



DISASTROUS ECONOMICS OF CLIMATE CHANGE

WITH PROF STEVE KEEN



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Agenda

- Highlight of prof. Keen's recent article
- Reflections & discussion
- Energy price update
- Investment implications



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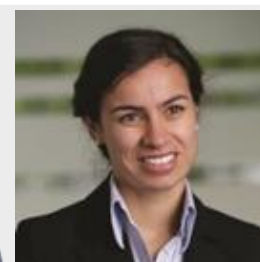


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Economists & Climate Change

-   · 6 Oct
- No, I mean about your reply about a 10°C warmer world: 'we would move indoors'.
- Was it sarcastic?
- 1 2
-   · 6 Oct
- People in places like Riyadh have moved indoors.
- It stems to reason that in a warmer future, more people will do so.
- 2 1
-   · 6 Oct
- It's difficult to understand why would you say that, when you know that a warm region in a given global temperature is not comparable to a global warming.
- I choose to believe you are just having fun.
- 1 4
-   · 6 Oct
- People thrive in a wide range of climates. The projected climate change is small relative to the diurnal cycle. It is therefore rather peculiar to conclude that climate change will be disastrous.
- Those who claim so have been unable to explain why.

*Referencing the user with the covered red username/image & verified checkmark



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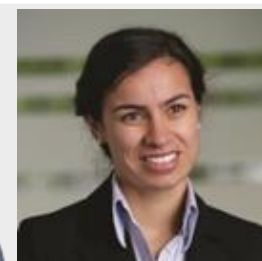


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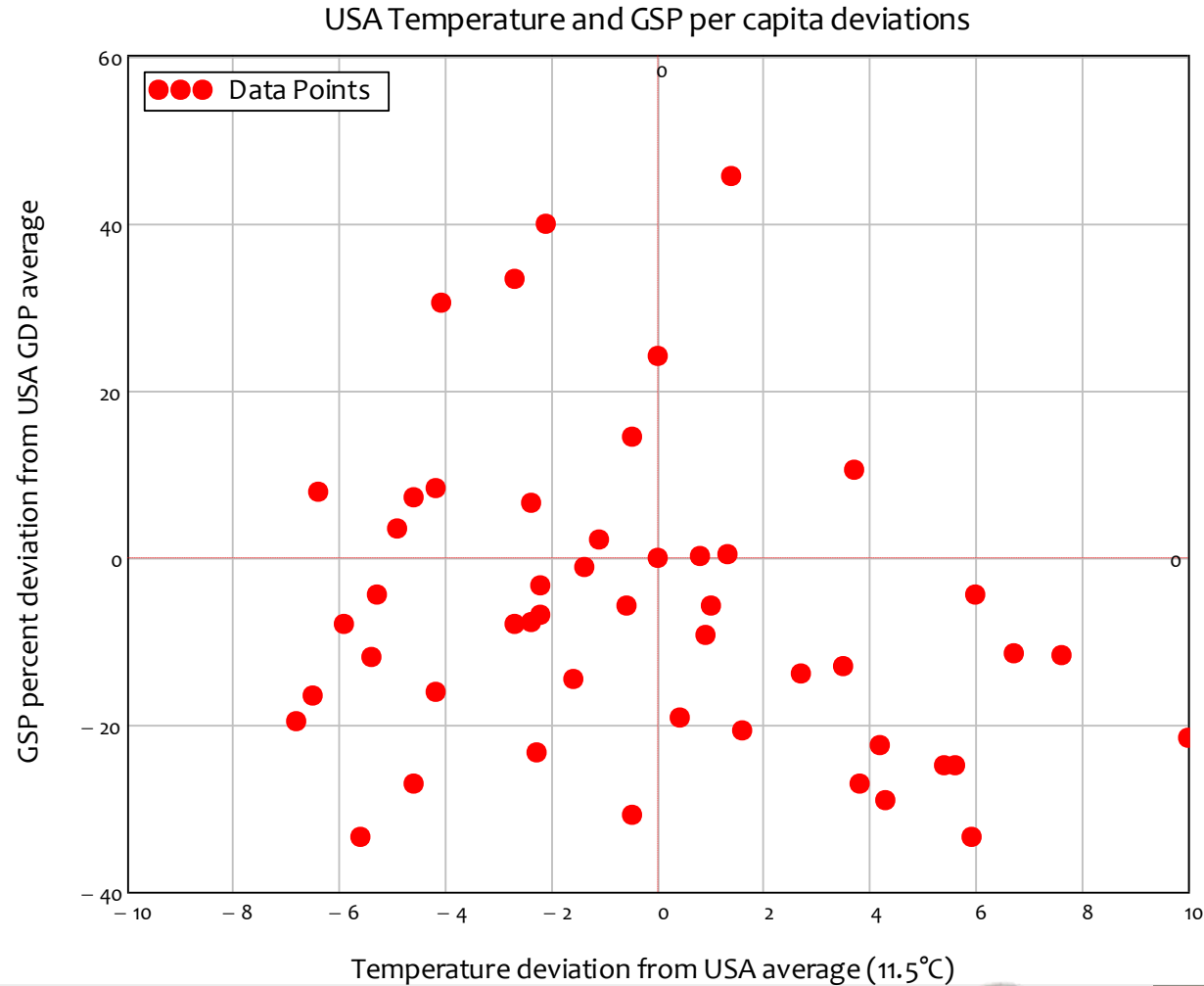


