

MAJOR OIL & GAS COMPANIES' GROWING INTEREST IN RENEWABLE ENERGY INVESTMENTS

PASSING FAD OR MAJOR TREND?

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Agenda

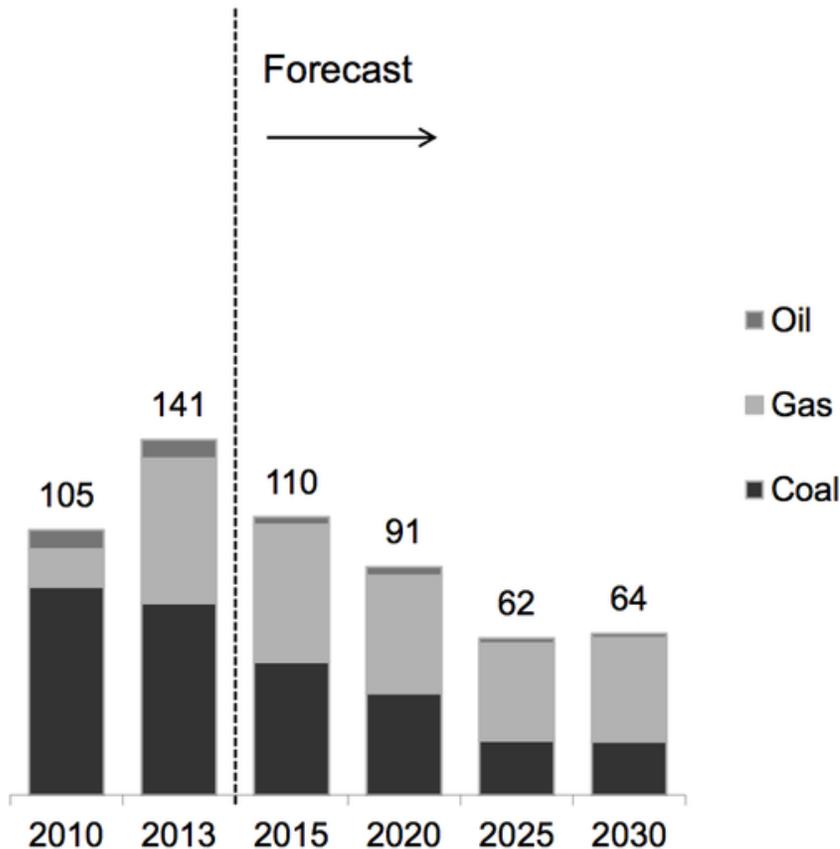
- Renewable energy investment trends
- Fossil fuel majors investing more in renewable energy
- Drivers
 - Falling costs
 - Lower technology risks
 - Attractive risk/return profiles
 - More asset classes
 - Paris Climate Accord
 - Stranded Asset concerns
 - Growing investor interest in infrastructure
- Contrarian perspectives
- Conclusion

Renewable Energy (RE) Investment Trends

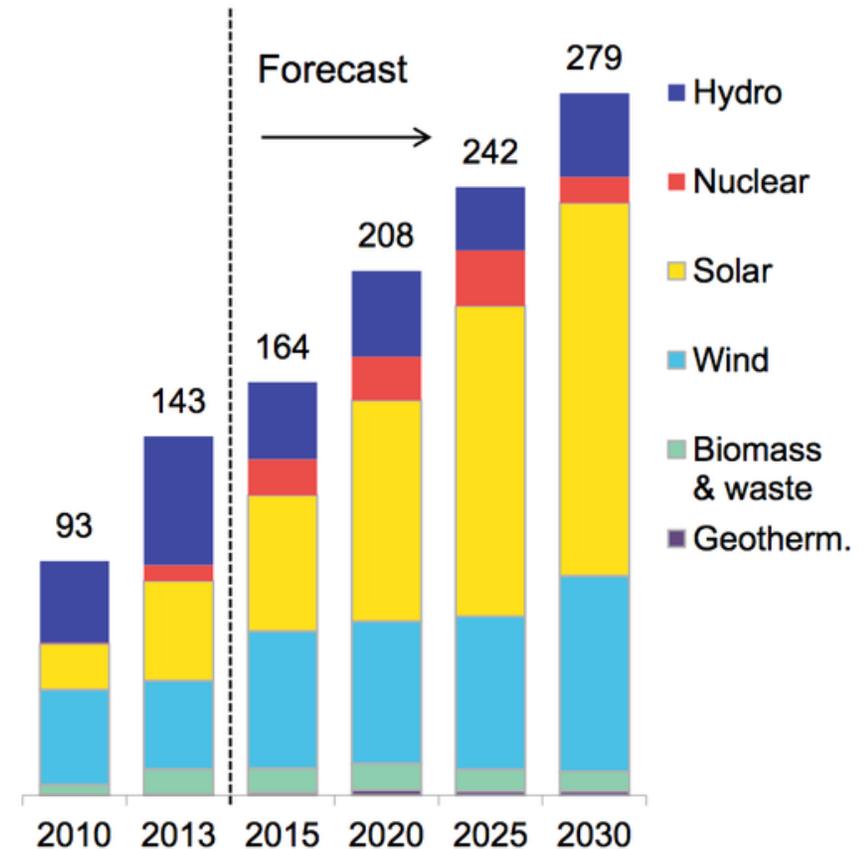
Fossil fuels down. Clean energy up — \$348B invested last year (Source: BNEF)

Projected Global Electricity Additions (GW): 2015 to 2030

FOSSIL FUEL



CLEAN ENERGY

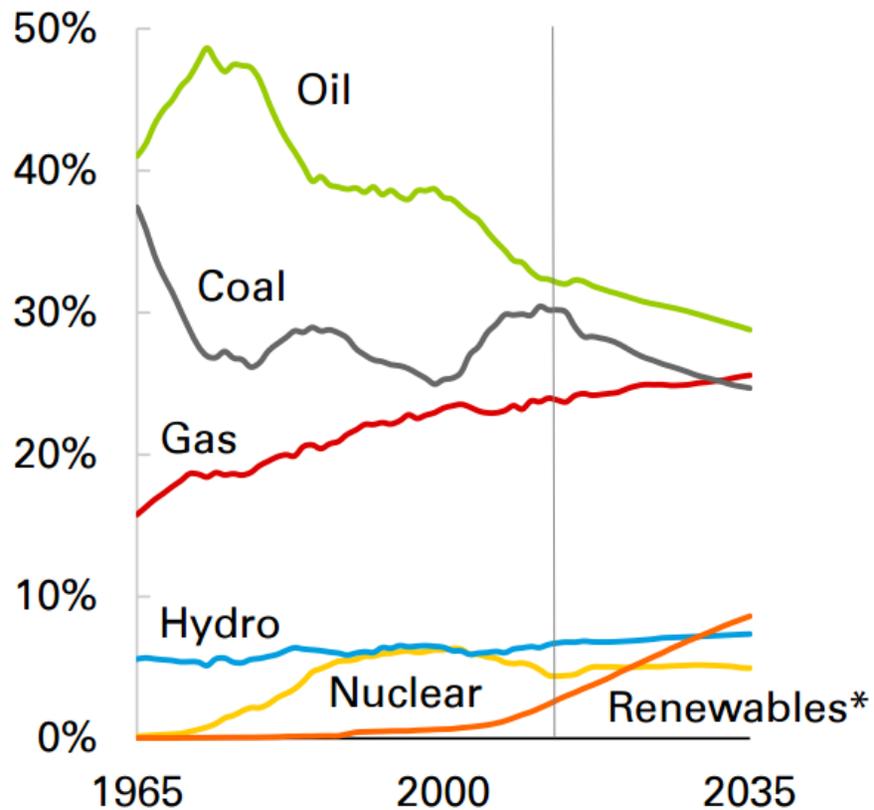


(Source: BNEF)

