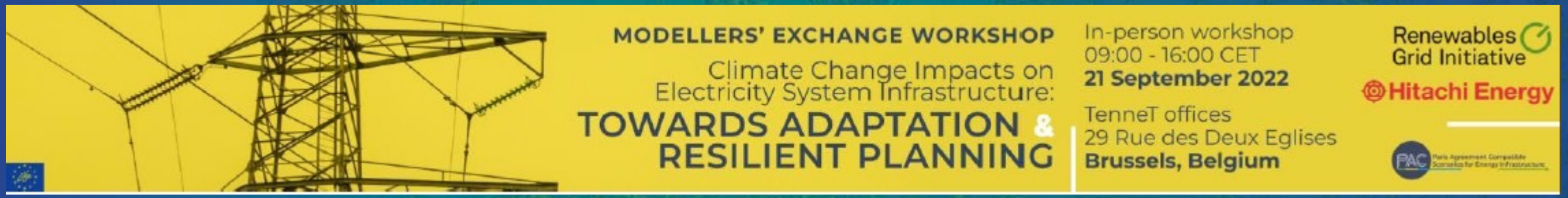
Towards a future-proof climate database for European energy system studies



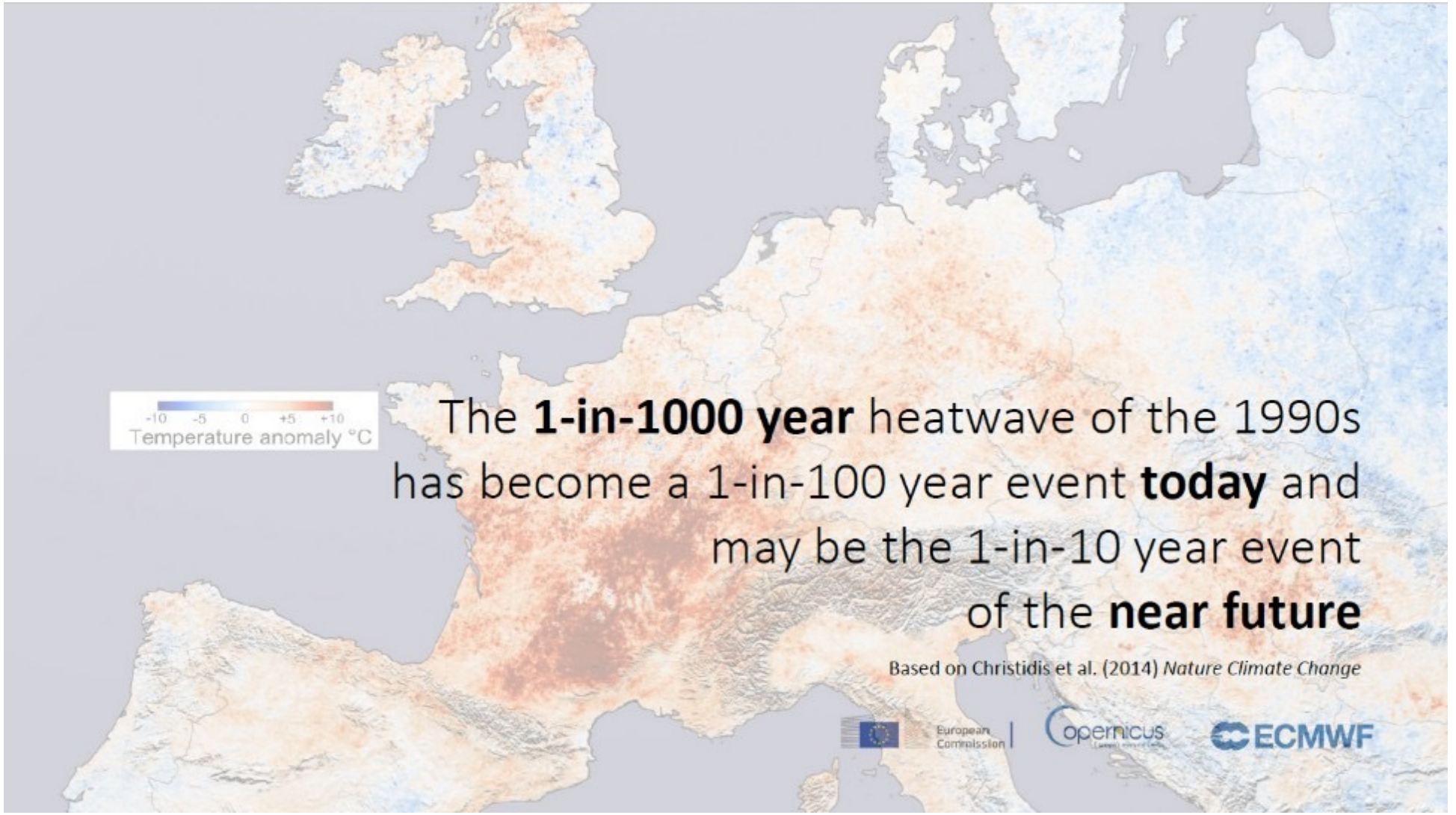
Laurent Dubus (RTE), Laurens P. Stoop (Utrecht University & TenneT) and ENSTO-E Task Force on PECD

