



NEW ZEALAND  
**INFRASTRUCTURE  
COMMISSION**  
*Te Waihanga*

# An infrastructure perspective on Net Zero

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**Te Kāwanatanga o Aotearoa**  
New Zealand Government

Disclaimer - This presentation contains general information and is not formal advice. It is recommended that you seek independent advice on any matter relating to the use of the information. We will not be liable for any loss or damage whatsoever arising from the use of the information.



# Overview of talk

1. Investment needs
2. Why do (some) things get cheaper?
3. Challenges we still need to solve
4. The NZ Infrastructure Strategy

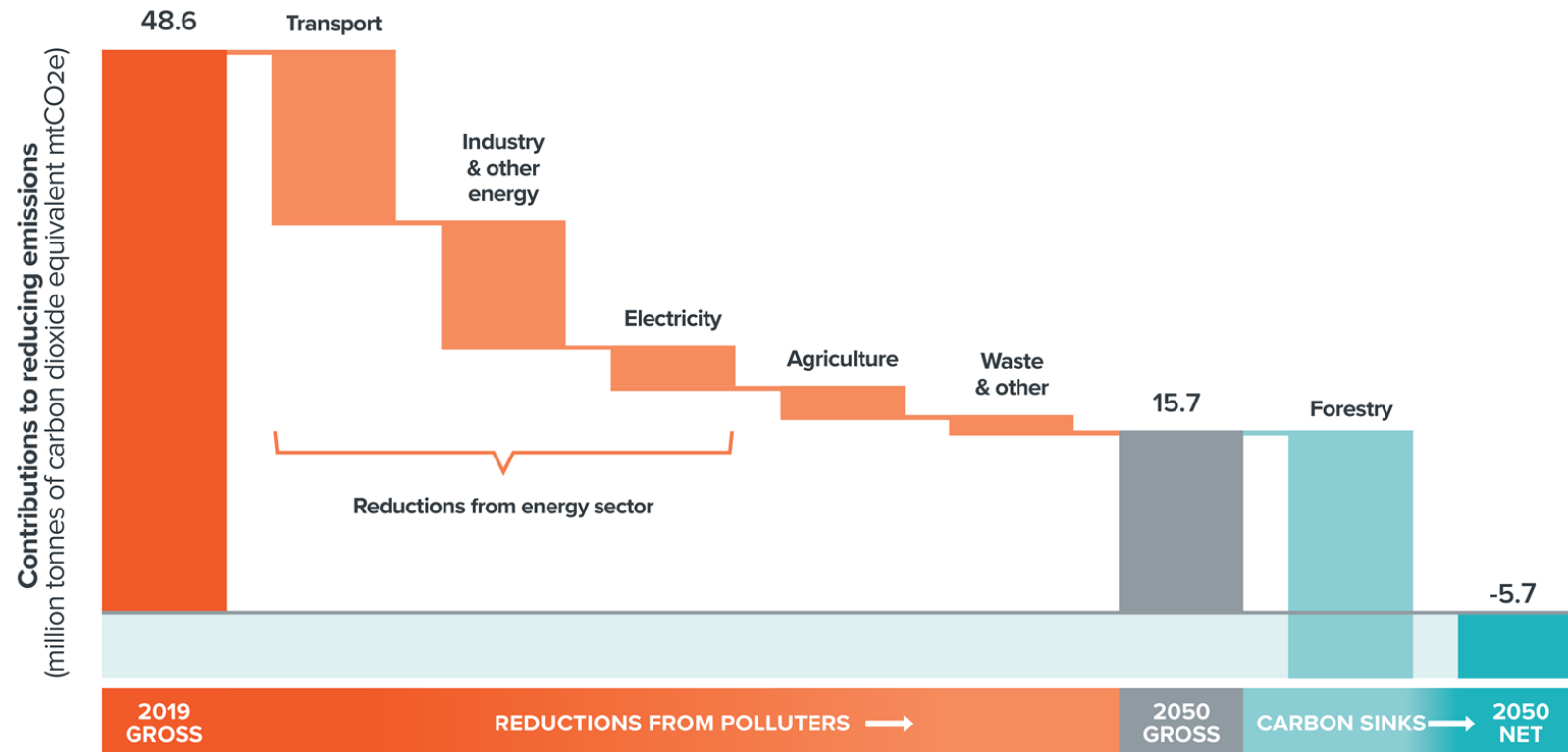


# **Section 1: Investment needs**



# The scale of the challenge

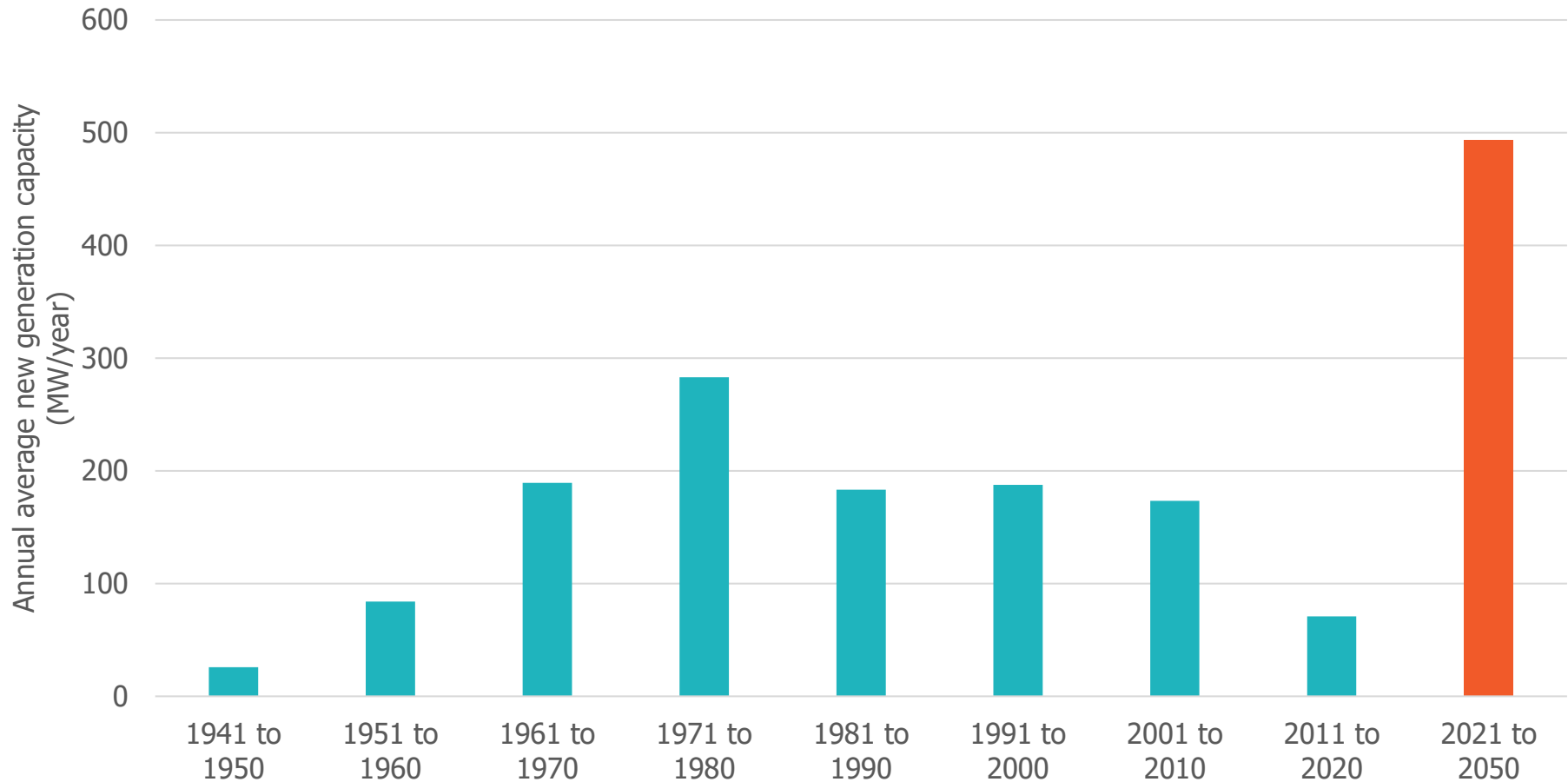
## Carbon reductions required by sector





# The scale of the challenge

Build rates need to ramp up rapidly...