Renewable Energy (RE) Investment Trends

“FOMO” — Fossil fuel companies have Fear Of Missing Ot

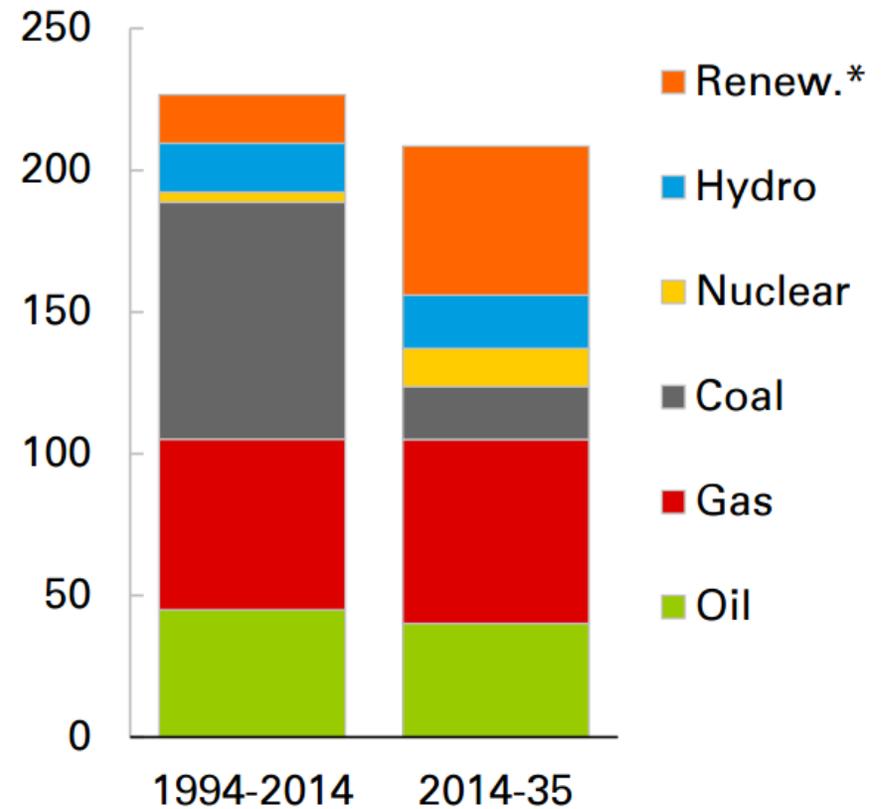
Shares of primary energy



*Includes biofuels

Annual demand growth by fuel

Mtoe per annum



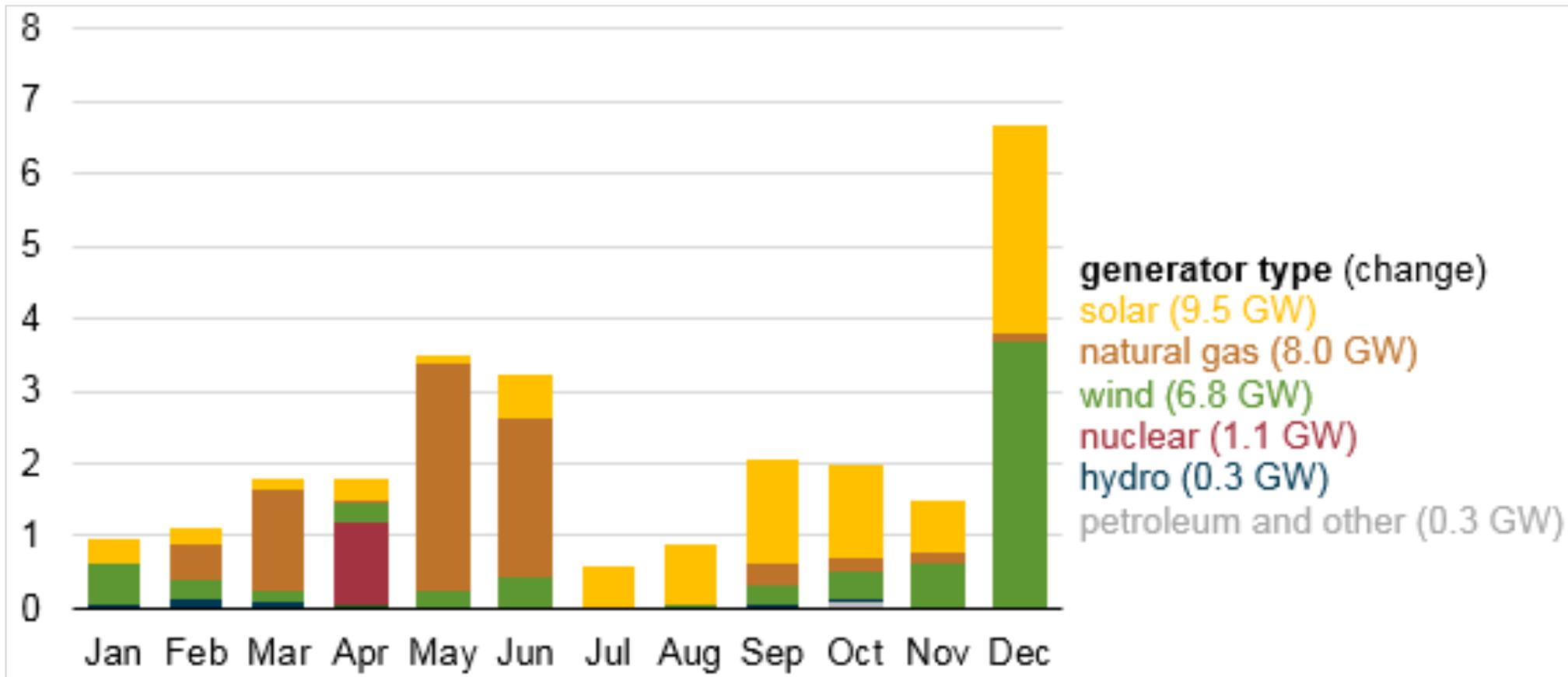
(Source: BP)

RE Investment Trends — Stock vs. Flow

Look backward, or look forward?

