

# European Resource Adequacy Assessment (ERAA)

Towards the Implementation of the  
“Clean Energy Package”

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# Adequacy reports: historical evolution and current status

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# Focus on Adequacy: temporal and spatial granularity

Spatial Resolution



Mid-Term Resource Adequacy

Seasonal Adequacy

Short-Term Adequacy



Mid-Term regional sensitivity

Seasonal regional sensitivity

Intra-week regional adequacy

Optional

Several years

Several months

month

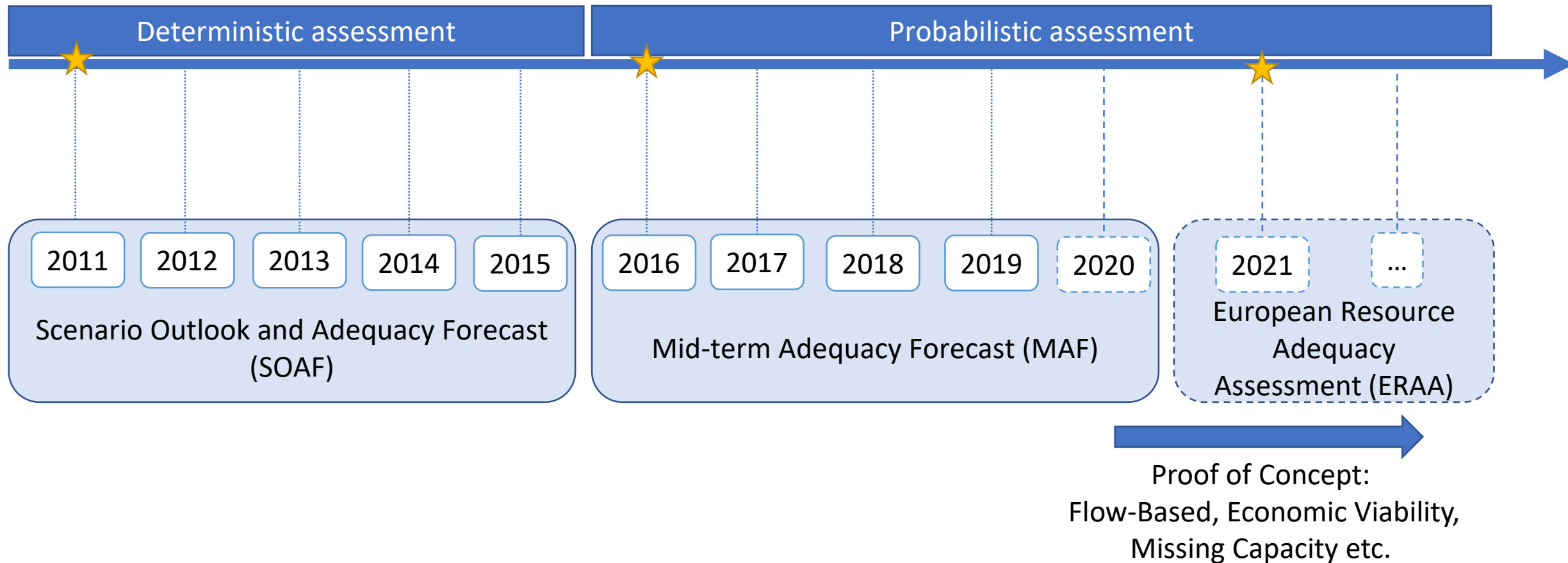
week

day

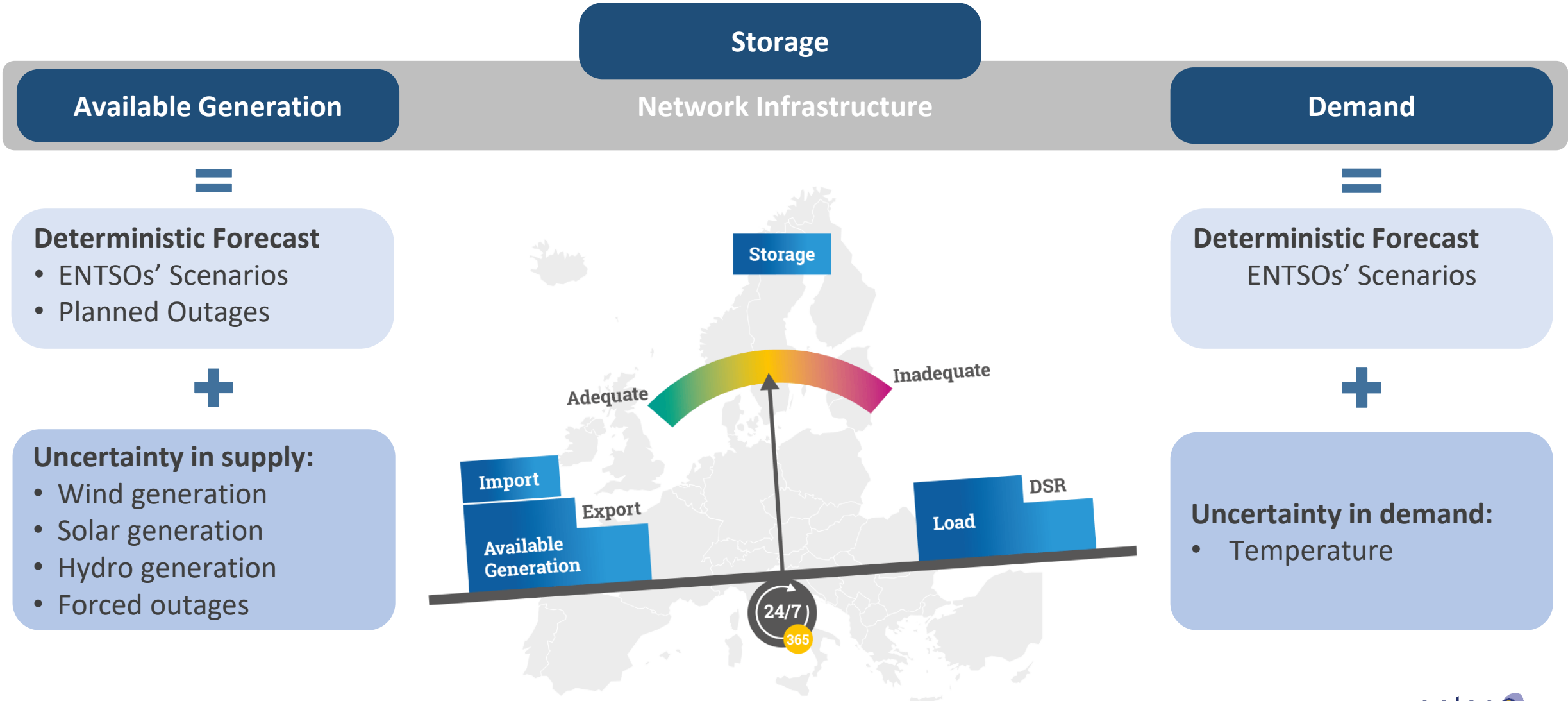


Temporal Resolution

# From deterministic to probabilistic adequacy assessments

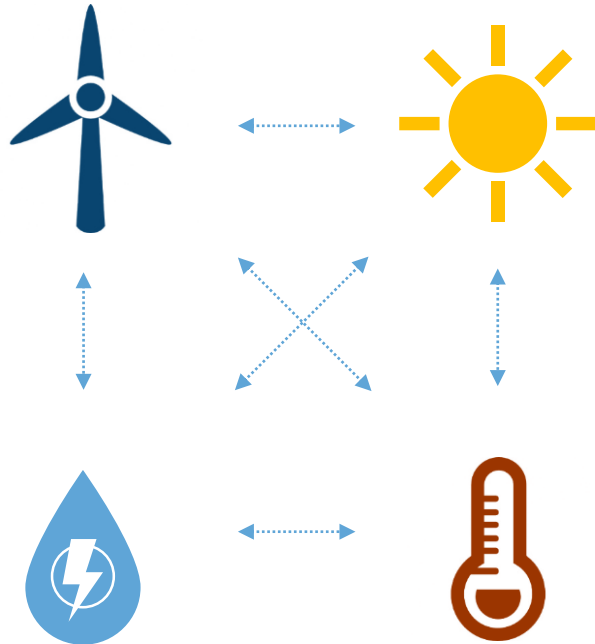