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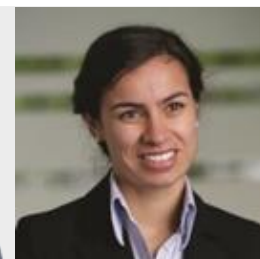


USA temperature and GSP per capita deviations

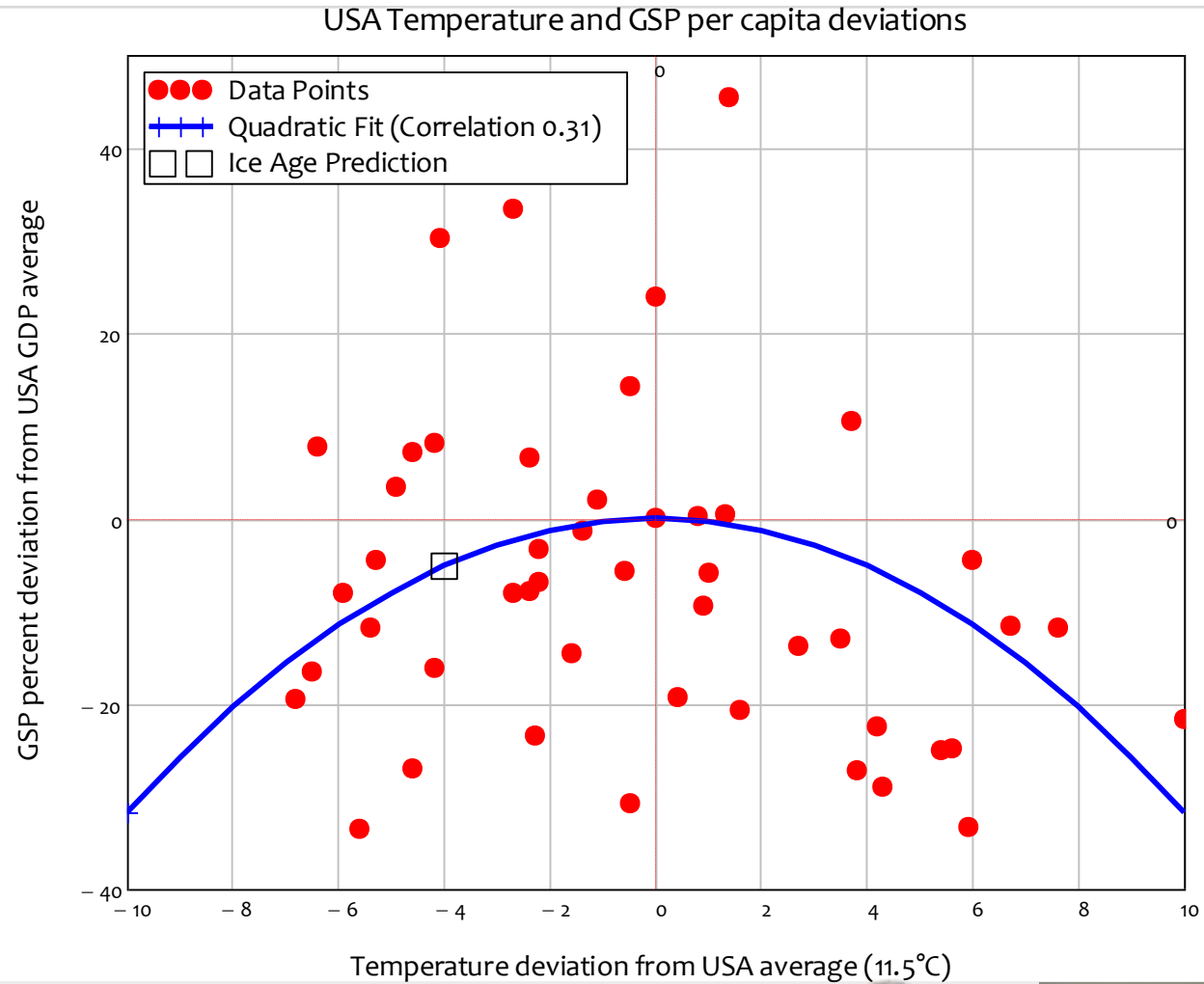


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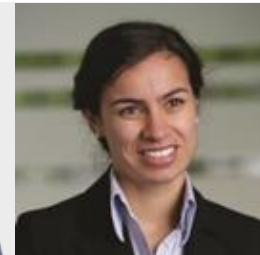


