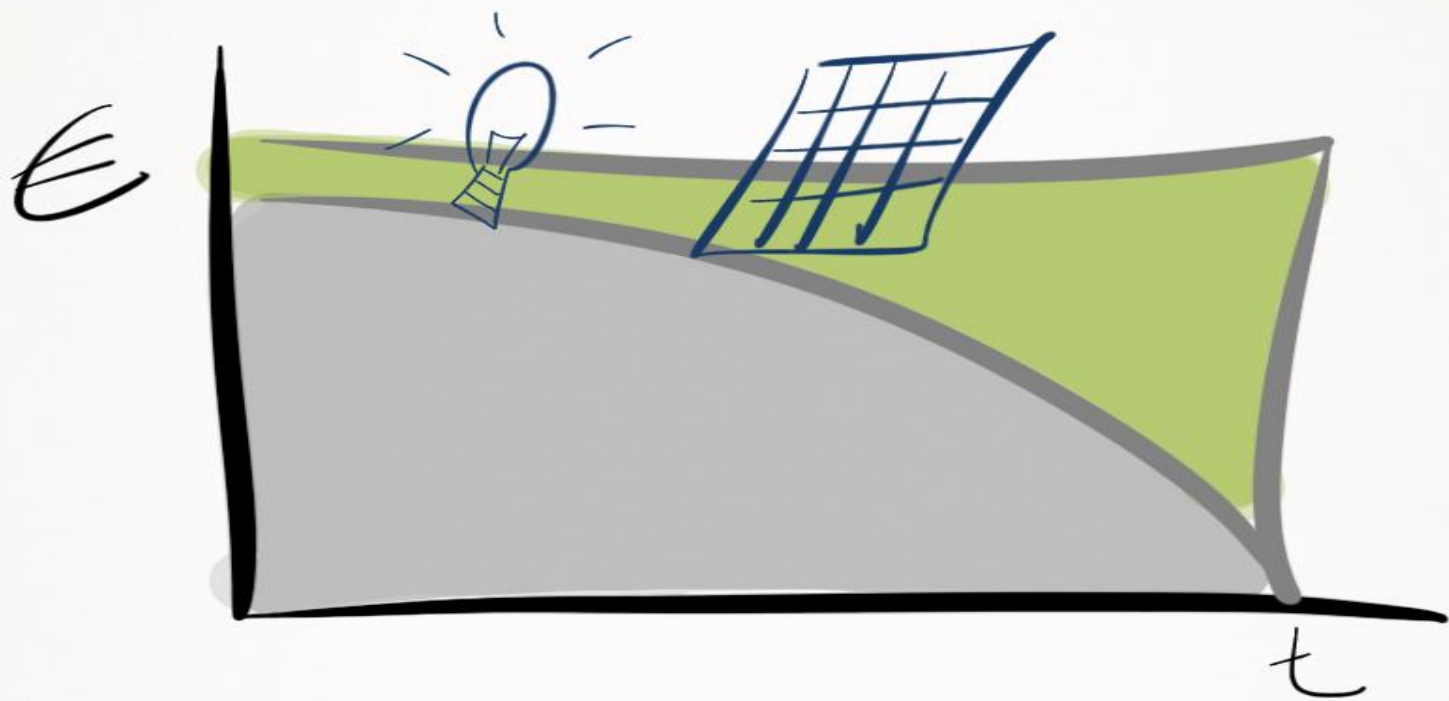
The background image shows a large, industrial-style event space, possibly a warehouse or a modern concert hall. The room is filled with people, some standing and some sitting. The lighting is a mix of bright blue and deep purple, creating a dynamic and energetic atmosphere. There are several beams of light shining across the room, and a DJ booth is visible on the right side. The overall scene suggests a high-profile event or concert.

