Stakeholder Workshop: ERAA 2022 Assumptions, principles and scenarios

17 March 2022

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Agenda

1. Welcome & introduction
2. Stakeholder views/suggestions for the next ERAA
   - key takeaways from ERAA 2021 consultation
   - views from PLEF, Eurelectric, SmartEn
3. Overview of ERAA 2022 principles:
   - Main assumptions & scenarios
   - Modelling improvements
   - Economic Viability Assessment (EVA) principles
4. Conclusions & next steps

Introduction

Gerald Kaendler, Chair, System Development Committee, ENTSO-E

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Background

- ERAA is an ENTSO-E legal mandate, which aims to understand how the rapid changes to our energy system will affect security of supply.
- It is a full pan-European monitoring assessment of power system resource adequacy, based on a state-of-the-art, globally unparalleled probabilistic analysis looking up to a decade ahead.
- Stepwise implementation of the ACER methodology already began with ERAA 2021, and aims for a full target methodology to be applied as of ERAA 2024.
- ERAA 2022 aims to be an effective tool to identify adequacy risks, and includes an **enhanced Economic Viability Assessment**, **more specific representation of demand response**, and **Flow-Based market coupling** incorporated in the central reference scenarios.
- By proactively and factually identifying any system adequacy challenges, ERAA supports decision-makers in ensuring secure, affordable and sustainable energy to citizens and industries.

Our Shared Objective is *Net-Zero*

Role of ERAA 2022

The comprehensive techno-economic assessment provided by ERAA helps understand how system changes interact, will inform decision makers and strengthens Europe's trajectory to net-zero.

NET ZERO

CO2

Objective of net-zero by 2050 structures all activities.

Central role of electricity means TSOs must manage an increasingly complex system.

FLEXIBILITY

Wide range of factors influence resource adequacy.

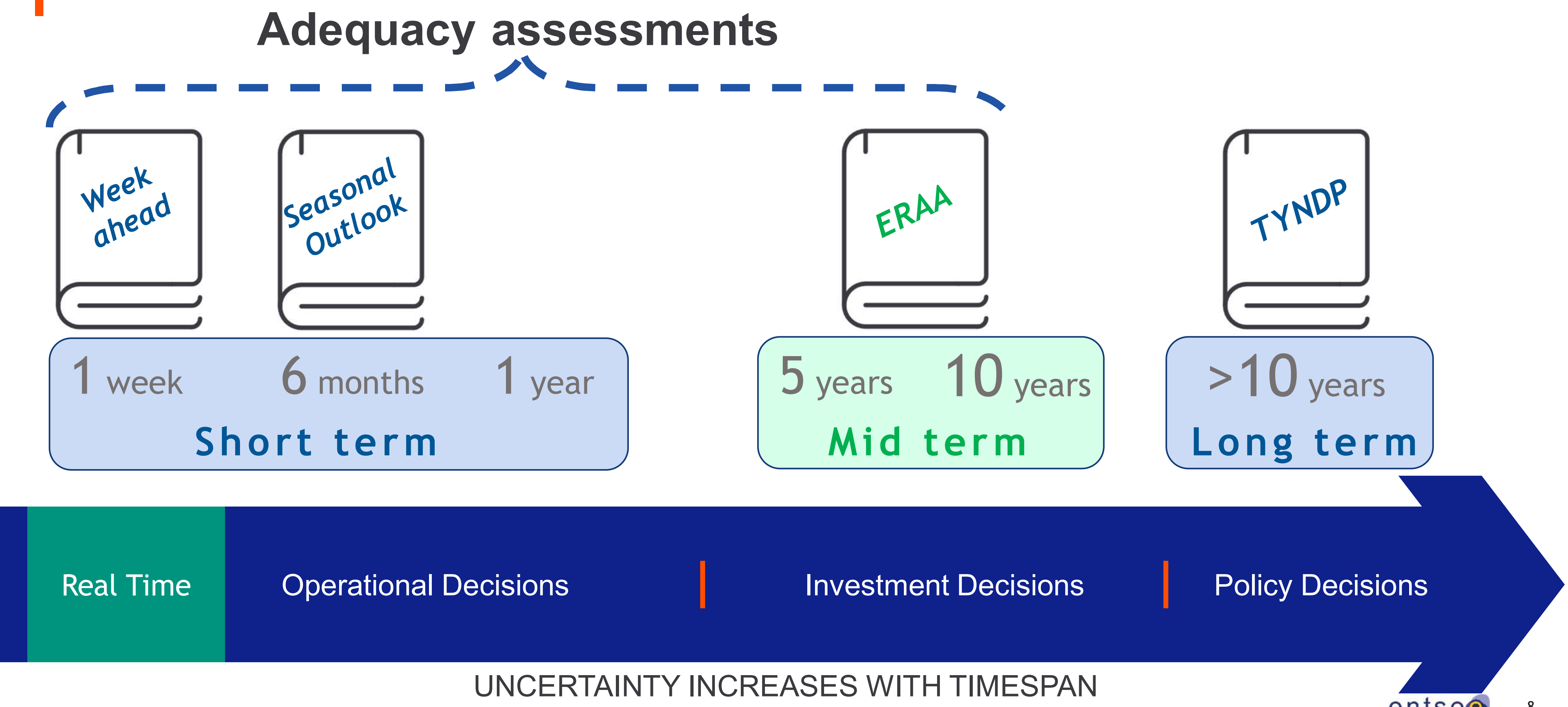
New trends require forecasting adequacy years in advance.

EFFICIENT PLANNING

Public support for the energy transition requires security of supply, lowest cost in the long run.

Sharing of resources in integrated markets enables this.

Dedicated assessments for different timeframes



2. Stakeholder views/suggestions for the next ERAA

Kristof Sleurs, Convenor, ERAA Steering Group, ENTSO-E

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Main stakeholder feedback following ERAA 2021

Increased interest on EVA & economic assumptions

Several improvements in ERAA 2022 – discussed today

Flow Based consideration in the central scenarios

Will be appplied at least for CORE in ERAA 2022

Overall feedback received on UCED* & proposals for quality improvements

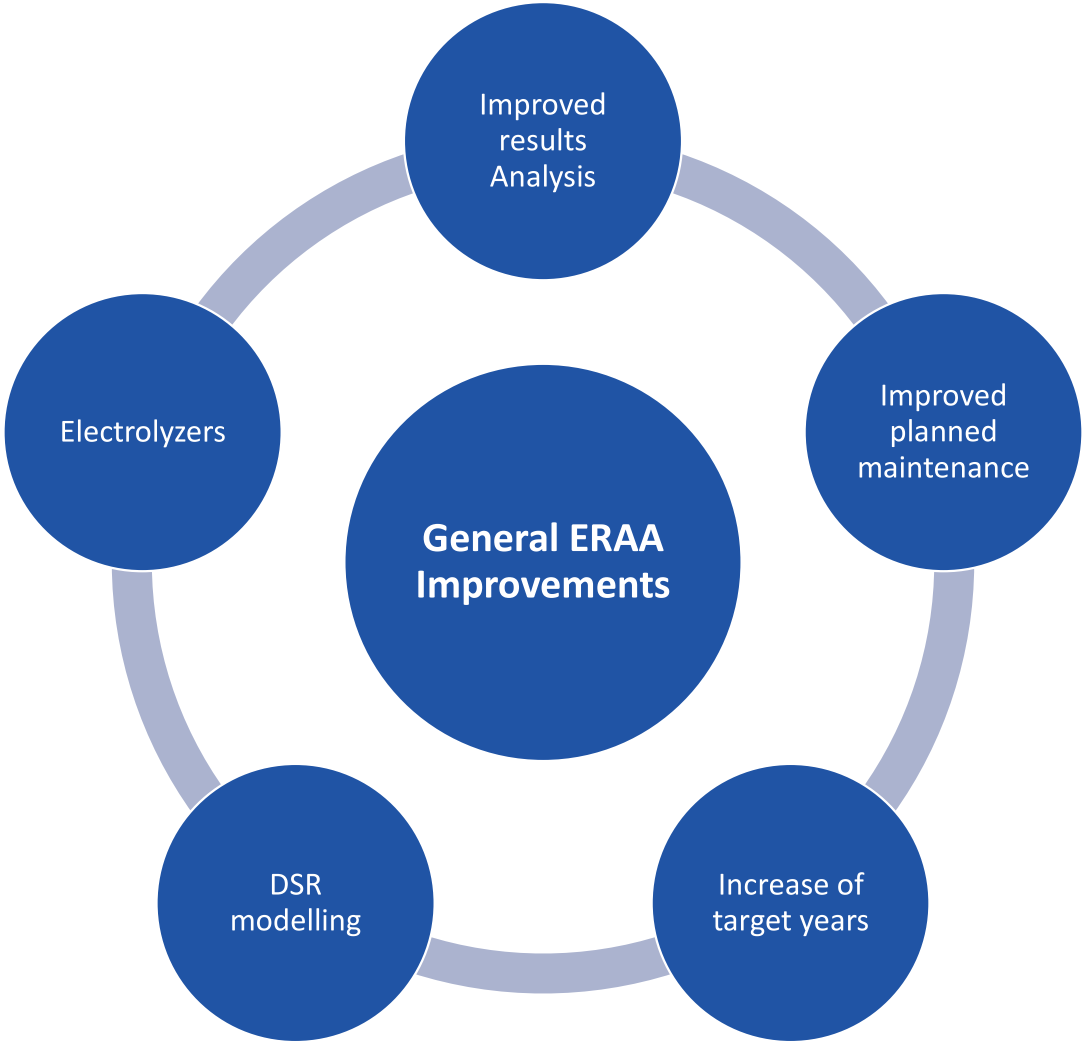
Several improvements in ERAA 2022 – discussed today

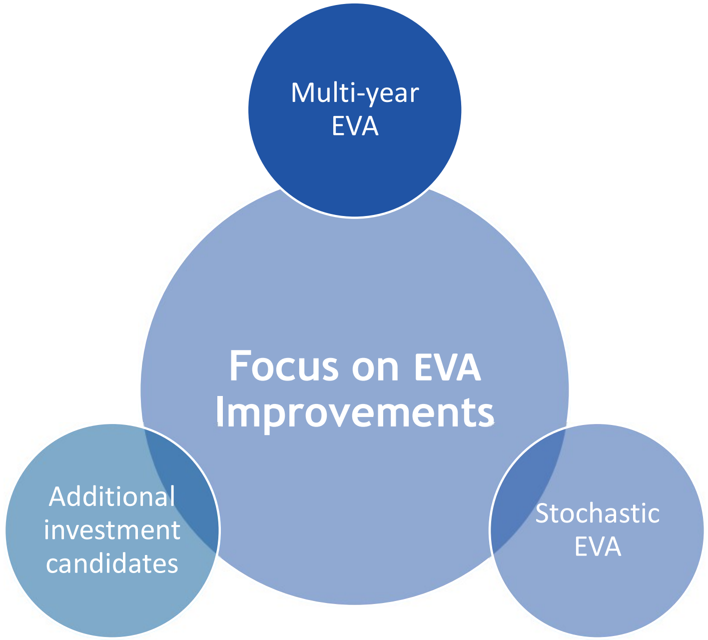
Numerous country-specific comments on bottom-up scenarios

