

The Future Coming At Us

Kaila Colbin
Co-founder, Boma Global



Who will win the presidency?



Chance of winning

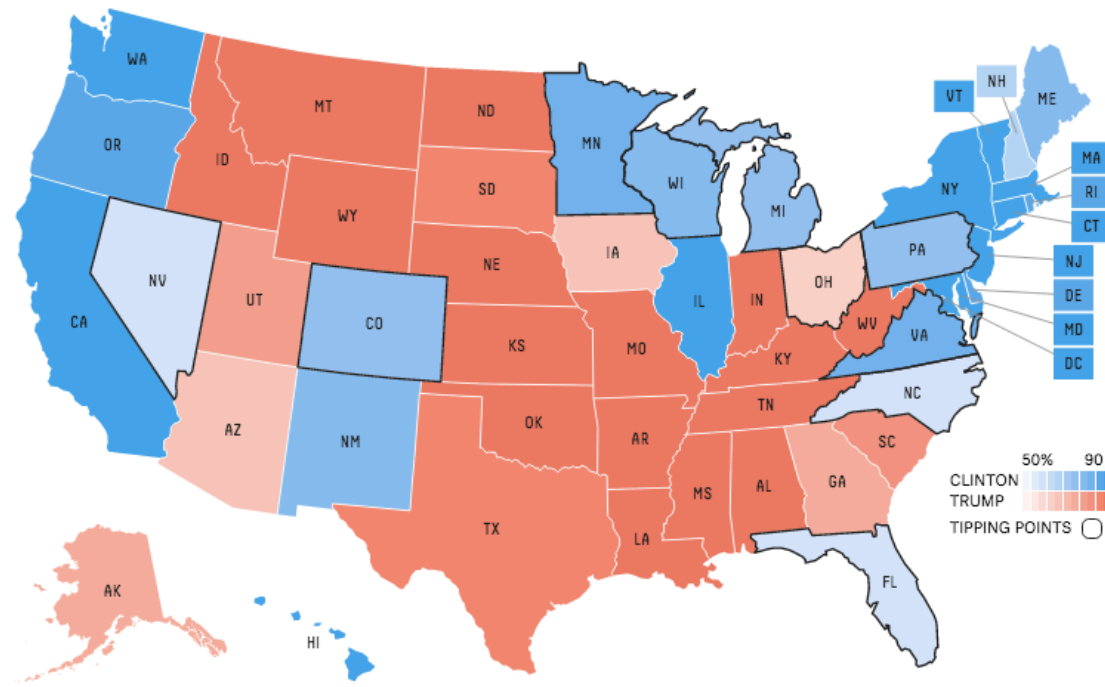


Hillary Clinton

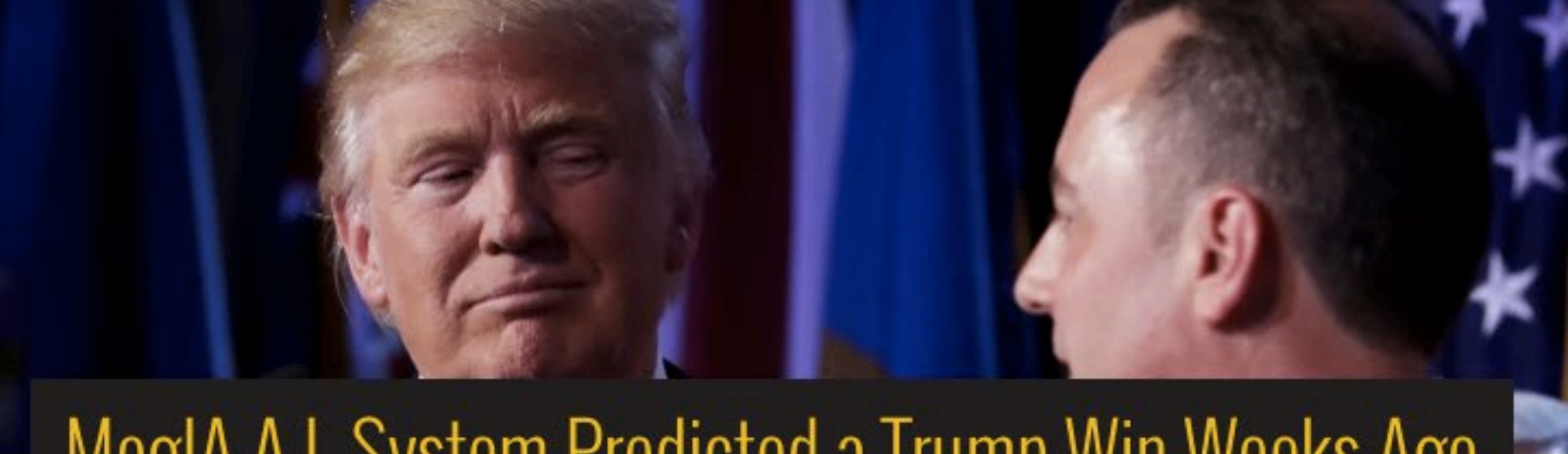
71.4%

Donald Trump

28.6%







MogIA A.I. System Predicted a Trump Win Weeks Ago

Mike Brown | Election 2016 | November 9, 2016

It's fair to say pundits did not expect [Donald Trump](#) to win the presidency. Even after polls began to close Tuesday, [Hillary Clinton](#) remained the favorite. *FiveThirtyEight* gave Trump a 31 percent chance of winning, one of the highest