USA temperature and GSP per capita deviations

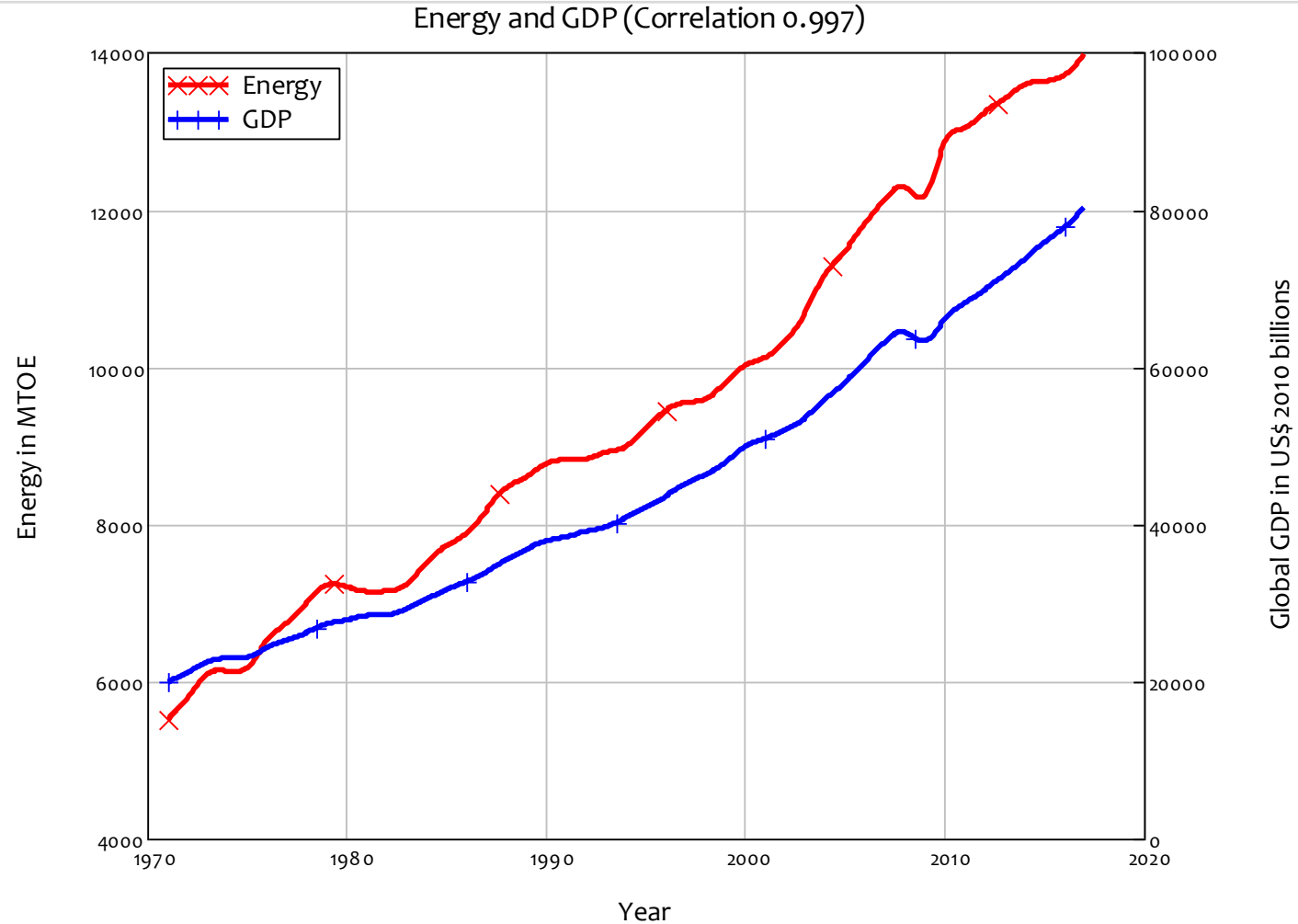


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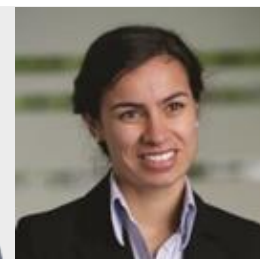