Call for Evidence launched for ERAA 2022

*UCED: Unit commitment and economic dispatch

ERAA 2021 consultation: stakeholders’ priorities for improvements





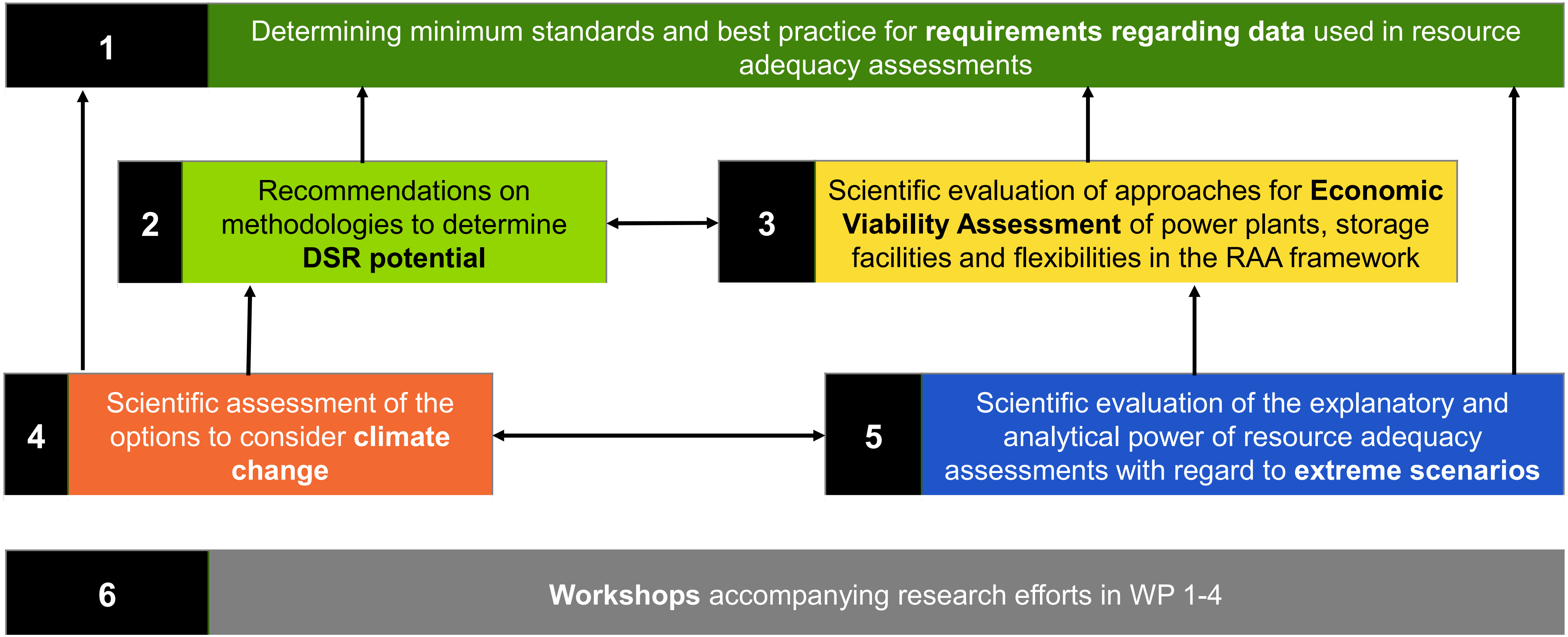
Support for research on methodological improvements of Resource Adequacy Assessments prepared by the Pentalateral Energy Forum

Presentation of the WP3: Economic Viability Assessment methodologies for Resource Adequacy Assessments

17 March 2022

Dmitri Perekhodtsev

The work package overview



Work Package 3 tasks and workshop objectives

3	Evaluate approaches for Economic Viability Assessment of power plants, storage facilities and flexibilities in the framework of Resource Adequacy Assessments
3 Step 1	3.1 Analysis of the main gaps in the existing Economic Viability Assessment (EVA) approaches
3 Step 2	3.2 Addressing practical constraints of the Economic Viability modelling
3 Step 3	3.3 Accounting for market signals as well as policy targets and subsidy programs
3 Step 4	3.4 Modelling of strategic decisions considering risks

Two expert workshops organised in June 2021

- Focus on industry perspective on the drivers of the capacity entry/exit decisions:
  - Revenues across markets
  - Role of market regulation and non-market drivers
  - Specificity of the entry/exist decisions for DSR and storage
  - Impact of the hedging strategies
  - Entry/exit decision under uncertainty

Two expert workshops organised in March 2022

- Focus on specific modelling issues of EVA and the industry perspective on the specific elements of entry/exit decisions:
  - The choice between the two EVA options proposed by ACER
  - Consistency of the EVA framework with the overall RAA
  - Assessment of the market risk in the EVA

Conclusions from the first workshops

Revenue sources and risk appetite can greatly differ by asset type

<table>
<tr><th></th><th>Conventional plants</th><th>Flexibility development</th></tr>
<tr><td>Wholesale market</td><td>• Main source of revenue
• Highly sensitive to scarcity pricing for peak-load plants</td><td>• Relatively low revenues from wholesale markets
• Market access is important</td></tr>
<tr><td>Ancillary service and balancing markets</td><td>• Considered more conservatively</td><td rowspan="2">• Highly sensitive on market design parameters defining market access
  • reservoir size
  • network tariffs
  • derating factors</td></tr>
<tr><td>Capacity markets</td><td>• Can be a key factor for entry/exit</td></tr>
<tr><td>Revenues outside of the electricity sector</td><td>• Relevant for CHP power plants</td><td>• Explicit and implicit subsidies relevant</td></tr>
<tr><td>Assessment of the risk in the entry/exit decisions</td><td>• Entry decision needs to be justified by a solid business case in the central scenario
• A form of risk aversion approach is applied in assessing forward scenarios</td><td>• Can be mobilized quicker and at lower investment costs → investors are more risk seeking</td></tr>
</table>

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The choice between the two EVA options proposed by ACER

Option 1: EVA of individual capacity resources	Option 2: EVA through minimisation of the system cost
• Soft link between dispatch and entry/exit modelling	• Integrated solution of dispatch and entry/exit modelling
• Focus on market revenues and decisions to enter/exit from the point of view of capacity providers • aims to estimate revenues with high precision	• Considers the system from the central planner perspective • Potentially simplifying the calculation of the revenue streams
• May be limited in how many combinations of investment/retirement options are tested	• Inherently accounts for all combination of all investment/retirement options (including interdependencies between resources and bidding zones)
• **Discussions results:** A more appropriate approach to assess the medium-term market disequilibrium situations	• **Discussions results:** A more appropriate approach to assess long-term market equilibrium, potentially to be used in combination with Option 1

Consistency of the EVA framework with the overall RAA

EVA has a different focus while needs to be consistent with ED

	Economic Viability Assessment (EVA)	Economic Dispatch (ED)
Objective	• Assess investment/retirement decisions each year driven by future revenues and costs expected in each modeled year • Informs the RAA regarding installed capacities → **Underlying assumptions of EVA and RAA must be consistent**	• Estimate the adequacy indicators LOLE and EENS for RAA in the modeled year accounting for the main uncertainties and drivers of adequacy in the main scenario
Time horizon	• EVA must analyze economic viability across multiple years beyond each target year • Must account for the capacity resource economic lifetime	• Modeled years over 10 future years
Main uncertainty drivers	• Commodity prices • Long-term market development • Weather-related drivers might be less important	• Weather-related demand and RES profiles • Outage patterns

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Views on ENTSO-E ERAA 2021 & Economic Viability Assessment

Yvan Hachez – Vice-Chair of Market & Investment Committee

ENTSO-E ERAA 2022 workshop – 17th March 2022

Follow us

ERAA 2021 is a step in the right direction but sensitivity scenarios should be strengthened

Assumptions on realisation of existing / new capacity should be complemented with clarification of uncertainties around economic viability

Sensitivity of the results to some key assumptions should be assessed taking into consideration Flow-Based Market Coupling

Sensitivity analysis of Low Thermal Capacity should consider the 2030 goals, the impact of the Fit for 55 package and the recent pledges for earlier phase-out of coal/lignite units.

ERAA and EVA should extend their analysis to 2030 + year by year trajectory until 2030.
Limiting EVA analysis in 2025 cannot accommodate the investments/disinvestments decisions and the system needs in terms of adequacy

Assumptions around DSR & Storage potential to be considered economically viable in 2025 should be further justified/explained.

Assumptions of very high scarcity prices (15,000 €/MWh) have important impacts on the EVA outcome while their realization in practice are questionable (e.g. political sensitivity and impact on customers of high prices)

Use of a comprehensive formulation (solved by mathematical programming tools) would be more efficient than the current EVA iterative process

Demand-side flexibility in the ERAA

SmartEn

stakeholder workshop
17 March 2022

smartEn members

APPLiA Home Appliance Europe
bne Bundesverband Neue Energiewirtschaft
centrica Business Solutions
dcbel
EATON Powering Business Worldwide
EDF
enel x
Entelios
entra
epq
KNAUFENERGY solutions
NODES
openADR ALLIANCE
Schneider Electric
SIEMENS Ingenuity for life
tiko
THE TRAXIS GROUP
vaasaETT
Voltalis
AFRY
ampx
AMPECO
AutoGrid
bamboo energy
chargepoint
cleanwatts
CUCULUS
CYBERGRID
DNV
Elli
Energy Pool
CATAPULT Energy Systems
epexspot
EVBOX
FLEXCITY by VEOLIA
geo smarter energy
GridSingularity
Honeywell
i-EM
IKEA/INGKA
Microsoft
THE MOBILITY HOUSE
NET2GRID
NUVVE
Powerledger
sonnen
TESLA
VIESSMANN
WATTSDAT
WIREPAS
ade
DELTA Energy & Environment
ENERCOUTIM
EVN
FLEXIBLEPOWER ALLIANCE NETWORK
gridX
JOULE ASSETS
next
REGALGRID sharing your power
ThermoVault
vgc VANGUARD CONSULTING OY
Vestas
VIOTAS