“Ray Kurzweil” by Humanity+ is licensed under CC BY 2.0

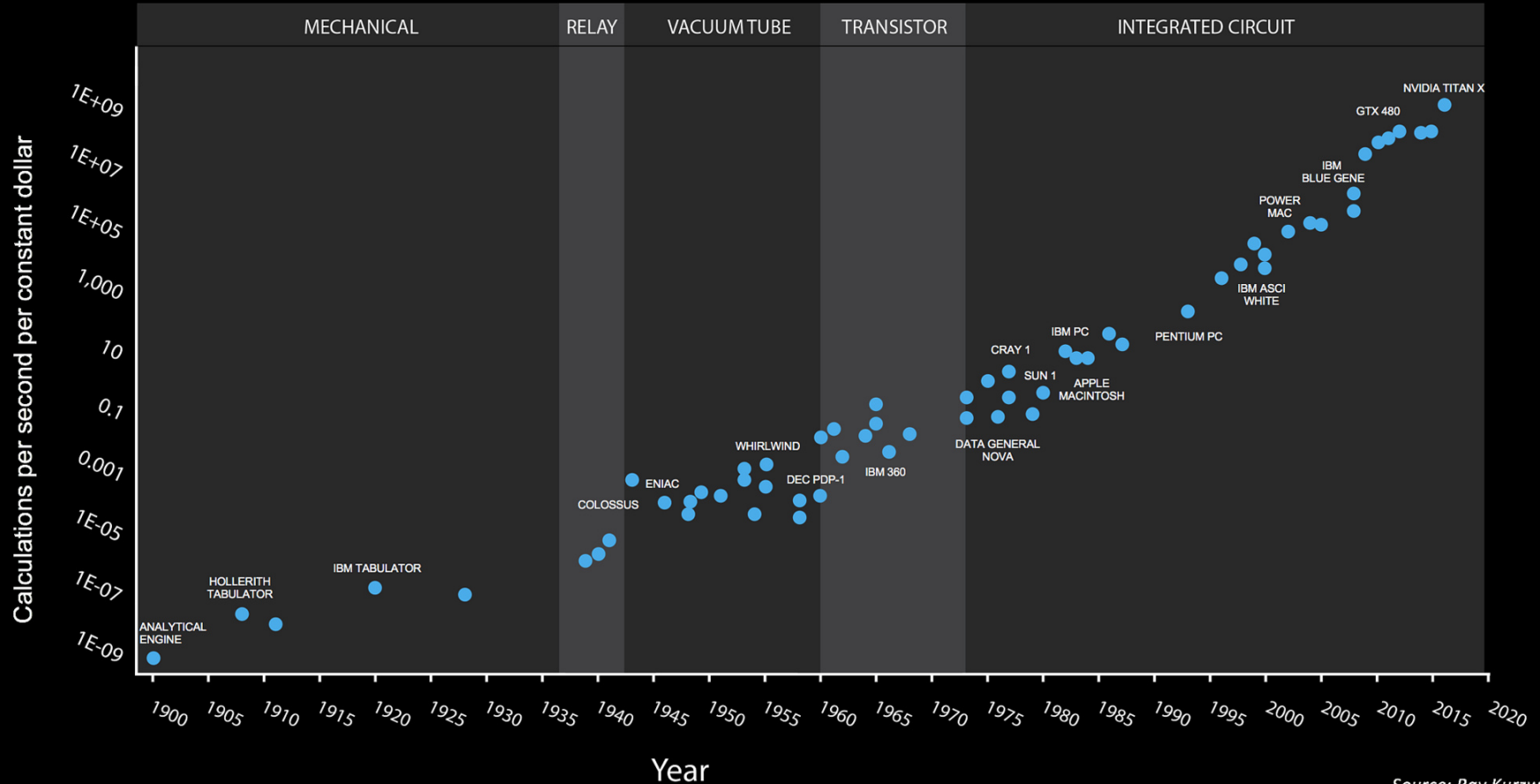
3 insights



"Gordon Moore" by OnInnovation is licensed under CC BY ND 2.0

Insight #1:
It's not about
the transistors

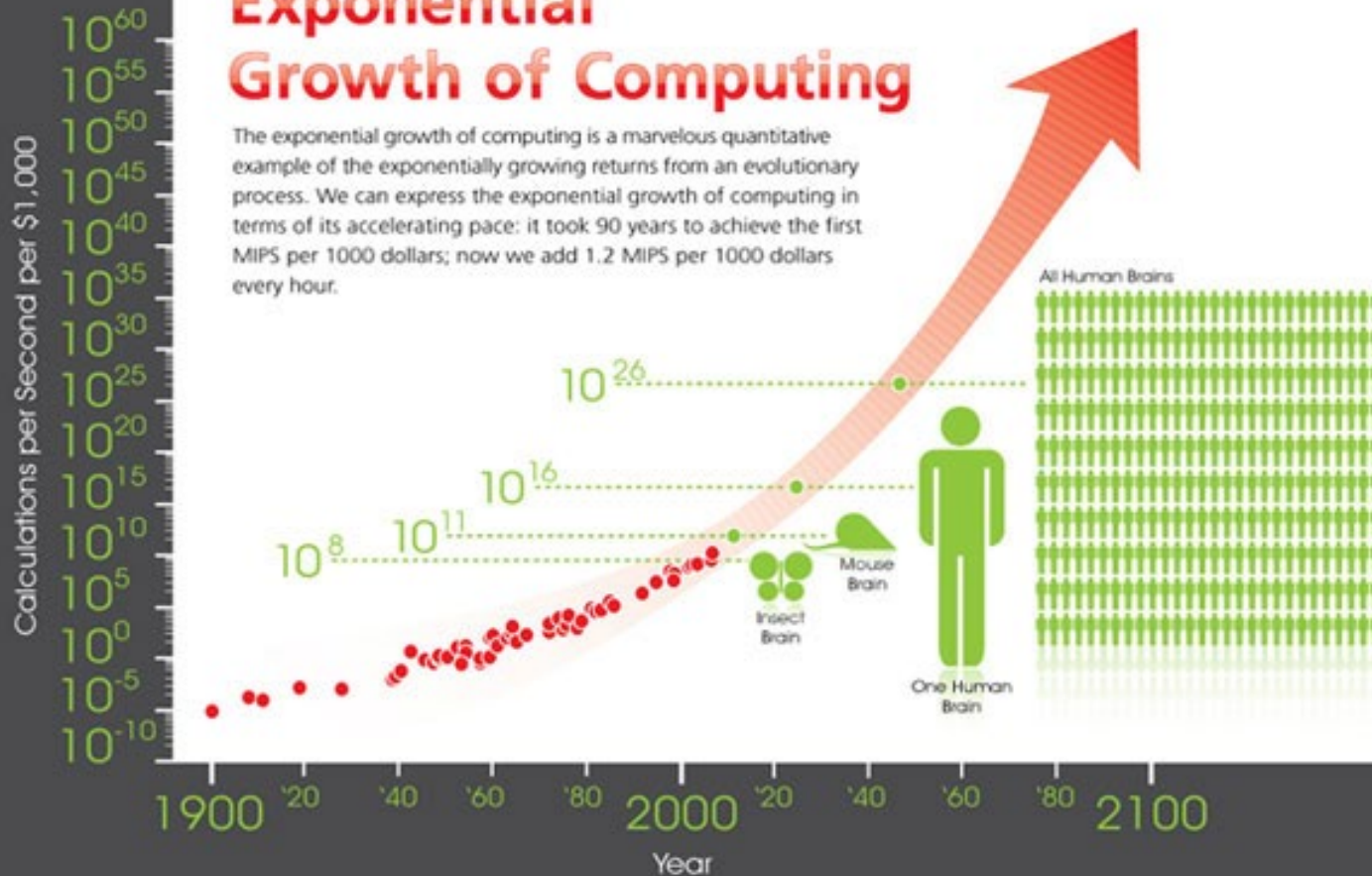
120 Years of Moore's Law



Law of Accelerating Returns

Exponential Growth of Computing

The exponential growth of computing is a marvelous quantitative example of the exponentially growing returns from an evolutionary process. We can express the exponential growth of computing in terms of its accelerating pace: it took 90 years to achieve the first MIPS per 1000 dollars; now we add 1.2 MIPS per 1000 dollars every hour.