Energy and GDP (correlation 0.997)

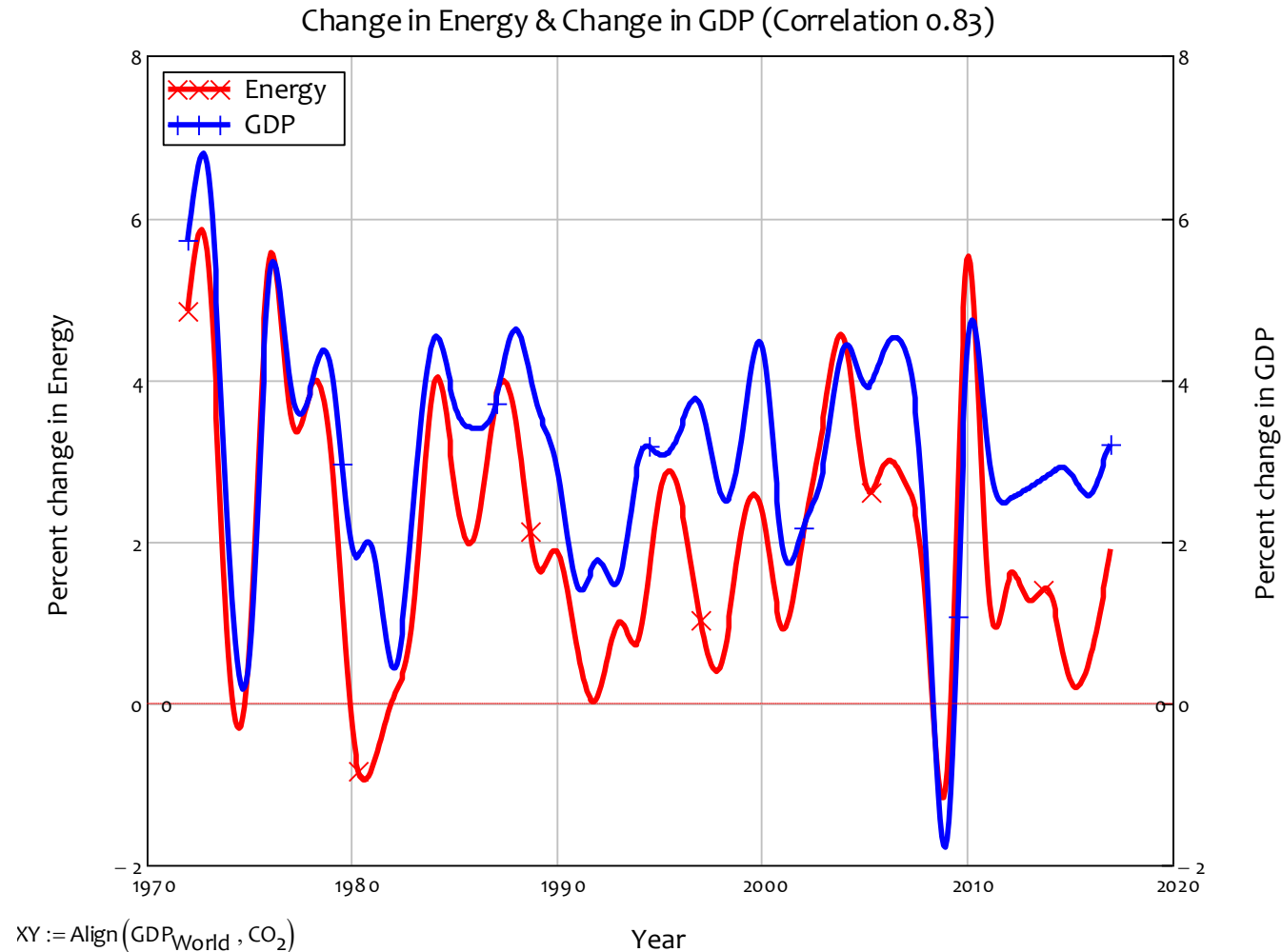


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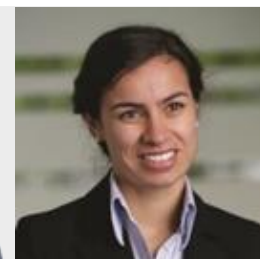


Change in energy and change in GDP (correlation 0.83)