smartEn Smart Energy Europe

Andrés Pinto-Bello Gómez

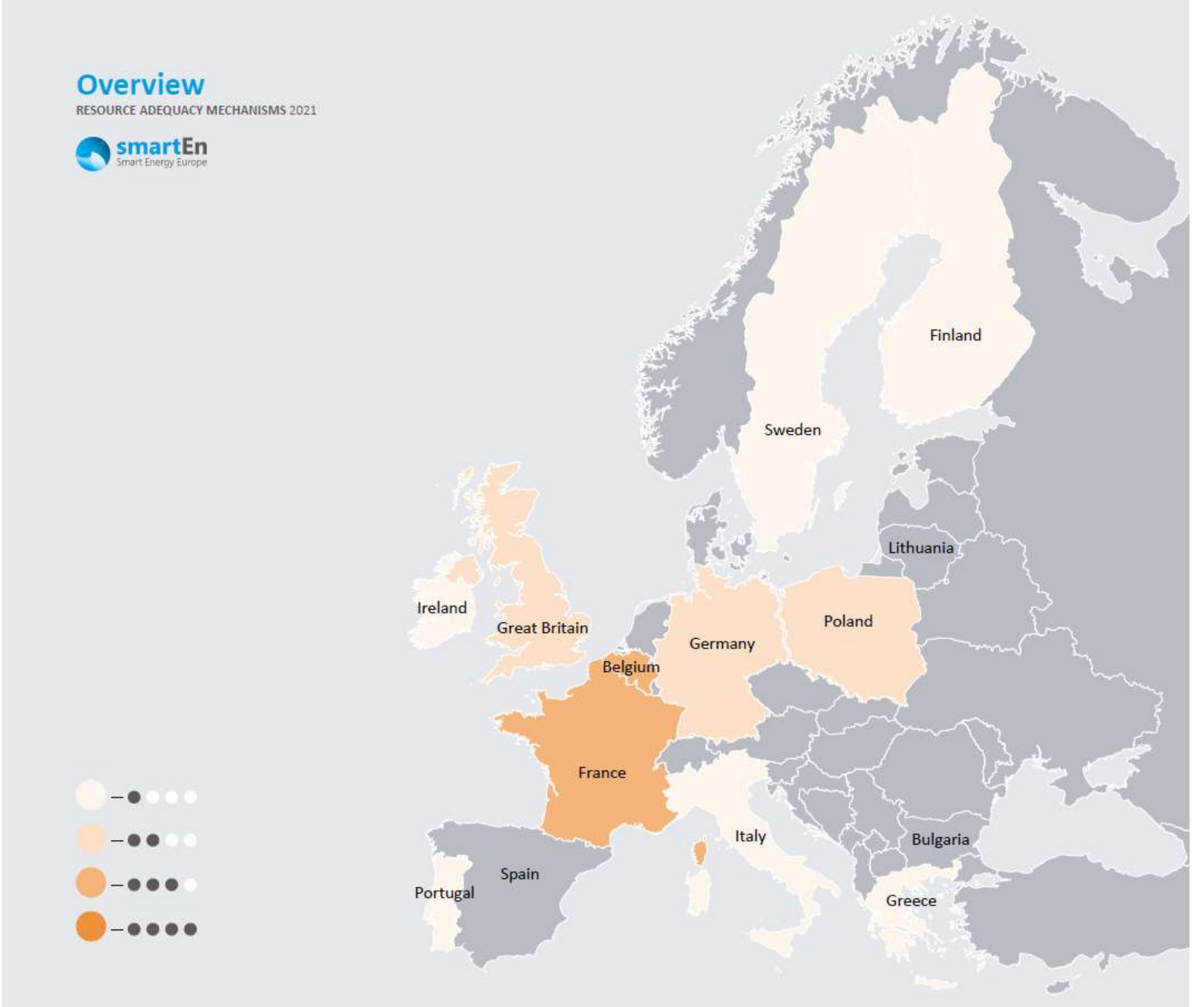
Head of Research and Projects

smartEn

DR participation in Resource Adequacy Mechanisms

Limited market-based approach

Mostly provided by traditional generation



Main takeaways

- Reduced DR activity due to participation requirements
- Lack of participation makes it difficult to forecast potential available DR capacity
- “Hidden” DSF in industrial processes won’t be visible until markets allow monetization

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ERAA 2022 suggestions

Challenges

- Risk of extrapolating current participation of DR in RAMs in modelling
- Fragmented and/or incomplete available/activated capacity data sets
- Difficult to calculate available flexibility in different price bands:
  - Most potential DR providers do not know (exactly) their short-run marginal costs (SRMC)
  - They adapt their dispatch capacity based on estimations and not on market-price
  - Hidden DR that won't be visible until a market exists
- Different price structures for DR and traditional generation make them difficult to compare

Suggestions

- More ambitious targets on already available technologies (e.g., heat pumps, smart charging and V2G) and future development of DSR
- Increased information sharing on dispatched bids and the technologies behind them
- Consider DSF as an equal investment option as traditional assets (e.g., with its own ROI)
- Include a scenario that models more technology inclusive mechanisms and markets to compare to status quo

smartEn/DNV Quantification of DSF study

Challenges

- Lack of accurate DSF potential quantification
- Lack of targets for DSF (e.g., no % of peak-shaving, or amounts of GW for DR)
- No accurate economic comparison between traditional generation and DSF
- Underrepresentation of DSF in modelling exercises and network development plans

Metrics modelled in study

- the **potential DSF capacity (GW)** available in 2030 to achieve the 55% GHG reduction and the renewables targets set by the European Commission in the Fit for 55 package proposal,
- the amount of **DSF that should be activated (GWh)** to support those objectives,
- **system level savings (€)** and **end-user benefits (€)** that would result from the activation of DSF.
- Increased ambition to reflect EC's Repower communication and higher needs of energy independence

Example of collected metrics

Industrial load flexibility – *exemplary input data overview for market model*

Industry	option	Min shut down time (hours)	Max shut down time	Cooling down time	Type	Steps	Replaceability	Current (2020)		2030	
								Capacity (MW)	Price (€/MWh)	Capacity (MW)	Price (€/MWh)
										2030	2030
Oil refineries	Production stop factory	504	504	504	Stepwise	5 to 10					
Ceramics	Shut down whole sector	168	504	168	Stepwise	17					
Metal industry	Shut down whole factory	168	504	168	Binary	N/A	5, 6				
Metal industry	Shut down cold ironing	1	23	24	Stepwise	5	4				
Metal industry	Shut down tin production	1	23	24	Binary	N/A	4				
Aluminum	Batch processes	1	5	24	Binary	N/A	8, 9, 10				
Aluminum	Batch processes	6	23	24	Binary	N/A	7, 9, 10				
Aluminum	Batch processes	24	47	24	Binary	N/A	7, 8, 10				
Aluminum	Batch processes	48	504	48	Binary	N/A	7, 8, 9				
Zinc	Shut down whole factory	168	504	168	Binary	N/A					
Paper industry	Production shift of batch processes	1	23	24	Stepwise	8					
Paper industry	Production stop of continuous processes	24	504	24	Stepwise	8					
Glass industry	Stop production line/turn down furnace	24	504	24	Stepwise	24					
Chemical industry - fertilizers	Shut down whole factory	6	23	24	Stepwise	2	16, 17, 18				
Chemical industry - fertilizers	Shut down whole factory	24	167	24	Stepwise	2	15, 17, 18				
Chemical industry - fertilizers	Shut down whole factory	168	503	168	Stepwise	2	15, 16, 18				
Chemical industry - fertilizers	Shut down whole factory	504	504	504	Stepwise	2	15, 16, 17				
Chemical industry - Salt	Shut down salt factory	6	504	24	Stepwise	2					
Chemical industry - Chlorine	Shut down chlorine factory	24	504	24	Stepwise	5					
Chemical industry - Chlorine	Scalable flex	1	24	24	Scalable	N/A					
Chemical industry - Other	Batch processes	24	504	24	Stepwise	155					
Food industry	Full production stop	1	23	168	Stepwise	40					
Food industry	Continuous processes	24	504	24	Stepwise	40					

Technologies

- Industrial loads
- Electric vehicles
- Electric heating and cooling
- CHP plants
- Small-scale batteries
- PV curtailment

Market and system insights:

- Wholesale and adequacy benefits
- Balancing and infrastructural benefits

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For further questions please contact

andres.pintobello@smarten.eu

Q&A with the audience

Don’t forget to post your questions on Sli.do:

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or scan the following QR with your phone to login

Audience polls

Question 1: What are your expectations for the CO_2 price trajectory in the coming decade?

Question 2: What are your expectations for the gas price trajectory in the coming decade?

Question 3: What are your expectations for other fuel price trajectories in the coming decade?

Have your say here:

3.1. ERAA 2022 Main Assumptions & Scenarios

Kristof Sleurs, Convenor, ERAA Steering Group, ENTSO-E

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Main assumptions

Fit-for-55 & NECPs

- *Data collected from TSOs comply with the National Energy and Climate Plans (NECPs)*
- *Pave the way towards Fit-for-55*

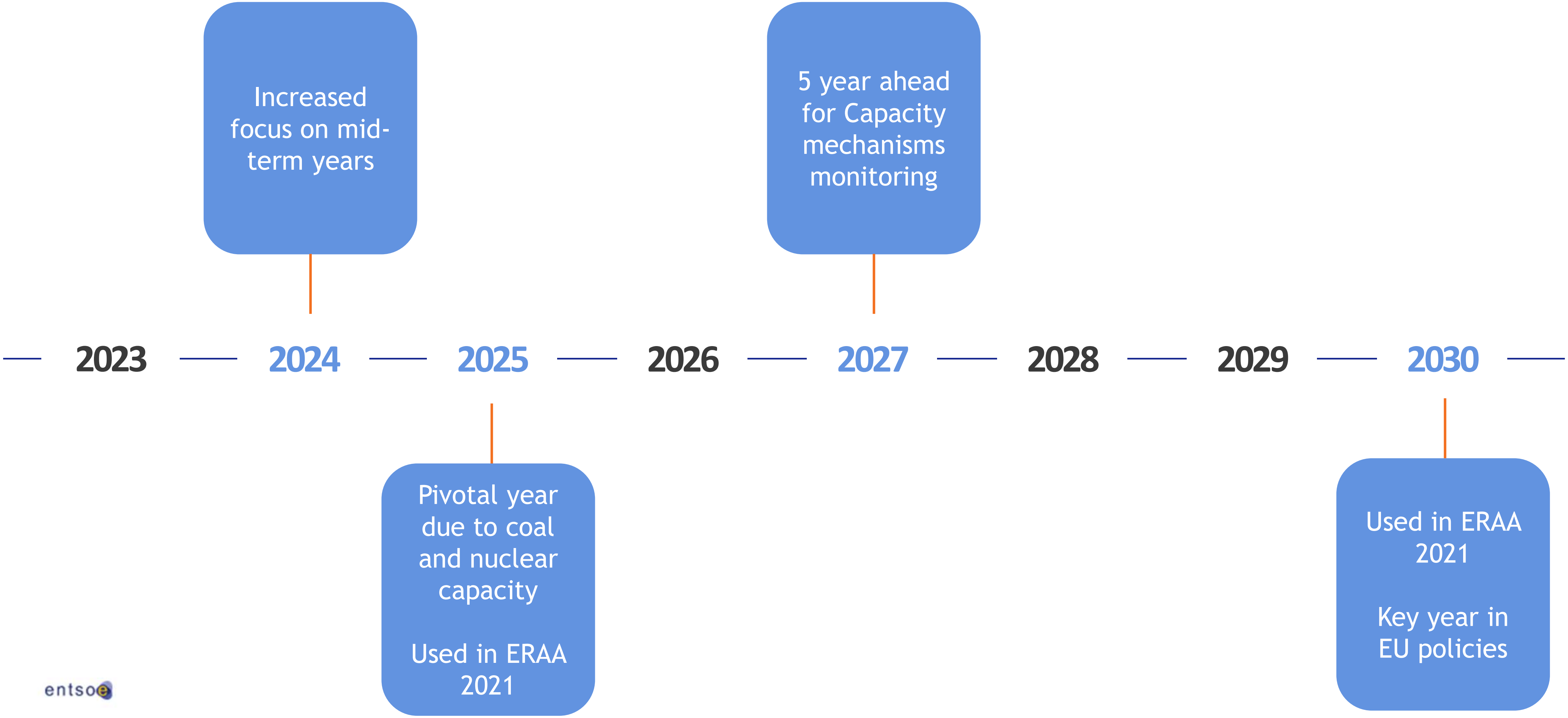
Climate

- *Climate change accounted through temperature detrending*

Interconnection

- *Flow-Based in central scenarios at least for the CORE region*
- *Net Transfer Capacities*

Choice of modelled Target Years



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Scenario Calculation Workflow

NATIONAL ESTIMATES

TSOs provide forecasts for capacity based on planned lifetime, new generation estimates and NECPs.

