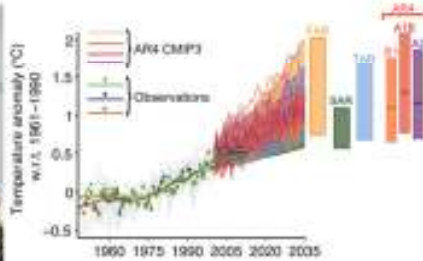




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Moneypoint power station, Co. Clare

900 MW, coal-fired

Planned retirement: 2025

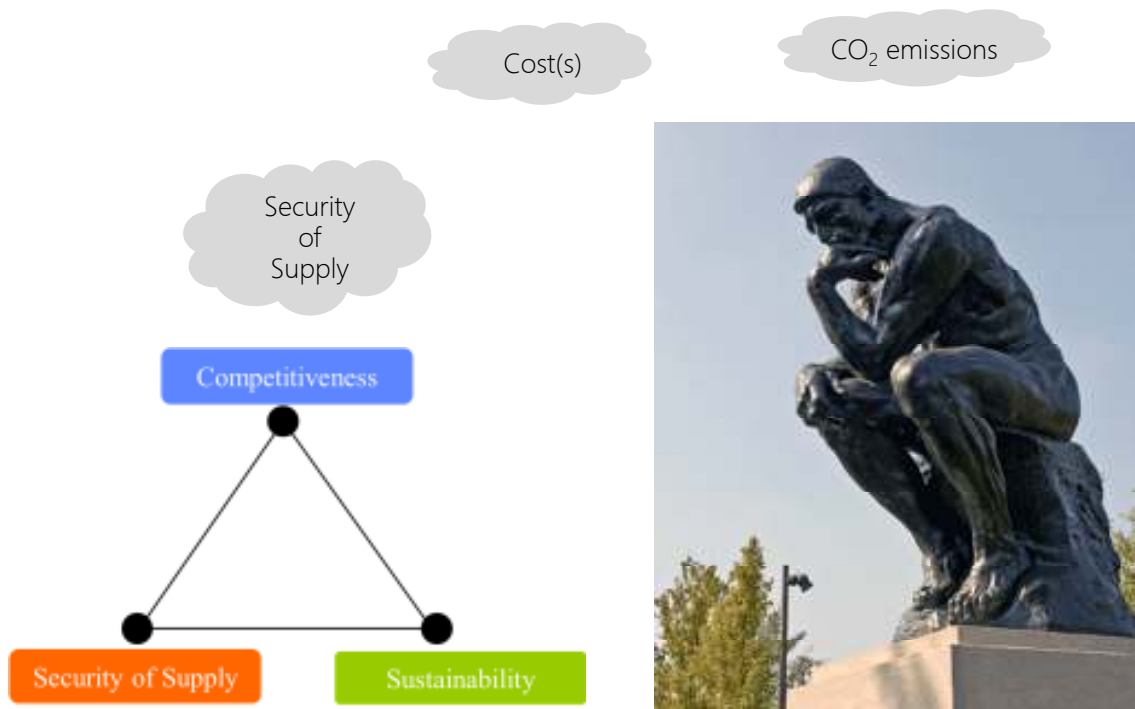


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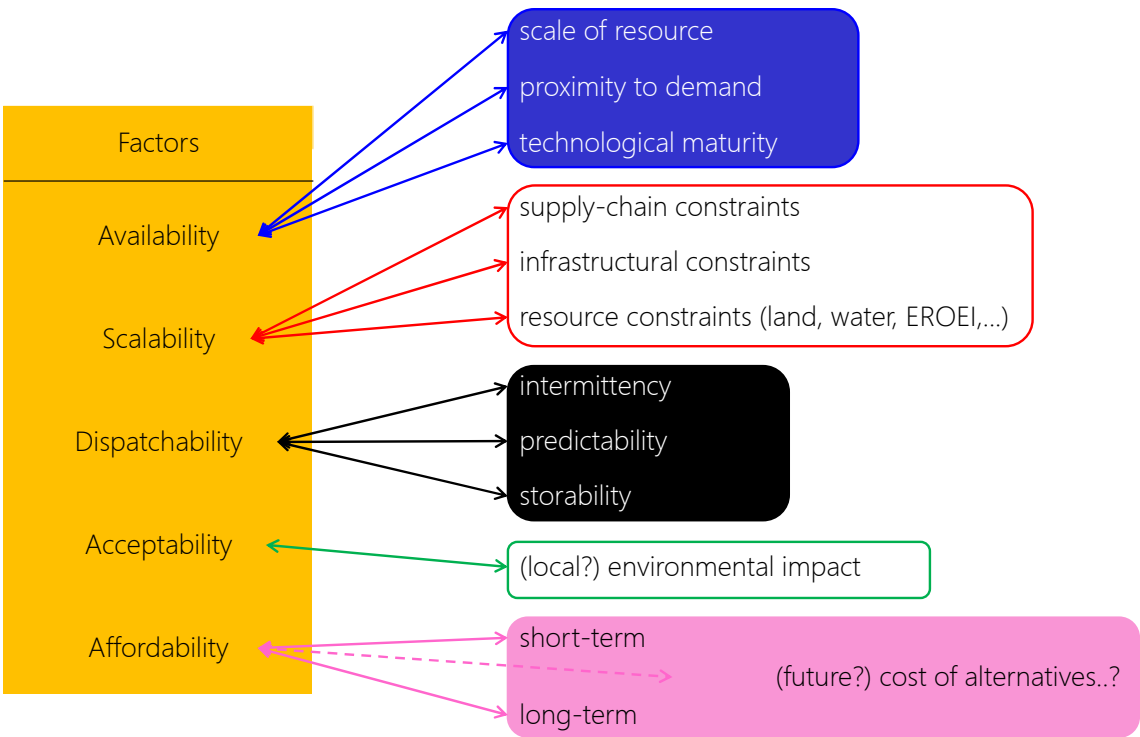
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# Evaluating alternatives



# Evaluating alternatives



Time preference for money:



Time preference for money:

$$\text{Present value} = \text{Future value} \times \frac{1}{(1 + r)^n} \rightarrow n = \text{number of years}$$

↓  
→  $r$  = discount rate (per year)