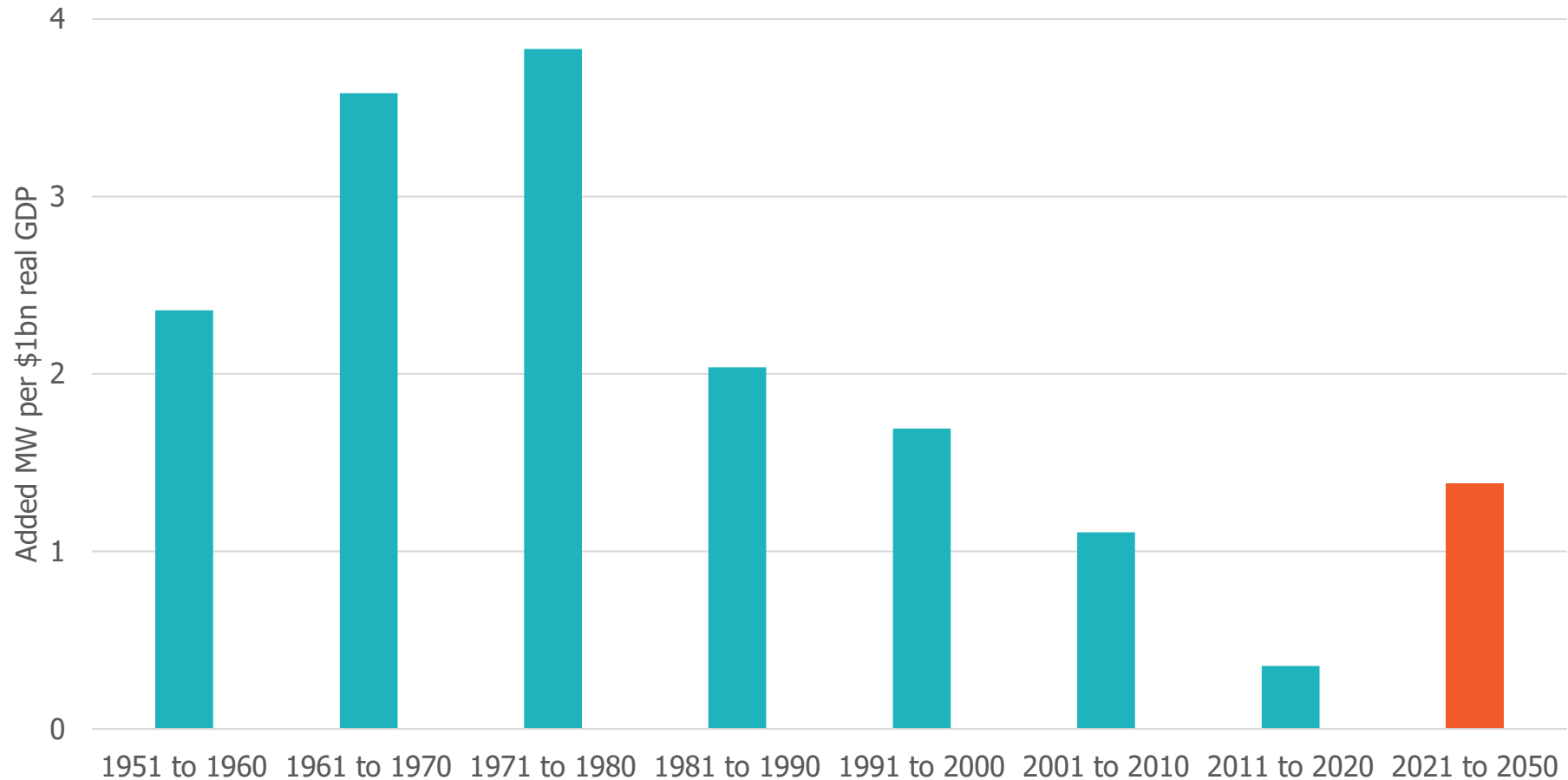


<https://www.tewaihangā.govt.nz/strategy/infrastructure-reports/leveraging-our-energy-resources-to-reduce-global-emissions-and-increase-our-living-standards/>



# The scale of the challenge

...but remain manageable relative to our income



<https://www.tewaihang.govt.nz/strategy/infrastructure-reports/leveraging-our-energy-resources-to-reduce-global-emissions-and-increase-our-living-standards/>

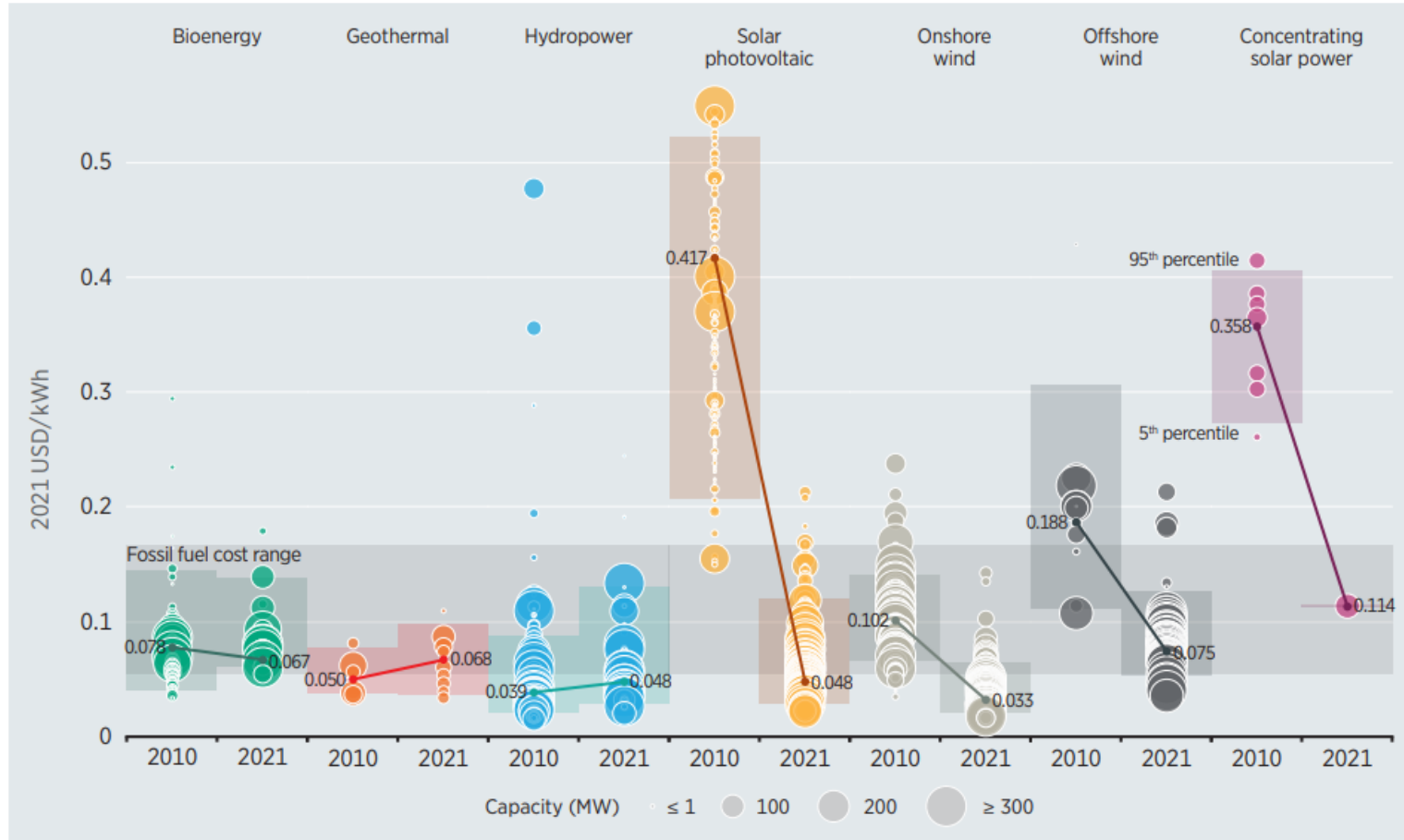


**Section 2:  
Why do  
(some)  
things get  
cheaper?**



# Faster than expected

## Cost reductions for solar and wind power



<https://irena.org/publications/2022/Jul/Renewable-Power-Generation-Costs-in-2021>