WITHOUT CM

Economic Viability Analysis carried out, factoring in forecast carbon price and market price cap. Includes already contracted CM.

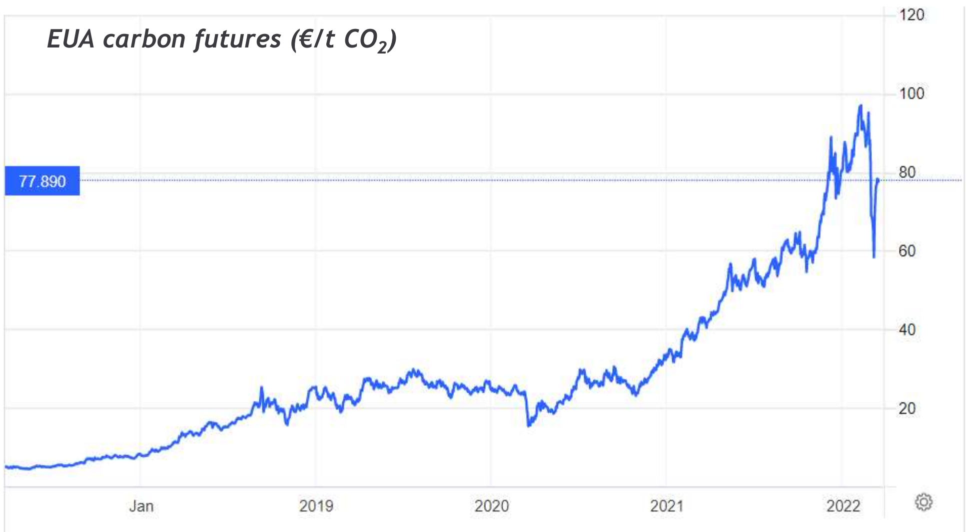
WITH CM

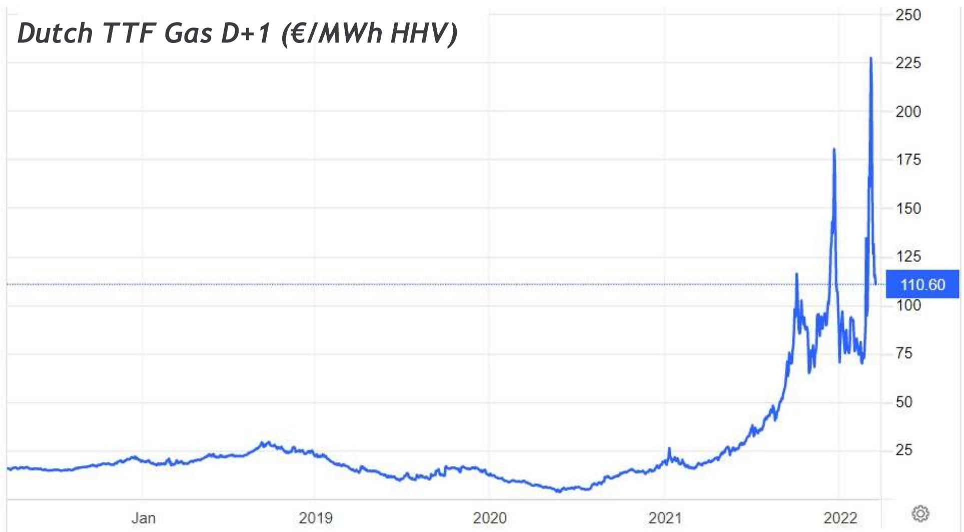
As above, with addition of capacity needed to meet system reliability standards in countries with an approved capacity mechanism.

Q&A

Fuel and CO_2 prices

- Significant CO_2 and Fuel price increase in 2021 due to COVID rebound, political climate, etc.
- Markets remain uncertain and volatile
- ENTSO-E welcomes stakeholder input on CO_2 and fuel price assumptions

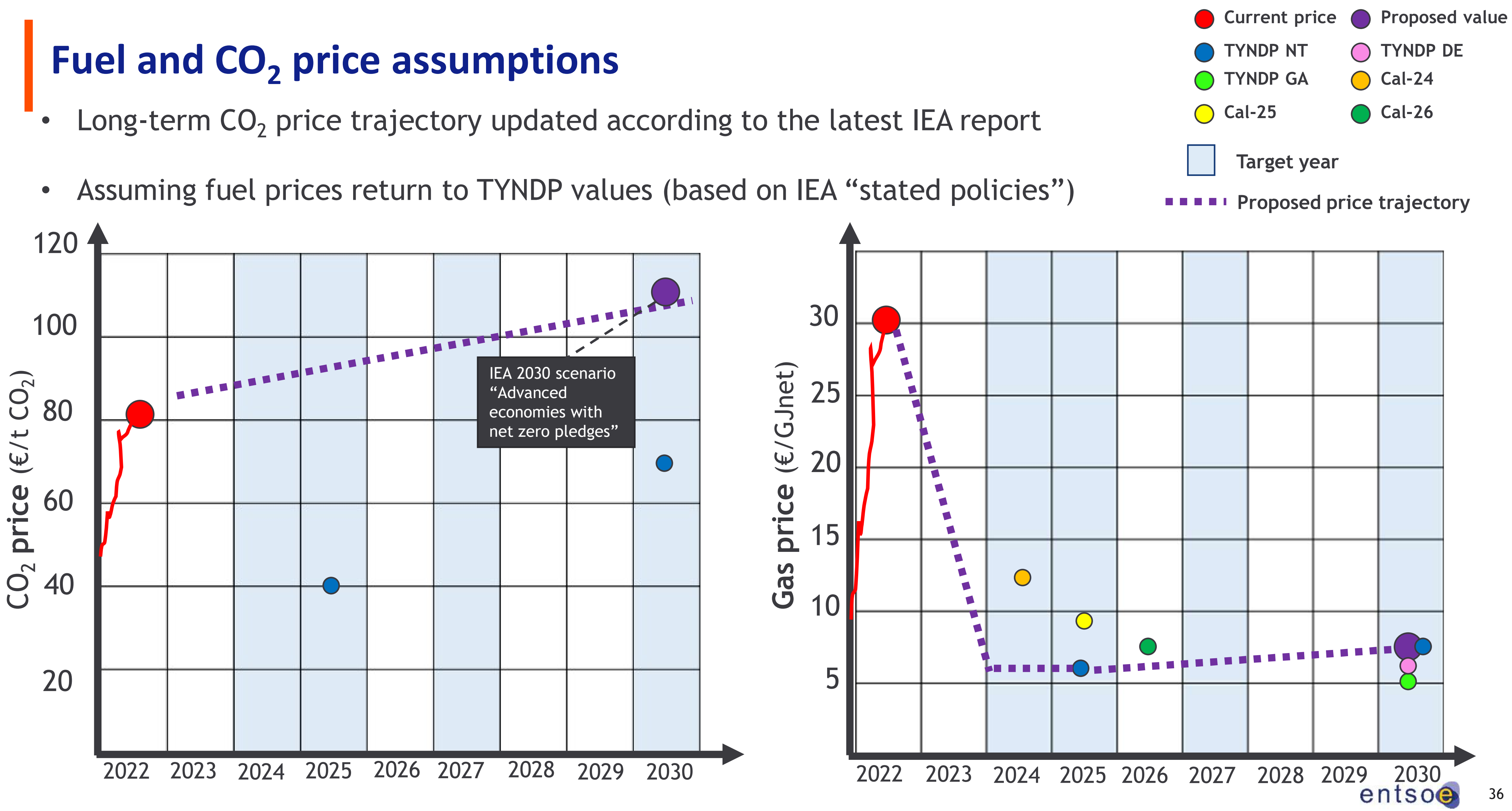




Source: Tradingeconomics.com - 16th March 2022

Fuel and CO_2 price assumptions

- Long-term CO_2 price trajectory updated according to the latest IEA report
- Assuming fuel prices return to TYNDP values (based on IEA "stated policies")



*Macro drivers - World Energy Model - Analysis - IEA

Q&A with the audience

Don’t forget to post your questions on Sli.do:

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Audience polls

Question 1: Which aspects do you consider as most important regarding the modelling of implicit DSR?

Question 2: Which aspects do you consider as most important regarding the modelling of electrolysers?

Question 3: Which aspects do you consider as most important regarding the modelling of planned maintenance of generation units?