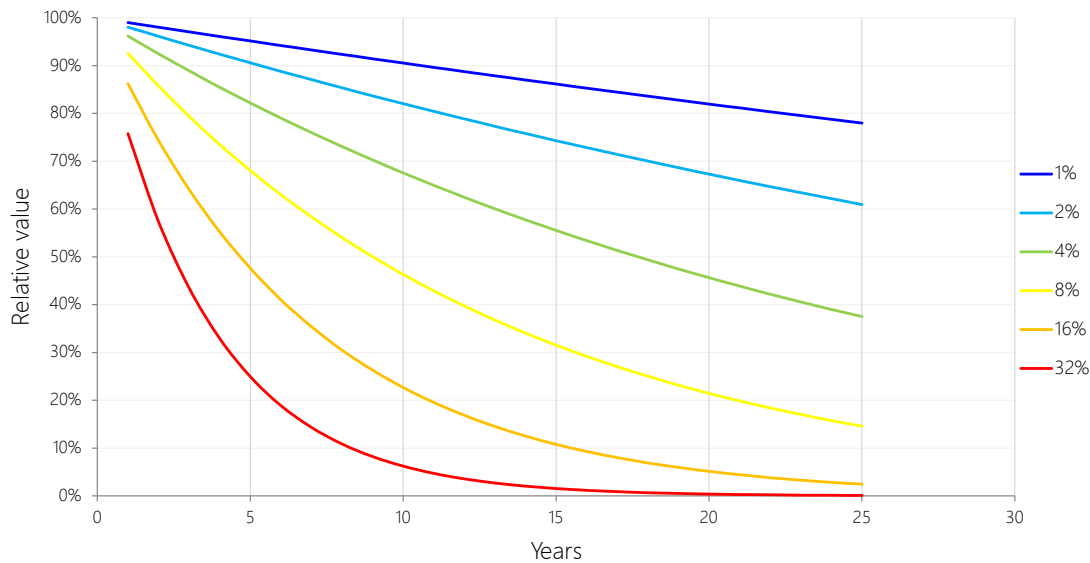


## Time preference for money:

$$\text{Present value} = \text{Future value} \times \frac{1}{(1 + r)^n}$$

Discount factor

- Present value of future income is very sensitive to  $r$ .
- How to choose an appropriate value for  $r$ ?

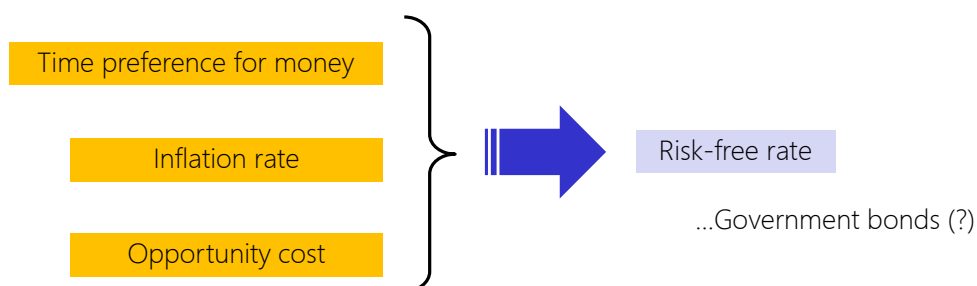


## Time preference for money:

Opportunity cost:

- Value of the next-best alternative
- Spend €50 on a night out, or on a pair of jeans, or invest it...in the hope of getting more than €50 later
- Not all investors have the same opportunities

Hence: projects compete for investors; investors compete for projects



## Time preference for money:

### Risk premium:

- Shares versus deposits
- Wind versus marine
- Denmark versus Yemen
- Leads to WACC

Risk-free rate

+ Risk premium

= Discount rate

Technology risk

Country risk

Firm risk

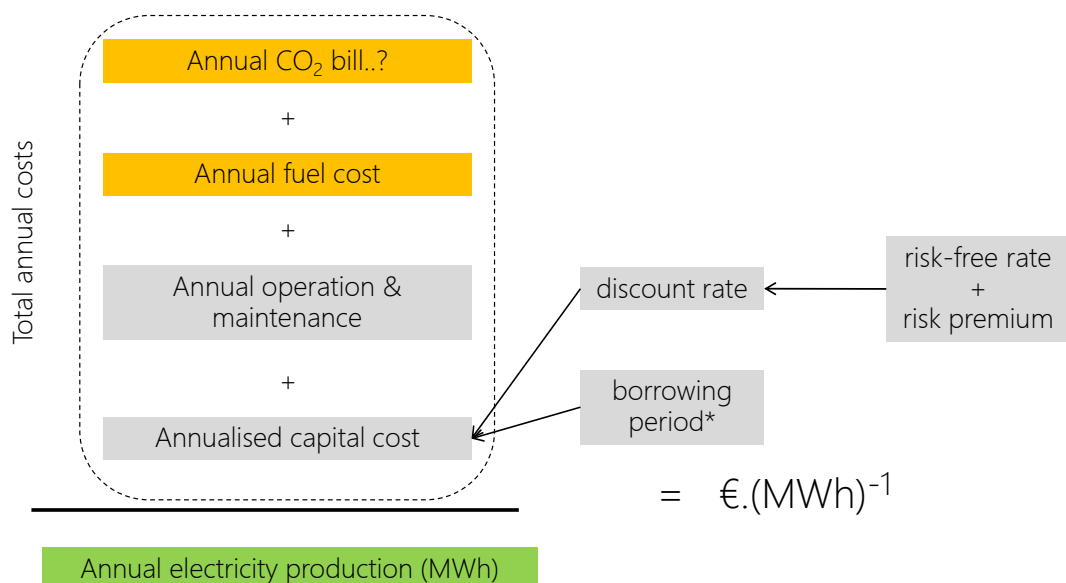
Market risk

etc...