Agenda

- Context and scope
- Target PECD v4.0
- Technical solution
- Current status & next steps

Context & scope

Do we need to take climate change into account ?



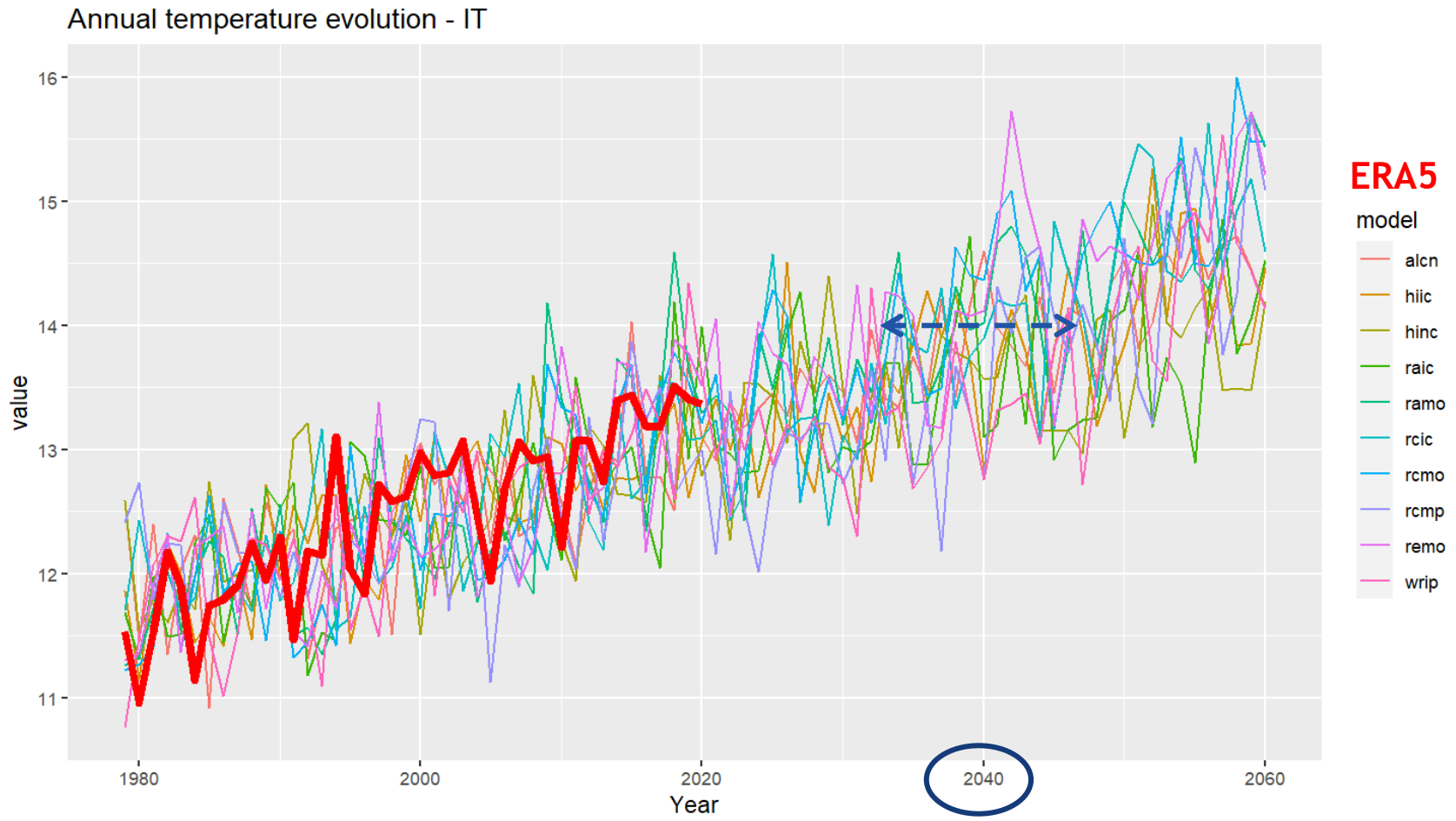
Erich Fischer, ETH Zurich, C3S 2021 General Assembly