# State-of-Art probabilistic methodology

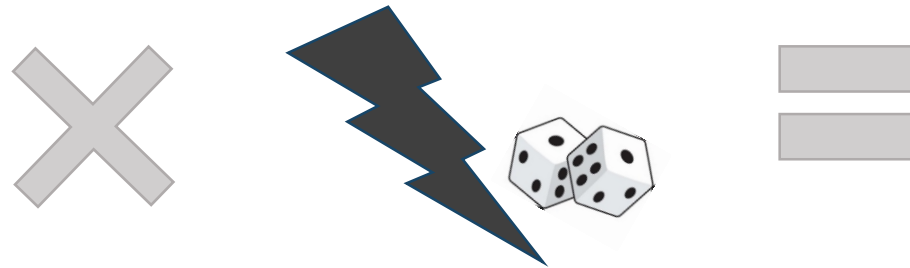


# Modelling Uncertainty: climate variables and random outages

$M$  climate years of interdependent climate data



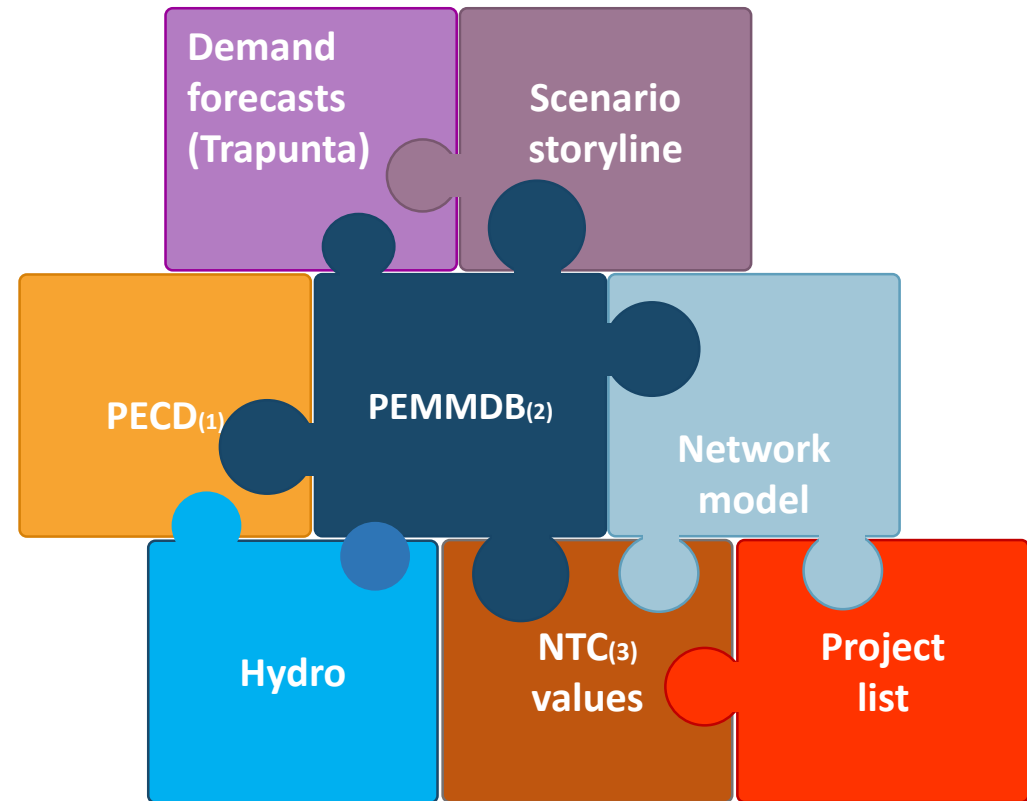
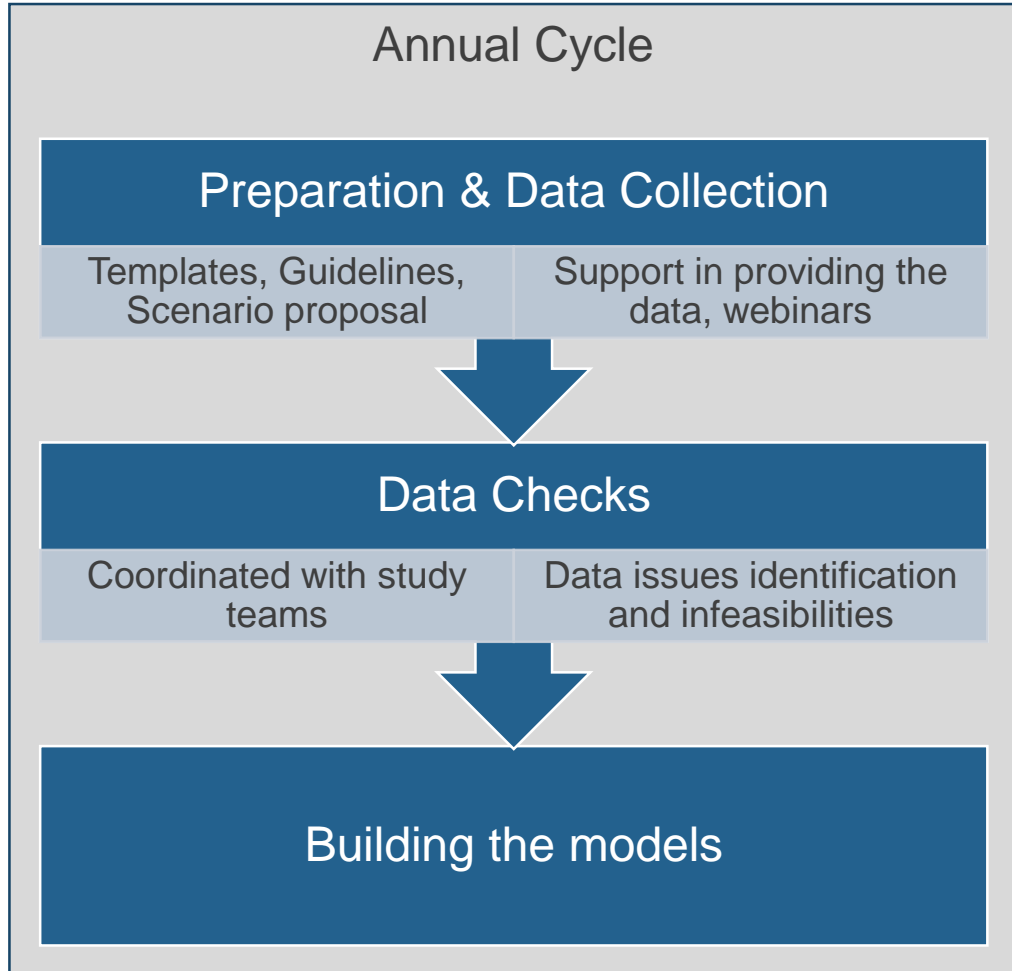
$N$  random draws for unplanned outages