Solar/wind = 6% of US power today vs. 63% of new electricity capacity

Scheduled 2016 US Power Additions (GW)



(Source: US EIA)

Examples of Fossil Fuel Majors Investing in RE

Oil and gas companies are placing more capital and paying more attention to RE

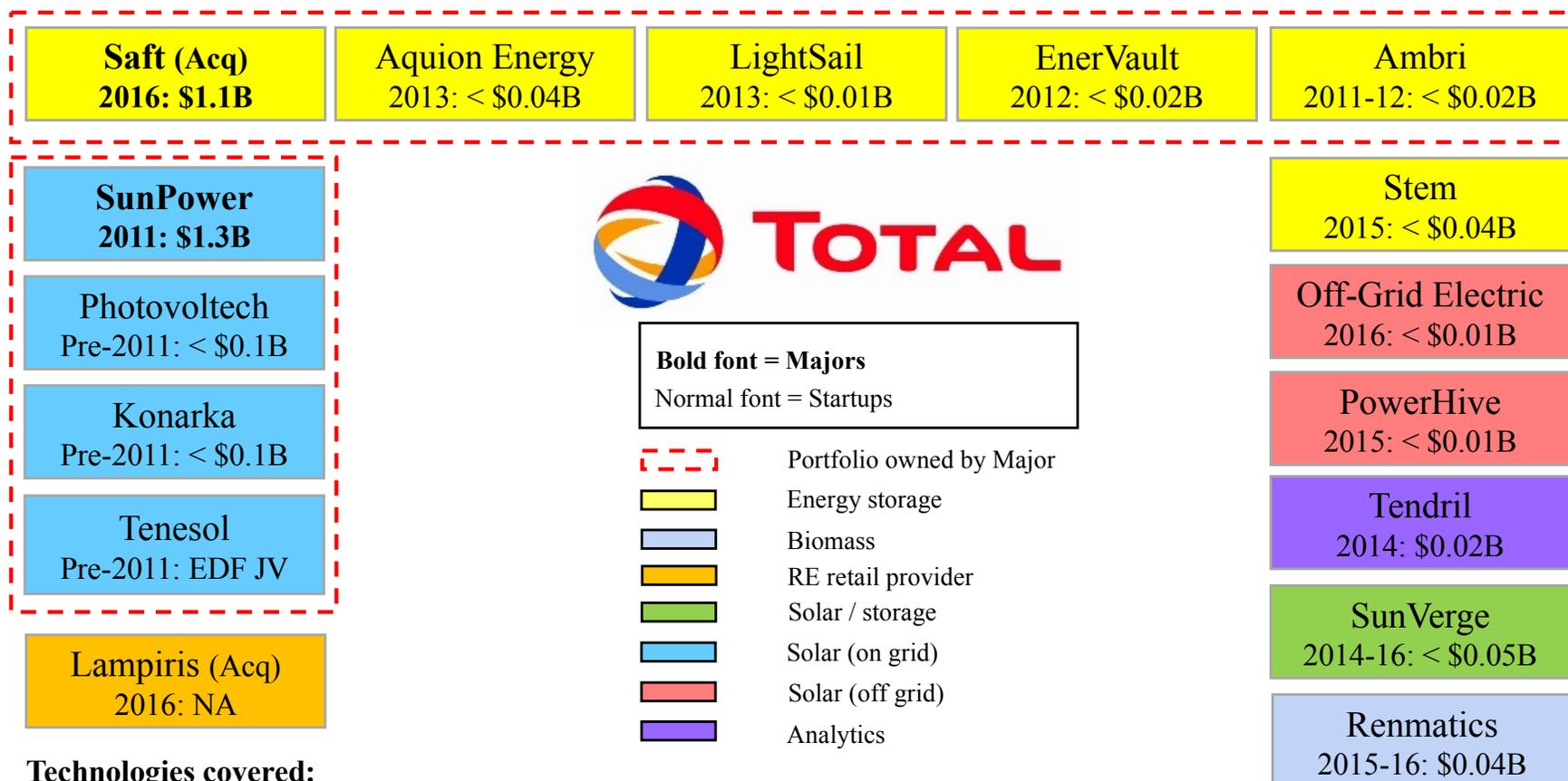
- Total acquired battery maker Saft for \$1.1B (2016)
- Shell created New Energies division to acquire wind and solar projects, with \$1.7B of assets and \$200M to invest each year (2016)
- Statoil launched New Energies division, including \$1.2B partnership with E.ON for major wind farms (2016)
- ENGIE acquired 80% stake in battery company Green Charge Networks (2016)
- E.ON invests in battery company Greensmith, solar installer Sungevity, fuel cell company Bloom Energy (2015, 2013)
- Shell's CEO proclaimed that solar will be the backbone of the world energy mix in the decades to come (2013, 2015)



Peer Pressure — Fossil Majors' RE Investing

Supermajors' need to respond to Total's vision of a more diversified energy future?

- BP, Chevron, ConocoPhillips, Exxon Mobil, Royal Dutch Shell, and Total all have \$5B to \$30B of cash on hand — Could be used for RE M&A *(Source: Lux)*



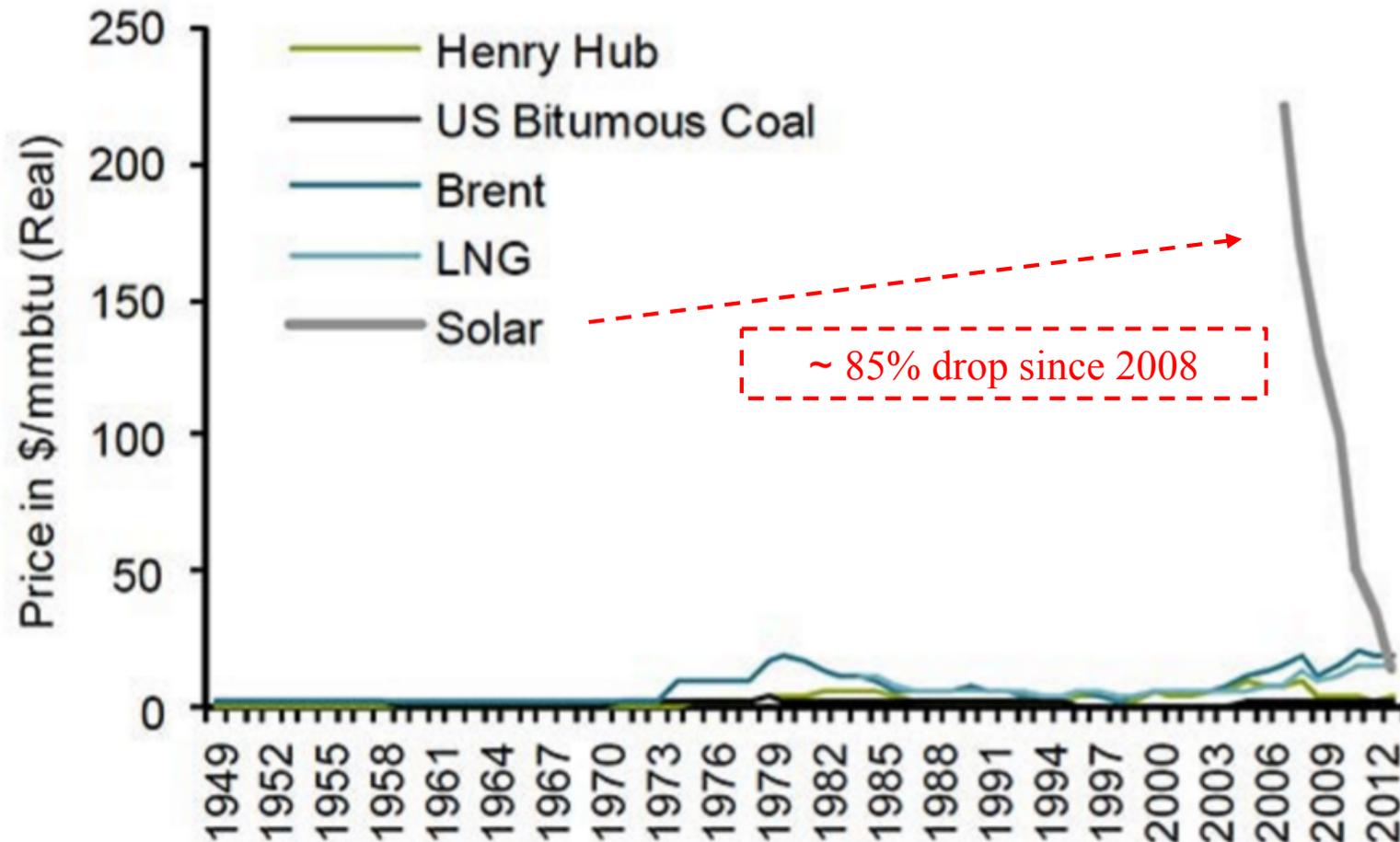
Technologies covered:

Lithium ion, sodium ion, flow, compressed air, and liquid metal batteries; organic, monocrystalline, and aesthetic solar; and business model innovation

(Source: Lux, IronOak Energy, CB Insights)

Drivers — Rapidly Falling Costs

RE costs are falling precipitously, while environmental regulation plus transmission or distribution costs continue increasing conventional energy costs

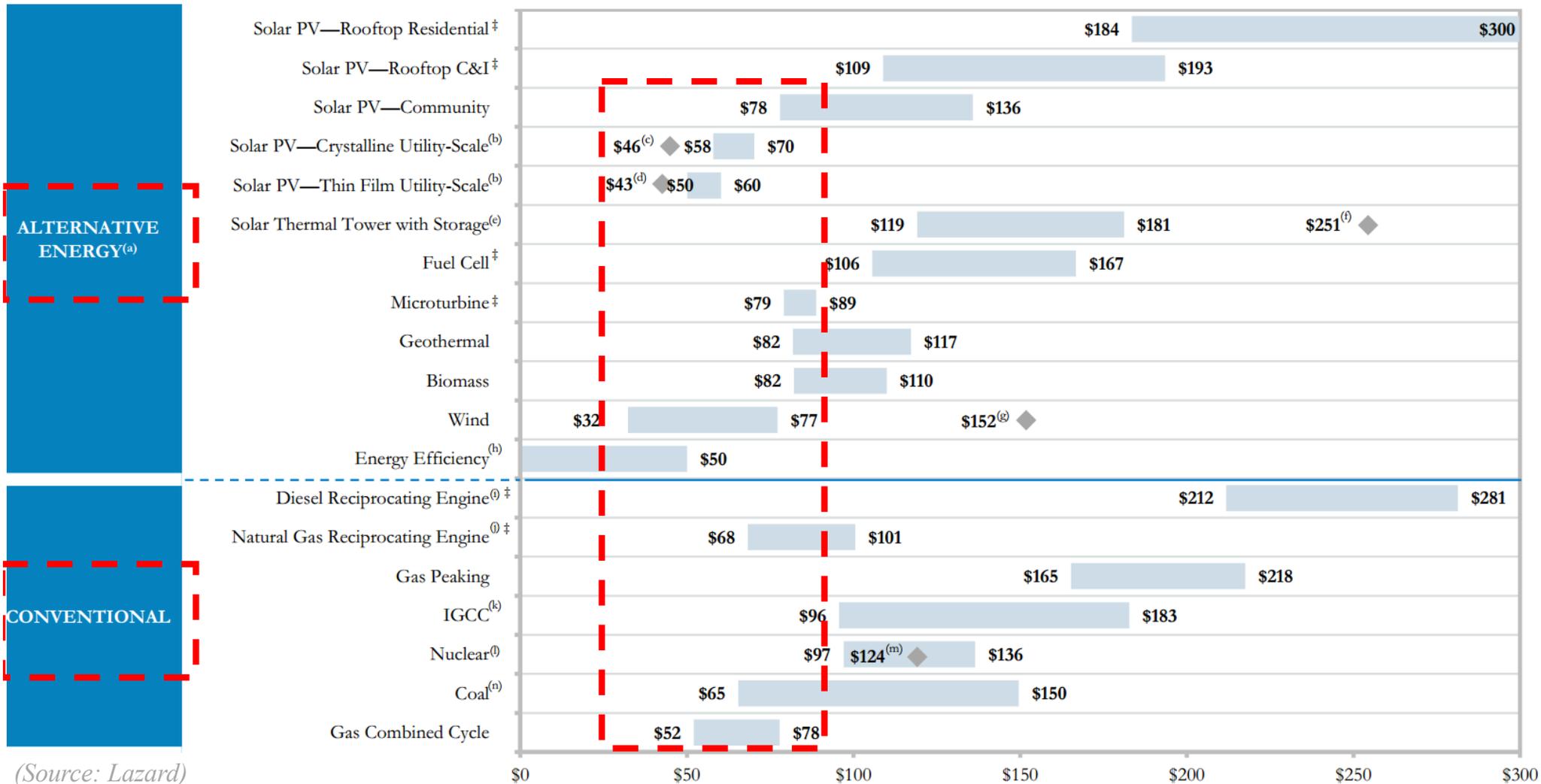


(Source: Bernstein Research. Data: CIA, EIA, World Bank)

Drivers — RE's Competitiveness with Fossil Fuels

Wind and solar costs are down 50% and 80%, respectively, since 2009

Levelized Cost of Electricity: Renewable Energy vs. Conventional Energy (\$/MWh)

