The Nuclear Option

Increasing our chances of surviving climate change and meeting the world's energy needs

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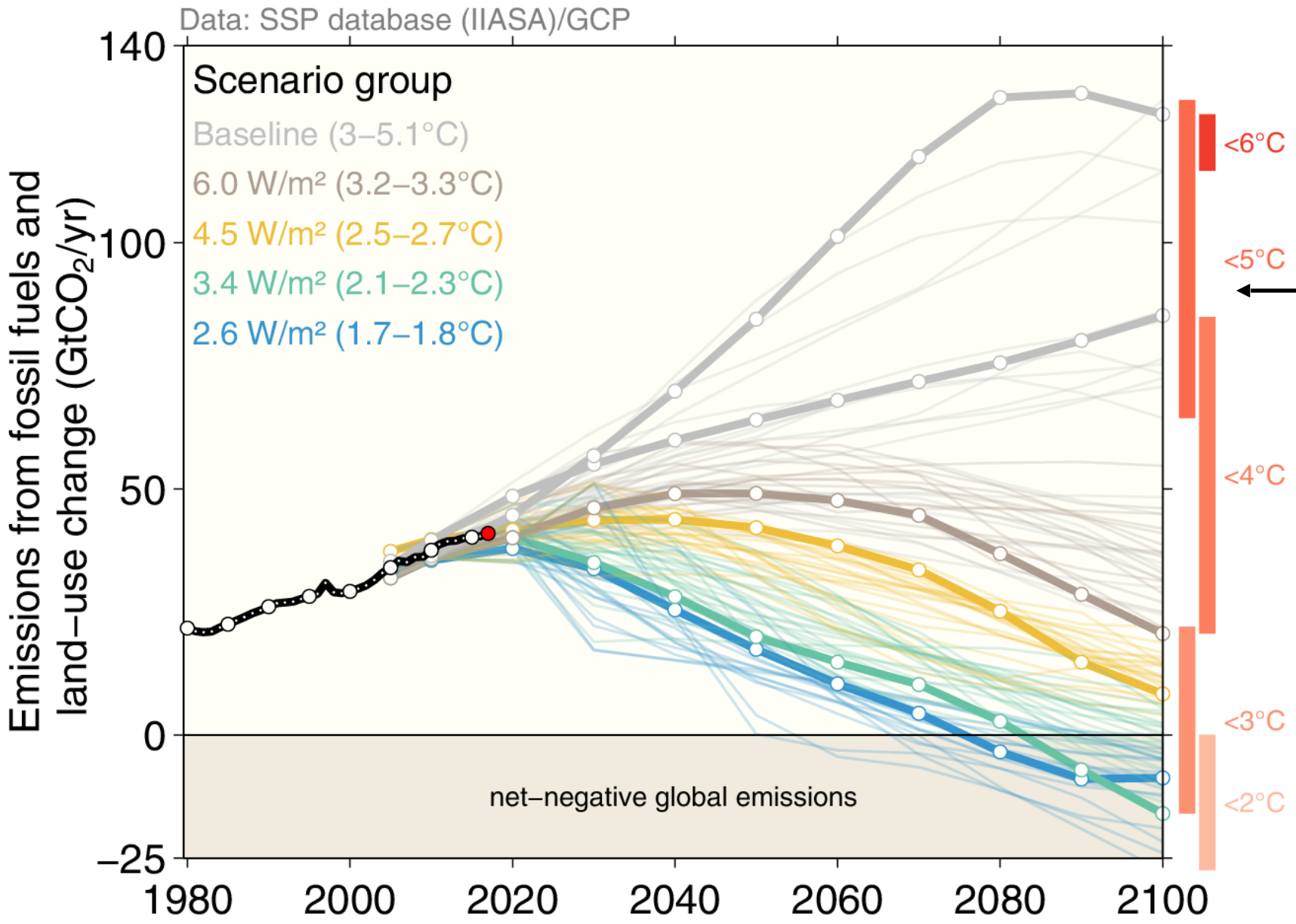
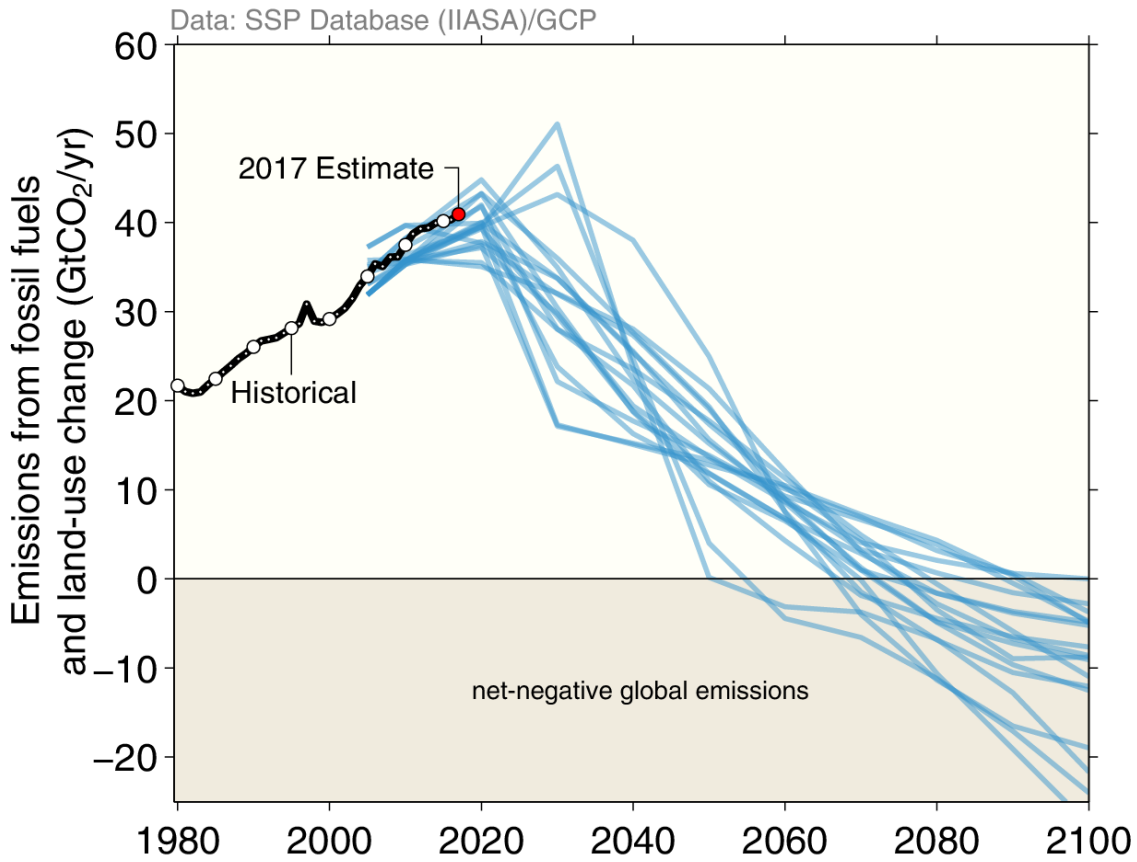