## Scale and cost

### Scale in production drives cost reductions

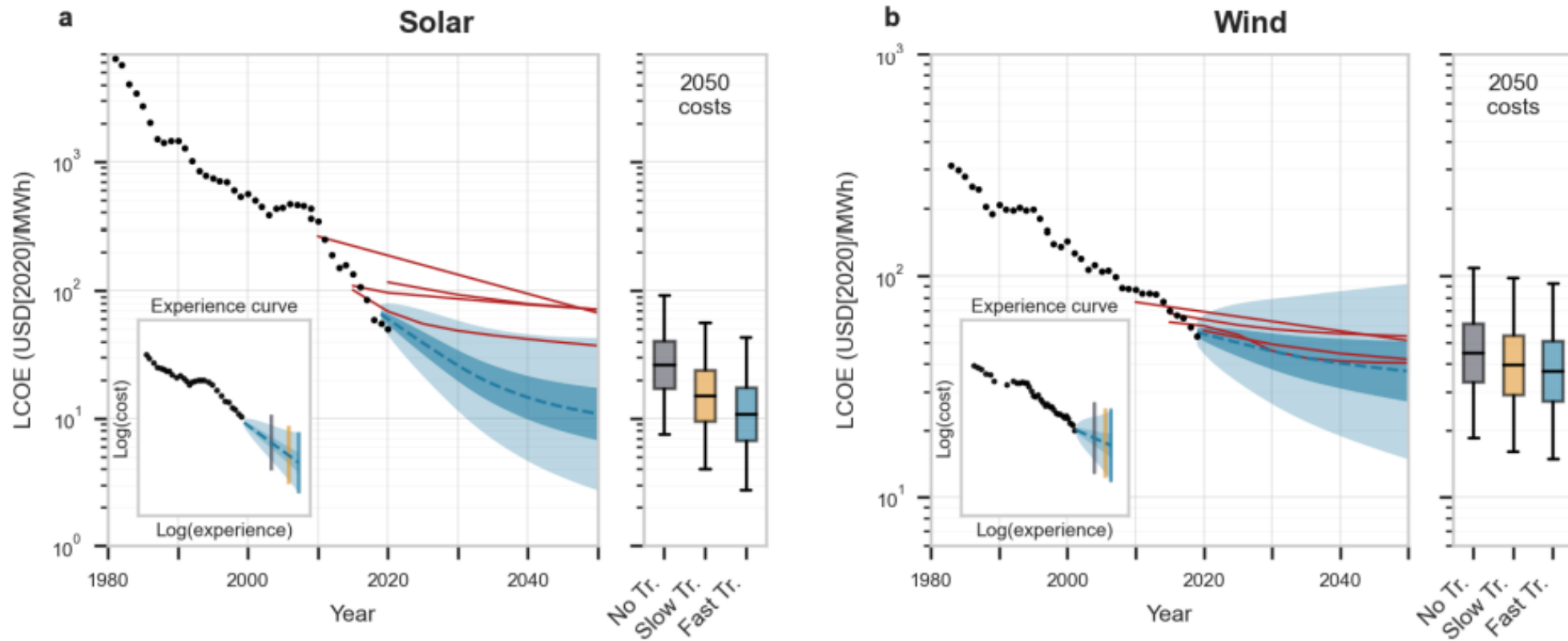
- Ted Wright (1936): cost decreases as a power law of cumulative production
- This simple model produces reasonable predictions of cost trends for 62 technologies

<https://www.santafe.edu/research/results/working-papers/statistical-basis-for-predicting-technological-pro>



# What should we expect next?

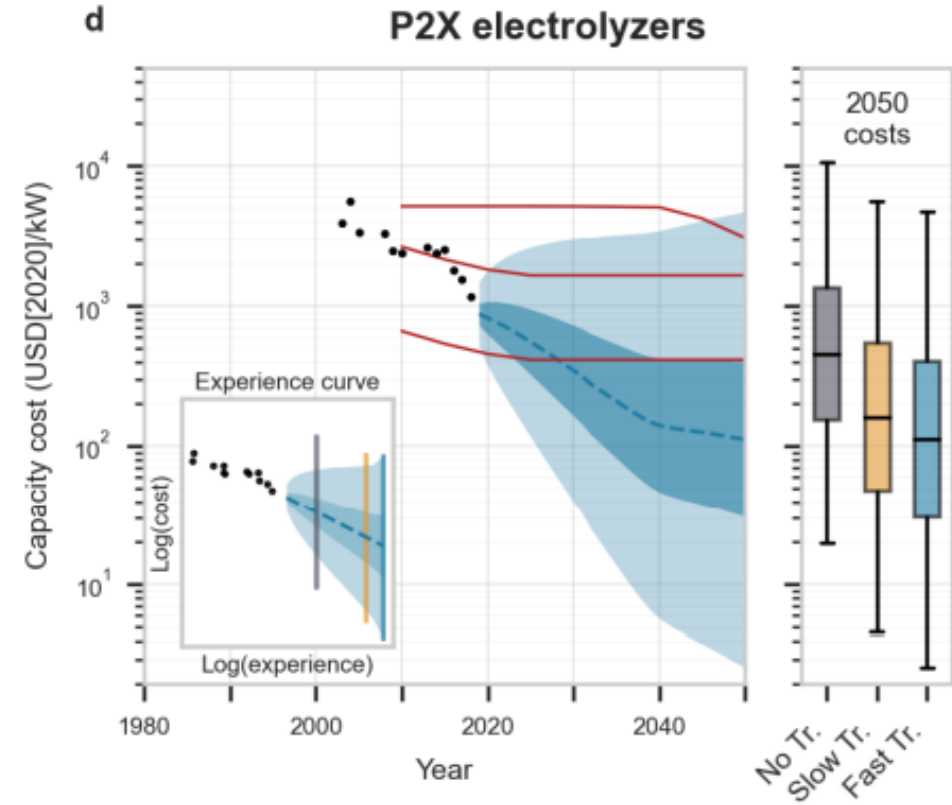
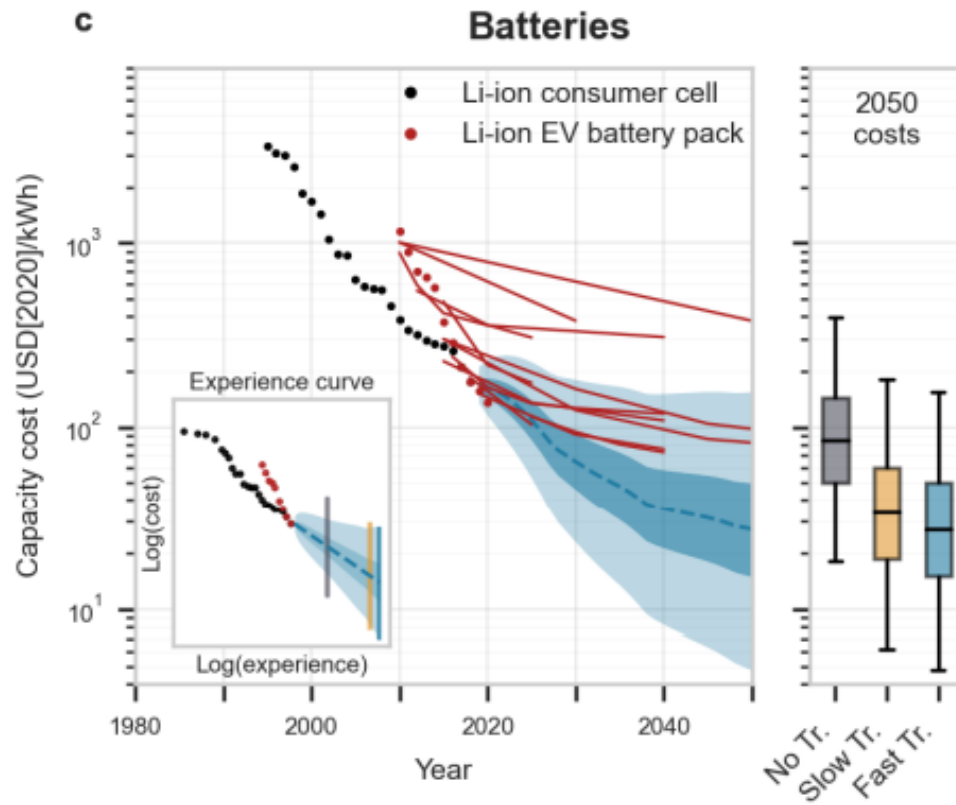
## Some forecasts for electricity generation