Why do we need to take climate change into account ?

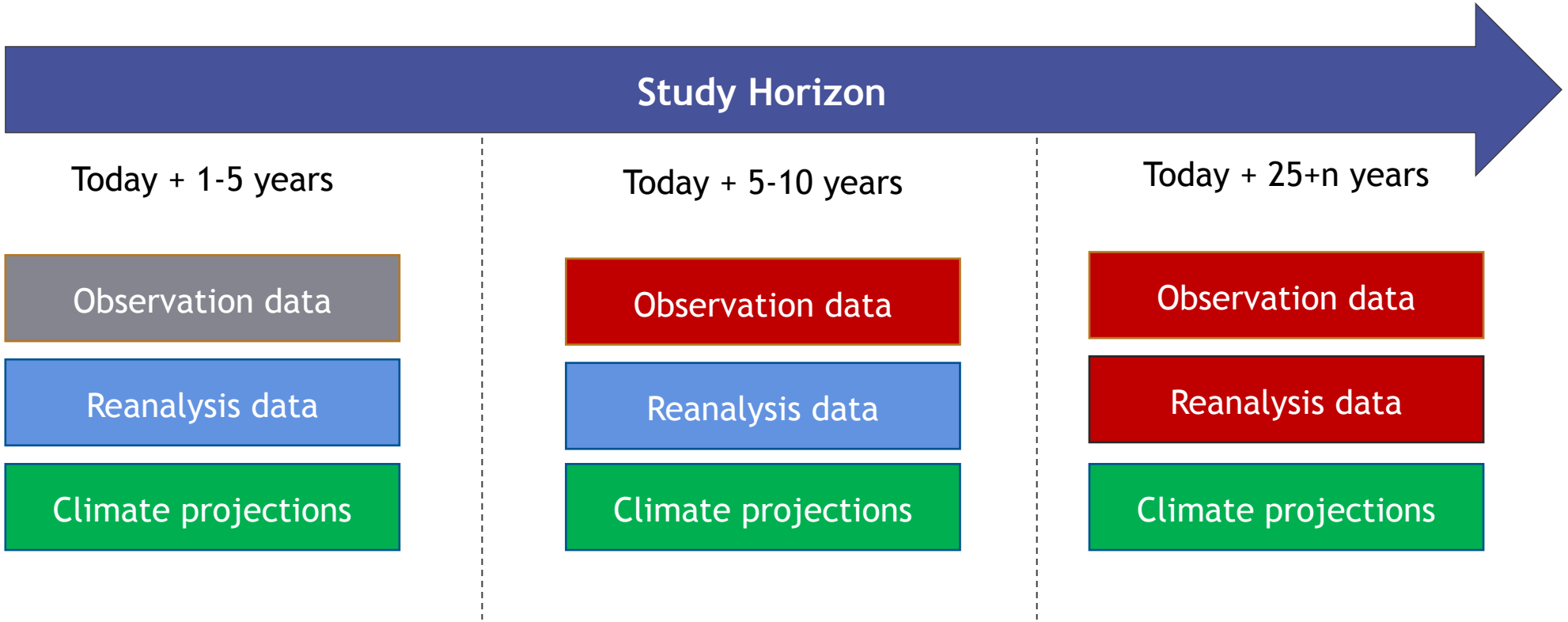
With Climate Change, past climate information is no more relevant for prospective studies

Long-term studies in particular should take into account greenhouse gases emissions scenarios

➔ Need to take into account future climate evolution projections



What climate science says



Legend:

- Suitable if good quality
- Choice by default
- Preferred option
- Not suitable

Why do we need to change the PECD?