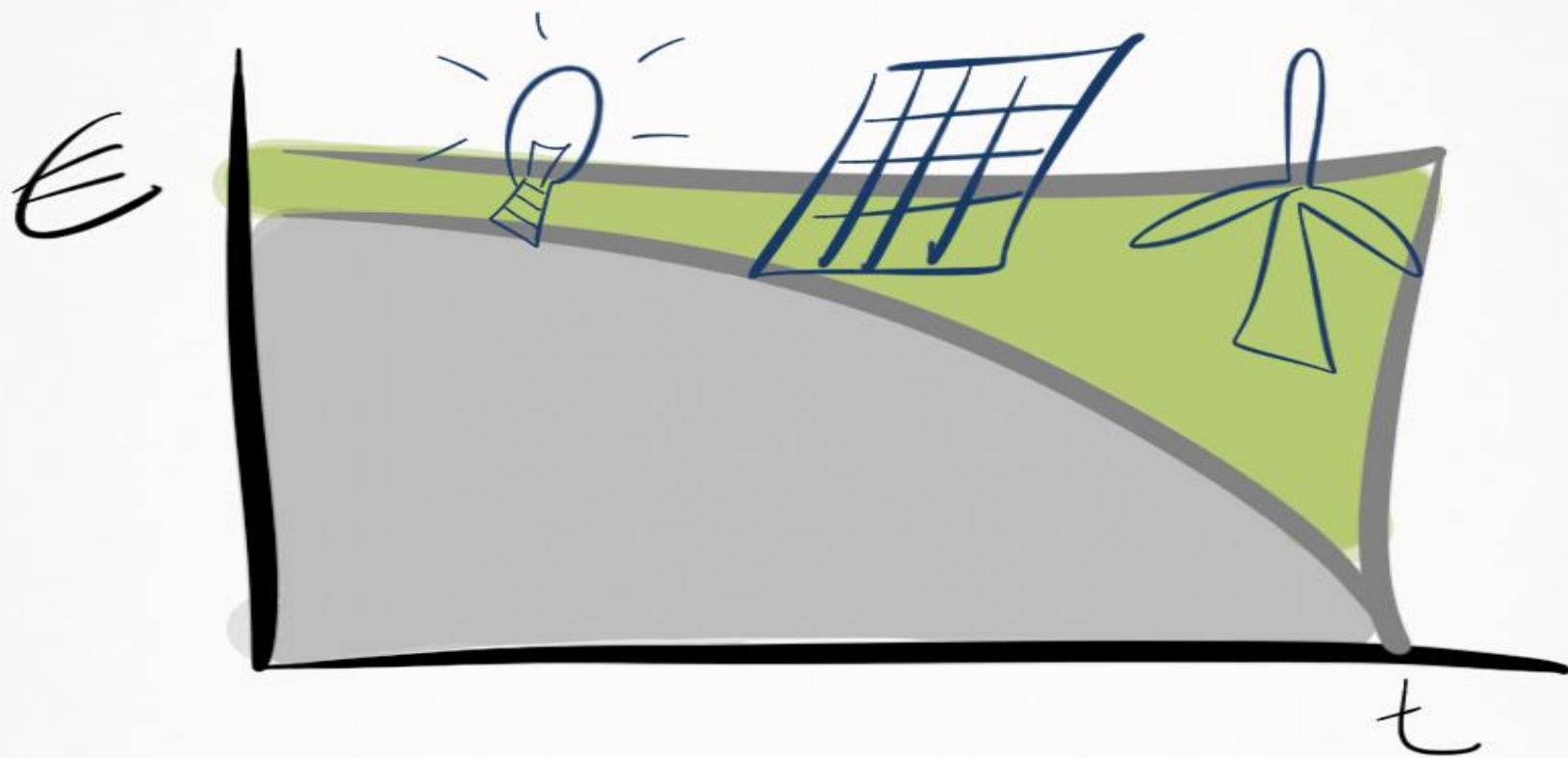
Path to Zero

how the energy transition can finance itself









from volume to value



Internet of Energy

...when everything is connected