# What should we expect next?

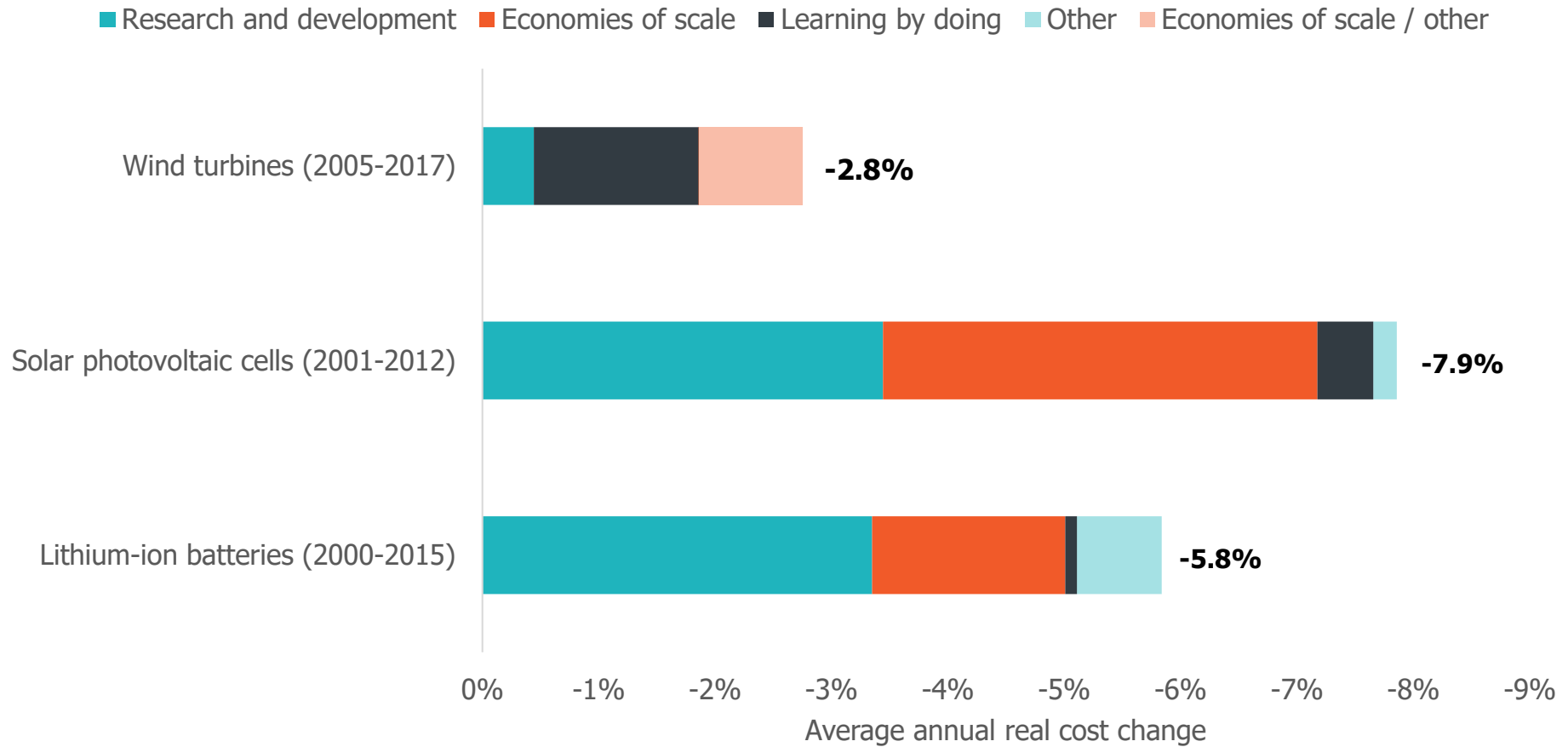
## Some forecasts for electricity storage





# R&D, scale, and learning by doing

## Drivers of cost reductions for low-emission tech



<https://www.sciencedirect.com/science/article/pii/S0301421520306236>

<https://www.sciencedirect.com/science/article/pii/S0301421518305196#s0045>

<https://pubs.rsc.org/en/content/articlelanding/2021/EE/D1EE01313K>

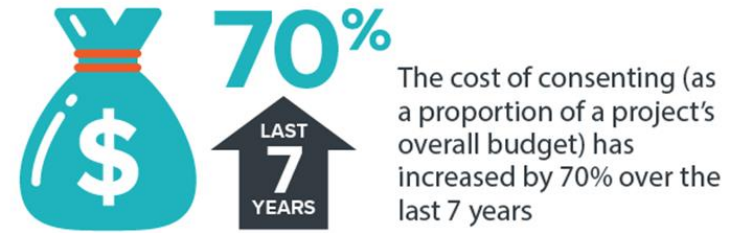
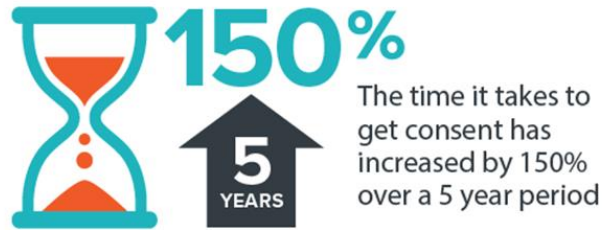