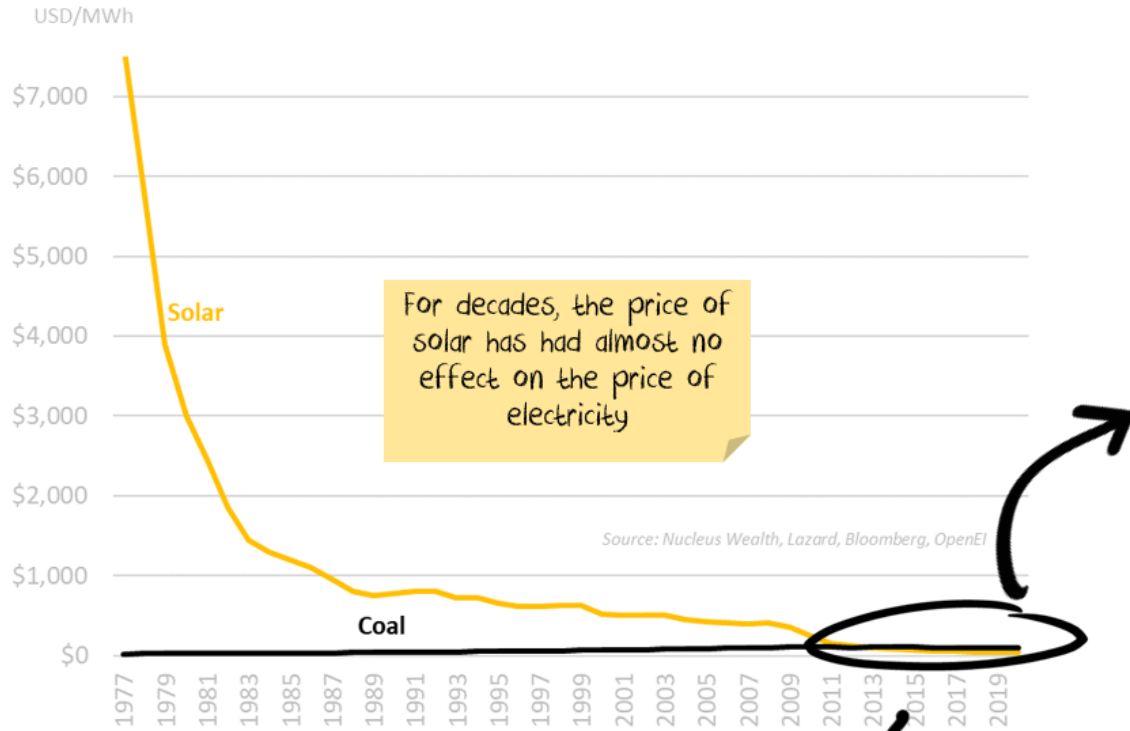
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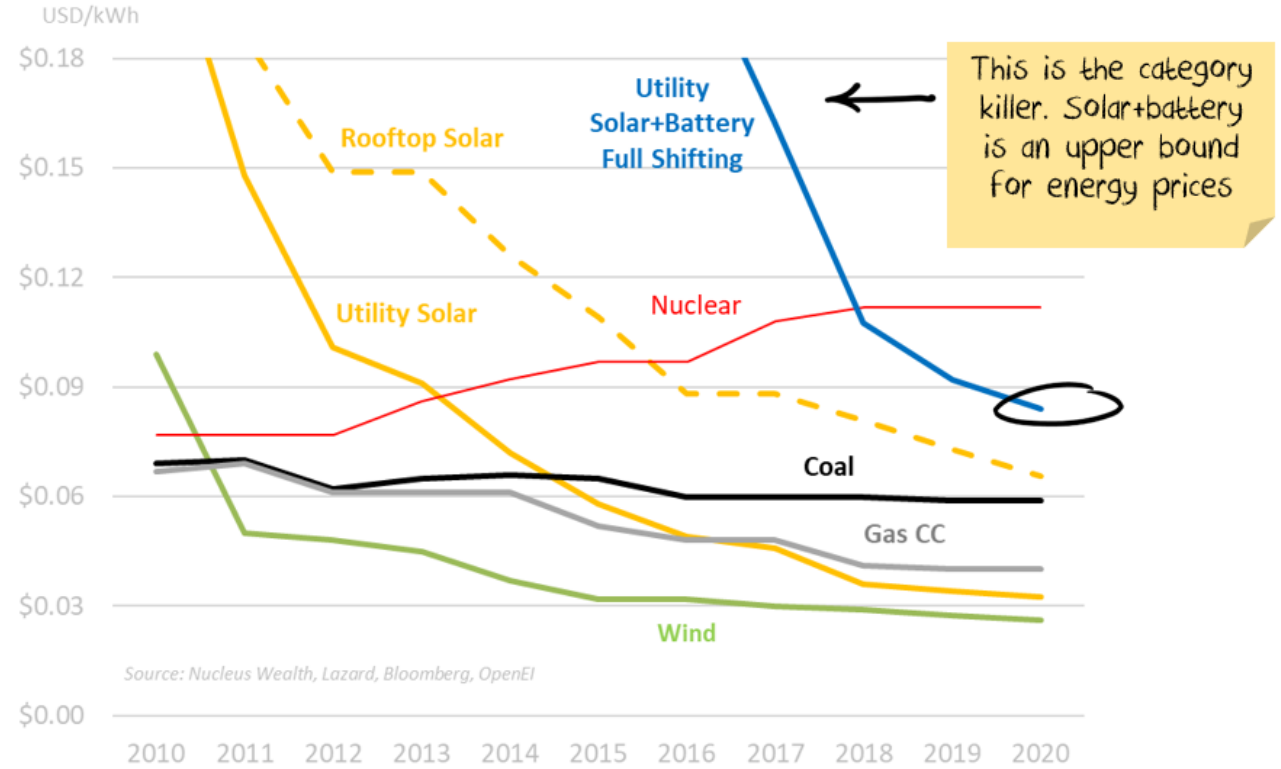