We are appear to be aiming for 5ºC

2 Degrees: In our dreams!
We are not on any of these paths



Implications:

- The <u>risk</u> of failure to decarbonize looks unacceptably high
- We need to <u>radically</u> improve the chances of success
- Re-examination of our energy technology preferences and risk prioritization is necessary

Assumptions:

- Air capture is needed for 50% of required negative emissions
- Capture, compression and disposal requires ~250kWh/tonne
- 10Gt_{CO2}/yr would require over 300 GW of baseload nuclear plants.

Delaying significant emissions reductions increases required negative emissions

But wait—countries with predominantly nuclear electricity generation have already achieved very low levels of carbon intensity

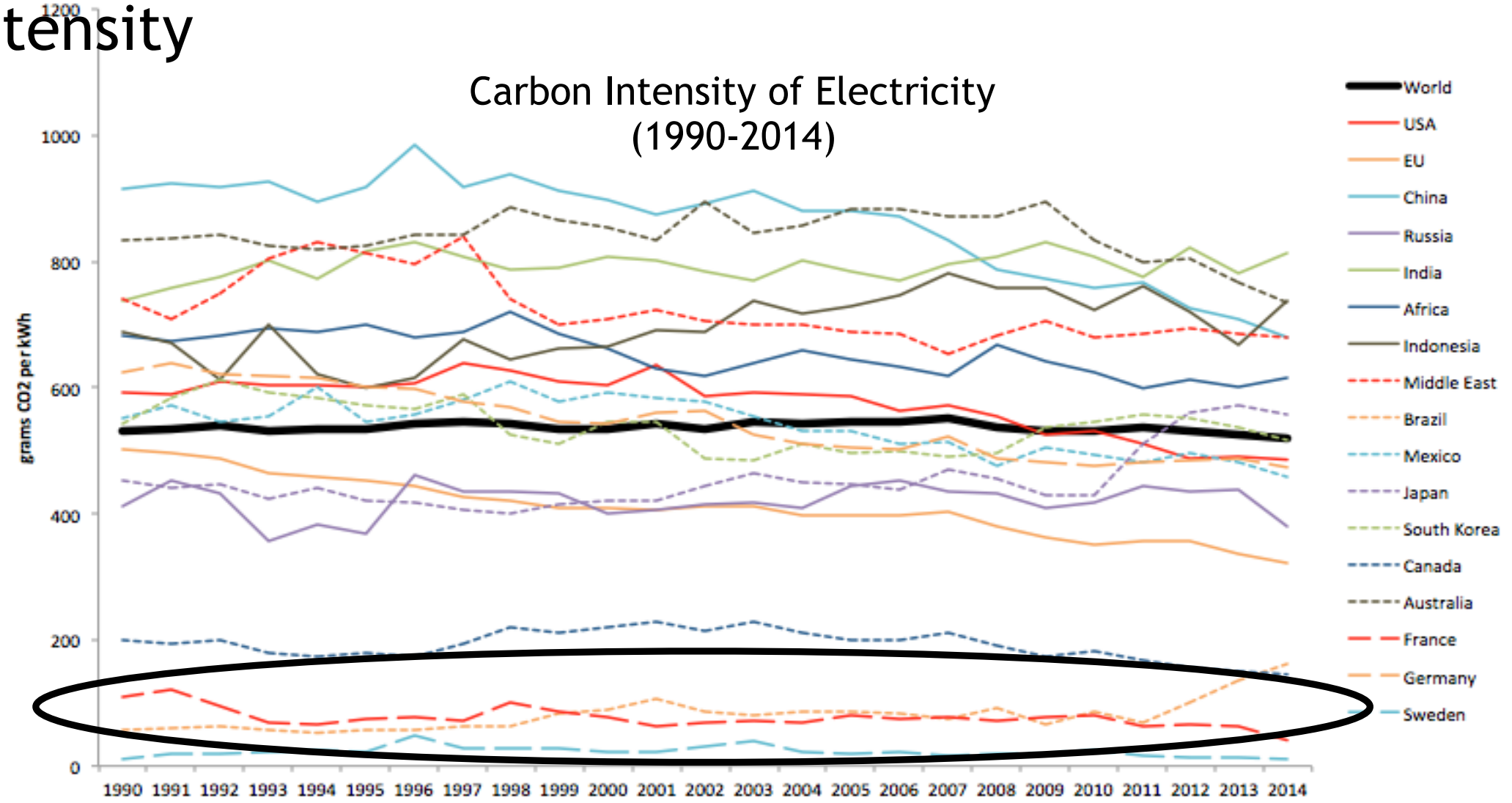
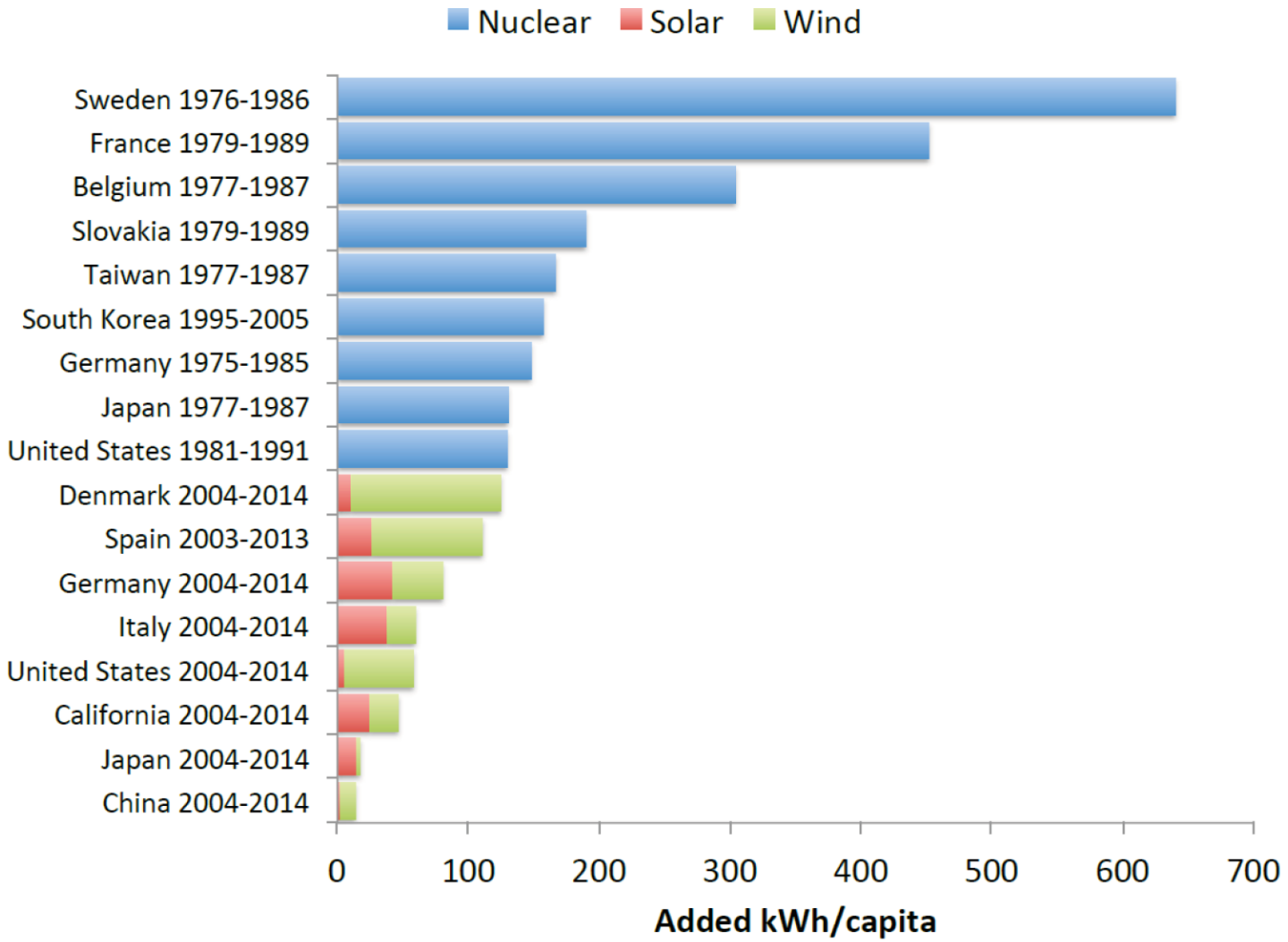