Monte Carlo sample years

$M \times N$  years

# Data & Models at ENTSO-E: data collection



- (1) **P**an-**E**uropean **C**limate **D**atabase
- (2) **P**an-**E**uropean **M**arket **M**odelling **D**ata**B**ase
- (3) **N**et **T**ransfer **C**apacities



# Assumptions and limitations

## Perfectly competitive market

- Unit commitment model for each hour of the target years;
- Generation offers are considered equal to the generating costs of each unit without strategic bidding/offering.

## Elasticity of demand

- Inelastic demand to price;
- Demand Side Response with activation price and duration.

## Focus on Day-Ahead & Intraday markets

- Resources designed to cope with real-time scarcity events are not part of the available capacity;
- Out-of-the-market measures, e.g., strategic reserves, are not in scope.

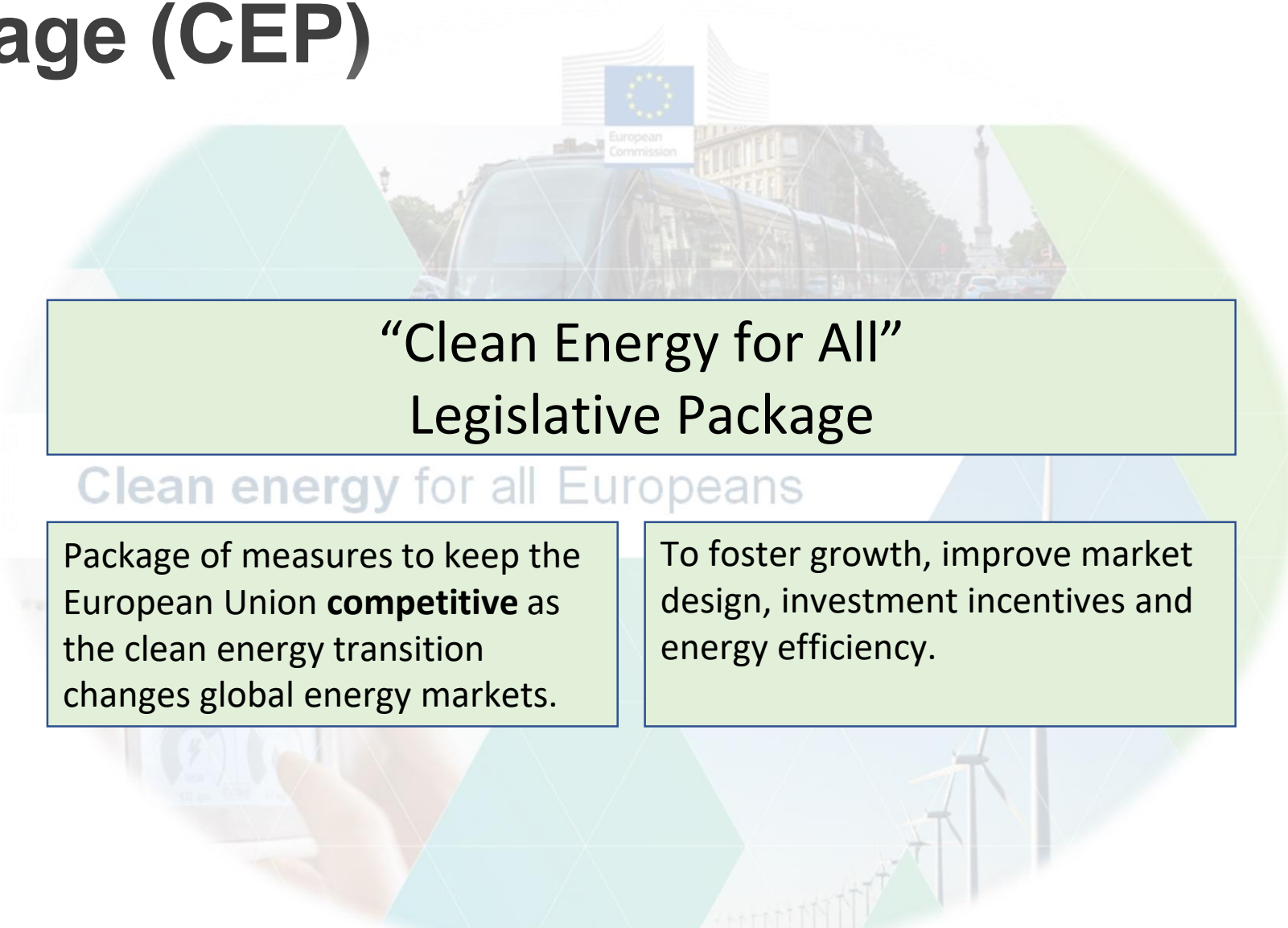

## Perfect foresight

- Forecast errors from day-ahead to real-time are not considered;
- Perfect foresight for RES generation, hydro generation and demand.

# Clean Energy Package: new adequacy methodology and challenges of implementation

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# The “Clean Energy for all Europeans” legislative package (CEP)