Current issues:

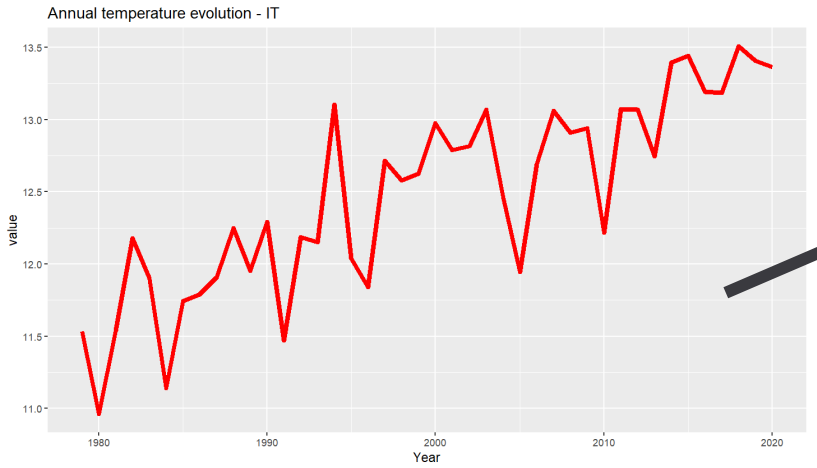
- Due to climate change, historical data not relevant for medium to long term studies (+5/10 years ahead)
- Long-term prospective must account for different greenhouse gases emissions scenarios
- Current PECD is based on several providers, and some proprietary datasets / models
- ERAA methodology requires that climate change is taken into consideration (art4(1)f and 4(3)(a))