Have your say here:

3.2. ERAA 2022 Modelling Improvements

Nils Müller, ERAA modelling, ENTSO-E

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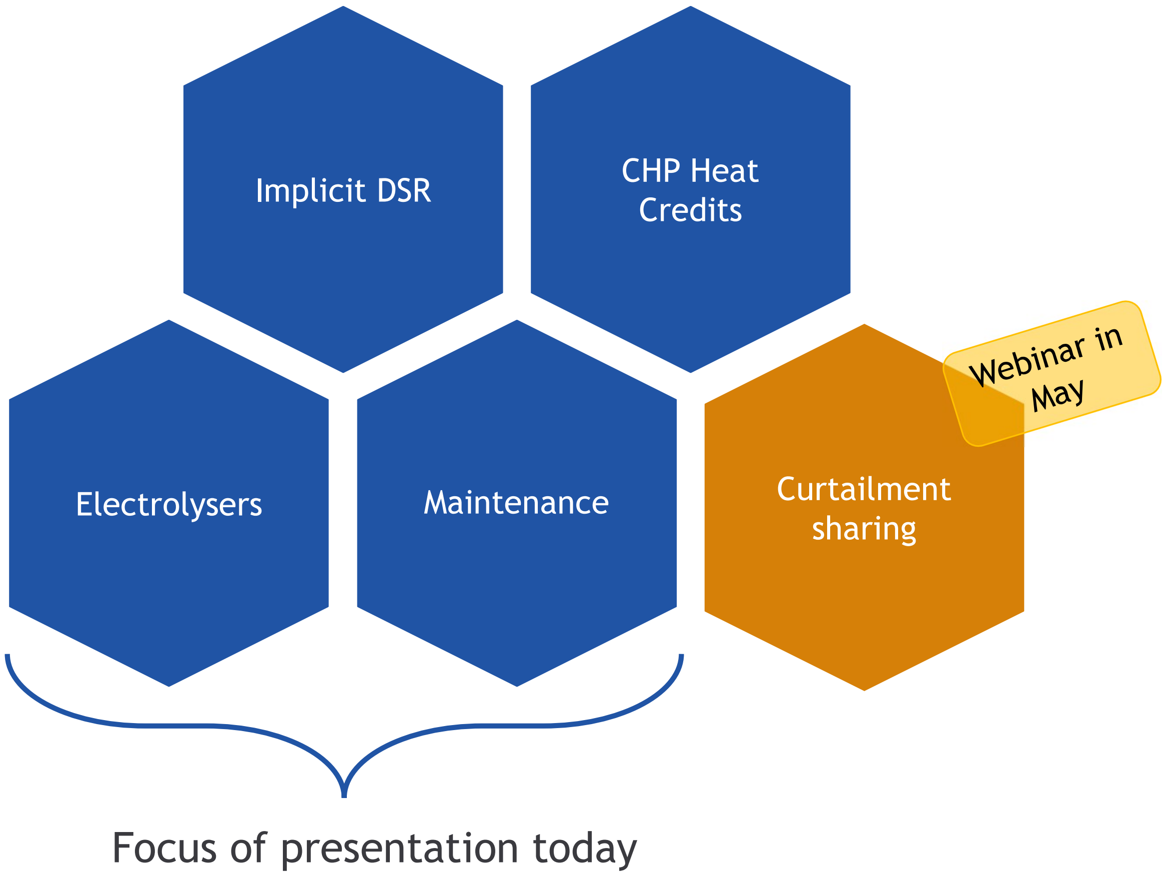
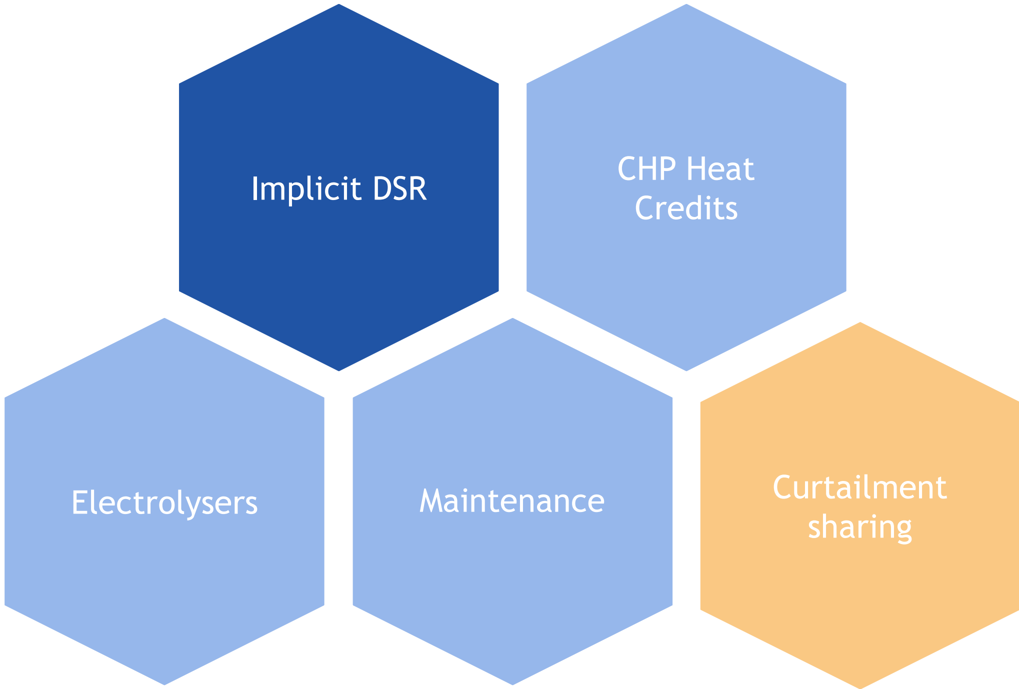
Multiple improvements in ERAA 2022 for more accurate prices and results



Modelling improvements in ERAA 2022: An Overview



Implicit DSR: improved modelling approach considering the flexibility from flexible end-consumers

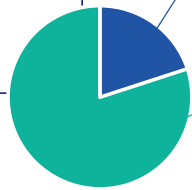
ERAA 2021

End consumer consumption **100% exogenous** for all technologies calculated by a demand model trained on historical profiles.

ERAA 2022

For each technology, end consumer consumption partly ***"time-tariff and inflexible"*** & partly ***"price-tariff"***

Ratios estimated by TSOs



"Price-tariff"

- Demand is included in the modelling tool and can react to price changes.
- React to market prices.

"Time-tariff and inflexible"

- Demand is computed by the demand prediction tool.
- Do not react to market prices.

- 3 flexible implicit DSR technologies:

Small-scale / household batteries

Heat Pumps

Electric Vehicles

Modelling description for the different end-consumer types

Small-scale / household batteries

- *”Price-tariff” demand* fully flexible within storage restrictions.
- Same behavior as large-scale market participating batteries.

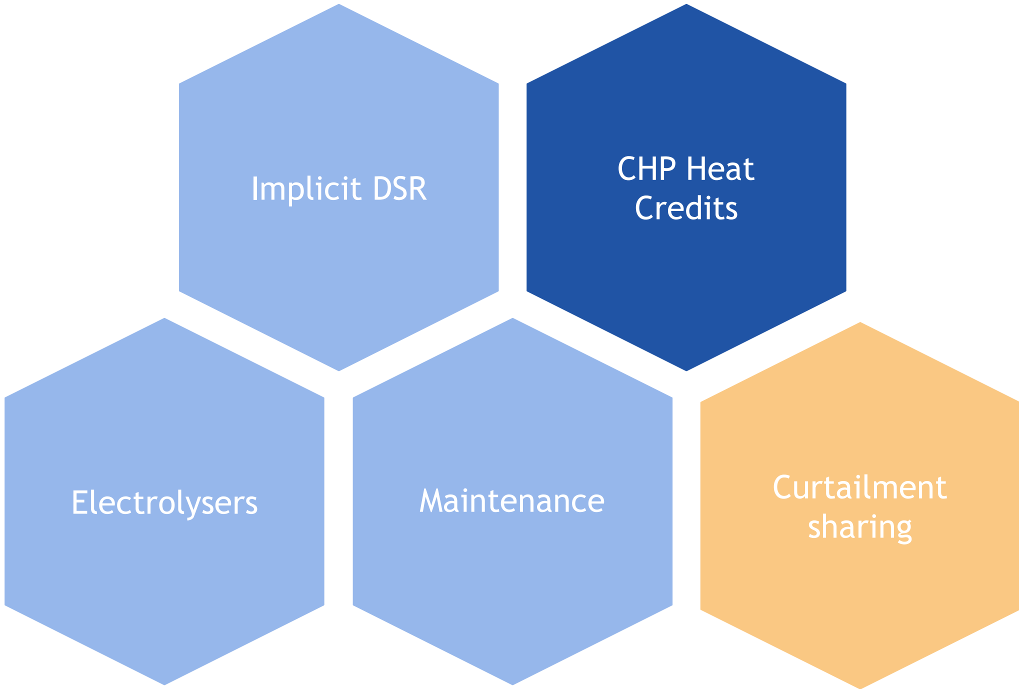
Heat Pumps

- Base consumption is still exogenous.
- ”Price-tariff” demand can be shifted within 4-6 hours time windows in case of scarcity.

Electric Vehicles

- Base consumption is still exogenous.
- ”Price-tariff” demand can be shifted within 4-6 hours time windows in case of scarcity.
- No V2G feed-in.

Modelling improvements in ERAA 2022: An overview



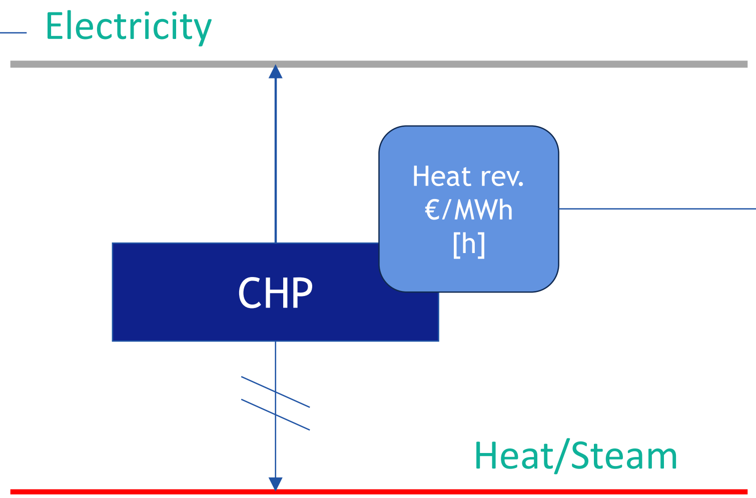
Q&A

New modelling will allow more realistic viability assessment of CHP units

ERAA 2021	ERAA 2022
• CHP units were marked by most TSOs as "*must-run/policy units*". • Not included in the EVA. • Electricity prices underestimated due to feed-in at zero cost.	• CHP units no longer "*must-run/policy units*" by default. • Included in the EVA step as "*retirement candidates*". • More accurate electricity prices with dispatching at marginal cost.