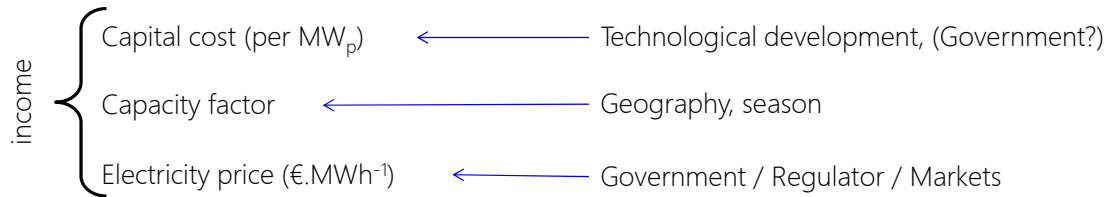
## Levelised cost of electricity (lcoe):

LCOE estimates the average cost of producing electricity over the lifetime of a plant.

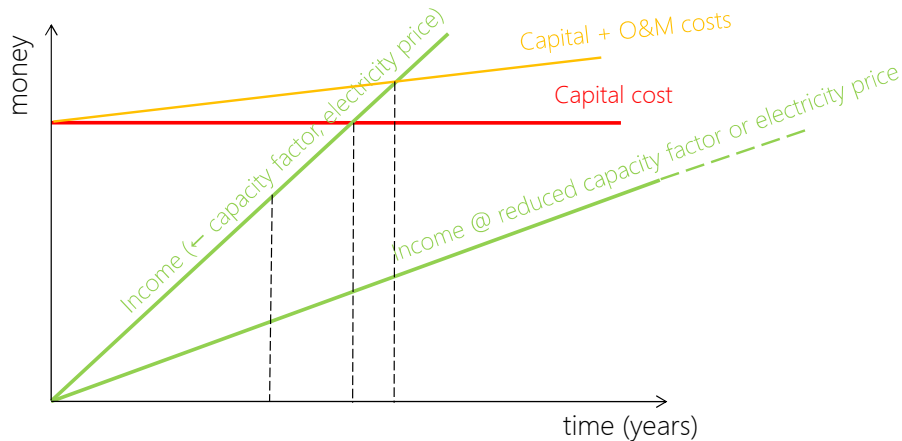


## Levelised cost of electricity (lcoe):

Three main factors dominate the economic viability of renewable electricity plant:



Consider (very) simplified analysis:



## Levelised cost of electricity (lcoe):

Sensitivity of lcoe to external variables, for each technology type

	coal	gas	nuclear	renewables
<i>Capital cost</i>	high	moderate	high	very high
<i>Discount rate (WACC)</i>	high	moderate	high	very high
<i>Fuel cost</i>	moderate	high	very low	zero
<i>CO<sub>2</sub> cost</i>	high	moderate	zero	zero
<i>Capacity factor</i>	high	moderate	high	very high