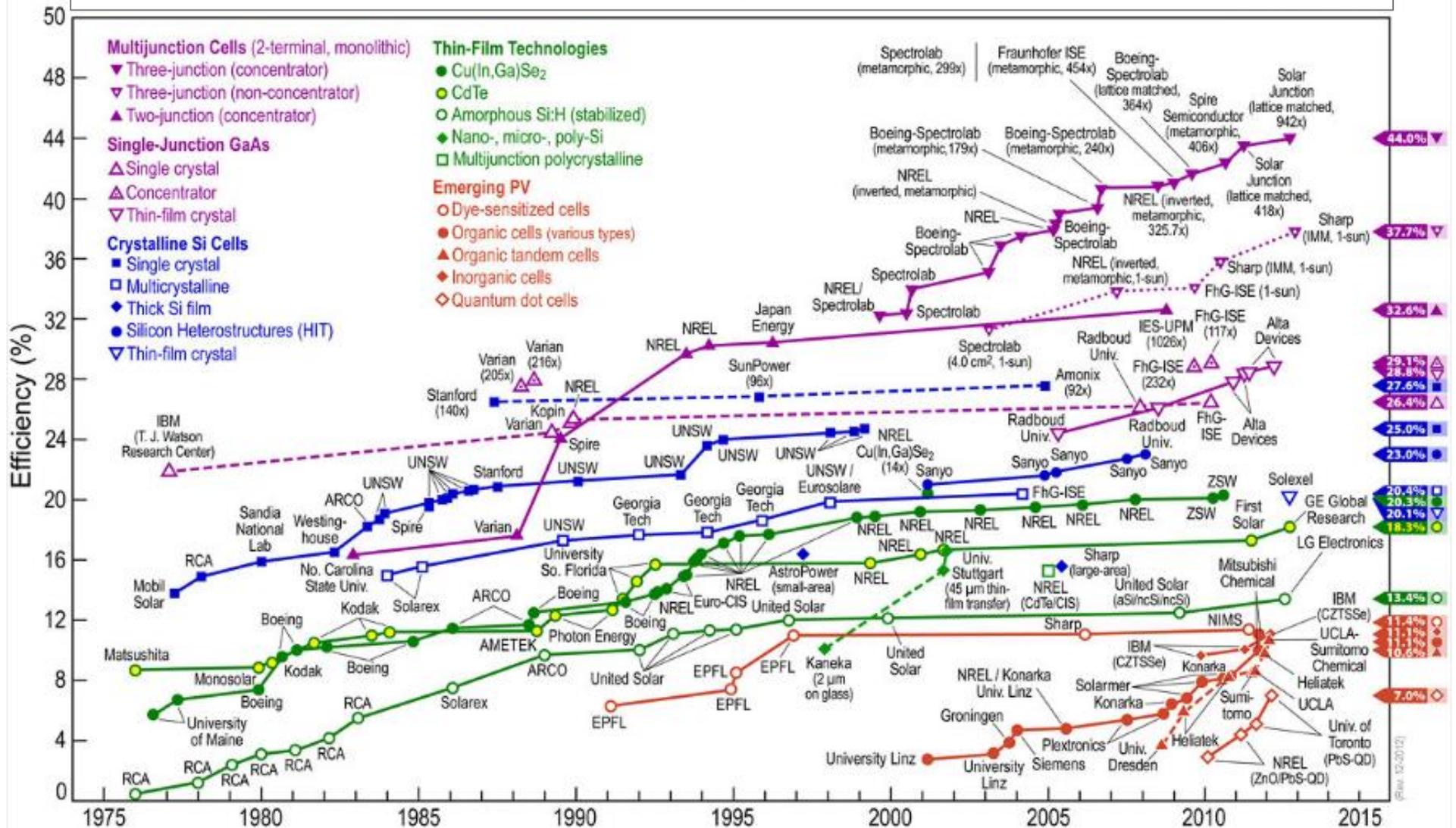


(Source: Lazard)

Drivers — Lower Technology Risks

Numerous and varied technologies create the illusion of risk; but reality is different

Efficiency of Solar Panel Technologies: 1974 to 2015 (Source: US NREL)



Drivers — Concern re: Stranded Assets

\$100T of fossil fuel assets could already be “stranded” *(Source: Citi)*

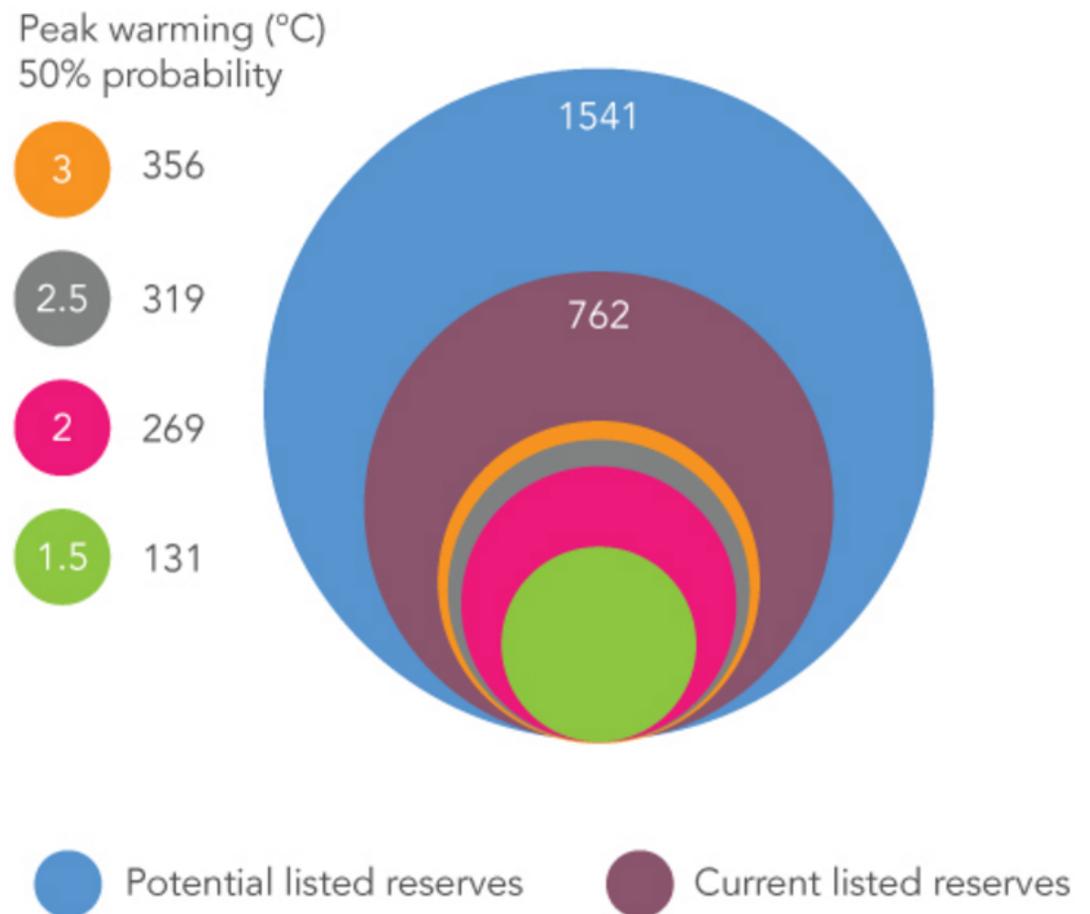
- 60-80% of coal, oil and gas reserves of publicly listed companies are ‘unburnable’ if the world is to have a chance of not exceeding global warming of 2°C

(Source: Carbon Tracker, Grantham Research Institute, LSE)

- Despite these trends, fossil fuel companies continue spending more than \$500B per year on exploration

(Source: Ibid.)