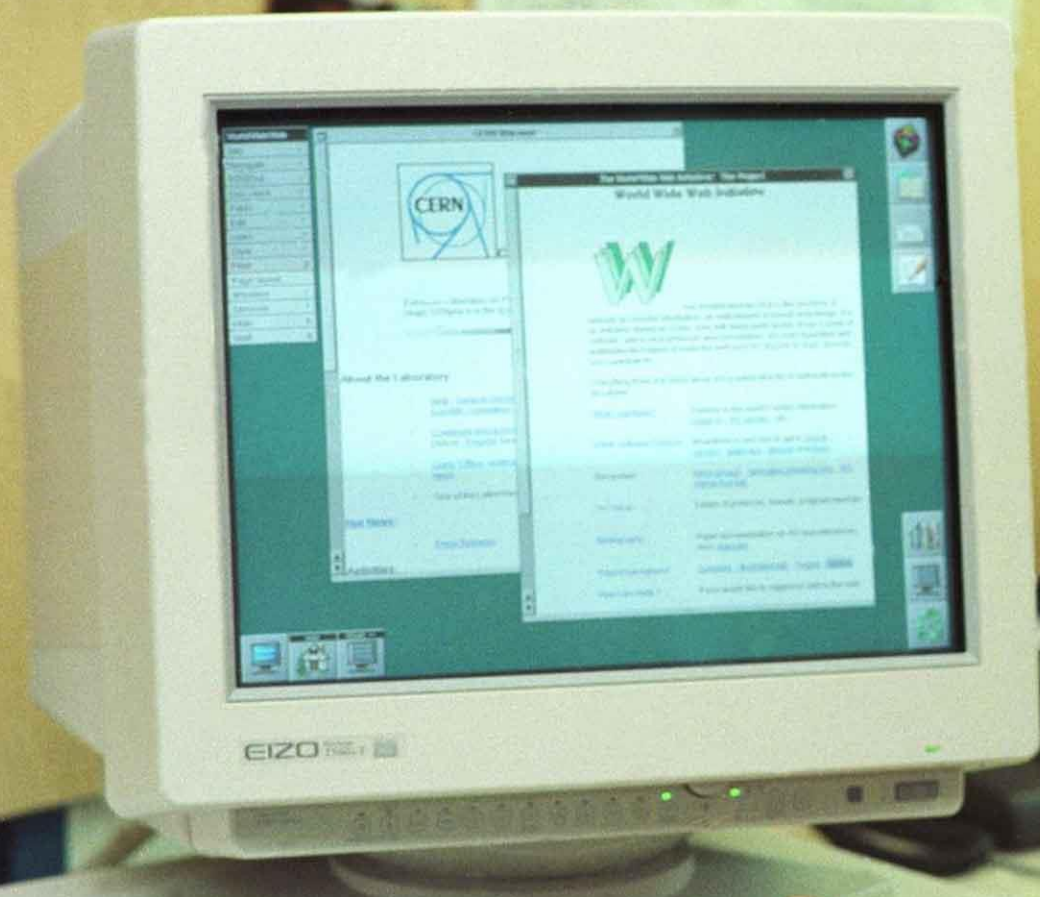


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the birth of the web



http

TCP/IP

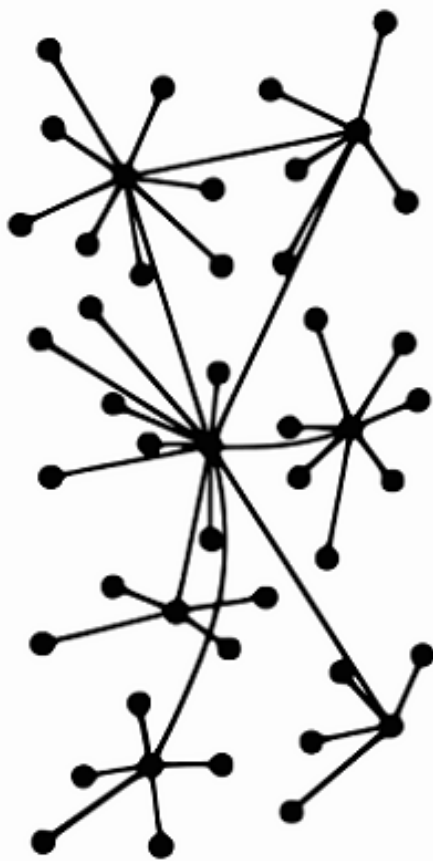