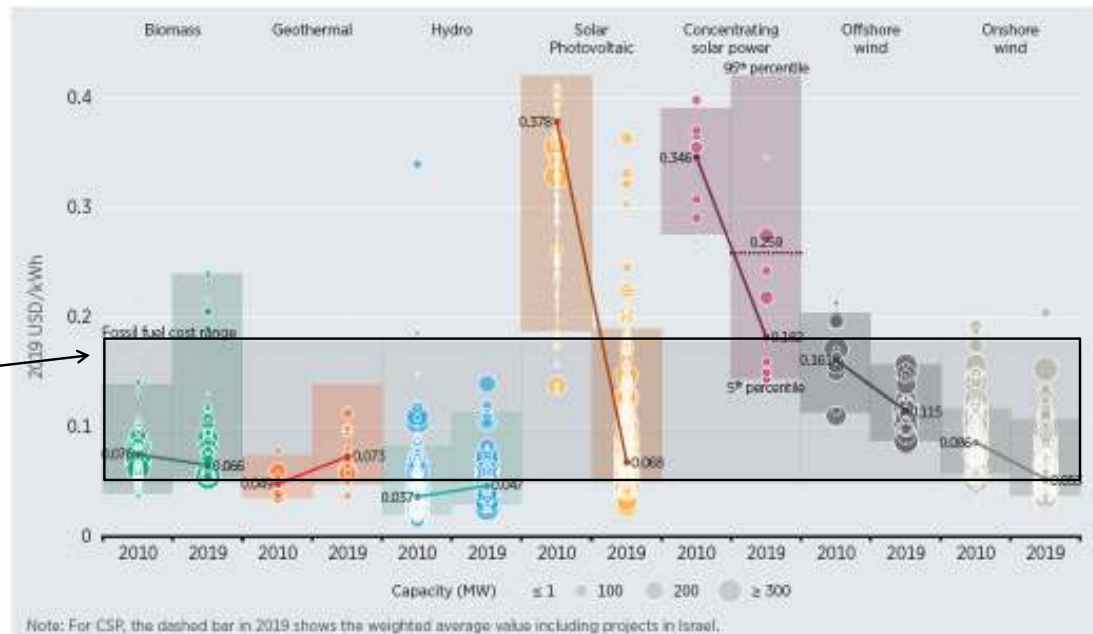
*Sensitivity*

...so estimates of future lcoe for each technology are sensitive to the specific values assumed for these parameters



## Levelised cost of electricity (lcoe):

**Figure 1.2** Global LCOEs from newly commissioned utility-scale renewable power generation technologies, 2010-2019

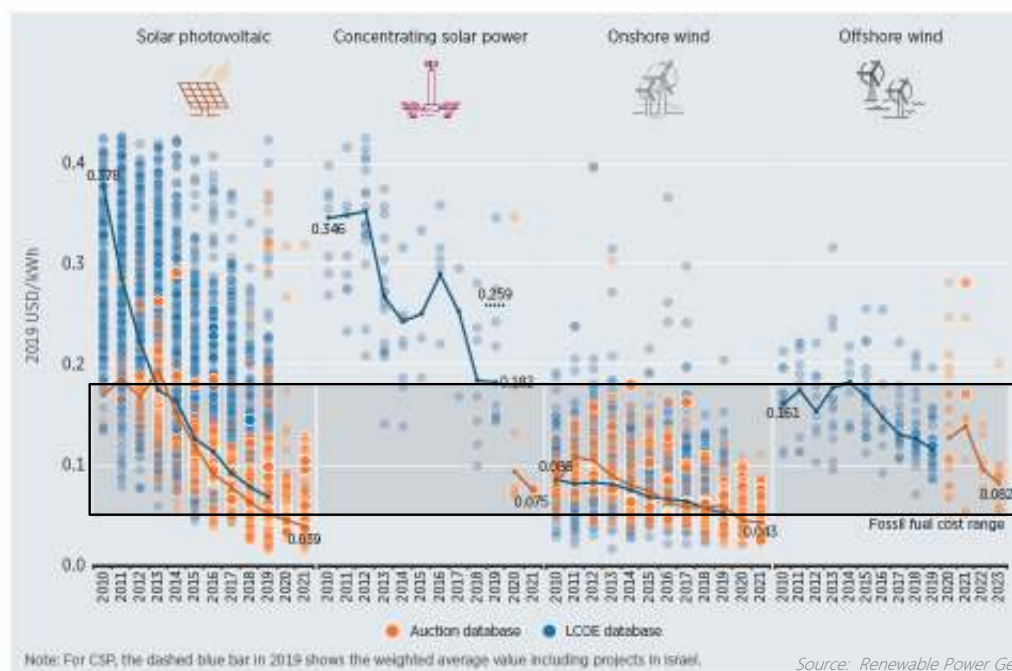


Source: Renewable Power Generation Costs in 2019. IRENA (2020)