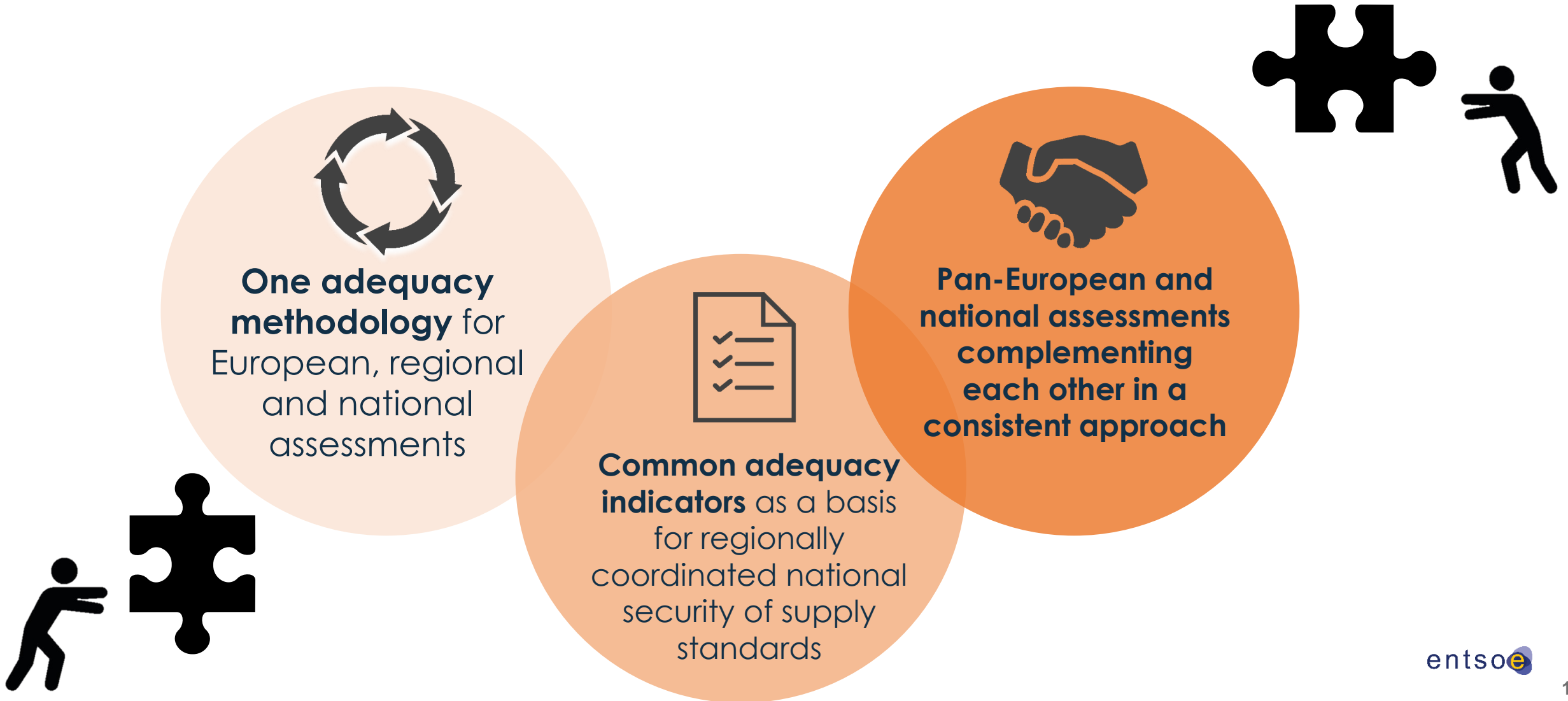
## “Clean Energy for All” Legislative Package

### Clean energy for all Europeans

Package of measures to keep the European Union **competitive** as the clean energy transition changes global energy markets.

To foster growth, improve market design, investment incentives and energy efficiency.

# ERAA: A basis for enhancements of market design, market integration & security of supply



# CEP deliverable methodologies from ENTSO-E

What does this mean for ENTSO-E and adequacy in Europe?

★ Three main methodology packages (to be delivered by ENTSO-E):

- 1 Methodology for the European Resource Adequacy Assessment (ERAA)
- 2 Methodology for:
  - Cost of New Entry (CONE)
  - Reliability Standards
  - Value of Lost Load (VoLL)
- 3 Methodology for calculating the maximum entry capacity for cross-border participation to Capacity Mechanisms

# ERAA: Impact of CEP implementation and new challenges

## What are the main differences with current methodologies?

### Current Approach (MAF 2019)

- Probabilistic market modelling
- 7 years ahead - 2 simulated years
- Bottom-up approach and expectations of commissioning / decommissioning
- No explicit CM considerations
- NTC approach, flow-based only tested
- No sectoral integration

### Target Approach

- Probabilistic market modelling
- 10 years ahead - annual granularity
- Economic viability of generation assets, integrated in the model
- Integrated consideration of CM
- Compliance with FBMC when available
- Sectorial integration (P2X consideration)