WWW

HTML

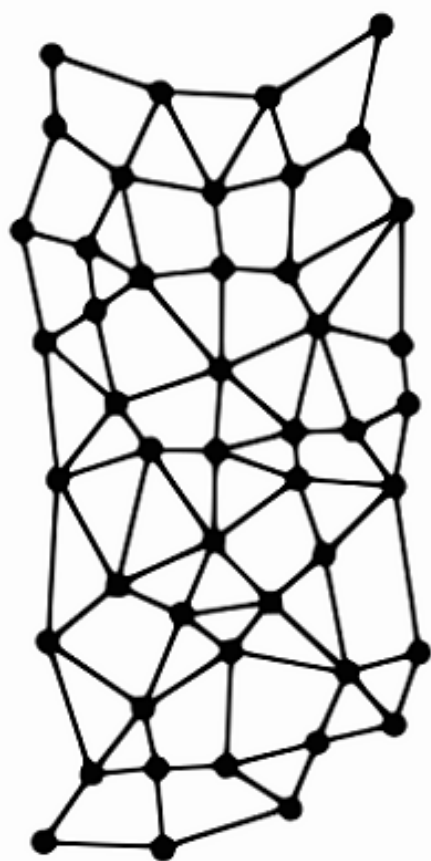
DNS



Centralized



Decentralized



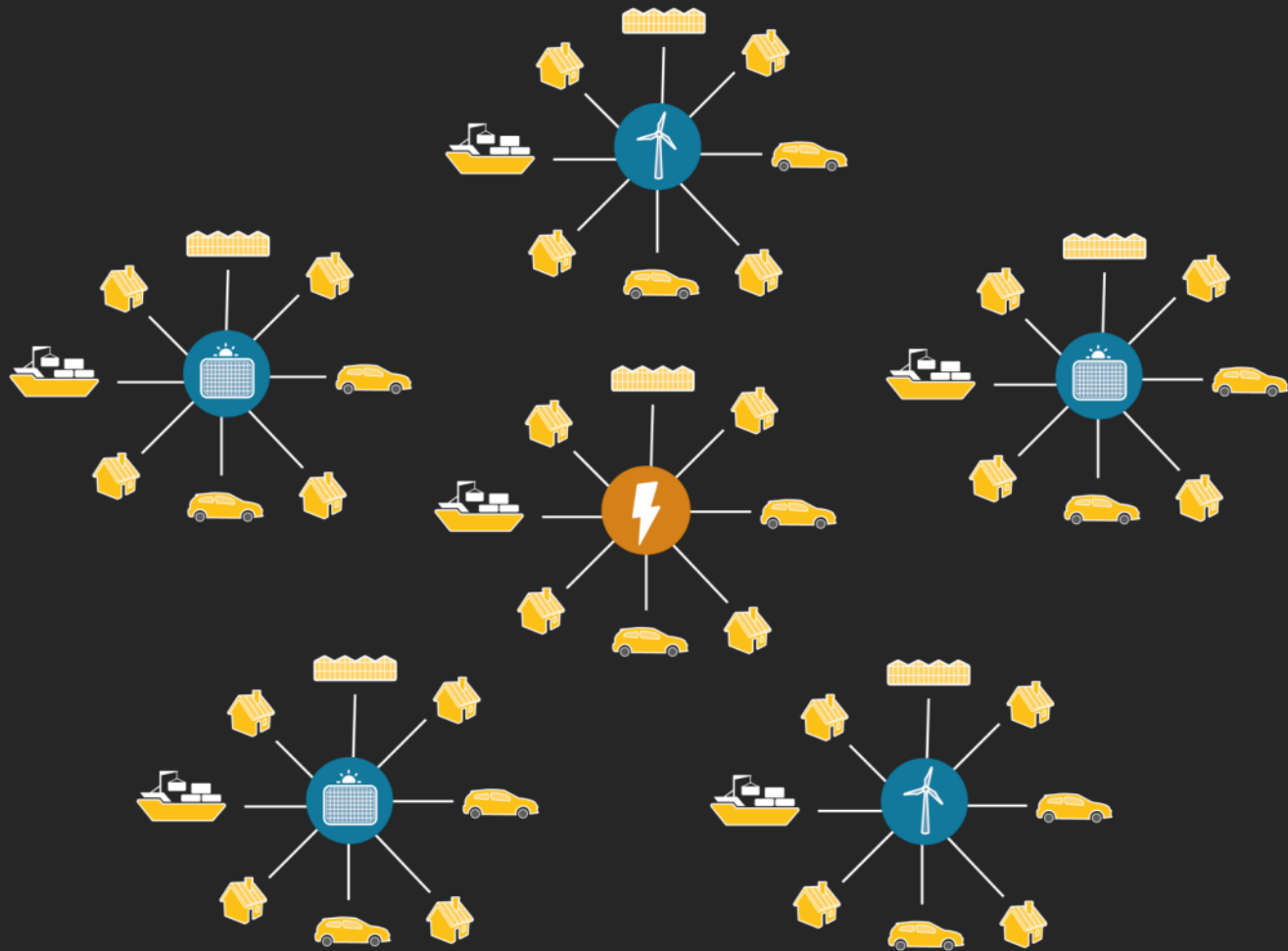
Distributed