## Levelised cost of electricity (lcoe):

**Figure 1.3** The LCOE and PPA/Auction prices by project for solar PV, onshore wind, offshore wind and CSP, 2010-2023



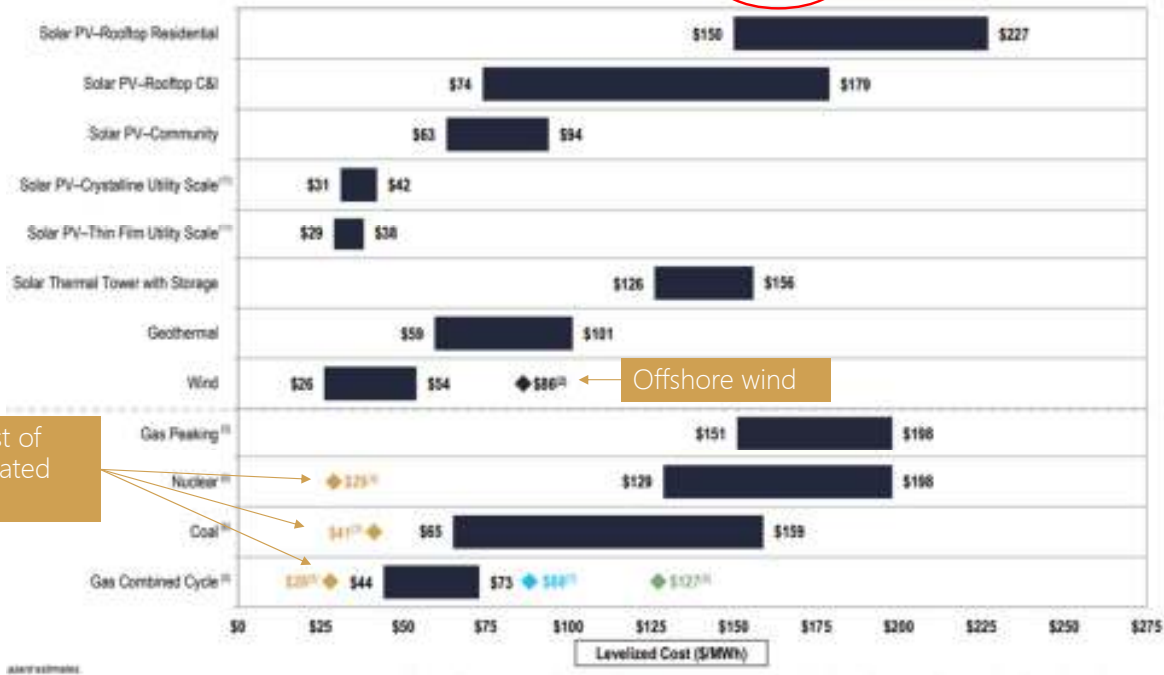
Source: Renewable Power Generation Costs in 2019. IRENA (2020)



Levelised cost of electricity (lcoe):