# Focus on ERAA: appropriate scenarios for a reliable assessment

## ERAA methodology (Art. 23)

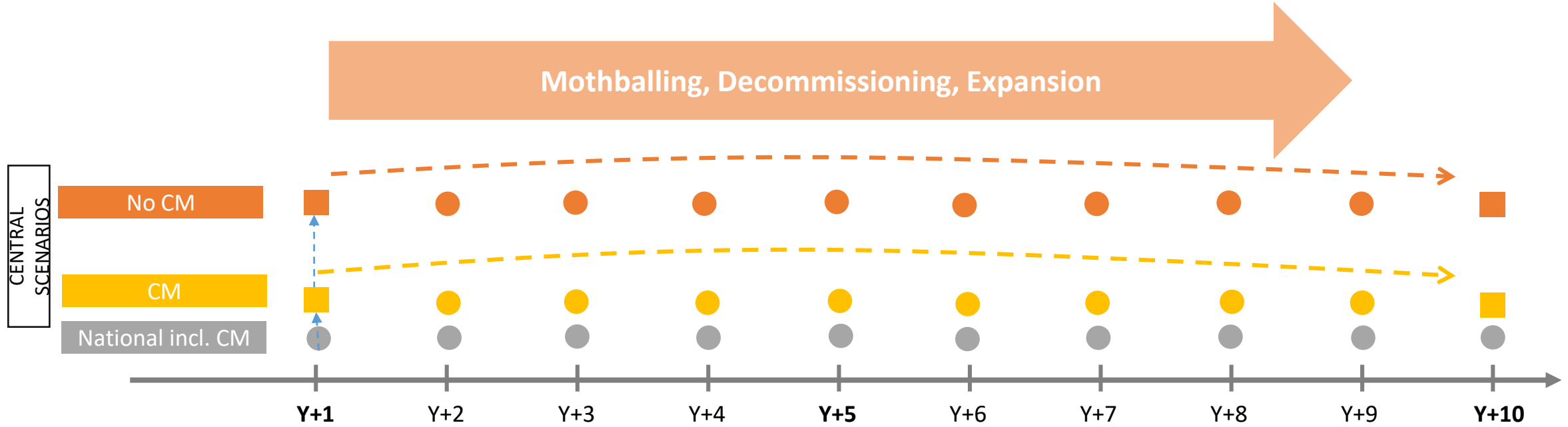
The European Resource Adequacy Assessment shall include:

- An **economic assessment** of the likelihood of retirement, mothballing, new-build of generation assets;
- Definition of policy units – can't be mothballed or retired;
- Transparent source of costs – specifics to be defined;
- Number of climate years – compromise between accuracy and computational complexity.