Comparison of listed reserves to 50% probability pro-rata carbon budget

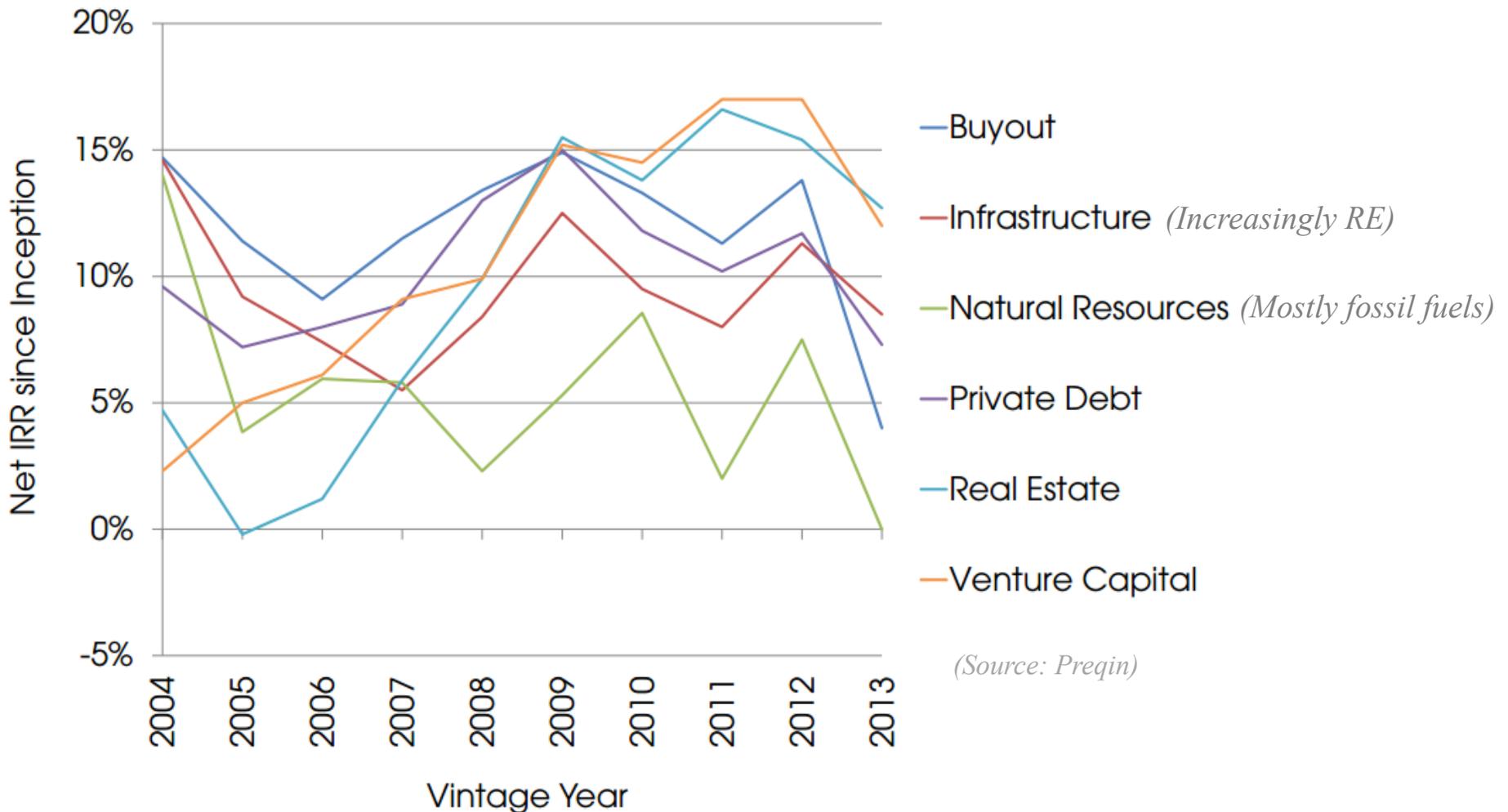


(Source: Carbon Tracker, Grantham Research Institute, LSE)

Drivers — Attractive Risk/Return Profile

Investors are increasingly interested in infrastructure's low volatility and solid IRR

Median Net IRR by Vintage Year: Infrastructure vs. Other Private Capital Strategies

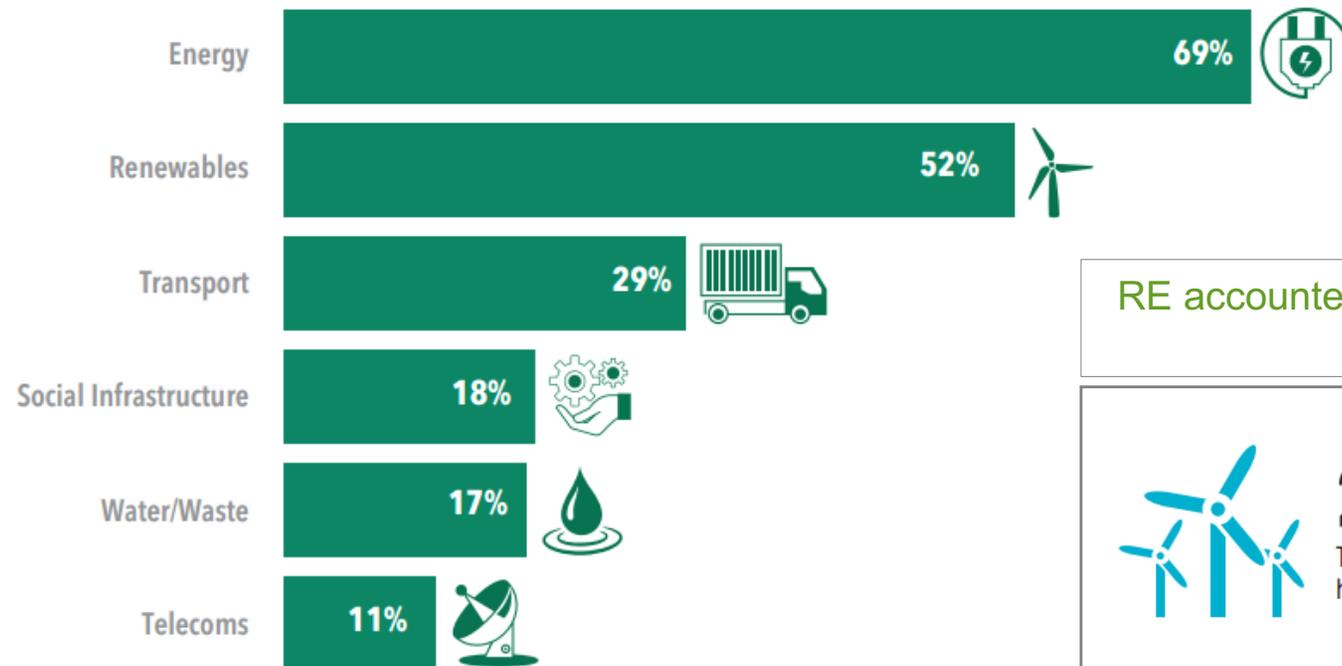


Drivers — Growing Interest in Infrastructure

Investors are increasing allocation to infrastructure for at least two reasons:

- Low-yield environment
- \$350B/year gap between global infrastructure needs and limited government budgets *(Source: McKinsey)*

Infrastructure Funds in Market by Sector Focus (249 funds, \$157B)



(Source: Infrastructure Investor)

RE accounted for 55% of all infrastructure deals in 2015



295

The renewable energy sector had the highest number of deals in 2015.