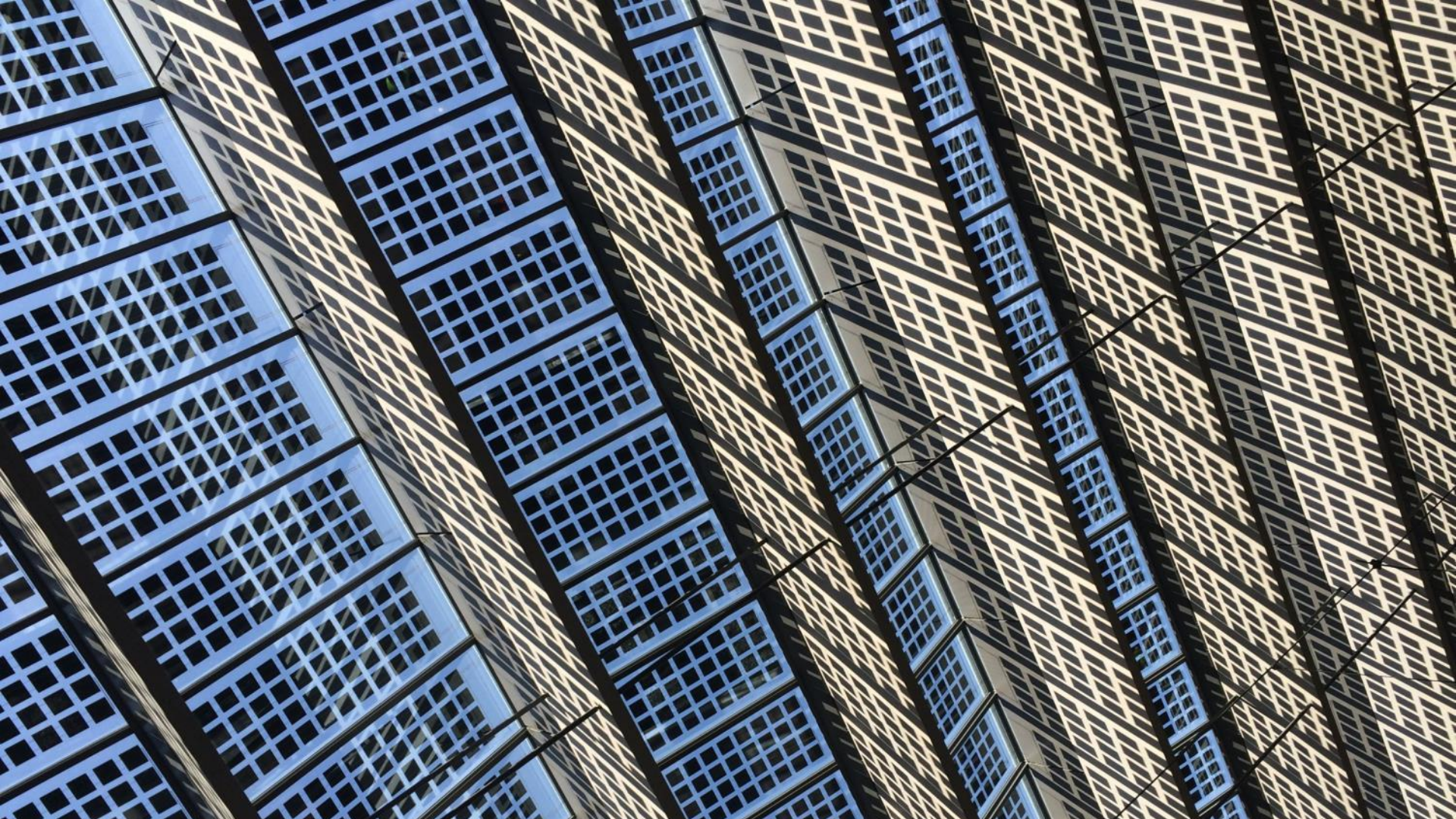


prosumer









peer to peer

self-balancing



multi-carrier

distributed

“all connected machines will exchange
energy with one another...