**Section 3:  
Challenges  
we still  
need to  
solve**



# The role of consenting

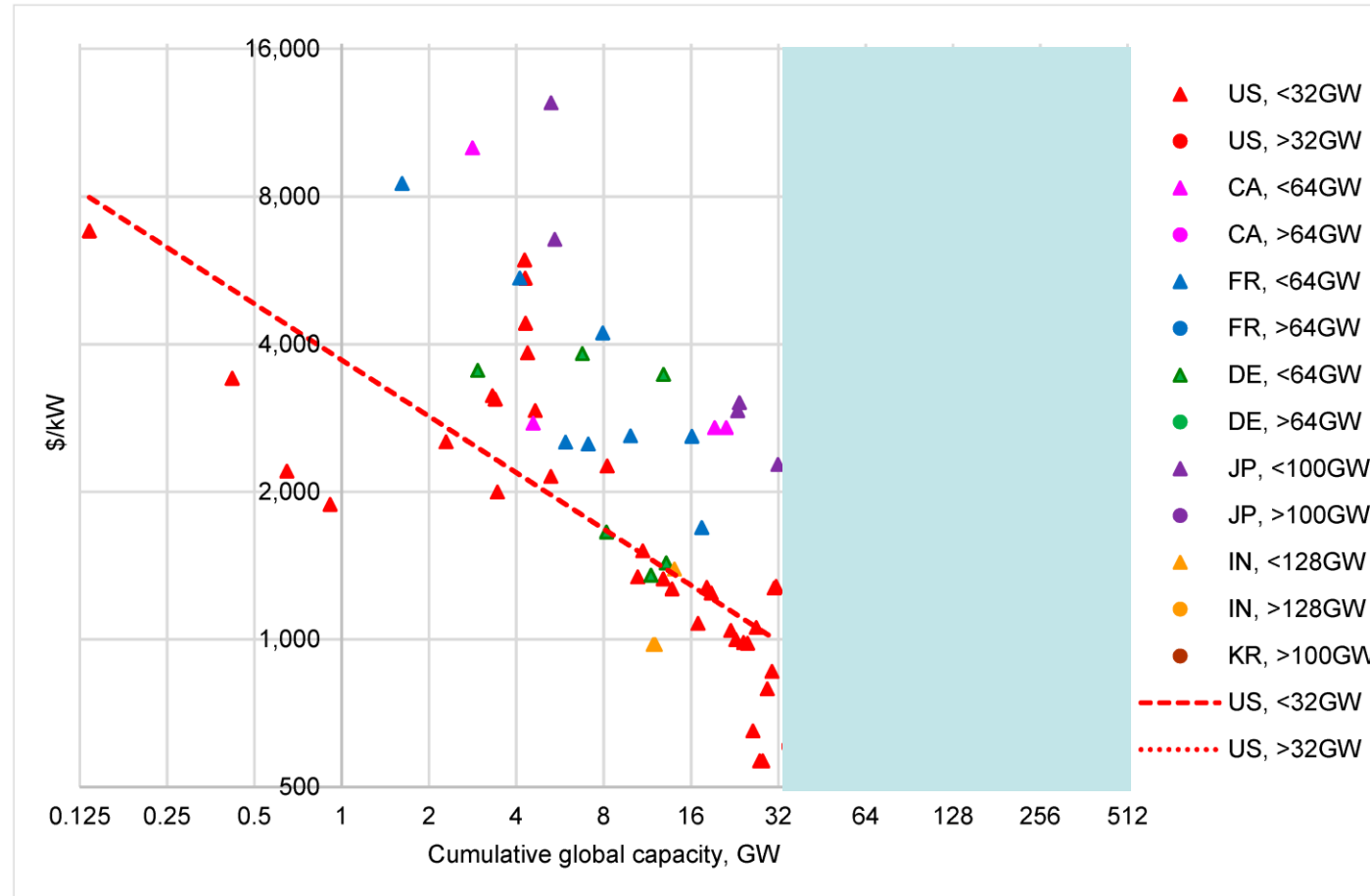
## Confusion and delay?





# Cost reductions aren't guaranteed

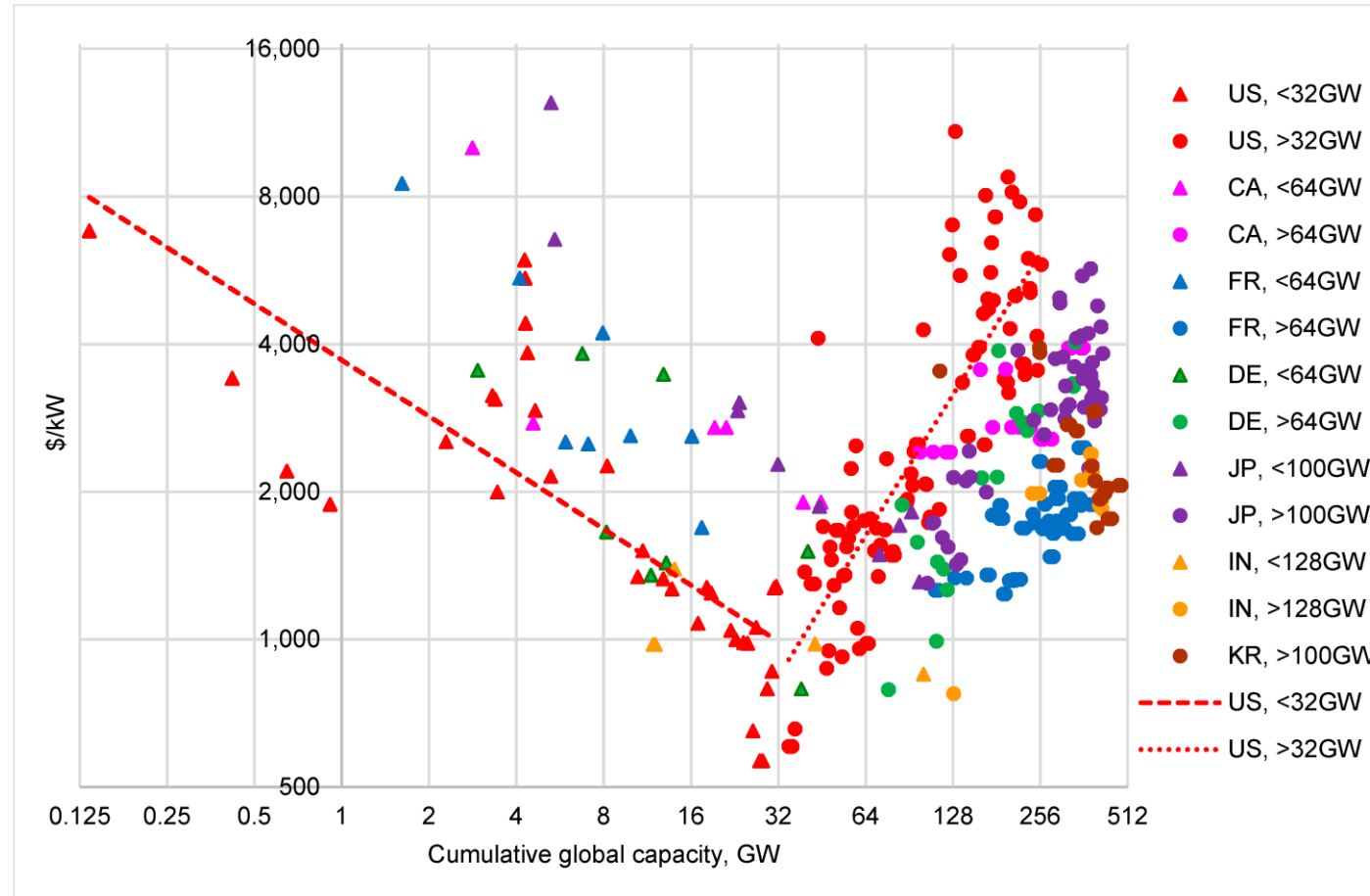
## Nuclear used to learn...