CHP Heat Revenues' modelling: assumptions for the Simplified Heat Credit Approach

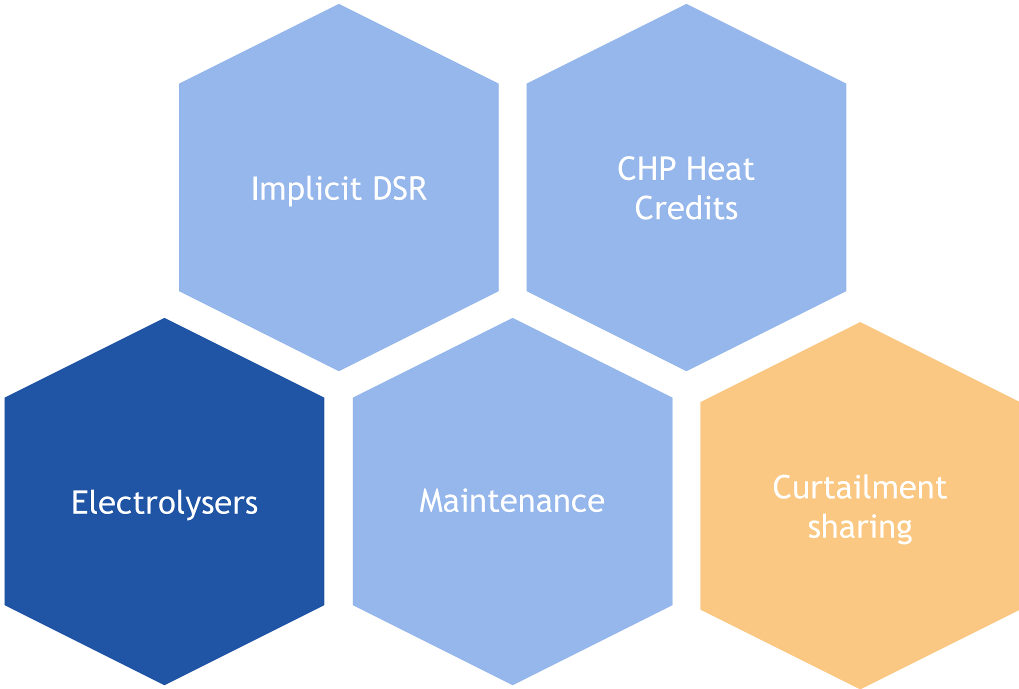
- **Hourly heat credit profiles** reduce marginal costs of CHP units
- Lower marginal costs increase dispatch likelihood



Heat Revenue Profile depends on:
- Annual Heat Production
- Temperature Profile
- Heating limits
- Heat Price
- P2H Ratio

Simplifications in current modelling:
- No explicit modelling of the heat market
- No heat demand needs to be fulfilled on hourly basis

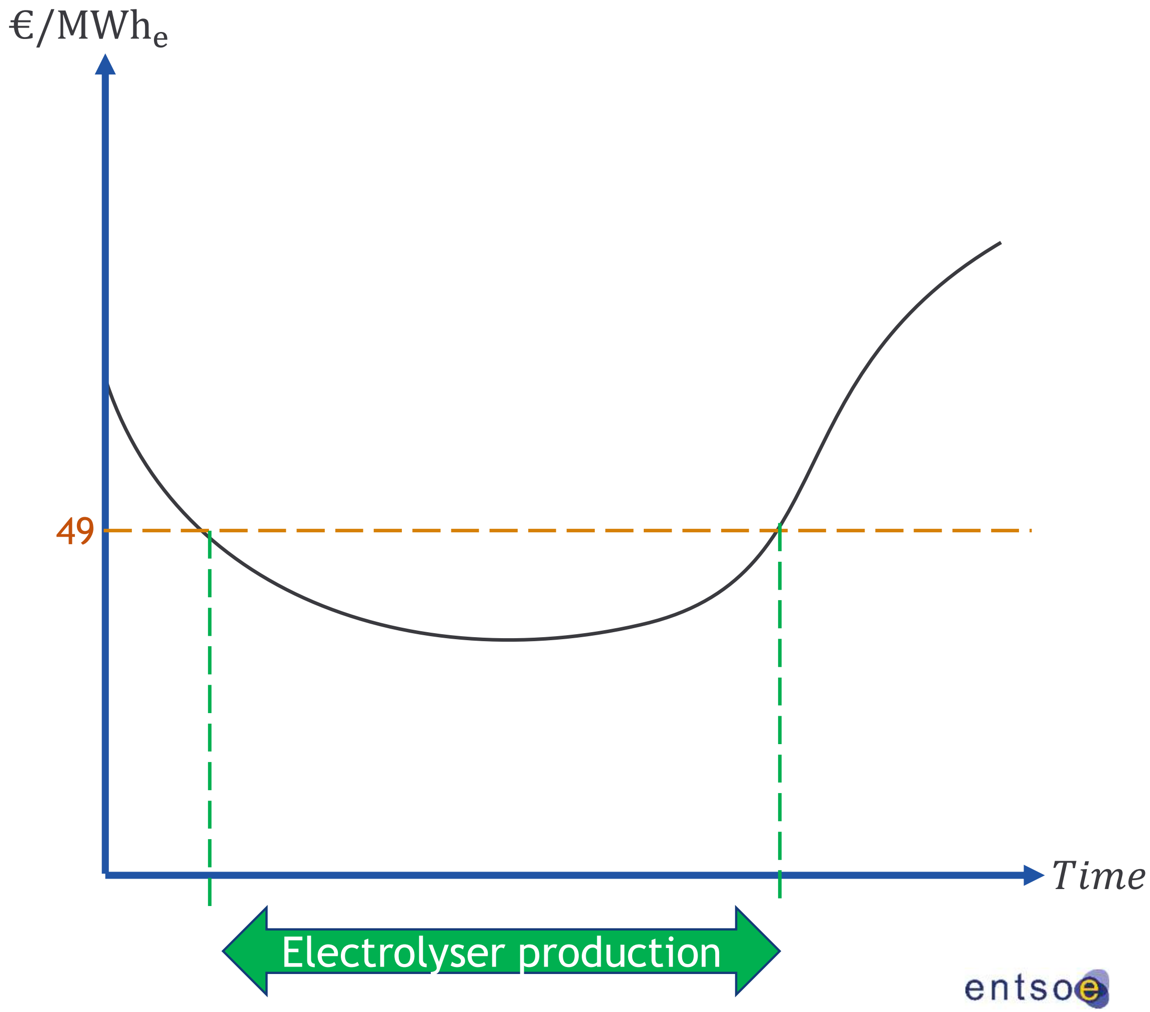
Modelling improvements in ERAA 2022: An overview



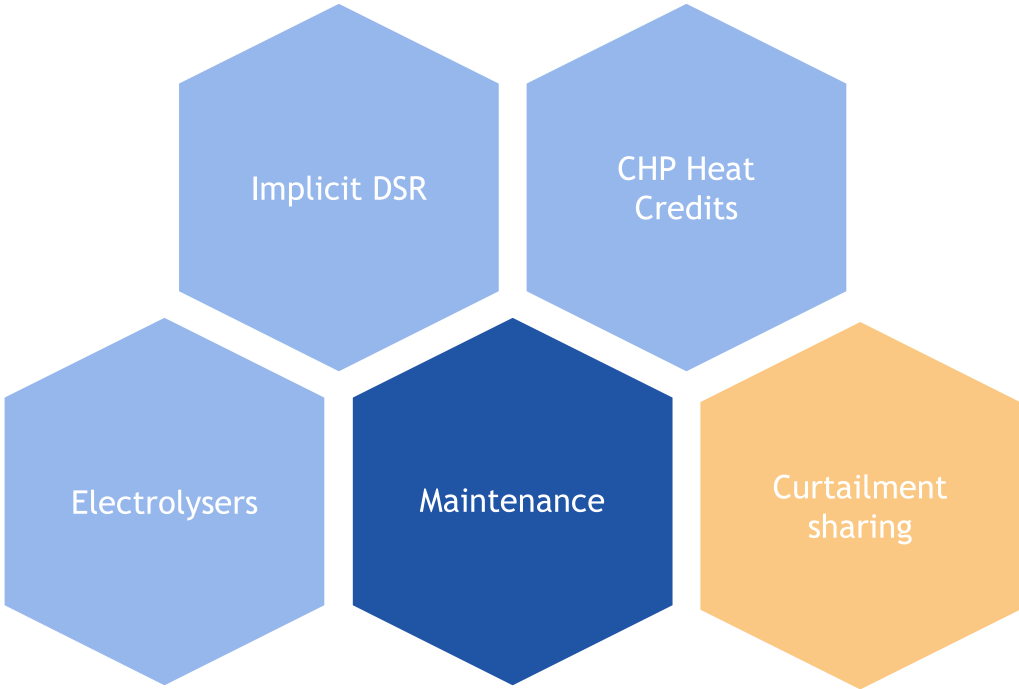
Electrolyser modelling gives further insights on flexibility

- Electrolysers' modelling is aligned with the ENTSO-E Scenario Building approach for Bottom-Up scenarios.

- Electrolysers produce if electricity price is below a threshold, e.g. 49 EUR/MWh derived from H2 2030 forecasted price (70 EUR/MWh of H2) and electrolyser efficiency (68%).



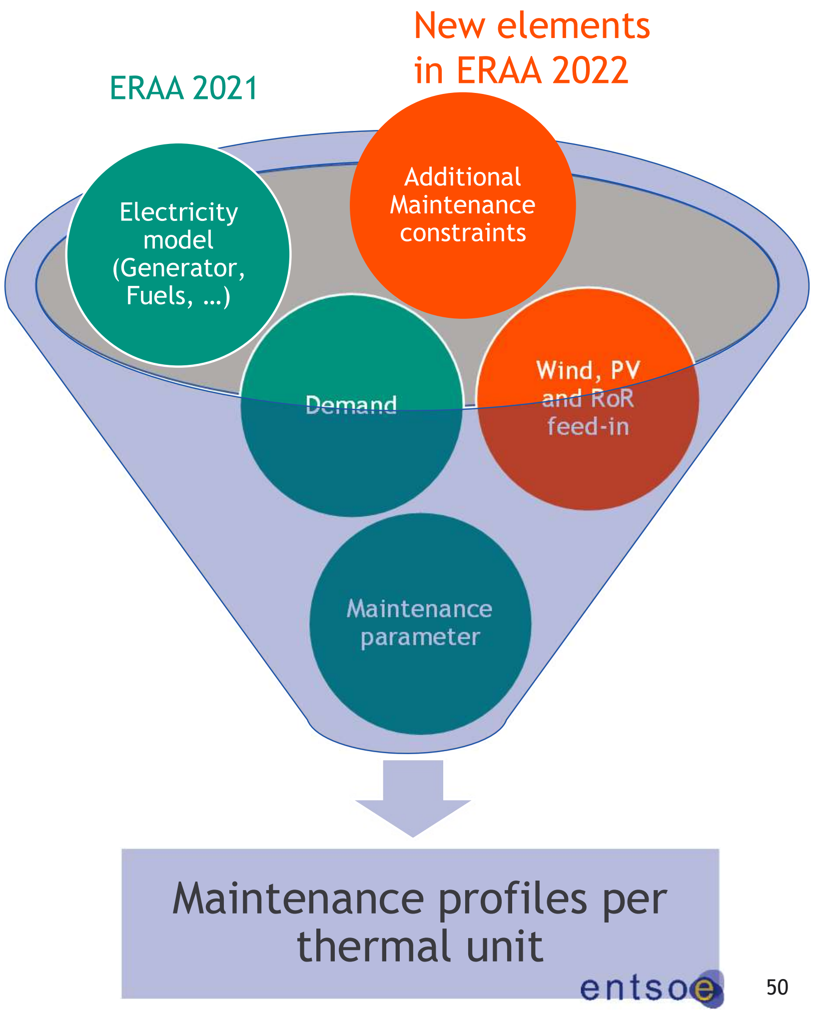
Modelling improvements in ERAA 2022: An overview



Q&A

Important pre-optimization insights based on modelling improvements

- Maintenance of thermal units is modelled considering
  - Specific constraints (e.g. work force availability)
  - RES feed-in
- Maintenance usually scheduled in times of low residual demand, i.e. high supply margins
- TSOs may provide exogenous maintenance patterns (e.g. French nuclear fleet)



Q&A with the audience

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Audience polls

Question 1: What modelling improvements would you consider as priority regarding the EVA?