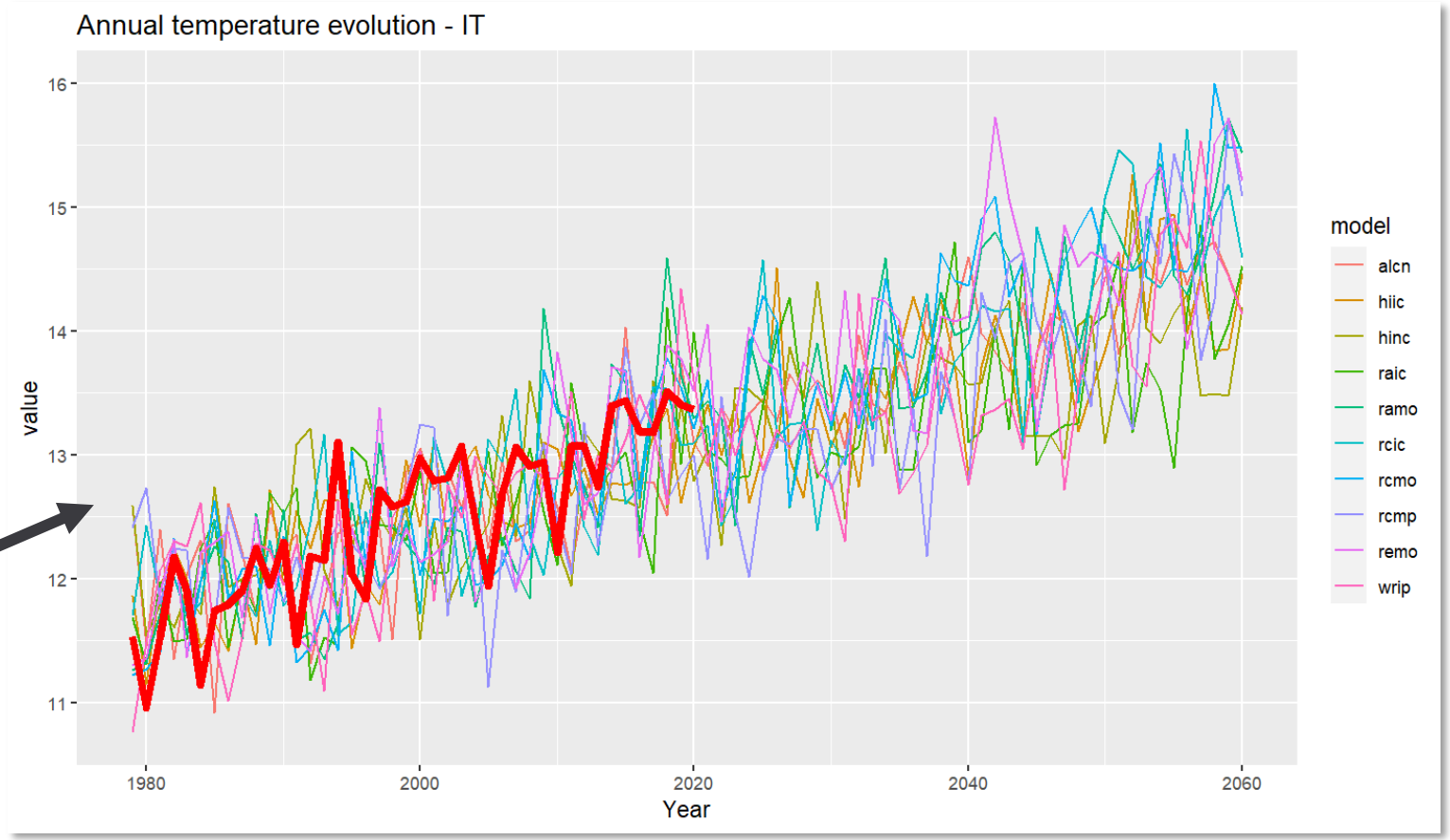
➔The aim is to define and provide a new PECD (v4.0) to fill these gaps. It will be more **flexible**, separating the **climate** and **energy** components and allowing TSOs to use their own inputs and assumptions to generate different generation profiles for specific studies

It is also an oppotunity:
- To switch to fully public and open access data
- Be transparent on the data and models used to make studies
- Have the opportunity of models improvements by third parties

Target PECD v4.0

From here to there





Historical data

- Climate projections
- Several climate models
- Several greenhose gases emissions scenarios

PECD: Target v4.0

Principle: moving from 1 dataset of 35 historical years which contains « only » the final variables