Insight #2: It's not only computing


Accelerating Technologies

- Computing
- Artificial Intelligence
- Robotics
- Biotech
- Nanotech
- Gene sequencing
- Neuroscience
- Energy

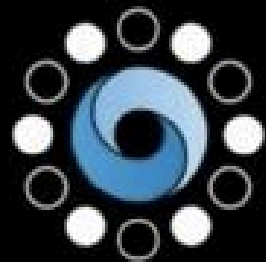
Characteristics of Exponential Growth

- Looks flat for a long time
- Brains not wired for it
- Experts continue to predict linear
- BUT...


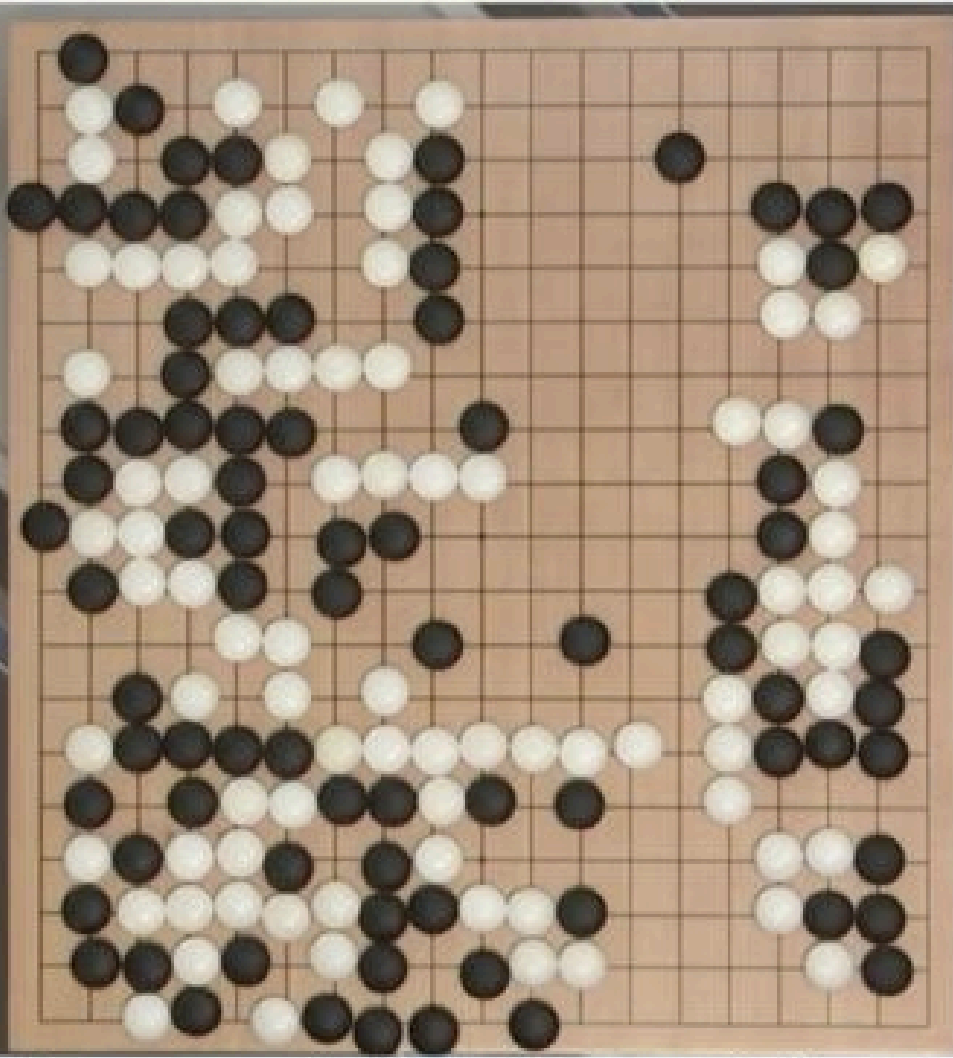
30 linear steps = 30 metres
30 doubling steps = 26 times around the world