Question 2: Which aspects would you consider as most important regarding the use of climate years for EVA?

Question 3: Which aspects would you consider as most important regarding the modelling of price caps?

Have your say here:

3.3. EVA Principles

Yaser Tohidi, ERAA market study team, ENTSO-E

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Key considerations and parameters in the EVA process & methodology

Interconnection
- Cross border capacities

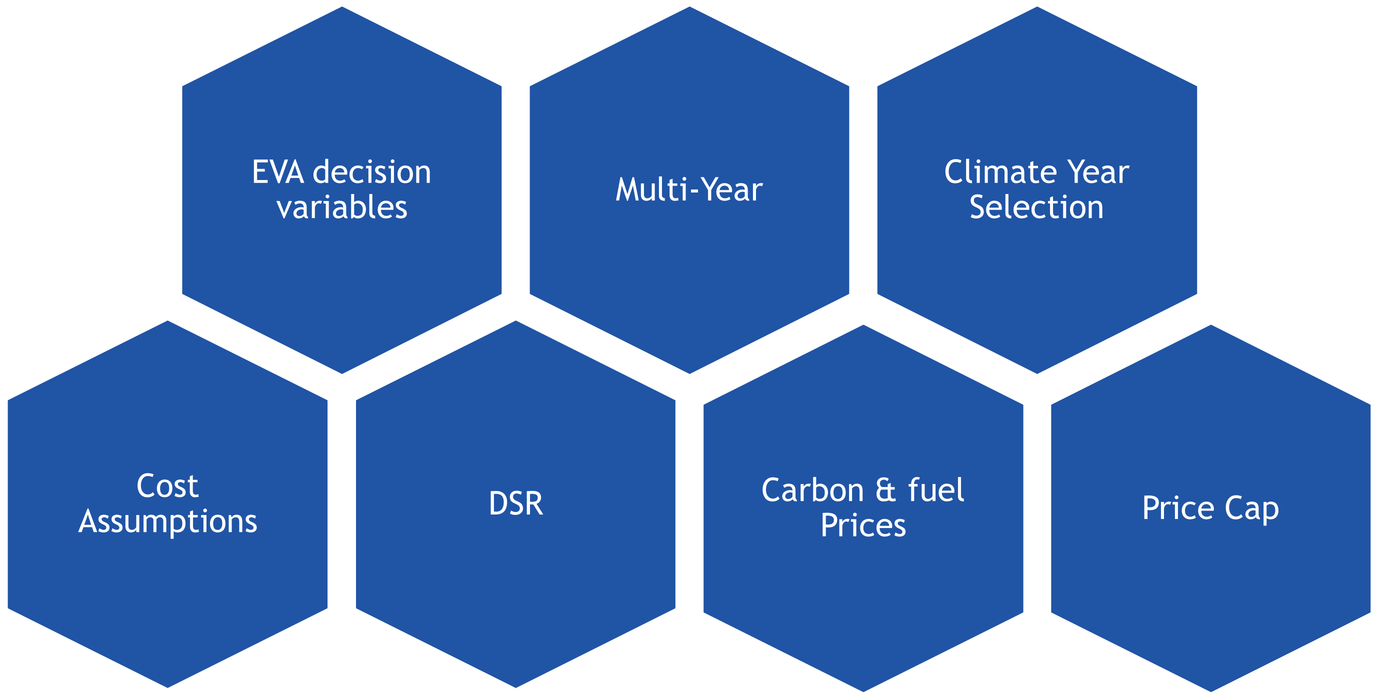
National Estimates
- Installed generation resources
- Planned outages
- Capacity mechanisms, policy contracts, must-run trajectories

Climatic Conditions
- Demand
- Renewable generation

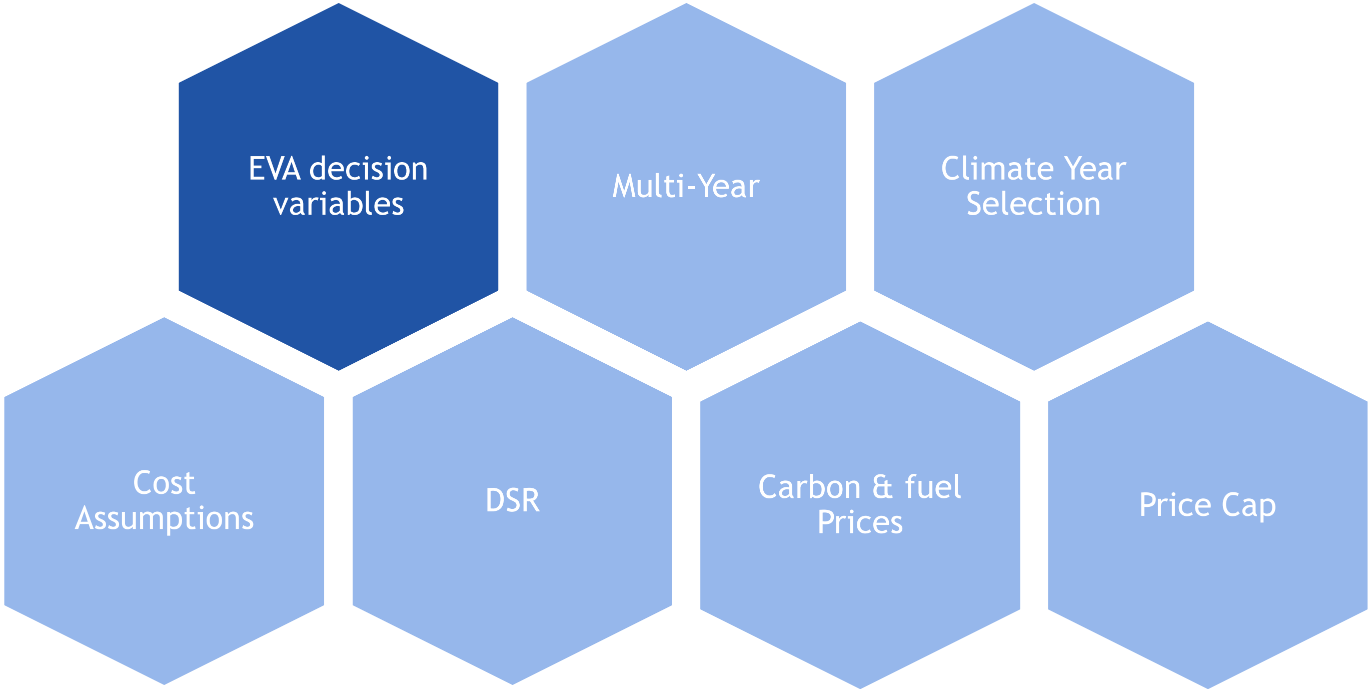
Economic Parameters
- CAPEX, FOM, Fuel/CO2 prices
- Price cap
- WACC (including risk)

Other Assumptions
- Planning horizon
- Standard technologies
- Other revenue streams

EVA Principles



EVA Principles



Q&A

EVA Principles – EVA Decision Variables

ENTSO-E welcomes stakeholder input on the costs of (de-)mothballing & life extension through the open call for evidence by 5 April

Technologies	Decomissioning	(De-)mothballing**	Expansion	Life-extension**
Hydro/RES				
Gas	✓	✓	✓	✓
Nuclear				
Lignite/Coal/Oil	✓	✓		✓
DSR			✓	
Batteries*			✓	

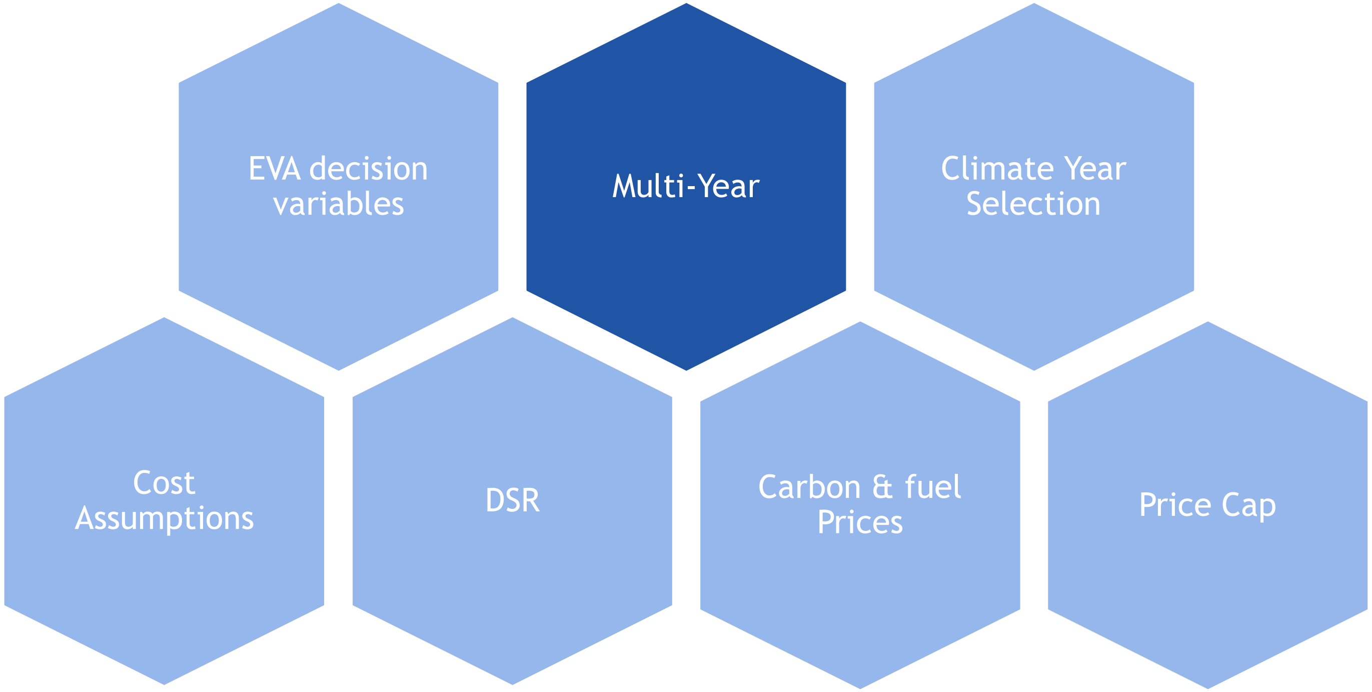
* New technology

** New decision variables

Renewable installed capacities as in national estimates:

- Investments driven mostly by (existing and future) subsidies and member states' policy targets
- Investment cost & potential are site-specific and difficult to represent appropriately in a European-wide investment model.