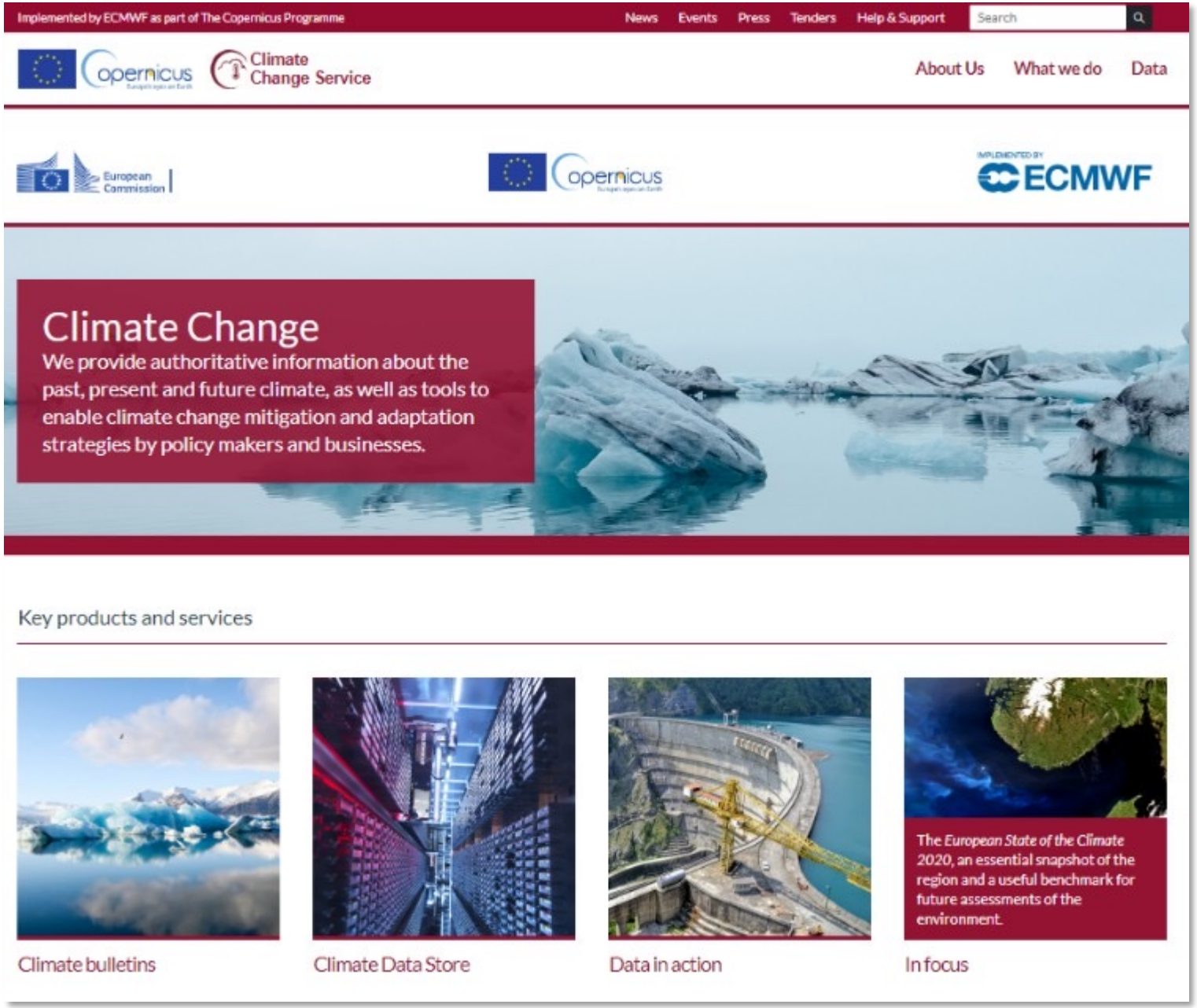
To: A large ensemble of public, updated and state of the art dataset, containing :

- ✓ **Climate** information on the past and the future
- ✓ Corresponding **energy** data (wind & solar) at different geographical resolutions, from **flexible energy models**
- ✓ **Guidance** on a method to select the right ensemble of data for a given application