<https://www.mdpi.com/1996-1073/10/12/2169#>



# Cost reductions aren't guaranteed ... until it stopped



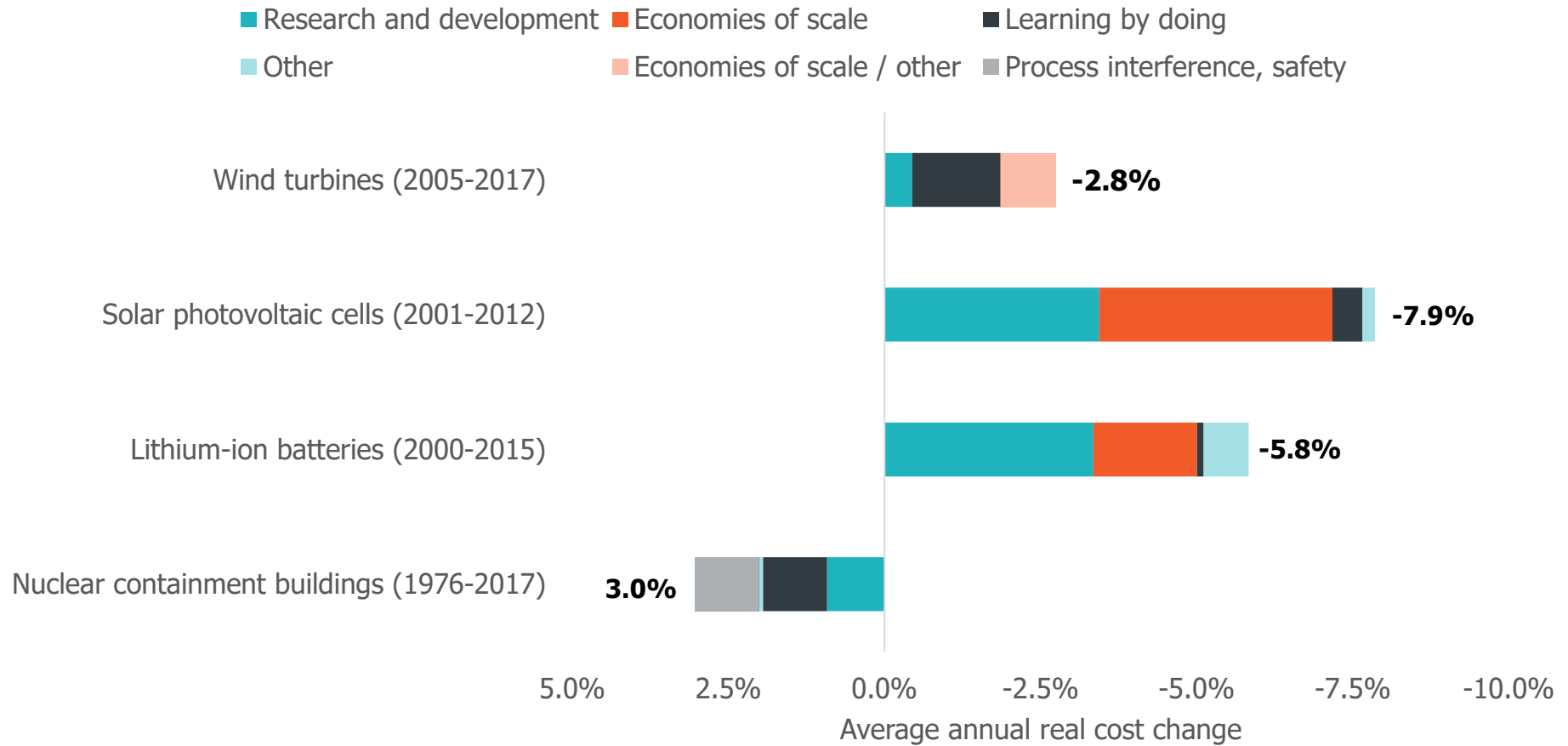
<https://www.mdpi.com/1996-1073/10/12/2169#>





# Cost reductions aren't guaranteed

## Drivers of cost reductions for low-emission tech



<https://www.sciencedirect.com/science/article/pii/S254243512030458X>



## Not just generation

### Transmission, distribution, and backup

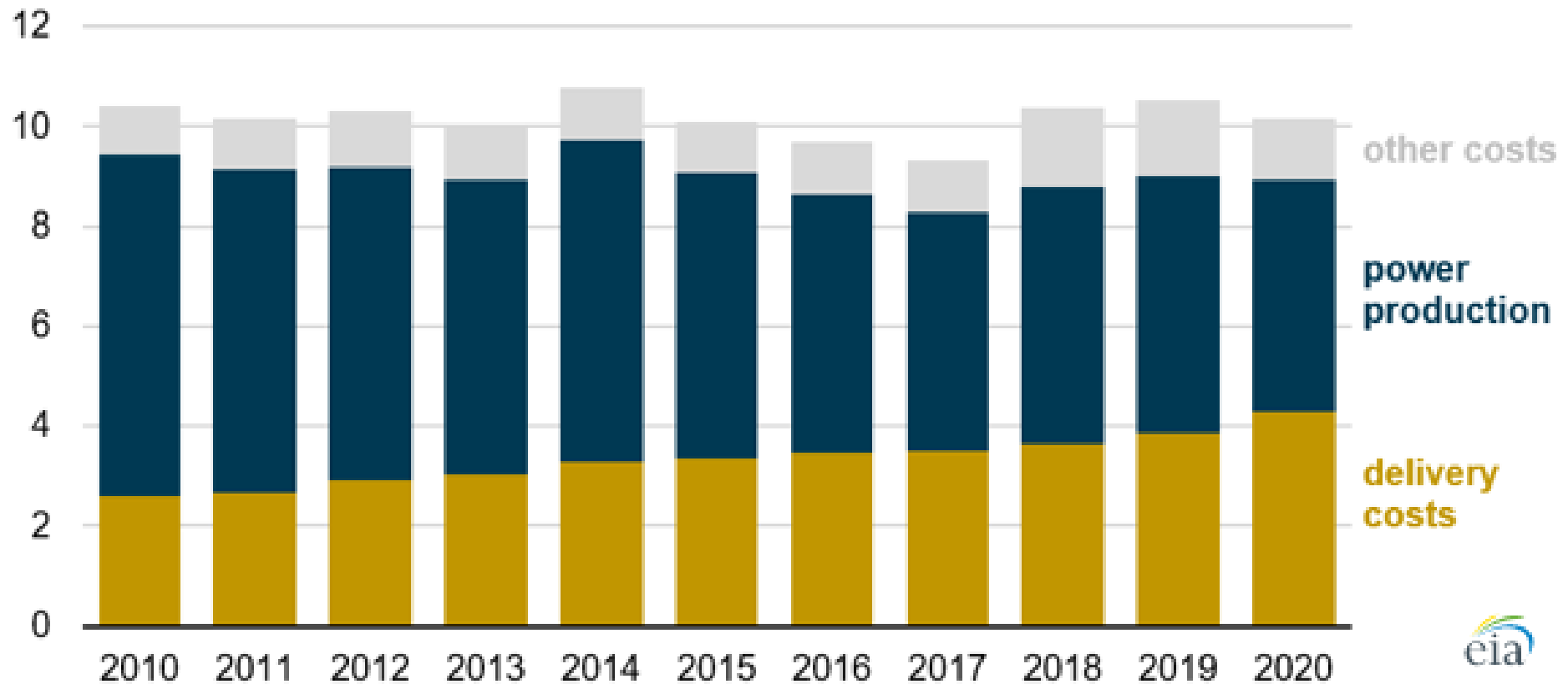
- Increased electricity generation and use requires more T&D
- Intermittent renewables will need more short/long-term storage



# Offsetting factors

## In the US, T&D costs offset generation savings

Major U.S. utilities annual spending, by spending category (2010–2020)  
cents per kilowatthour of electricity sales, in real 2020 dollars