# Focus on ERAA: central scenarios and increased complexity

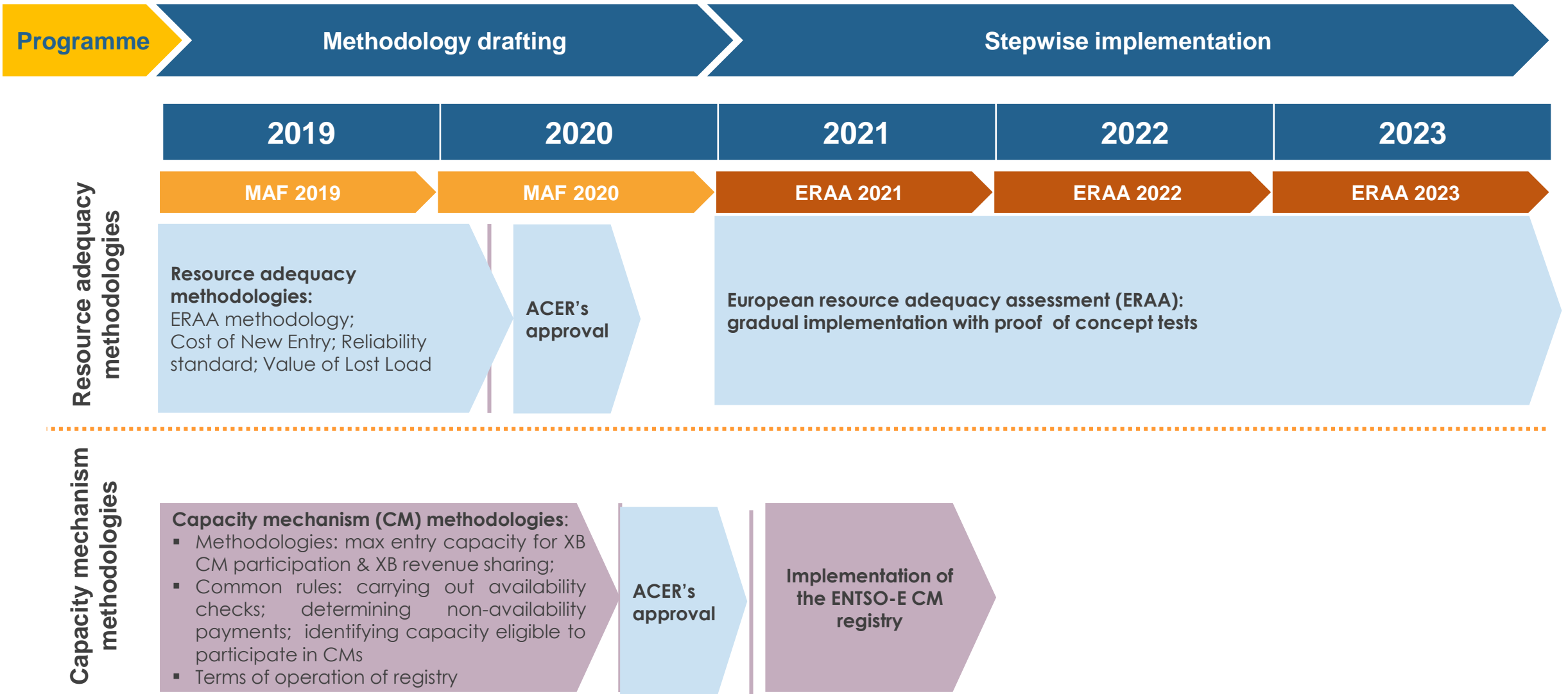


- Non-policy resources which are non-viable are retired/mothballed.
- Viable new resources are expanded.

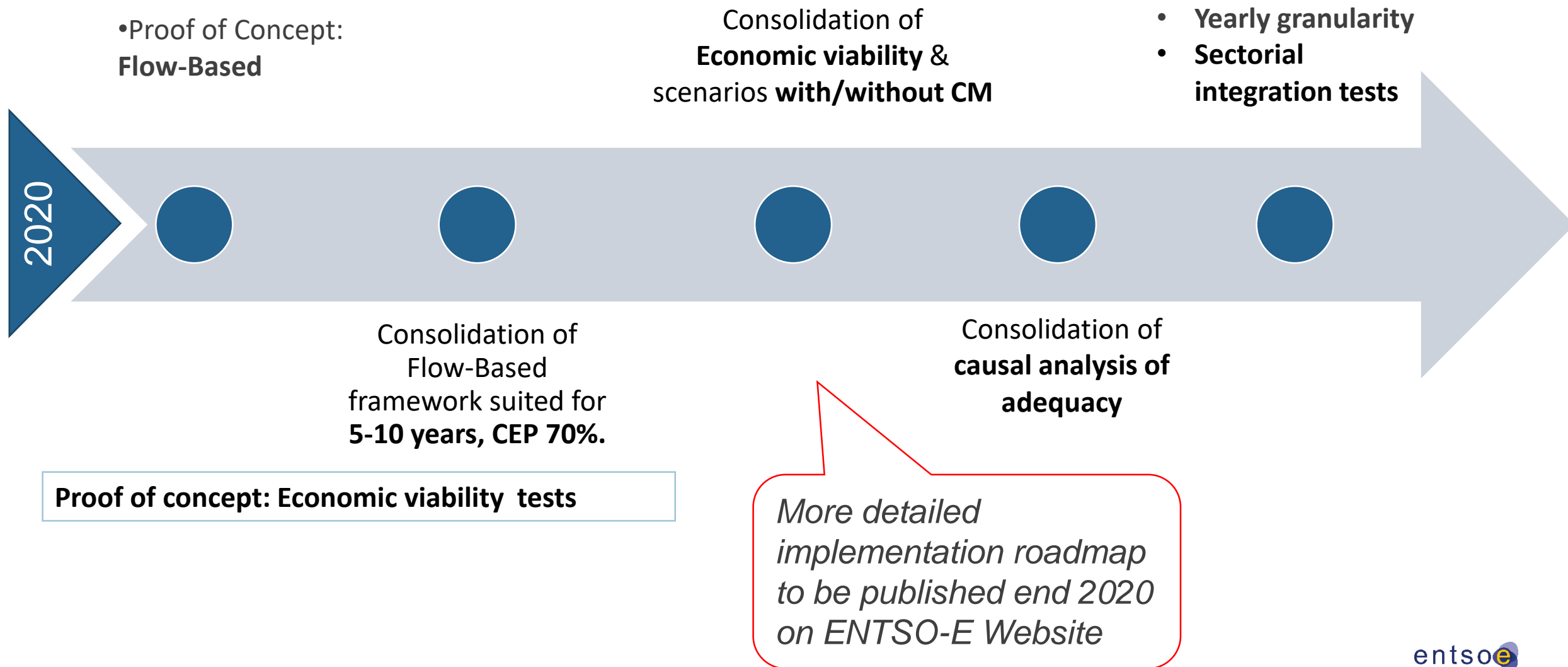
# European Resource Adequacy Assessment: Implementation roadmap

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# High-level resource adequacy programme plan



# ERAA: Stepwise implementation roadmap





Thank you!