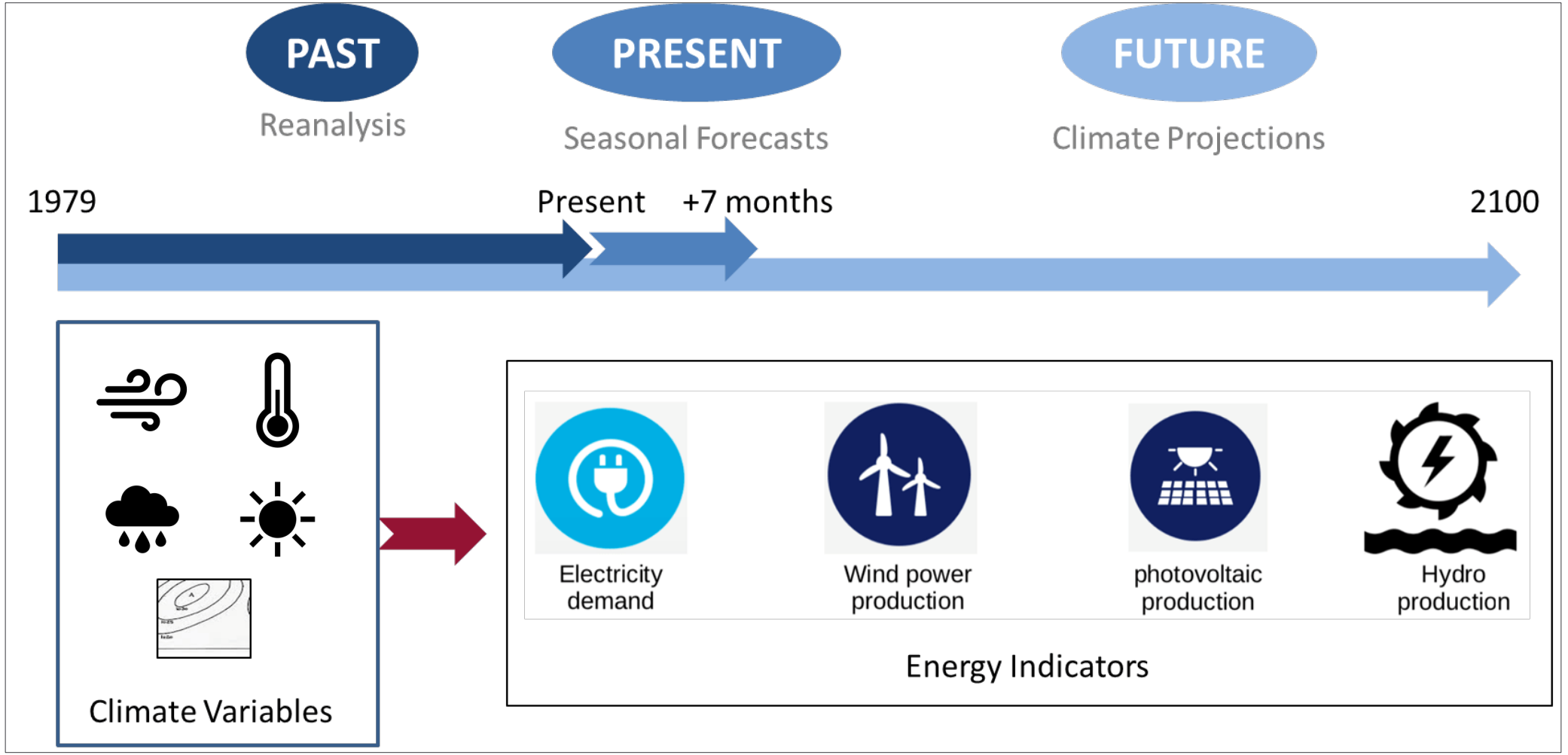
And the possibility to easily update when new data become available

Chosen Technical solution

Copernicus Climate Change Service



C3S Energy, current operational solution



PECD v4.0: chosen solution

EU Copernicus Climate Change Service as data and models provider

Past:

- ERA5 Reanalysis 1959-present : the « Historical » Reference. Regular (near real-time) updates

Past + Future:

- Climate projections (initially EURO-CORDEX, possible future updates with new climate projections ~CMIP6)
  - >= 10 different climate models
  - 2 (3) greenhouse gases emissions scenarios: RCP4.5 and RCP8.5 (RCP2.6)
  - Bias correction using ERA5

Model resolution = 25 km (currently) → from there, any aggregation level is possible (Current PECD zones, NUTS0, NUTS2…)

Time Resolution: 1 hour → from there, any time aggregation level is possible (1 day, 1 month…)

PECD v4.0: 3 Main pillars

Based on C3S data (Historical = ERA5 Reanalysis & Future = EURO-CORDEX Climate Projections)