(Source: Preqin)

Drivers — More RE Asset Classes

ENERGY STORAGE

Hype is greater than reality for this emerging sector today, but that is changing

- 25x global growth by 2028 *(Source: BNEF)*
- \$250B market by 2040 *(Source: BNEF)*

US Market to Grow 8x by 2020

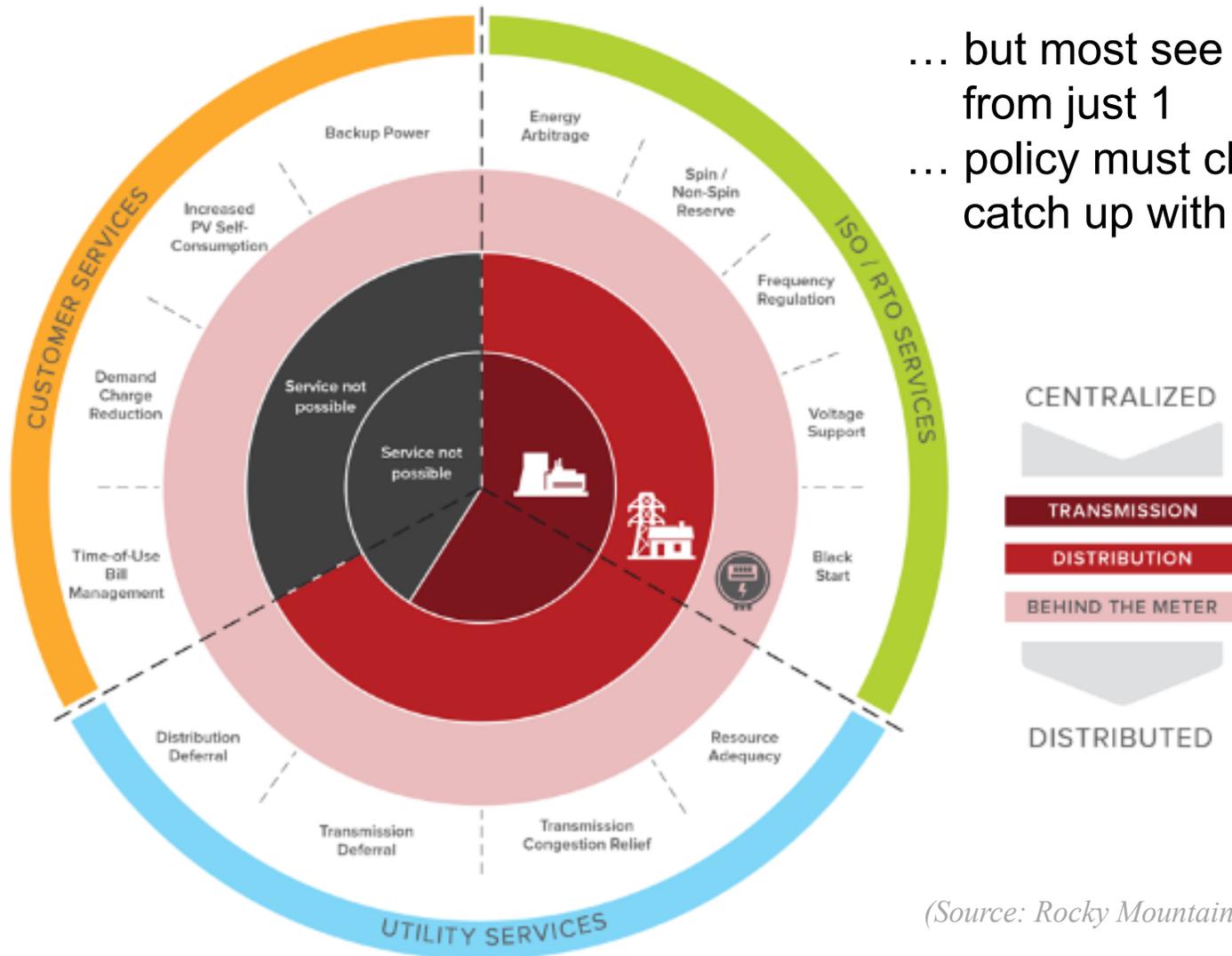


(Source: GTM Research)

Drivers — More RE Asset Classes

ENERGY STORAGE

Batteries can provide 13 services to the grid and power users (figure below)...



... but most see revenue from just 1
... policy must change to catch up with technology

(Source: Rocky Mountain Institute)