...peer to peer, from a multitude of resources, in
every suitable form, over self-balancing grids”

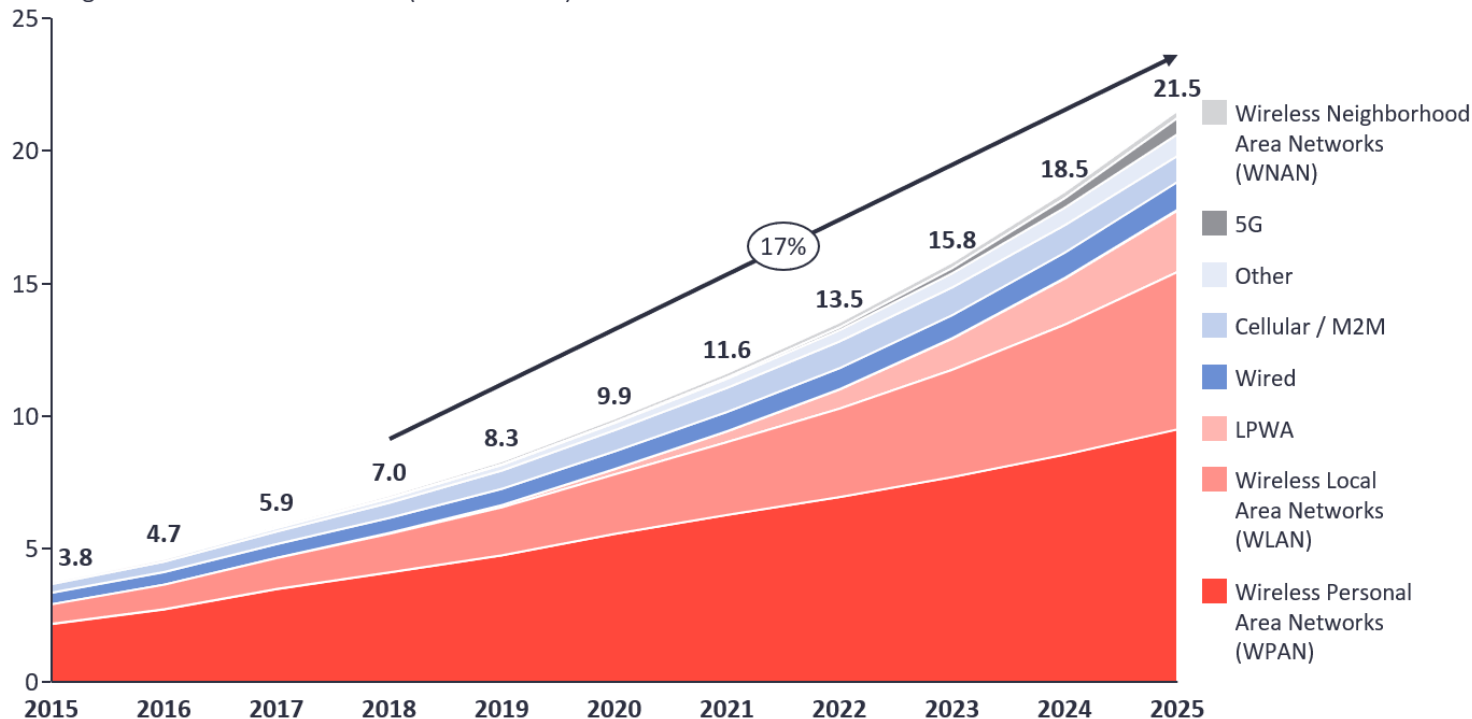
What does this mean?

Huge market for AI, sensorics and IoT in the energy sector:

- IoT in energy 2018-2024: +\$ 20,5 Bn, CAGR >17% (*Mordor Intelligence*)
- AI in energy 2019-2023: +\$ 6,1 Bn, CAGR 49% (*TechNavio*)
- From smart home energy management systems...
- ...to self balancing artificially intelligent energy grids

Global Number of Connected IoT Devices

Number of global active IoT Connections (installed base) in Bn



Note: IoT Connections do not include any computers, laptops, fixed phones, cellphones or tablets. Counted are active nodes/devices or gateways that concentrate the end-sensors, not every sensor/actuator. Simple one-directional communications technology not considered (e.g., RFID, NFC). Wired includes Ethernet and Fieldbuses (e.g., connected industrial PLCs or I/O modules); Cellular includes 2G, 3G, 4G; LPWAN includes unlicensed and licensed low-power networks; WPAN includes Bluetooth, Zigbee, Z-Wave or similar; WLAN includes Wi-fi and related protocols; WWAN includes non-short range mesh; Other includes satellite and unclassified

Source: IoT Analytics Research 2018

What does this mean?