Lazard data for USA

Marginal cost of fully-depreciated plant

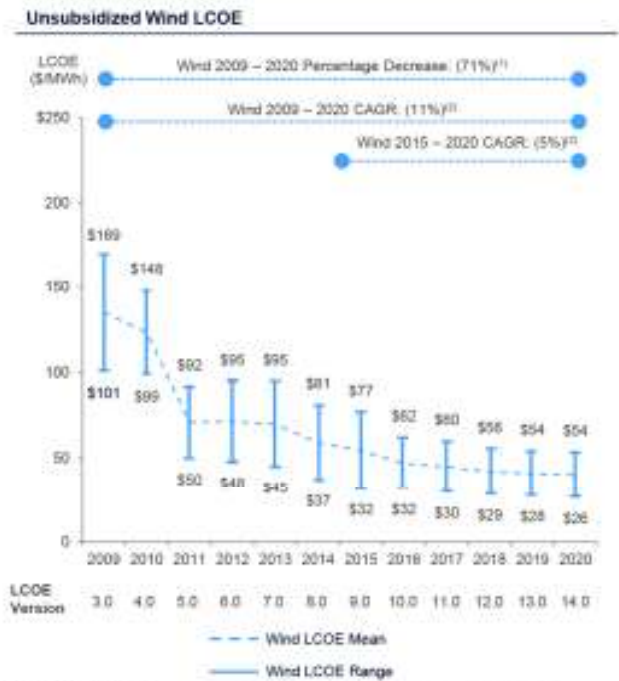


Source: Lazard's cost of energy analysis – version 14.0 (2020). [www.lazard.com](http://www.lazard.com)

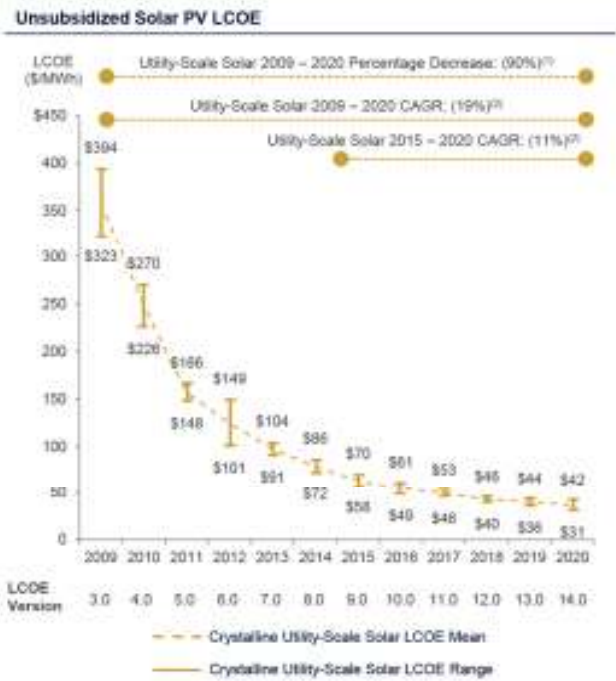


Levelised cost of electricity (lcoe):

Lazard data for USA



Source: Lazard estimates:  
(1) Represents the average percentage decrease of the high end and low end of the LCOE range.  
(2) Represents the average compounded annual rate of decline of the high end and low end of the LCOE range.