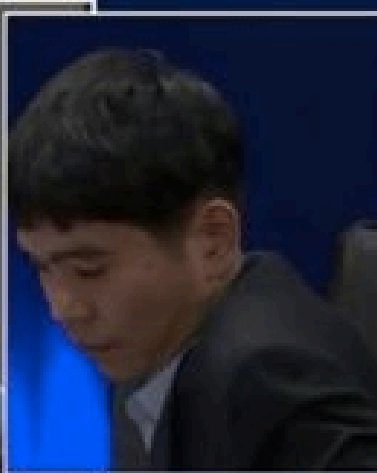
ALPHAGO
00:08:32



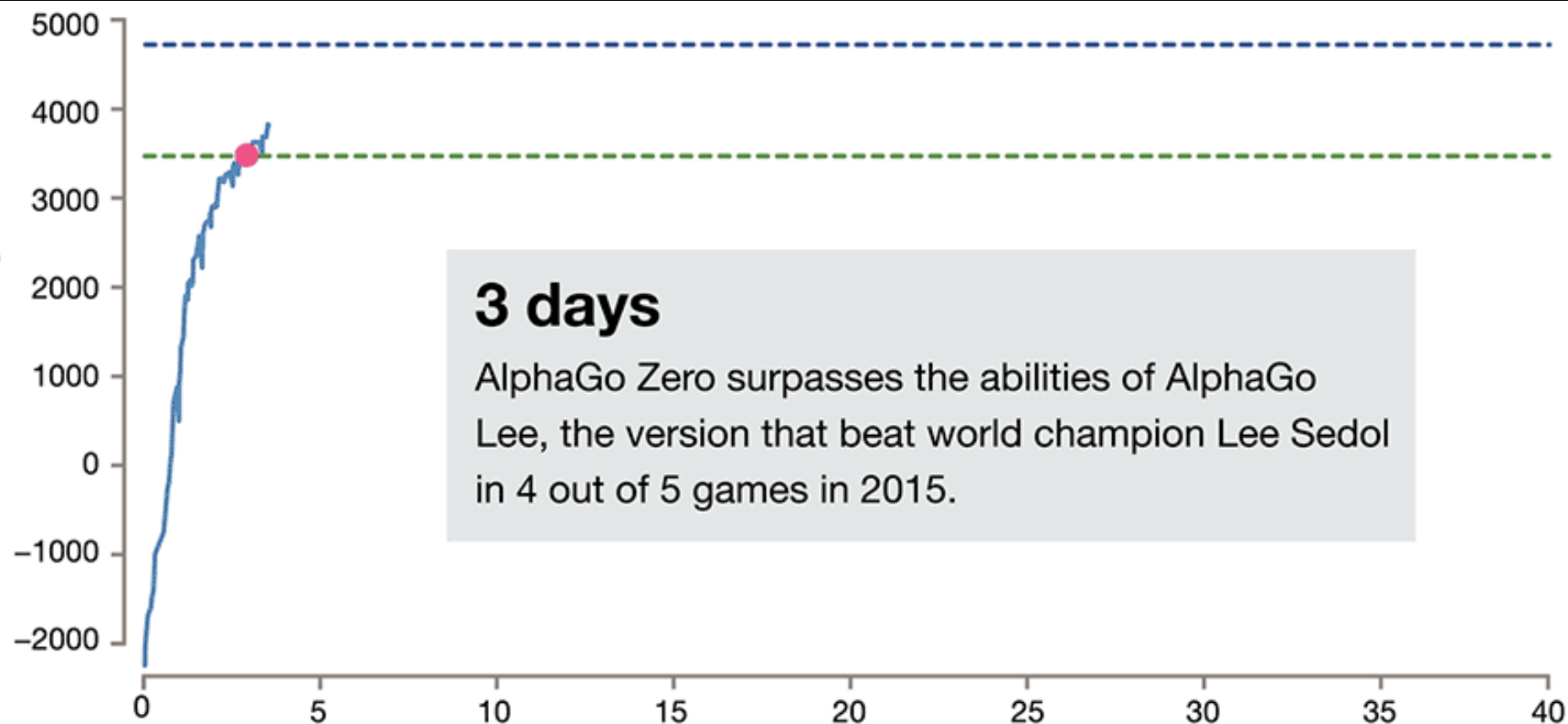
AlphaGo
Google DeepMind



LEE SEDOL
00:00:27



Elo Rating



3 days

AlphaGo Zero surpasses the abilities of AlphaGo Lee, the version that beat world champion Lee Sedol in 4 out of 5 games in 2015.

— AlphaGo Zero 40 blocks AlphaGo Lee AlphaGo Master

Insight #3:
The technologies
are converging

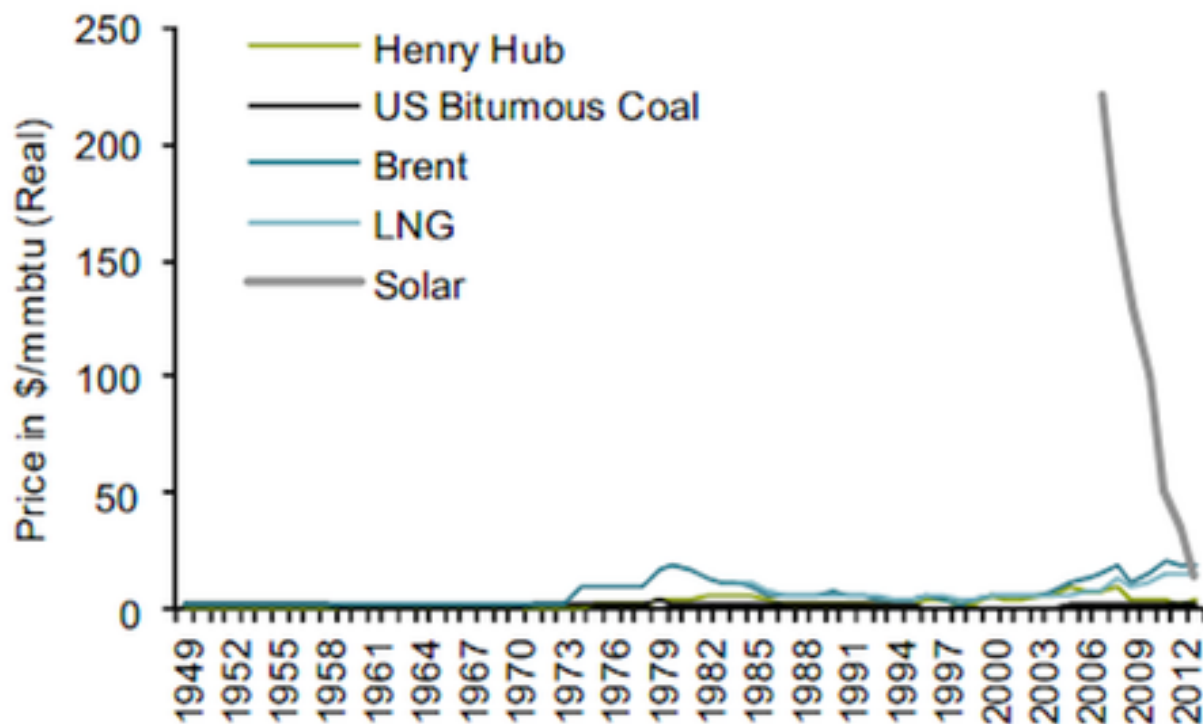
So what does this mean
for energy?

1:

Exponential Generation

Exhibit 2

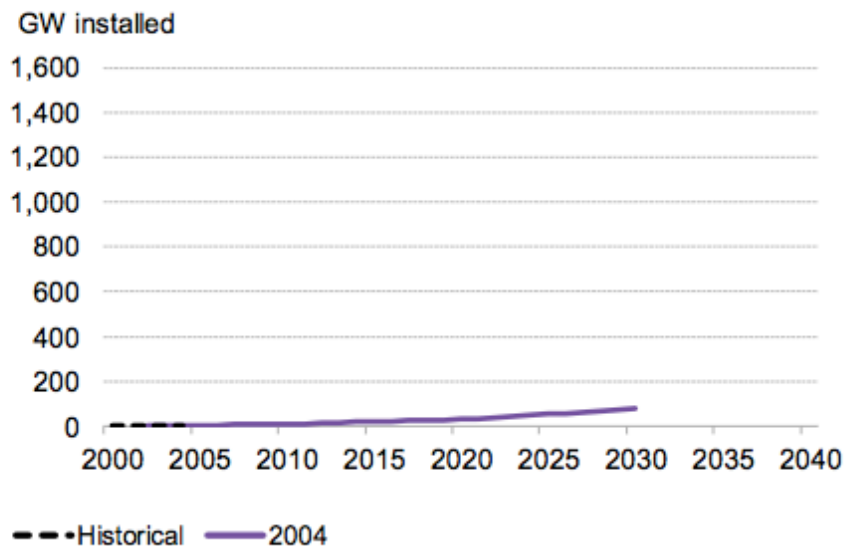
Welcome to the Terrordome... \$/MMBTU by Energy Type