Chart Source: Clean Air Task Force, from International Energy Agency data

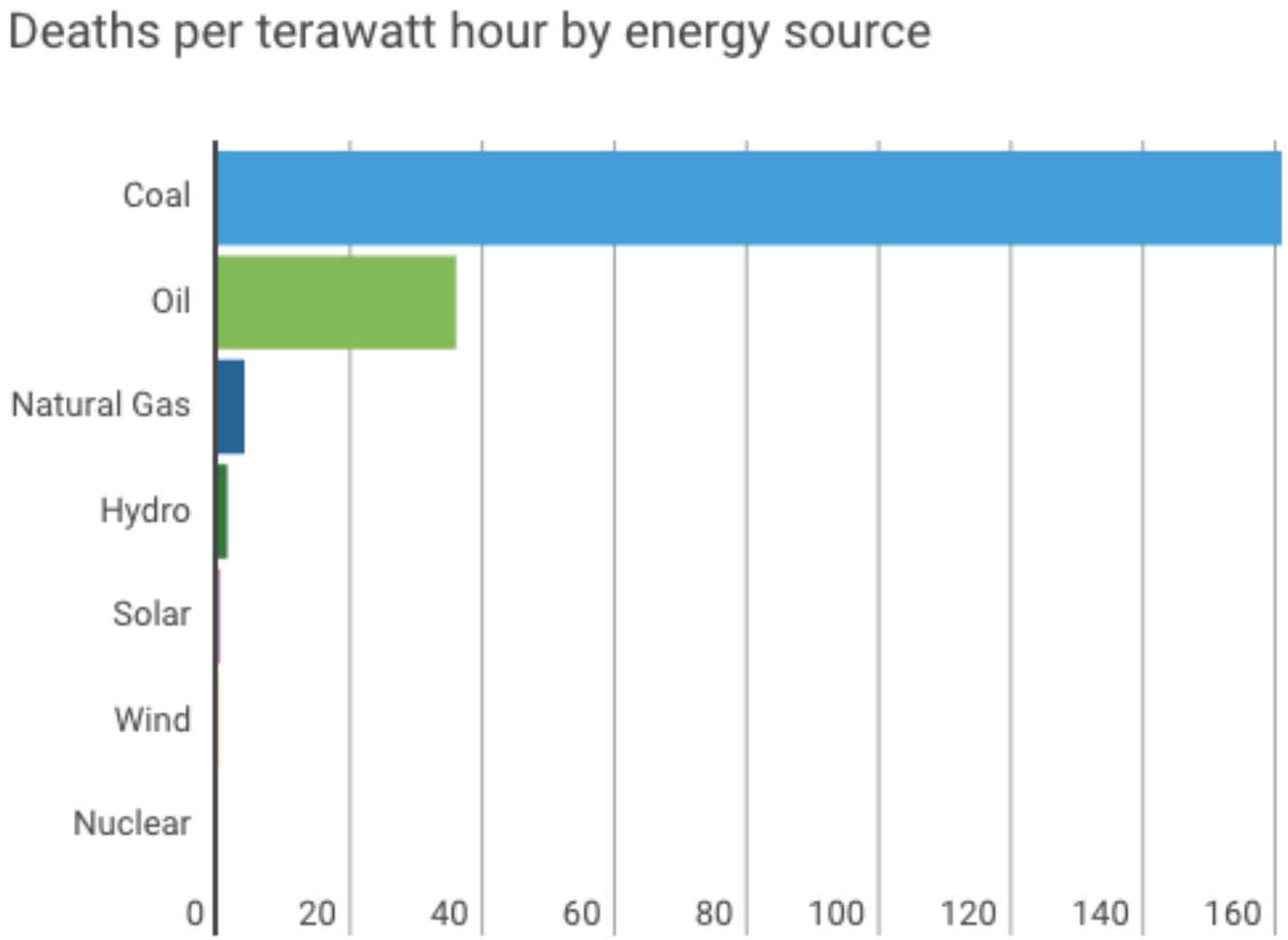
…and they achieved it very quickly



Source: EFH European Climate Leadership Report 2017, page 61

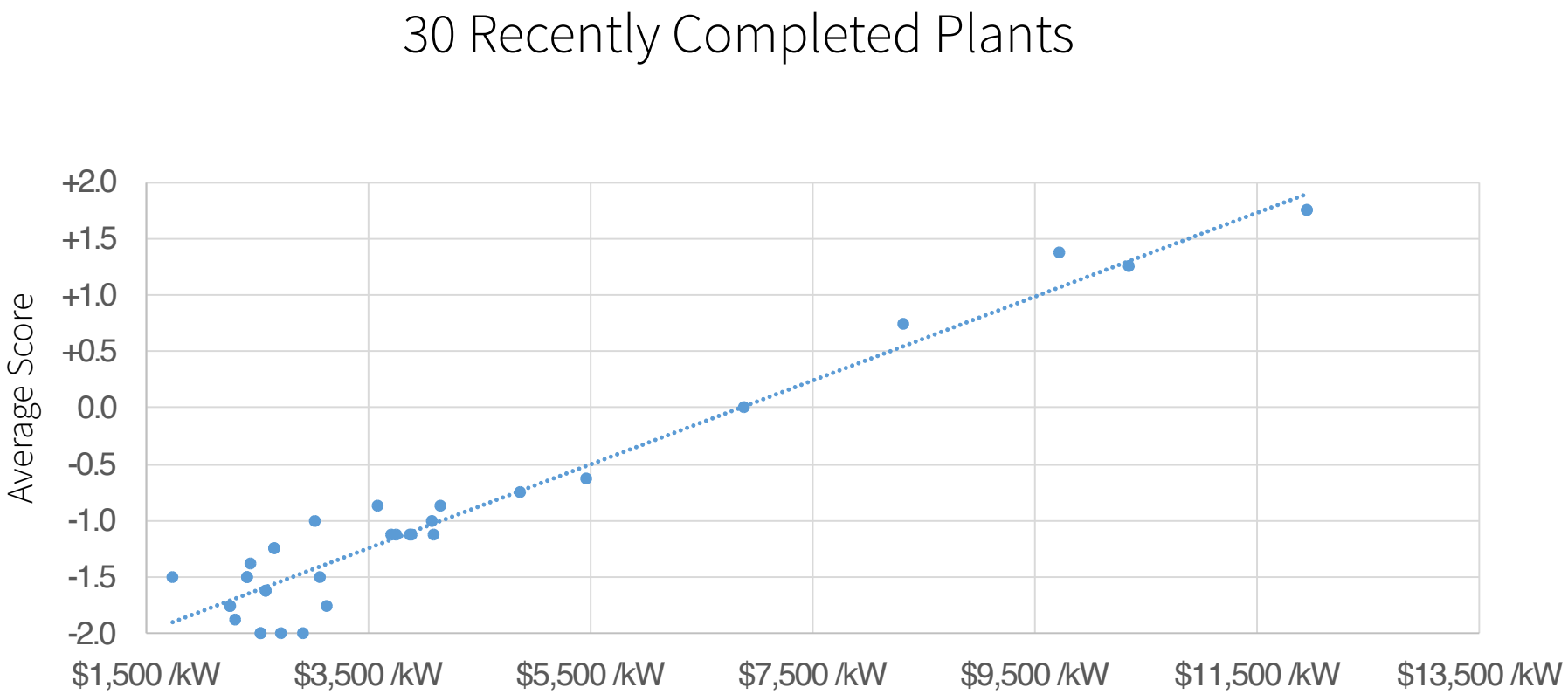
ENERGY FOR HUMANITY