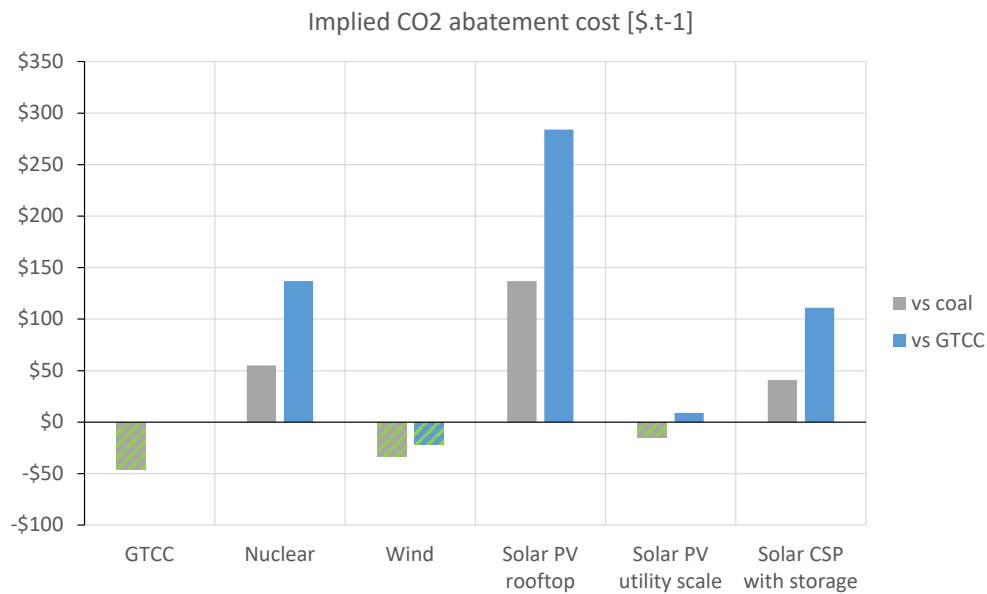


Source: Lazard's cost of energy analysis – version 14.0 (2020). [www.lazard.com](http://www.lazard.com)



Cost of CO<sub>2</sub> abatement:

Lazard data for USA



Raw data: Lazard's cost of energy analysis – version 11.0 (2017). [www.lazard.com](http://www.lazard.com)



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Levelised cost of electricity (lcoe):

Dubai's 900 MW solar tender sees lowest bid of \$0.0169/kWh

The offer was apparently submitted by Saudi energy giant ACWA Power, which refused to confirm the bid when asked by *the guardian*. The second lowest bid – \$0.0173/kWh – was reportedly submitted by a consortium formed by Emirati developer Masdar, French utility EDF and Chinese PV panel maker Jinko Power.

OCTOBER 18, 2019 | DUBLIN | BILLING

THE GUARDIAN



Average solar power price in Brazilian A-6 auction reaches \$20.52/MWh

Only 1/10 MWh of the 1.8 TWh of renewable energy generation capacity contracted in the previous auction was sold to date. Almost half of the capacity was sold to the state-owned utility, which is the lowest price offered by competing technologies.

OCTOBER 22, 2019 | FOR AN IN-DEPTH ANALYSIS OF THE AUCTION, VISIT [www.reuters.com](http://www.reuters.com)

REUTERS



Offshore Wind Costs Fall Below New Nuclear Plants in U.K.

By Andrew Hurren  
Investment, 18 Oct 2019 07:36. Updated on 18 Oct 2019 07:36

Joint venture to build €1.5bn wind farm off Dublin coast

Companies plan to build offshore wind farm 10km off east coast and close to the capital

Wed, Oct 16, 2019, 05:40 | Updated: Wed, Oct 16, 2019, 07:36



INTERNATIONAL • OFFSHORE WIND  
The World's Biggest Turbines and No Subsidies:  
How Offshore Wind Is Entering a New Era

By Geoffrey Smith | October 7, 2019



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## Levelised cost of electricity (lcoe):

Other costs, not captured by lcoe

Non-renewables

*Pollution*

*Water use*

*Upstream impacts - e.g. mining.*

*"Soft" (social) costs*

Renewables

*Grid costs*

*Impacts on non-renewable plant*

*Backup costs*

*Visual impact (social costs)*

*"Hard" (financial) costs*



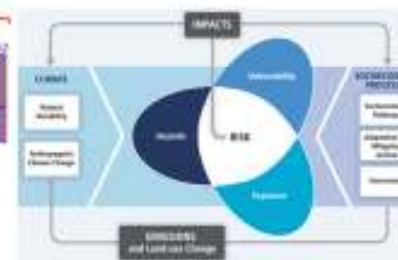
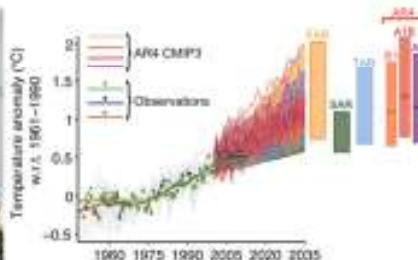
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