Smart Multi Commodity Grids

- Interoperable smart grids for electrons, molecules, heat and photons
- Everything is bidirectional
- Data traffic is integrated with energy traffic
- No more discrepancies between data reality and physical reality, no more “fake green” – WYSIWYG
- From a virtual union to a physical union

PATCHES

- Productieplatform
- Boorpunt
- Waterstofproductieplatform
- Windturbines
- Warmte-installaties
- Biomassa
- Mariene biomassaproductie
- Biomassaproductie
- Zonneparken
- Geothermie
- Oppervlaktewater
- Waterstofcentrale
- Energie-opslag (batterijen)

Wijk cluster van energie-infrastructuur

- Historische binnenstad (moleculen dominant)
- Vooroorlogse wijken (warmte 90 C)
- Naoorlogse wijken (warmte 60 C)
- 1975 - 1990 (warmte 40 C met extra isolatie)
- 1990 - huidig (warmte 40 C)
- Bedrijventerrein (elektronen dominant)

BACKBONES

- BIO-brandstoffen
- Elektriciteit
- Waterstof
- CO2 Opslag
- Geothermische boringen
- Regionaal elektriciteitsnetwerk
- Internationaal elektriciteitsnetwerk
- Thermische pijplijn
- Waterstof pijplijn
- Biobrandstoffen pijplijn
- Bio-naphtha pijplijn
- Aanvoer CO2
- Biobased industrie
- Industrie cluster

DELTA GRID 2050

...everything comes together

(Download our reports on <http://kamangir.eu/publications>)

What does this mean?

Energy as a currency

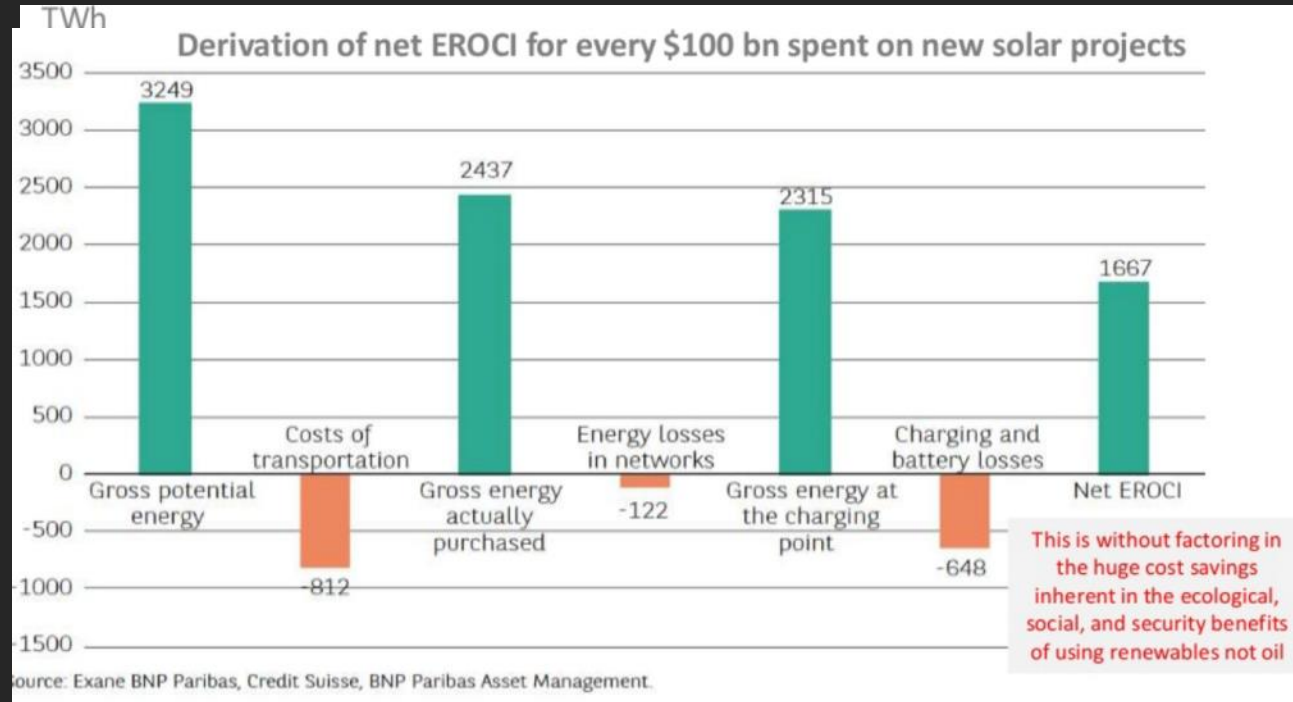
- Energy does not represent monetary value, but physical value
- Every unit spent yields a tangible result
- Renewable resources: zero marginal production cost
- With abundant resources, the power to create currency is democratized
- Like data on the internet, capacity and reliability will define pricing
- ROI becomes less relevant, EROEI becomes more relevant
- Energy operators are the banks of the future,
non-speculative, universal exchangers of value
that everyone can create or use