Maybe the most dangerous nuclear plant— is the one that isn't built



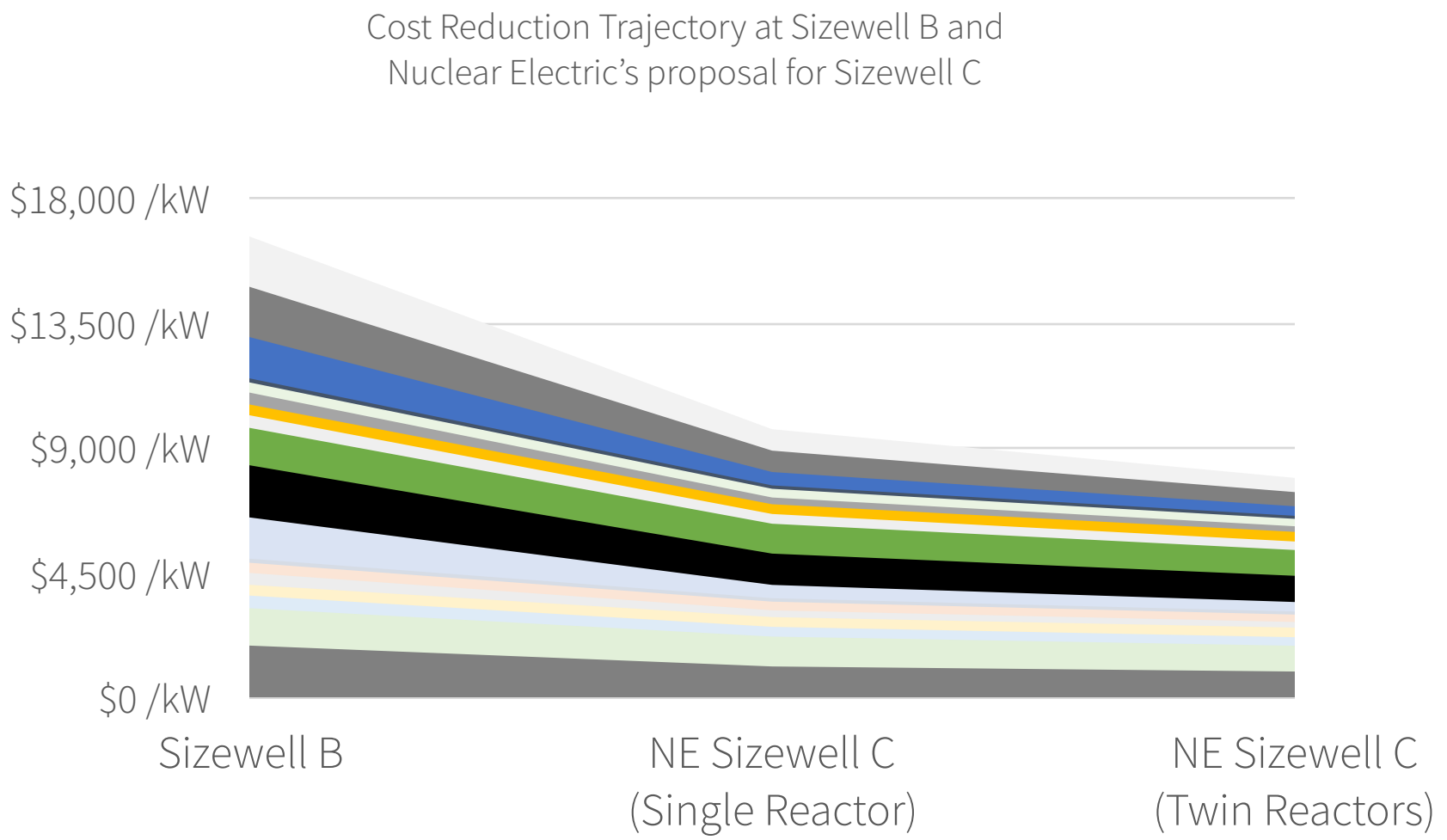
Source: Nextbigfuture.com

But nuclear is too expensive—or is it?



Source: https://www.eti.co.uk/library/the-eti-nuclear-cost-drivers-project-summary-report