Source: EIA, CIA, World Bank, Bernstein analysis

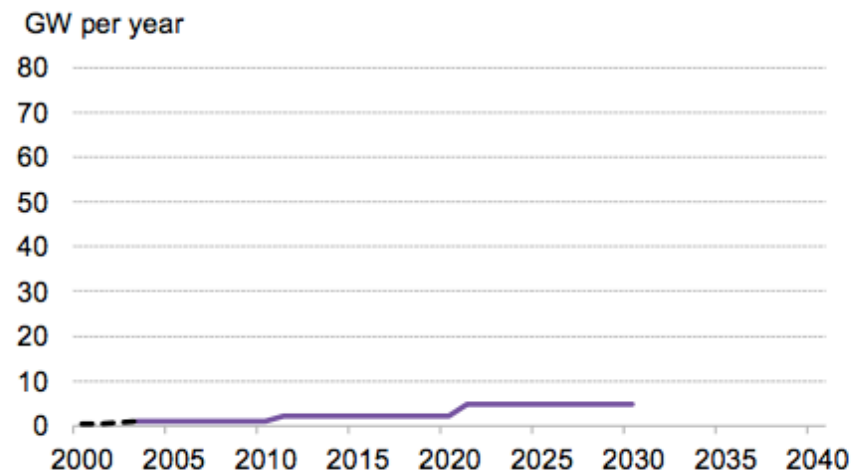
IEA solar capacity forecast evolution

Global cumulative solar installations



Note: 2004-2009 Reference, 2010-2016 New Policies Scenario

Annual solar additions

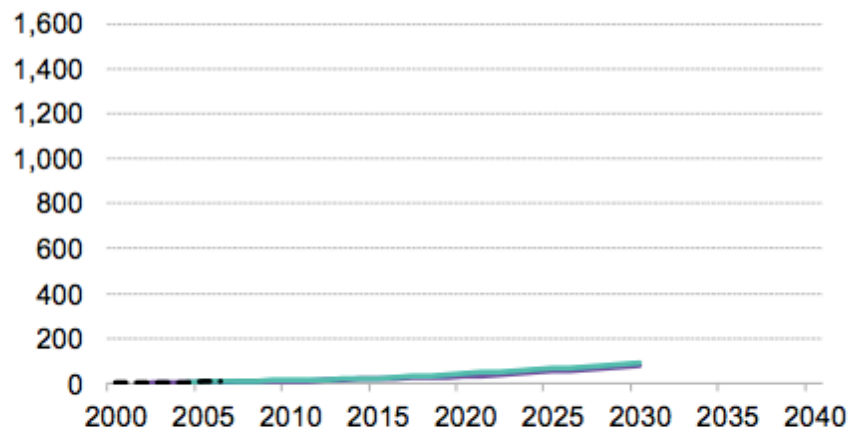


Source: IEA World Energy Outlook

IEA solar capacity forecast evolution

Global cumulative solar installations

GW installed

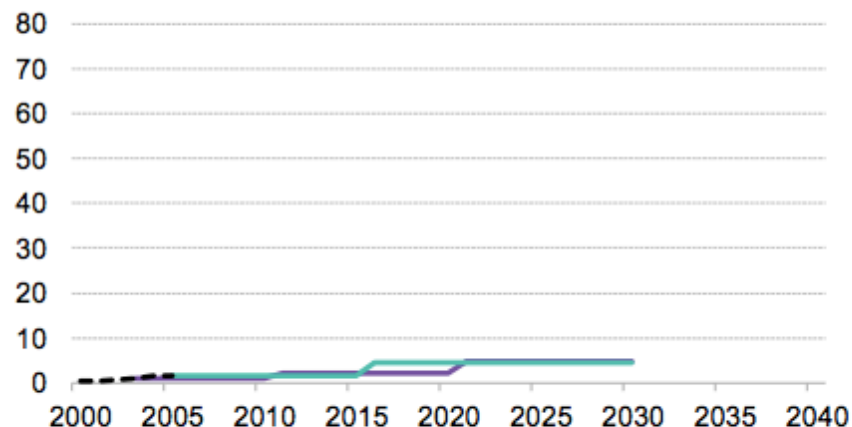


--- Historical 2004 2006

Note: 2004-2009 Reference, 2010-2016 New Policies Scenario

Annual solar additions

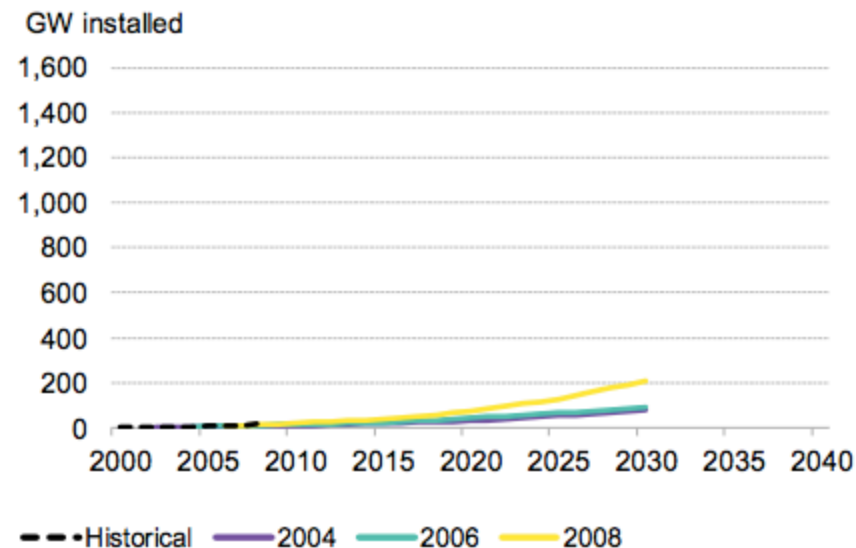
GW per year



Source: IEA World Energy Outlook

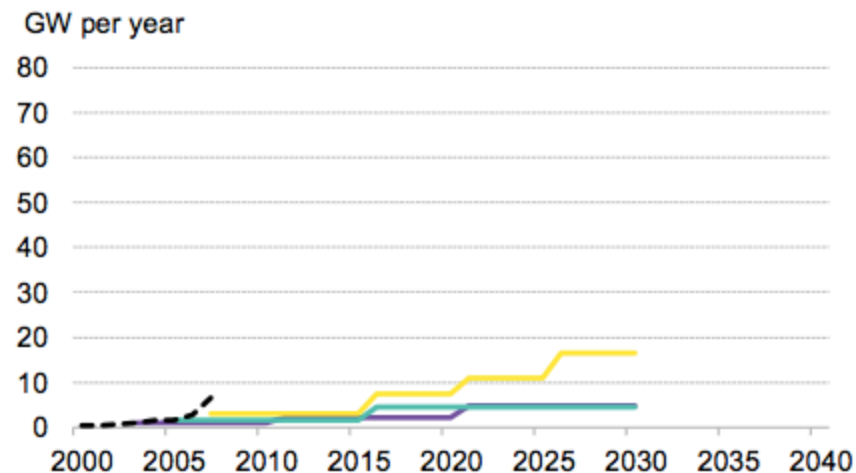
IEA solar capacity forecast evolution

Global cumulative solar installations



Note: 2004-2009 Reference, 2010-2016 New Policies Scenario

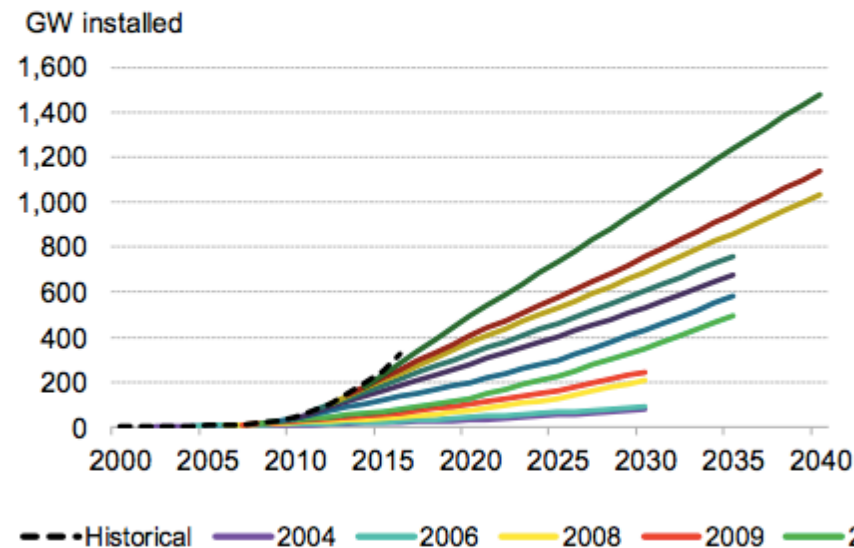
Annual solar additions



Source: IEA World Energy Outlook

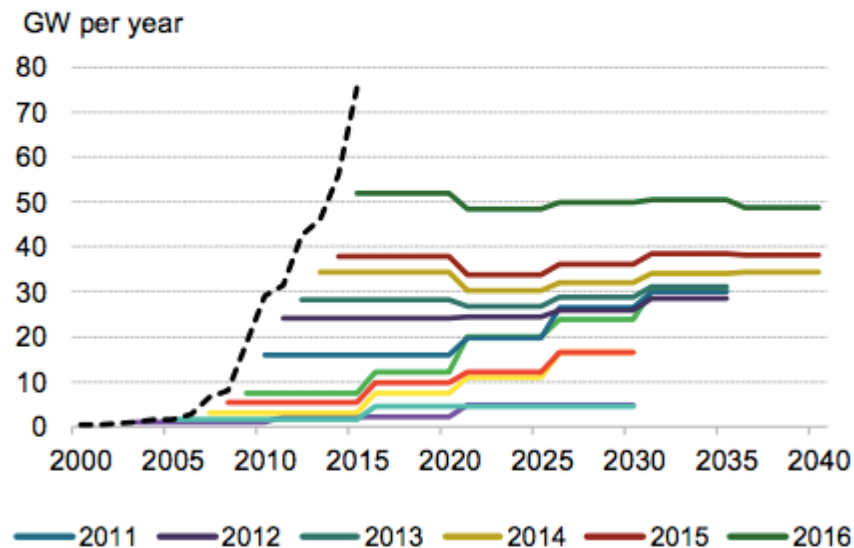
IEA solar capacity forecast evolution

Global cumulative solar installations



Note: 2004-2009 Reference, 2010-2016 New Policies Scenario

Annual solar additions



Source: IEA World Energy Outlook

Unsubsidised clean energy world records 2017

Solar PV



Country: United Arab Emirates
Bidder: Marubeni and Jinko Solar
Signed: 2017
Construction: 2019
Price: US\$ 2.42 c/kWh

Onshore wind



Country: Morocco
Bidder: Enel Green Power
Signed: 2016
Construction: 2018
Price: US\$ 3.0 c/kWh

Offshore wind



Country: Germany
Bidder: DONG/EnBW
Signed: 2016
Construction: 2024
Merchant Price: US\$ 4.9 c/kWh

Source: Bloomberg New Energy Finance; Images Siemens; Wikimedia Commons; Masdar