ROI – EROCI – EROEI: BNP Paribas takes a lead

ROI - Return on (capital)
Investment

EROCI – Energy Return
on Capital Invested

EROEI – Energy Return
on Energy Invested



*BNP Paribas report - Wells, Wires and Wheels,
aug 2019*

What does this mean?

The entire game is changing

- We need new market models
- New energy laws
- New ideas on the valuation of energy
- New investment decision making parameters
- Three basic freedoms for every user:
connection, production & trade, dispatch
- New governance: what is fair, what is inclusive, what is ethical?
- New models that make the old obsolete



INTERNET
OF
ENERGY

“on the IoE energy will be abundant and
priceless...
...like data on the internet”

from scarcity to abundance

SUNGLACIER





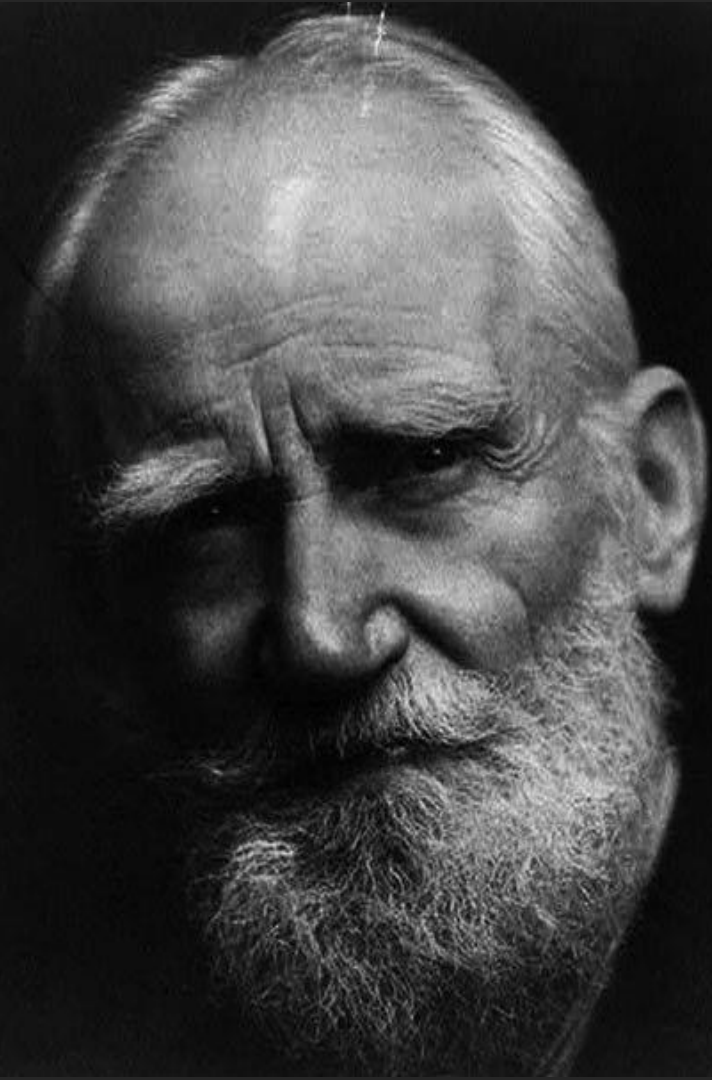




my dream:
universal access to clean, renewable
energy as a fulfilled human right

The reasonable man adapts himself to
the world: the unreasonable one
persists in trying to adapt the world to
himself. Therefore all progress depends
on the unreasonable man.

George Bernard Shaw



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