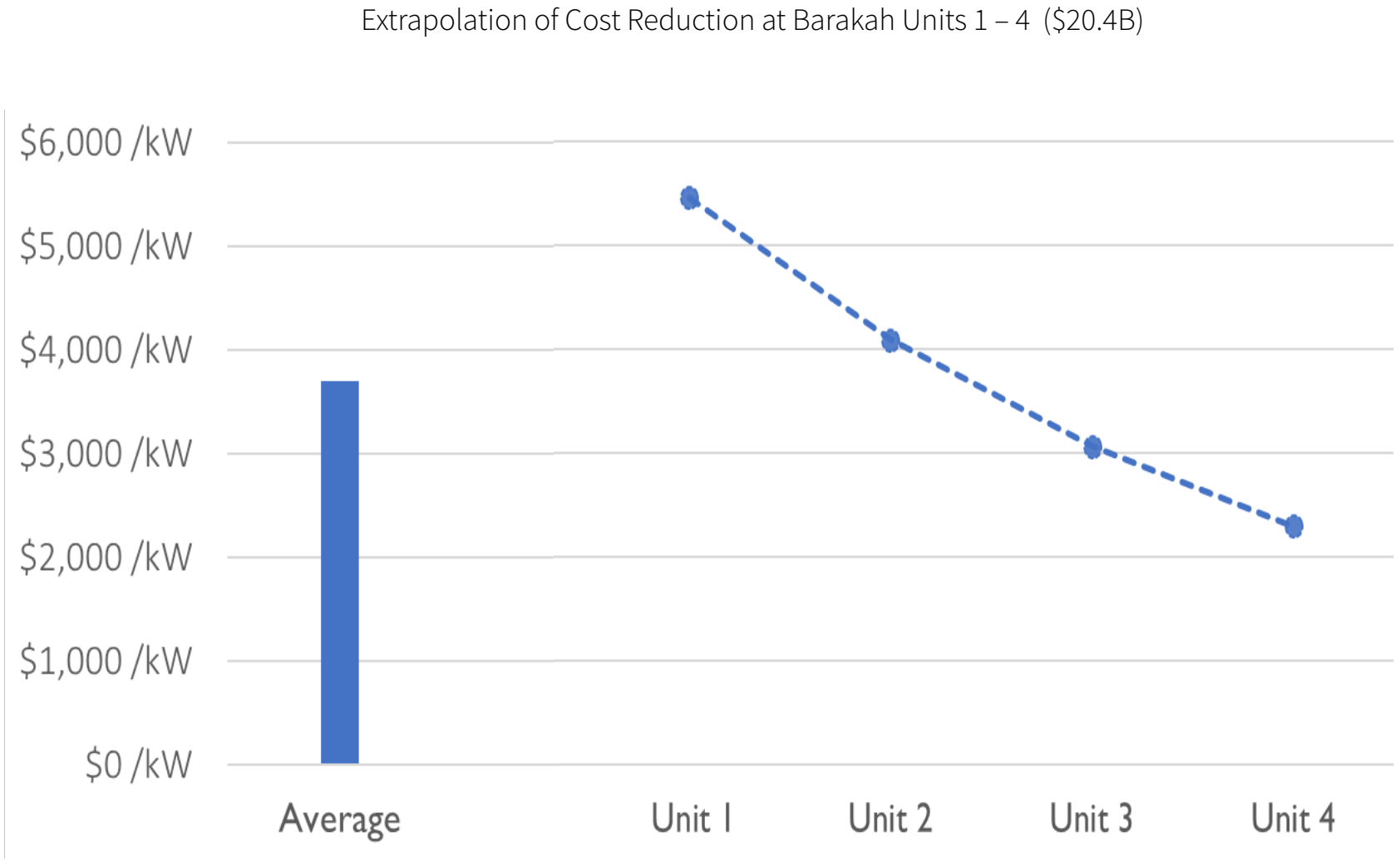
Learnings from Sizewell B to Sizewell C



- 30% reduction in overnight costs from Sizewell B to Nuclear Electric's proposal for Sizewell C (single reactor)
- Savings based on contractually-bound estimates
- ~20 month improvement in construction schedule

Barakah, Abu Dhabi 5,400 MW (4 x 1,400MW PWR)

Barakah (UAE): benefits of a multi-unit program



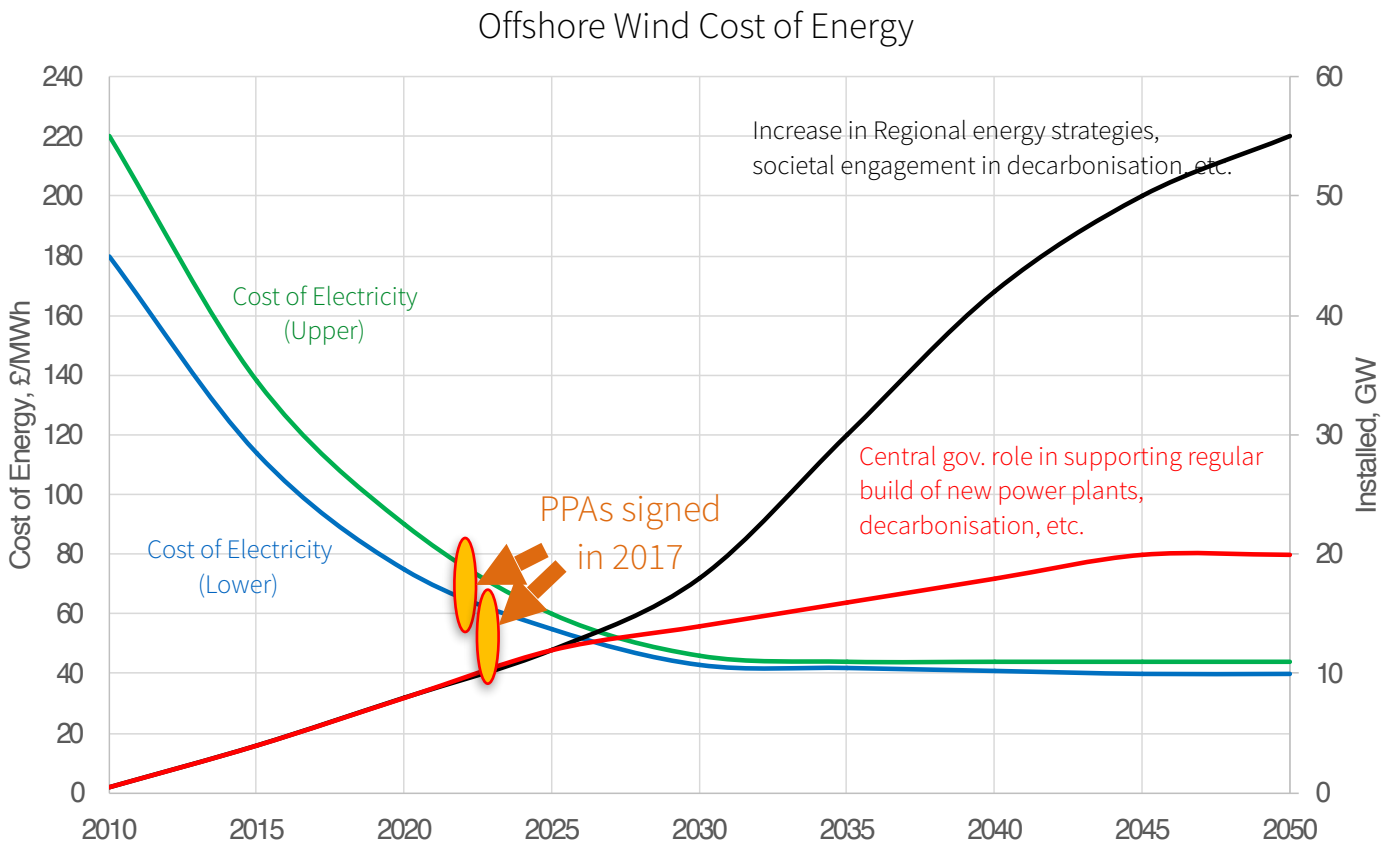
- A comprehensive “lessons learned” study informed RfP and bidding process
- Owner-led process that encouraged/imposed best practices in key aspects of project delivery
- Commitment to 4-unit purchase
- Same contractors and suppliers (building on successful deliveries in Korea)
- Vendor allowed to optimize process/ sequence, build continuously, maintain skills and experience
- 40% reduction in labor costs from unit 1 to unit 2
- No demobilization between units (moving people from unit to unit without lag)

Is it possible to organize significant cost reduction in a large industry?