Energy Costs: Peaked?

Long Term

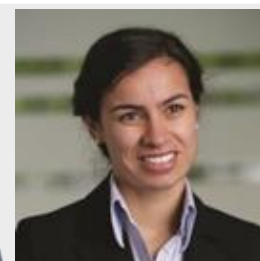


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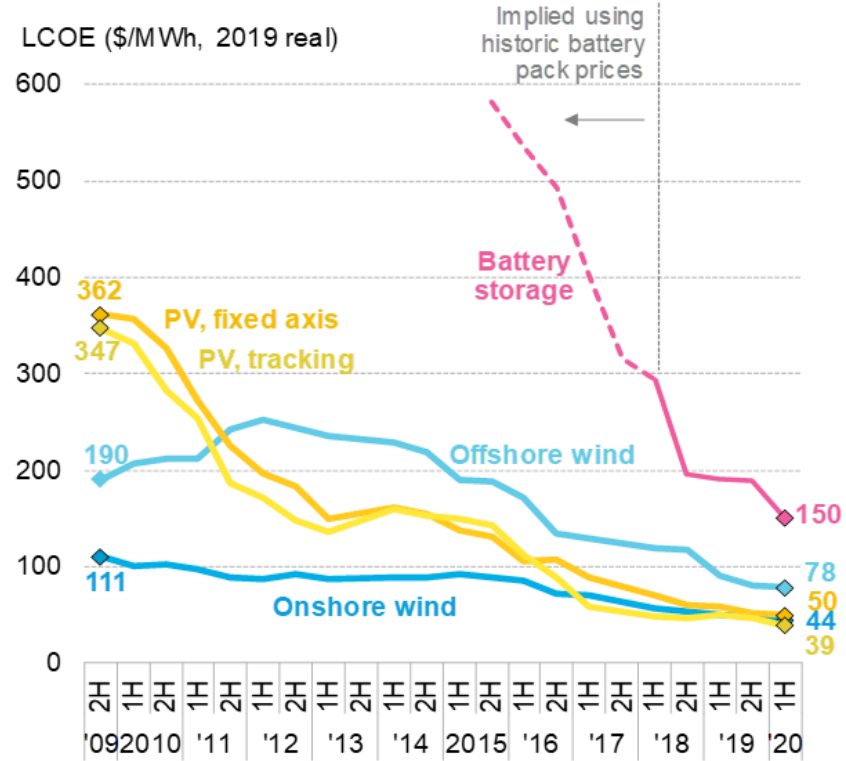
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Energy Costs: Peaked?

Figure 2: Global LCOE benchmarks – PV, wind and batteries

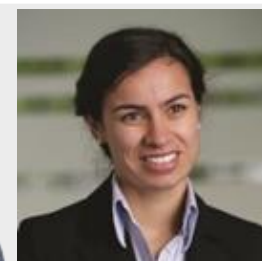


Source: BloombergNEF. Note: The global benchmark is a country weighted-average using the latest annual capacity additions. The storage LCOE is reflective of utility-scale projects with four-hour duration, it includes charging costs.



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Energy Costs:

Peaked?