<https://www.eia.gov/todayinenergy/detail.php?id=50456>

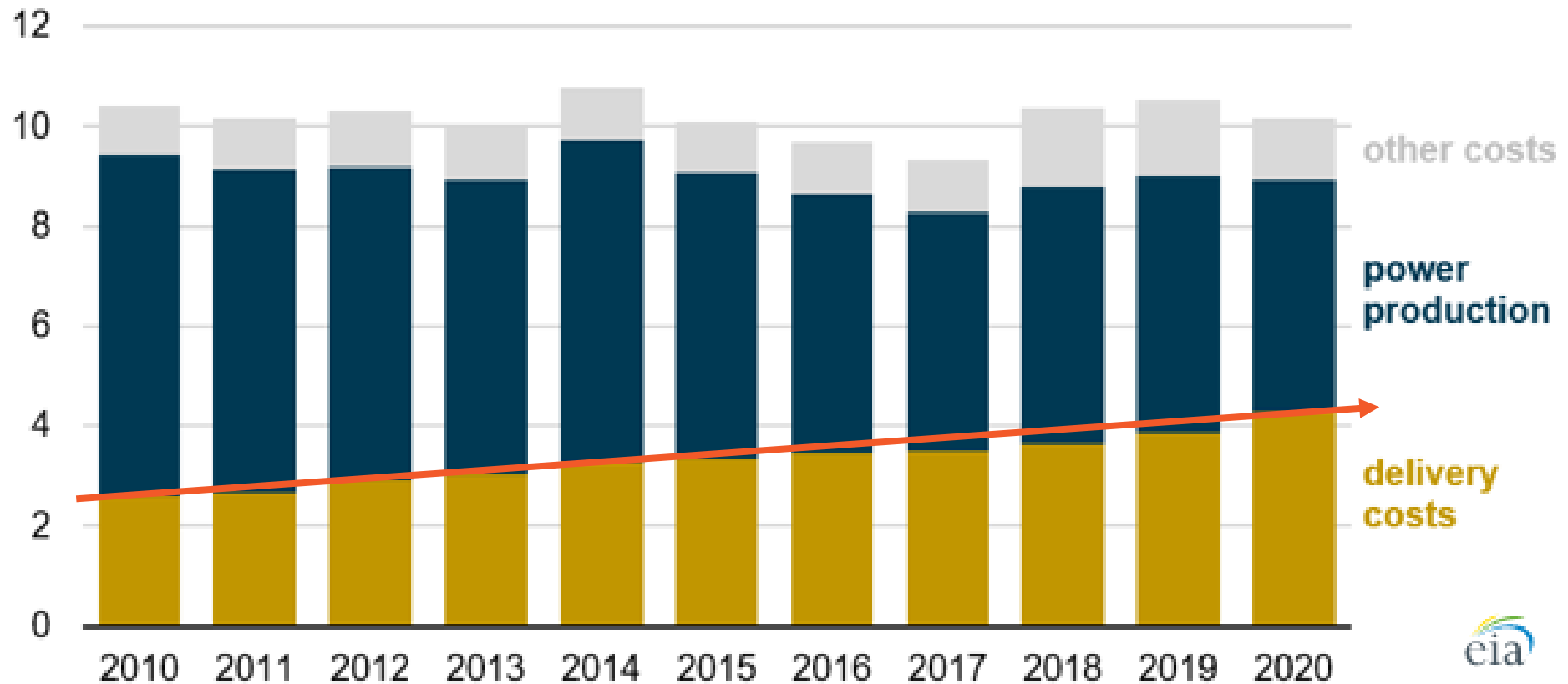
<https://www.ea.govt.nz/assets/dms-assets/16/16624Analysis-of-historical-electricity-industry-costs-final-published-Jan2014.pdf>



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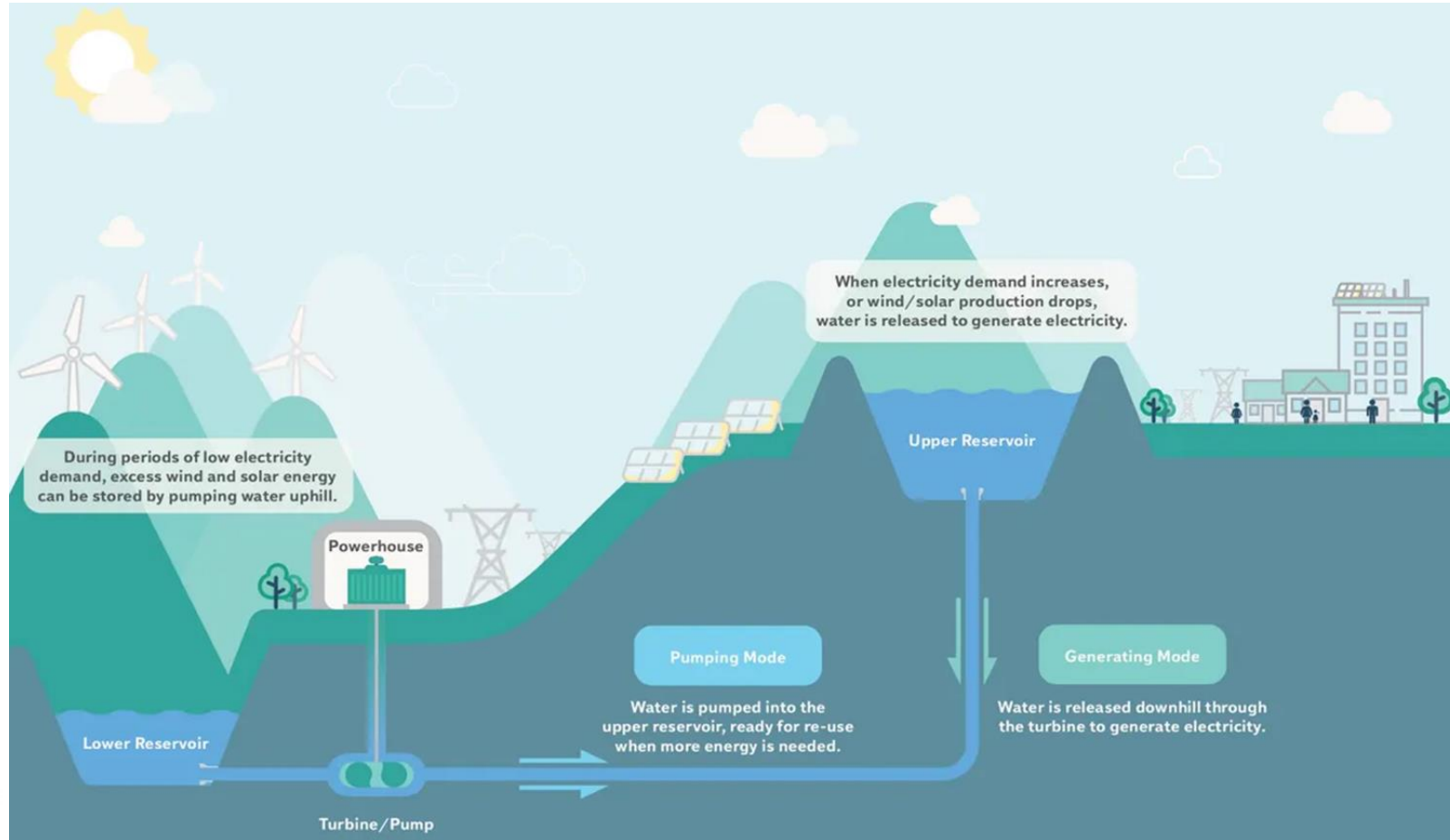
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<https://www.ea.govt.nz/assets/dms-assets/16/16624Analysis-of-historical-electricity-industry-costs-final-published-Jan2014.pdf>