LM WIND POWER
Pilot Plant

UK Offshore Wind (50% price drop over 2 years*)

- Gov't-supported "Offshore Renewables Catapult" funds R&D projects aimed at cost reduction through innovation and de-risking technology to lower financings costs
- Relentless focus on cost reduction innovations by developers

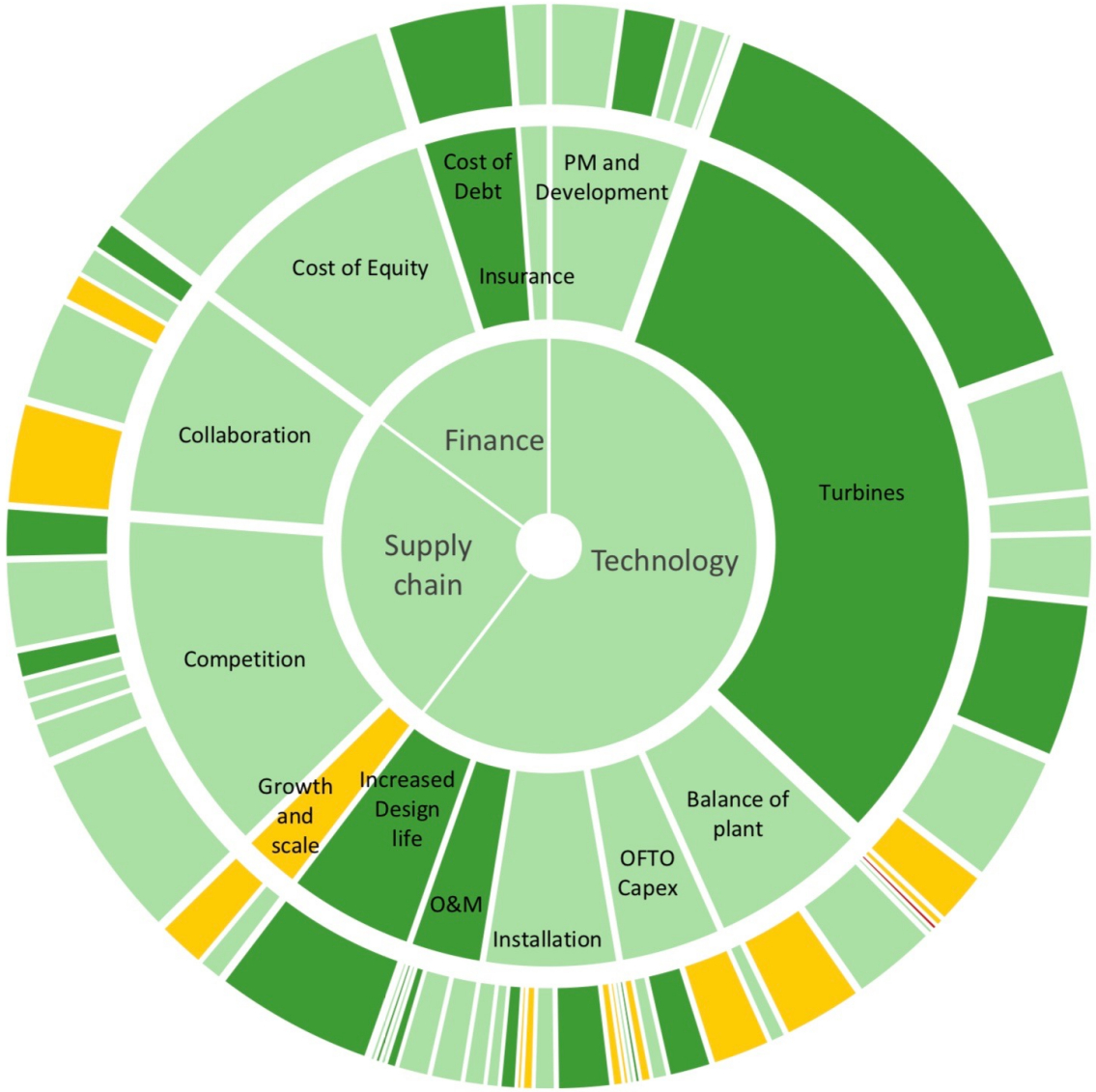


UK's Offshore Renewable Catapult

- Funded >150 collaborative R&D projects
- Tests, demonstrates, de-risks, and validates latest technologies
- Partnerships with 52 academic institutions

* The CFDs were half the price of contracts awarded in the last UK offshore wind tender in February 2015.

The UK took a very comprehensive approach



- Multiple projects
- All areas of cost
- Careful monitoring
- Clear incentives
- Auction model
- Would a similar approach work for nuclear?

Cost reduction is critical to climate/development success

What if we engaged with the nuclear industry as constructively and as persistently as we have with wind and solar?

Maybe the nuclear industry we have isn't the one we need to help solve climate?

What if we applied successful renewables policies—to nuclear?

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