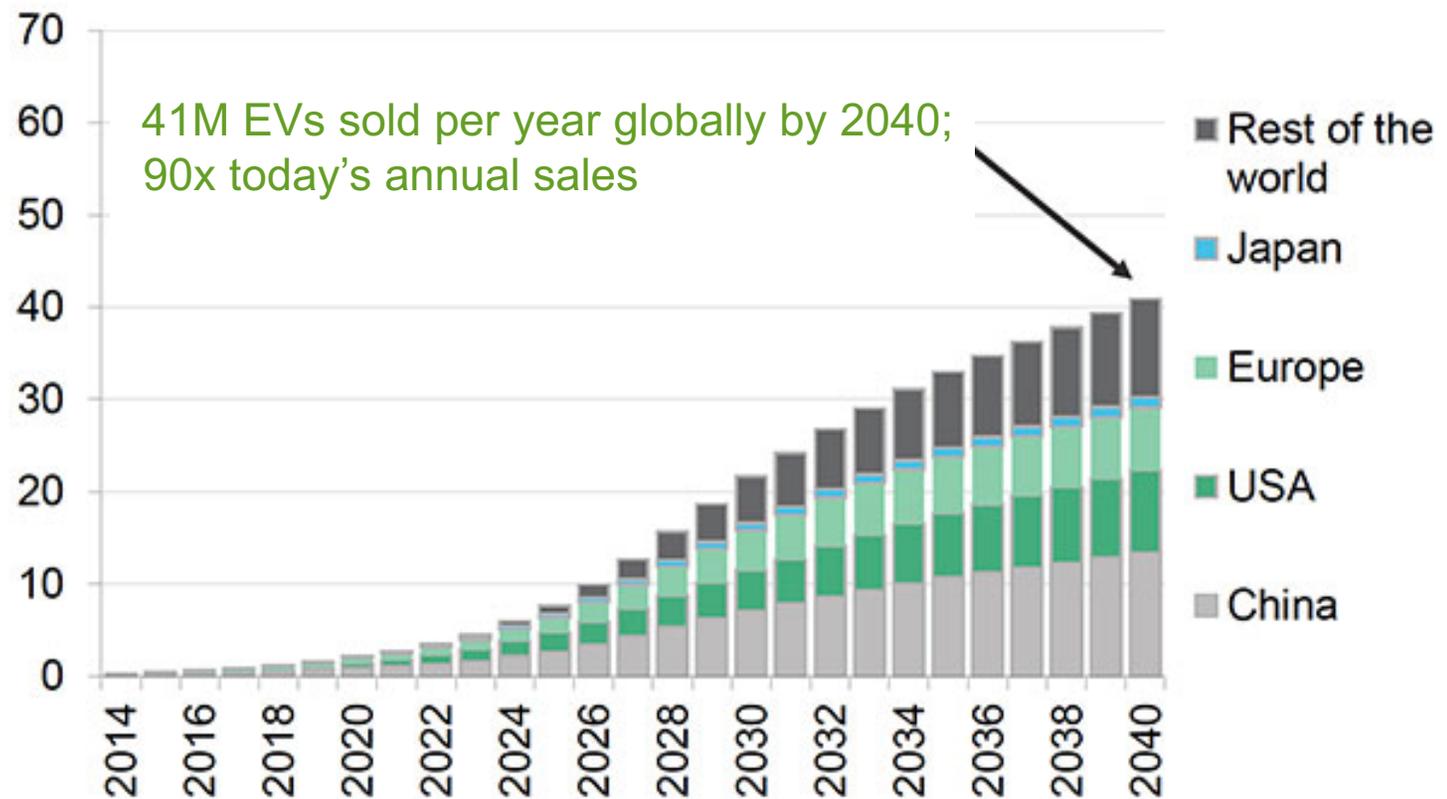
Drivers — More RE Asset Classes

ELECTRIC VEHICLES

These are not just “eco-toys for the rich” — They will become mainstream



Global EV Sales Forecast by Geography, 2015-2040

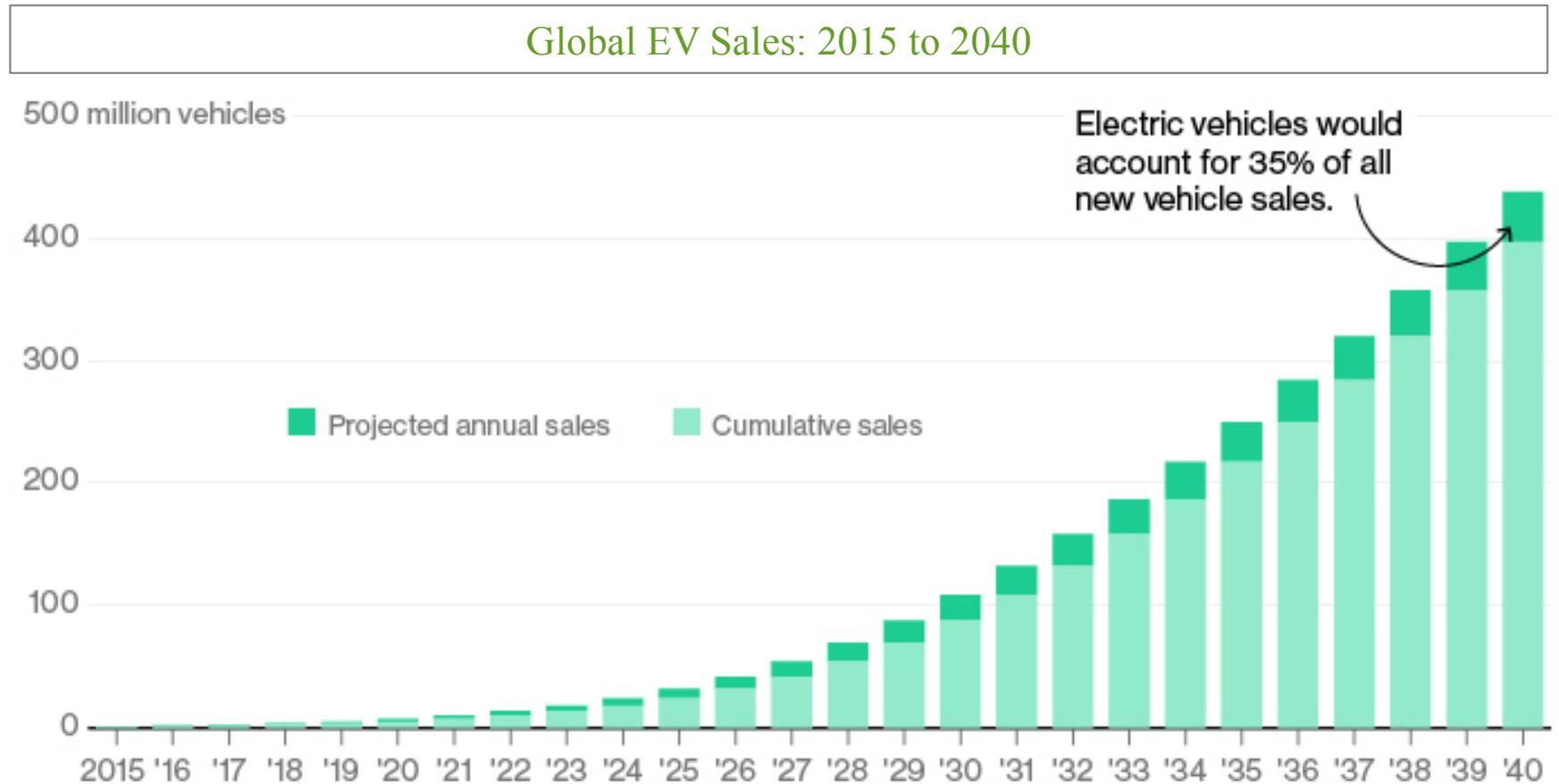


(Source: BNEF, Marklines)

Drivers — More RE Asset Classes

ELECTRIC VEHICLES

With first-cost neutrality with conventional cars by 2022, and 50-75% less operating costs, sales can grow quickly



(Source: BNEF, Marklines)

Drivers — Paris Climate Accord

Belief in climate change is not a point of discussion

- 187 nations — 98% of global greenhouse gas emissions — have now submitted national climate commitments, per the 2015 Paris Accord
- \$16.5T of investment needed by 2030 to achieve the Accord's target of 2° C temperature rise (Source: International Energy Agency)
- \$348B was invested in clean energy in 2015 (Source: BNEF)
- 3x the level of today's investment is required to meet global climate objectives



**Investing in
the Clean Trillion:**
**CLOSING THE CLEAN ENERGY
INVESTMENT GAP**



The Contrarian View

Fossil fuels make up 85% of the global energy mix. That makes for slow change.

- Less than 1%
 - Shell's New Energies budget VS. its \$30B annual investment in oil and gas
 - Electric vehicles sales VS. all US car sales
 - US solar electricity VS. all US power sales
- Fear mongering
 - “[The Carbon Bubble, or Stranded Asset discussions are just meant] to frighten away investors and capital. God help us all if they're successful because there won't be enough [energy] supply.” — ConocoPhillips chief economist
- All talk, no action
 - The Paris Climate Accord is a UN effort — may end up like the ineffective 1997 Kyoto Protocol

Conclusion

- **Headlines do not tell the whole story**
 - But the story is changing — RE is serious business (i.e., not for hippies)
- **Climate change and the Paris Accord may be irrelevant**
 - They do matter, but they do not need to drive these changes
- **Costs are moving in different directions — in favor of RE**
 - Oil and gas are cheap now, but they have one direction to go (up).
 - Deferred distribution investments may negate low commodity prices
 - RE costs are all falling fast — solar, wind, batteries, electric vehicles
- **RE offers fossil fuel majors many benefits beyond PR**
 - Includes diversification, lower risk profiles, higher growth sectors
- **Change does not happen overnight**
 - But it happens quicker than most think
 - Example: Many new technologies — refrigerators and smart phones — went from 0% to 80% adoption in 10-25 years *(Source: Felton, NY Times)*

More than \$500B of investment capital is hungry for clean energy opportunities. We can help find them.



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