[Exclusives](#)[EV Reviews](#)[EV News](#)[Tesla News](#)[Electricity](#)[About](#)[Search →](#)

Third Mexican Auction Awards Enel 593 Megawatts Of Wind, Canadian Solar Awarded 367 Megawatts Solar

[Twitter](#) [Google+](#) [LinkedIn](#) [Pinterest](#) [Facebook](#)

USD1.77 cents/kWh

November 28th, 2017 by [Joshua S Hill](#)

Solar power company Canadian Solar announced this week that it won 367 MW worth of solar power projects in Mexico's third Long-term Auction for renewables which was held earlier in the month, while the Enel Group was awarded an impressive 593 MW worth of wind projects, including a record low \$17.7/MWh award.

Canadian Solar announced on Monday that it had been awarded a total of 367 MW (megawatts) across three separate solar projects in Mexico's third auction for long-term renewable energy, held on November 15. The three projects will be developed in the Mexican cities of Aguascalientes, Hermosillo, and Obregón.

Upon completion, the three projects will sell their generated electricity to the Comisión Federal de Electricidad (CFE) under a 15-year Power Purchase Agreement for Energy and 20-year for Clean Energy Certificates (CELs) at an average price of \$21/MWh (megawatt-

[CleanTechnica Clothing & Cups](#)[Advertisement](#)

Advertise with *CleanTechnica* to get your company in front of our readers.

[Top News On CleanTechnica](#)[Tesla's Lemonade Stand vs](#)

New US Solar Record — 2.155 Cents Per kWh! (with Escalator for Inflation)



Twitter



Google+



LinkedIn



Pinterest

June 14th, 2018 by [Kurt Lowder](#)

We have seen solar power in the Middle East come into the low 2 cents per kilowatt-hour (kWh) range. We have seen it under 2 cents per kWh in Mexico. Misguided, casual

Join CleanTechnica!