Levelized Costs (USD/kWh)	Levelised Cost Ex Fuel	Fuel	Total
Onshore Wind	\$ 0.03		\$ 0.03
Utility Solar	\$ 0.04		\$ 0.04
Natural Gas @\$3/mmmBtu	\$ 0.02	\$ 0.02	\$ 0.04
Natural Gas @\$6/mmmBtu	\$ 0.02	\$ 0.04	\$ 0.06
Coal @ \$50/Ton	\$ 0.04	\$ 0.02	\$ 0.06
Coal @ \$75/Ton	\$ 0.04	\$ 0.02	\$ 0.07
Utility Solar + partial battery	\$ 0.07		\$ 0.07
Coal @ \$100/Ton	\$ 0.04	\$ 0.03	\$ 0.07
Natural Gas @\$9/mmmBtu	\$ 0.02	\$ 0.06	\$ 0.08
Utility Solar + full battery	\$ 0.09		\$ 0.09
Offshore Wind	\$ 0.10		\$ 0.10
Nuclear	\$ 0.10	\$ 0.01	\$ 0.10

Utility solar and wind
the cheapest option

And adding a partial
battery to offset the
evening load is now at
parity with other costs

Source: Nucleus Wealth, Lazard, Bloomberg, Open EI



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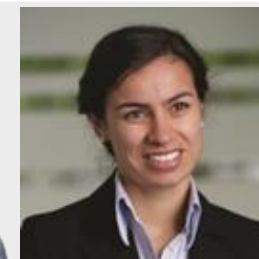


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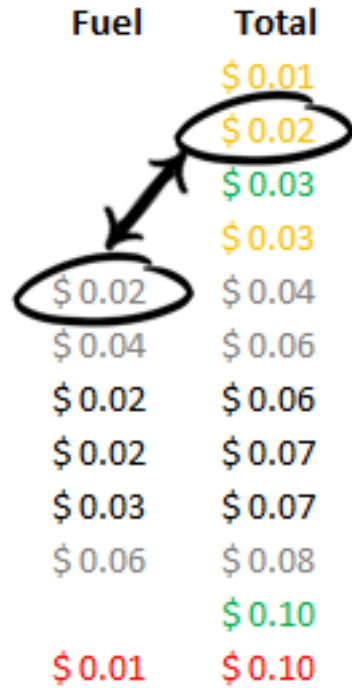


Energy Costs:

Peaked?

Prices if solar+battery costs fall 20% p.a. for 5 years (USD/kWh)

	Levelised Cost Ex Fuel	Fuel	Total
Utility Solar	\$ 0.01		\$ 0.01
Utility Solar + partial battery	\$ 0.02		\$ 0.02
Onshore Wind	\$ 0.03		\$ 0.03
Utility Solar + full battery	\$ 0.03		\$ 0.03
Natural Gas @\$3/mmBtu	\$ 0.02	\$ 0.02	\$ 0.04
Natural Gas @\$6/mmBtu	\$ 0.02	\$ 0.04	\$ 0.06
Coal @ \$50/Ton	\$ 0.04	\$ 0.02	\$ 0.06
Coal @ \$75/Ton	\$ 0.04	\$ 0.02	\$ 0.07
Coal @ \$100/Ton	\$ 0.04	\$ 0.03	\$ 0.07
Natural Gas @\$9/mmBtu	\$ 0.02	\$ 0.06	\$ 0.08
Offshore Wind	\$ 0.10		\$ 0.10
Nuclear	\$ 0.10	\$ 0.01	\$ 0.10



If costs decline at 20% per annum (like they have for the last ten years) then in five years time, the cost of running new solar will be cheaper than the fuel cost of an existing power plant

Source: Nucleus Wealth, Lazard, Bloomberg, Open EI



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Energy Costs: Peaked?

Prices if solar+battery costs fall 10% p.a. for 5 years (USD/kWh)

Retail Electricity Prices (USD/kWh)

Rooftop Solar (8% discount rate)

US

Rooftop Solar + partial battery

Rooftop Solar + full battery

Japan

Australia

European Average

Germany

Total

\$ 0.08

\$ 0.15

\$ 0.16

\$ 0.21

\$ 0.28

\$0.20-0.30

\$ 0.30

\$ 0.37

If costs decline at 10% per annum then networks will have to compete with consumers going "off grid"

Prices if solar+battery costs fall 20% p.a. for 5 years (USD/kWh)

Rooftop Solar (8% discount rate)

Rooftop Solar + partial battery

Rooftop Solar + full battery

US

Japan

Australia

European Average

Germany

Retail Electricity

\$ 0.04

\$ 0.09

\$ 0.12

\$ 0.15

\$ 0.28

\$0.20-0.30

\$ 0.30

\$ 0.37

If costs decline at 20% per annum then there will be major disruptions in retail electricity markets