# Dry-year storage

## Known unknowns and unknown unknowns

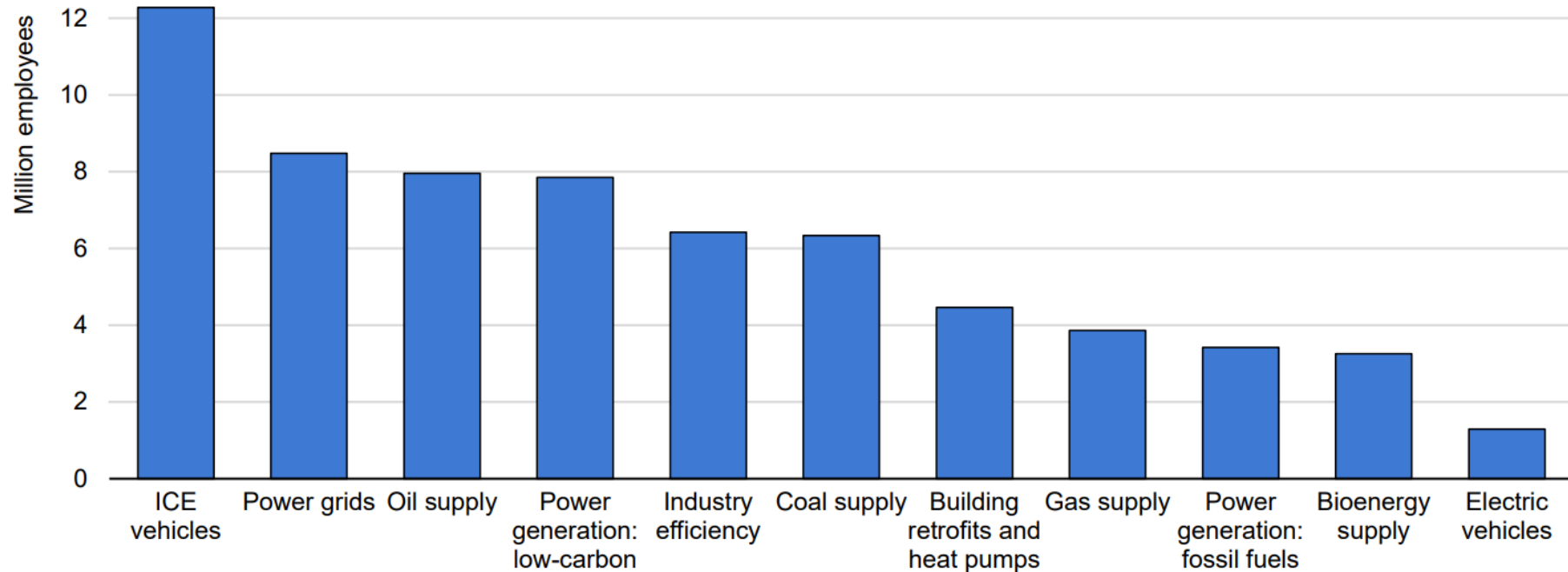




# The global energy workforce

## Early stages of transition

Employment in selected energy subsectors, 2019



IEA. All rights reserved.

Notes: ICE vehicles = internal combustion engine vehicles. Power grids includes transmission, distribution and storage. Low-carbon power generation includes nuclear and renewables. Electric vehicles includes the manufacturing of batteries.

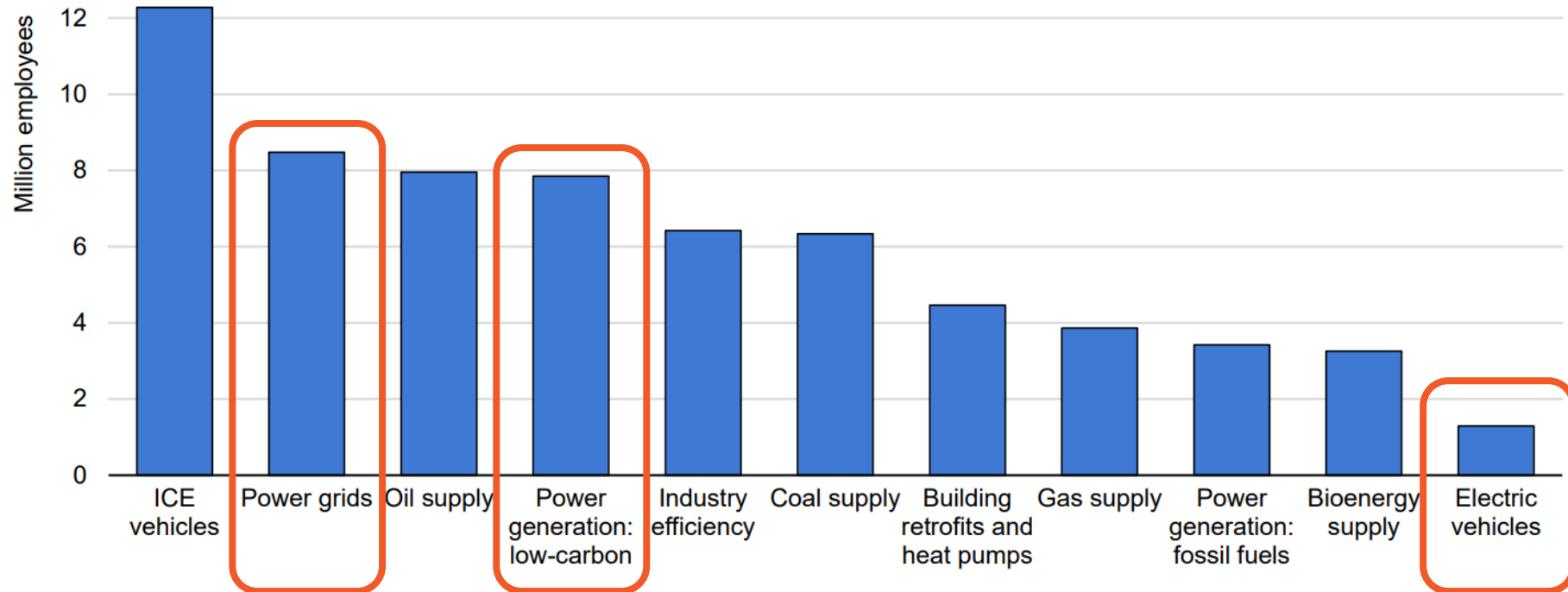
<https://iea.blob.core.windows.net/assets/a0432c97-14af-4fc7-b3bf-c409fb7e4ab8/WorldEnergyEmployment.pdf>



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Figure ES 3. Occupations most in demand across industries in a global energy sustainability scenario, 2030



Note: Difference in employment between the sustainable energy scenario (the 2°C scenario) and the business-as-usual scenario (the 6°C scenario) of the International Energy Agency (IEA) by 2030 (ILO, 2018a). Detailed information on the methodology is described in ILO, 2018a, pp. 39, 172–170).

Source: ILO calculations based on EXIOBASE v3 and national labour force surveys.





# **Section 4:**

# **The NZ**

# **Infrastructure**

# **Strategy**



# Summing up

## Infrastructure and net zero

- We need a step change in electricity investment to get to net zero
- Falling prices for low-emission technologies will help
- We need to address factors that could threaten deployment and productivity

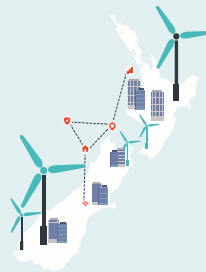
# Rautaki Hanganga o Aotearoa



**Net-zero  
carbon emissions**



**Flourishing  
towns and  
regions**



**Attractive and  
inclusive cities**



**A circular  
economy**



**Resilience to  
shocks and  
stresses**

# How we get there



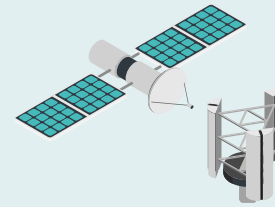
**Better  
decision making**



**Improve funding  
and financing**



**An enabling  
planning  
and consenting  
framework**



**Accelerate  
technology use**



**Build workforce  
capability and  
capacity**



Government response to  
**Rautaki Hanganga o Aotearoa  
New Zealand  
Infrastructure Strategy**

September 2022

Te Kāwanatanga o Aotearoa  
New Zealand Government

## Our next steps

### Assistance welcome

- Govt Response: Support for 58 of 68 recommendations; immediate action on several, including workforce capacity
- Some of our near-term actions:
  - RM reform – National Planning Framework for Infrastructure
  - Infra workforce capacity analysis
  - Infra pipeline improvements
  - Deep dive into infra and equity
  - Scanning for emerging issues



**Thank you for your time**

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