Support CleanTechnica's work by becoming a *Member, Supporter, or Ambassador.*

Or buy a cool t-shirt, sun, baby



Kentucky coal museum switching to solar power

By Alexandra Larkin, CNN

🕒 Updated 1714 GMT (0114 HKT) April 6, 2017



News & buzz



Chris Rock on cheating, divorce and Trump



7 bounty hunters are accused of killing an innocent man

ART-TAINMENT RESORT

PARADISE CITY

April 20 2017 OPEN

A whole new city that you have never experienced.

PARADISE CITY

2: Exponential Consumption



RethinkX

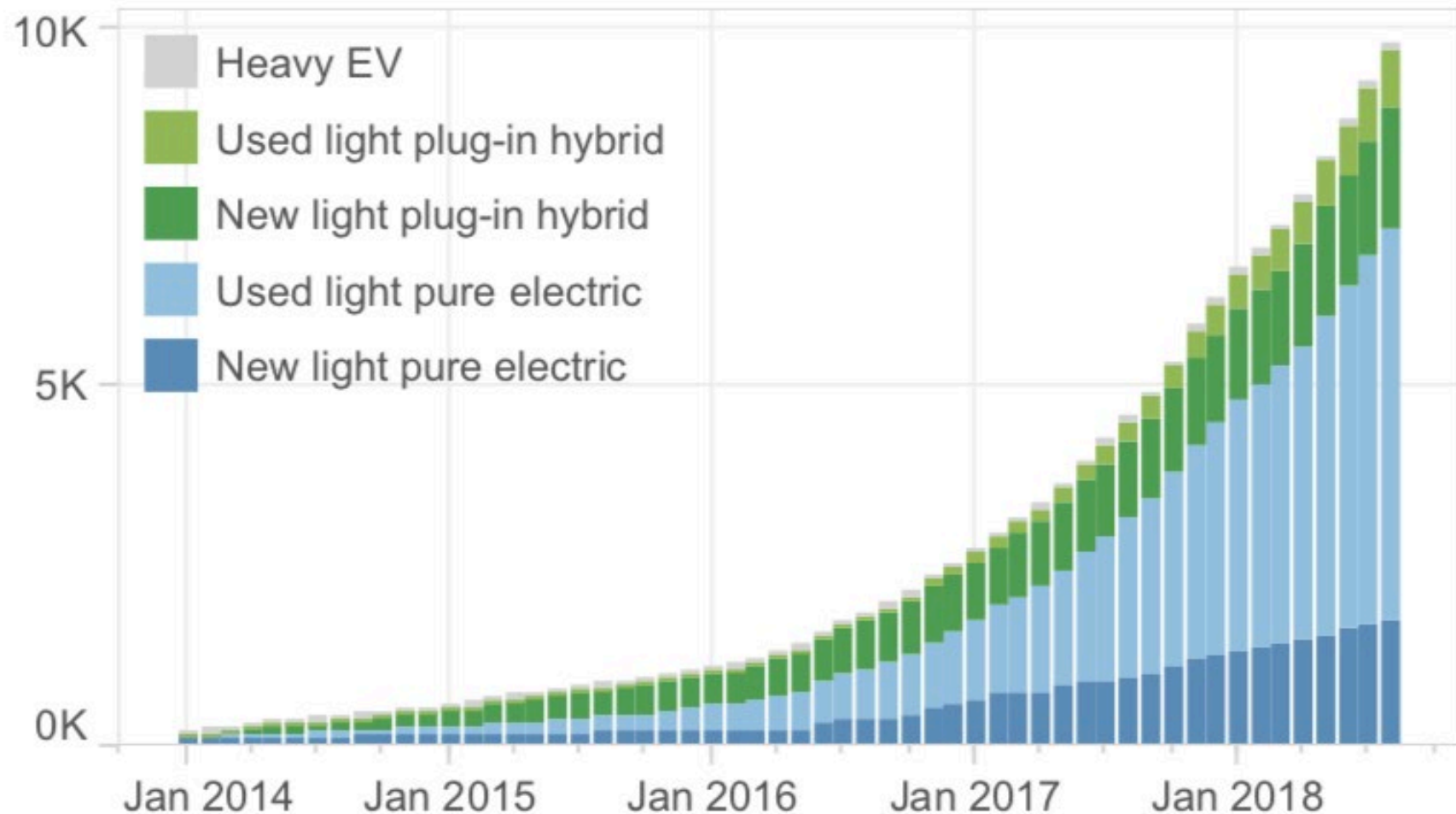
Disruption, Implications and Choices

Rethinking Transportation 2020-2030

*The Disruption of Transportation and the Collapse
of the Internal-Combustion Vehicle and Oil Industries*


EV fleet size

Source: ChargeMaster

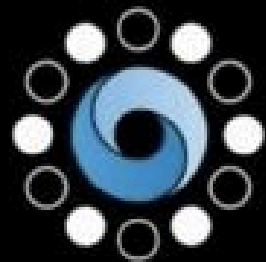


3:


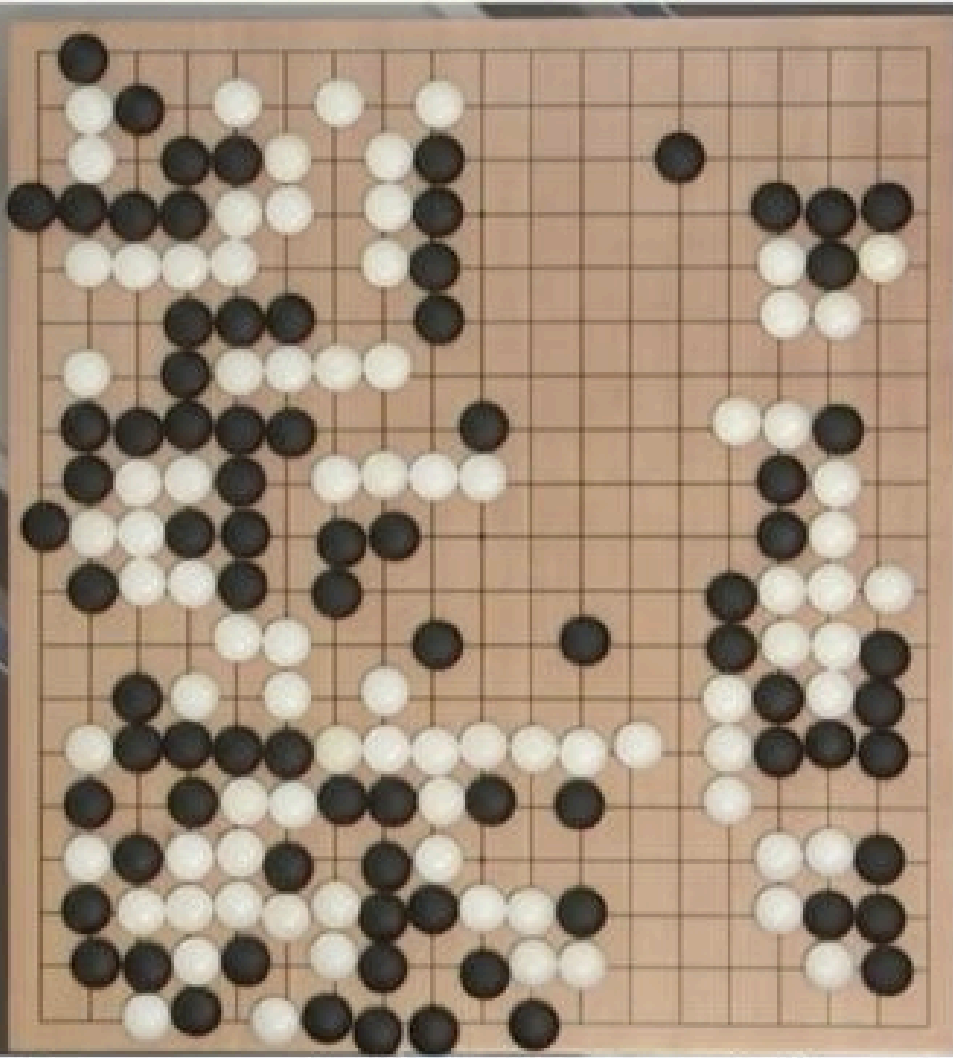
Exponential Transformation



ALPHAGO
00:08:32

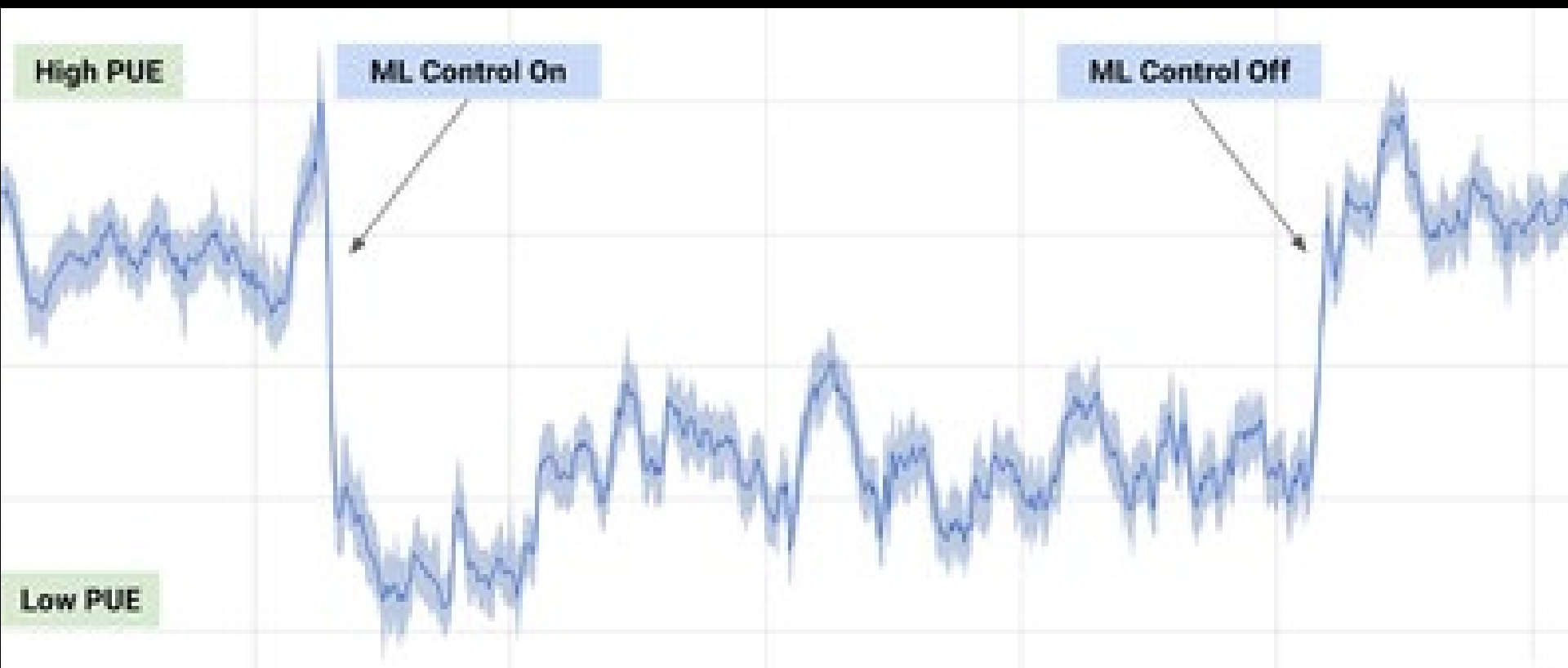


AlphaGo
Google DeepMind



LEE SEDOL
00:00:27





[Subscribe to the FT](#)

Latest on National Grid PLC



Ofgem allows National Grid to pass on Humber pipeline costs



Gone fishing, while casting an eye over investments

Ofgem tightens returns for energy networks



Six role models highlighted the image of in-house lawyers

National Grid PLC

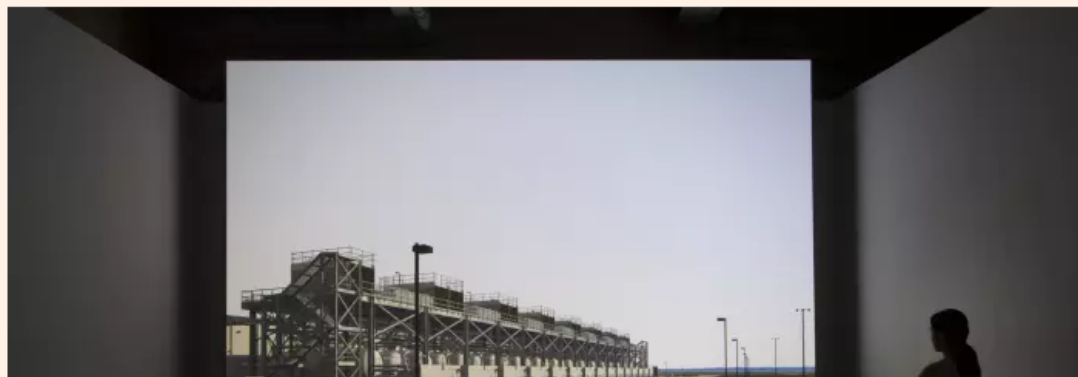
[+ Add to myFT](#)

DeepMind and National Grid in AI talks to balance energy supply

Google's machine learning technology likely to better predict UK electricity demand



Save



one last thing...

Thank you.

Kaila Colbin
nz.boma.global