Source: Nucleus Wealth, Lazard, Bloomberg, Open EI, Global Petrol Prices



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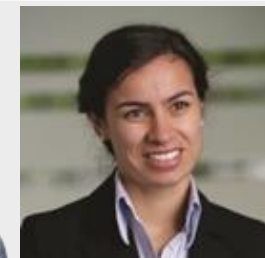


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Investment implications:

Stocks

- **Green Energy:** e.g. Vestas Wind.
- **Energy Conversion leaders:** e.g. Energias de Portugal, ENGIE (to lesser extent)
- **Service Companies:** Censored

Climate Change



Current Ethics

- No Fossil Fuels (Worst Offenders)
- No Fossil Fuels (Any)
- No Coal Seam Gas or Fracking
- No Nuclear
- No Old Growth Forest Logging



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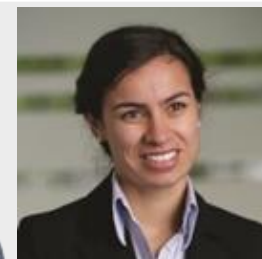


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Investment implications:

3Q numbers critical

All Companies

%tile	World	US	Canada	Eurozone	Non-Euro Europe	Japan	Developd Asia exJapan	Australia & NZ
NTM Forecast: Now vs 1 month ago								
10%	-4%	-1%	-3%	-7%	-3%	-8%	-10%	-4%
25%	-1%	0%	0%	-2%	-1%	-1%	-1%	-1%
40%	0%	0%	0%	-1%	0%	0%	0%	0%
50%	0%	0%	0%	0%	0%	0%	0%	0%
60%	0%	1%	0%	0%	0%	0%	0%	0%
75%	1%	2%	2%	1%	1%	1%	0%	1%
90%	6%	6%	13%	4%	6%	7%	0%	8%
NTM Forecast: Now vs FY2019								
10%	-66%	-48%	-68%	-75%	-48%	-87%	-80%	-76%
25%	-29%	-19%	-21%	-37%	-27%	-43%	-31%	-34%
40%	-14%	-4%	-8%	-23%	-14%	-22%	-20%	-24%
50%	-6%	0%	-3%	-14%	-10%	-15%	-14%	-17%
60%	0%	5%	3%	-6%	-3%	-7%	-10%	-9%
75%	11%	15%	16%	4%	8%	10%	-1%	8%
90%	39%	38%	59%	26%	32%	57%	24%	38%
Count	1539	613	77	234	182	309	55	69

Just Companies who have reported 3Q

%tile	Growth	Surprise	Revision	NTM vs 2019
10%	-57%	-5%	-7%	-64%
25%	-11%	7%	1%	-26%
40%	4%	12%	3%	-9%
50%	12%	15%	4%	2%
60%	19%	24%	7%	8%
75%	32%	38%	14%	17%
90%	62%	113%	32%	31%
Count	54	54	69	69



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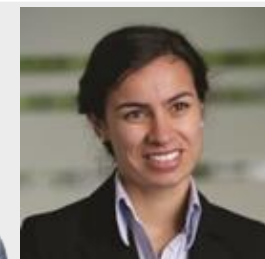


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Investment implications

Unemployment: Number one issue

Insolvencies: A close second

Equities:

- How far will earnings fall / recover
- -ve: Gearing changes, deglobalisation, increased redundancy, supply chain
- +ve: Reduced rent, travel, new efficiencies, lower staff costs

Bonds:

- Government stimulus very focussed on supply, not on demand
- RBA being dragged kicking and screaming into more unorthodoxy



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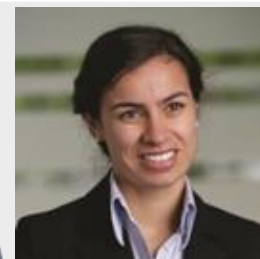


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Investment implications

Unemployment: Number one issue

Insolvencies: A close second

Equities:

- How far will earnings fall / recover
- Consensus earnings useless. Five year average more helpful.
- -ve: Gearing changes, deglobalisation, increased redundancy, supply chain
- +ve: Reduced rent, travel, new efficiencies

Bonds:

- Inflation vs safety

AUD:

- Stimulus vs disruption



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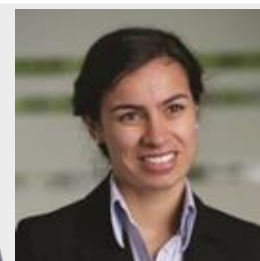


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Viewer question of the week:

Will reality force the economists hands or do they have a trump card?

Drop your answers in the comments



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Coming up

Nucleus Investment Insights: Cameron Murray

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next

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