1. Climate data: temperature, precipitation, solar irradiance, wind speed at relevant heights (+ river flow)

gridded (25x25 km) + relevant spatial aggregation levels

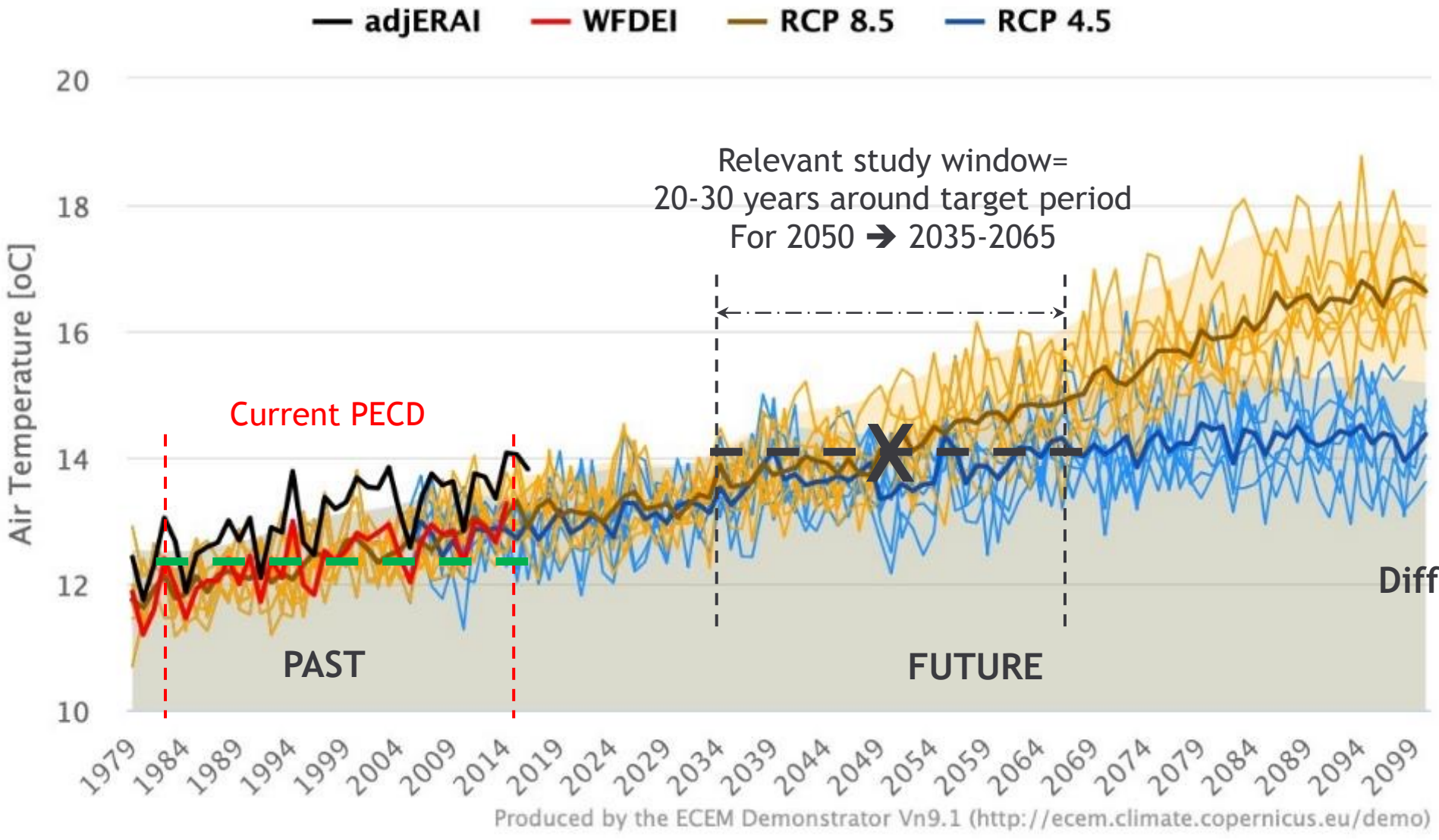
2. Energy models & data: wind & solar, hydro? (same spatial and temporal resolutions as climate)

3. Methodology for selection of relevant sub-dataset, depending on study

➔ **Primary goal is to have all the data included in the C3S Climate Data Store, then users can retrieve/use relevant sub-ensembles depending on target study & specific needs**

The dataset is primarily at the models grid resolution (25 km), but also any geographical aggregation level (PECD Zones, NUTS2, NUTS0, including similar Maritime zones for Offshore wind)

PECD: what it will provide



Different emissions scenarios

Different models

Current status & next steps

- A MoU has been signed between C3S/ECMWF and ENTSO-E
- Tender & contractor selection completed
- Contract started on 1st September for 3 years
- First results expected Q4 2022

Reference:

Dubus, L., Brayshaw, D.J., Huertas-Hernando, D., Radu, D., Sharp, J., Zappa, W., Stoop, L.P., *Towards a future-proof climate database for European energy system studies*, subm. to ERL, July 2022.

Thank you for your attention

For more questions:

contact:

laurent.dubus@rte-france.com
l.p.stoop@uu.nl