EVA Principles



EVA principles – Multi-year investment

- High computational complexity
- **Multiple options under investigation**:

Option 1: Stochastic approach	Option 2: Multi-year-Deterministic approach	Fall-back: Single-year Deterministic approach
• *Heavy model* • *Limited number of climatic conditions*	• *Moderate model* • *Increased number of climatic conditions*	• *Light model* • *High number of climatic conditions*
Multi-year step	*Multi-year step*	*Single year steps*
• *Single result* • *No post-processing needed*	• *Results per climatic condition* • *Post-processing (averaging) is needed*	• *Results per climatic condition per target year* • *Post-processing (averaging) is needed*

➢ **Final approach to be decided based on testing and computational feasibility**

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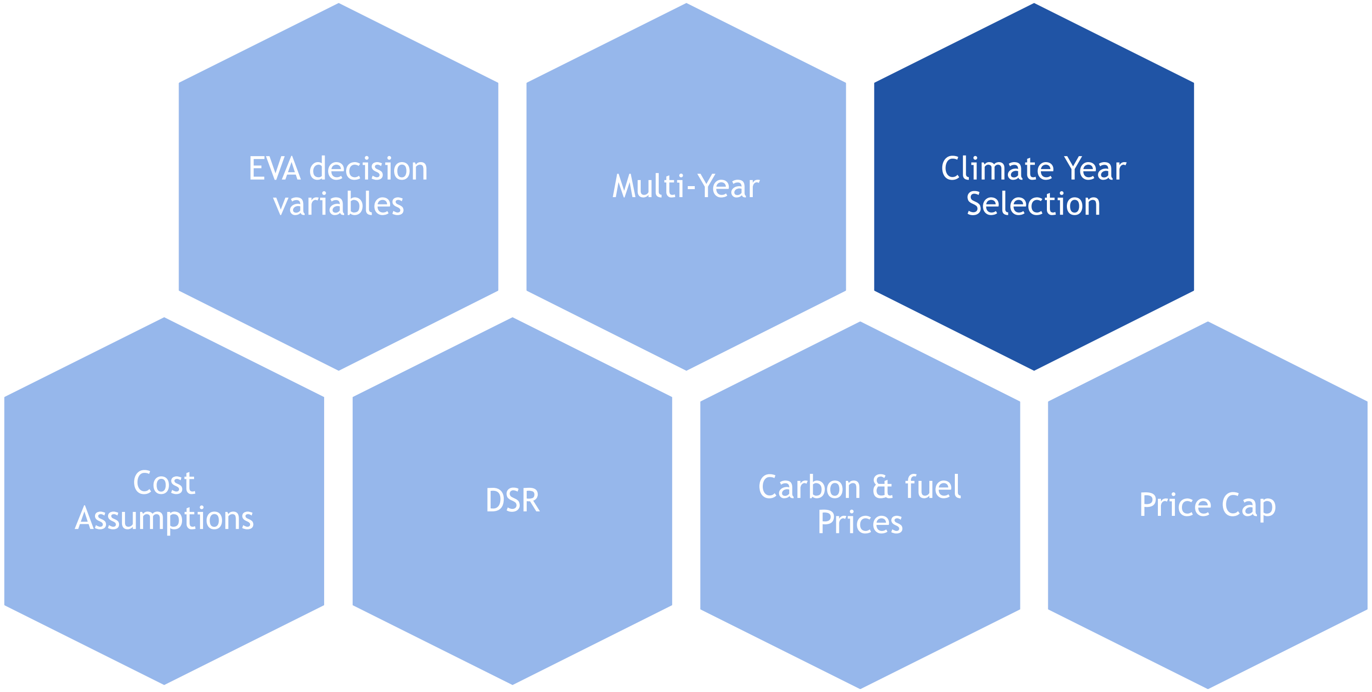
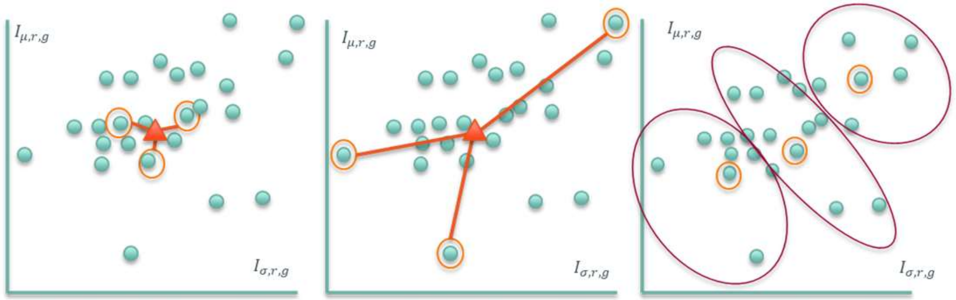
EVA Principles



EVA Principles – updated approach for climate year selection based on total system cost

EVA 2021
Clustering based on residual load of macro regions

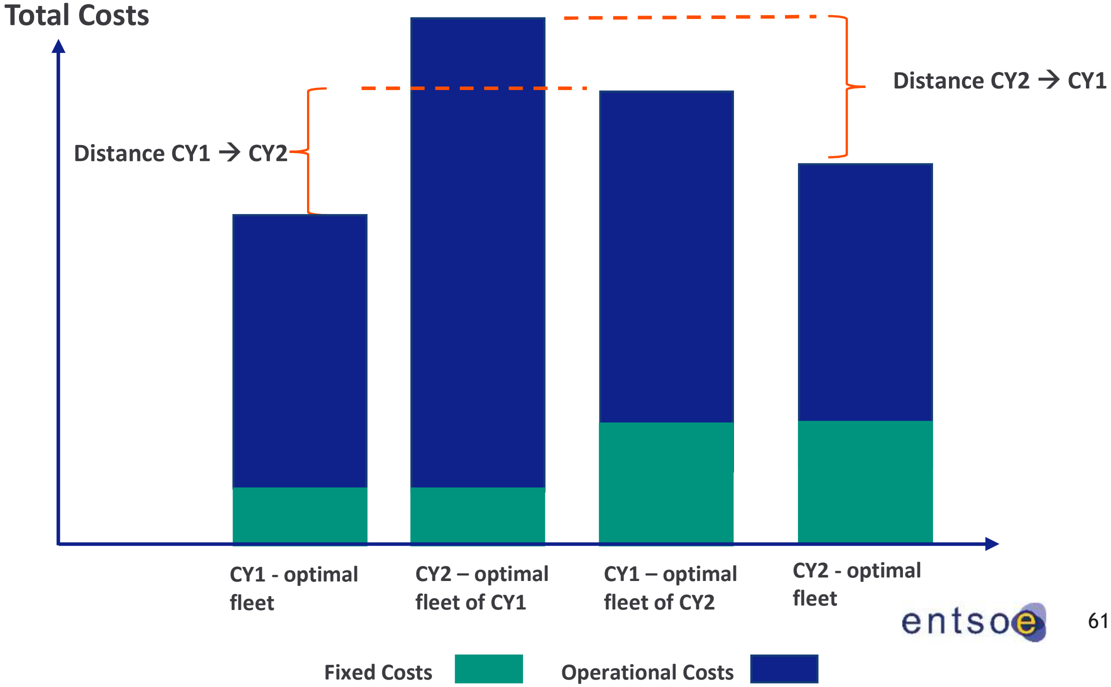
- Finding the climate year combinations that has the lowest error (mean&variance) to the aggregated distribution
- Choosing the best combination with the lowest distance to k-means of each cluster



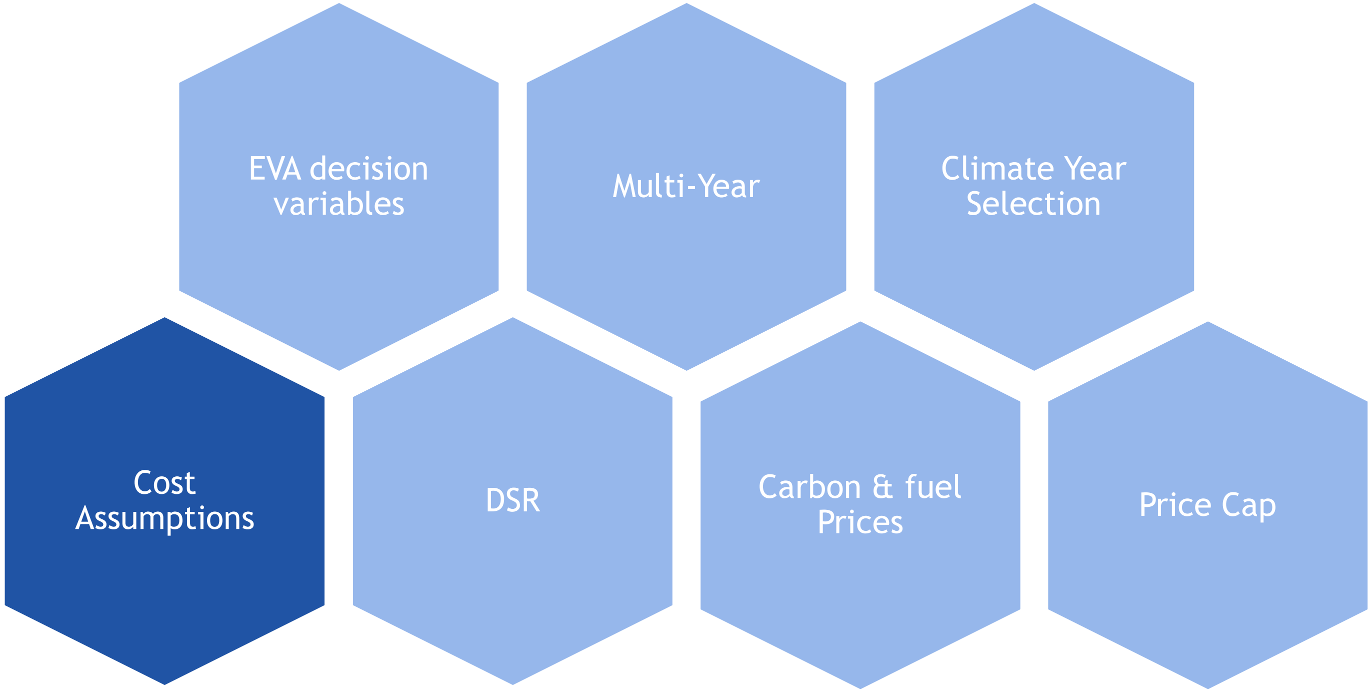
a) Eucledian distance combi "mild"   b) Eucledian distance combi "extreme"   c) Eucledian distance combi "K-Medoids"

EVA 2022
Clustering based on post-EVA total system cost distances

Distance between CY2 ←→ CY1 = Distance CY1 → CY2 + Distance CY2 → CY1



EVA Principles



Q&A

EVA principles – Cost of new entry (CONE) assumptions

- **CAPEX and FOM** from **VOLL/CONE studies**, where available
  - Only few countries have published CONE studies (DE, BE, EE, GR, IT, SE).
  - Member States have used different technical specifications, therefore, some rationalisation and harmonisation will be needed.
  - Not all countries published the underlying CONE assumptions in sufficient detail (e.g. CAPEX and FOM not published for Germany).
  - Not all studies consider DSR and report its potential.
  - Using different CONE for different countries may affect the EVA results.

- **Average values** for MSs where no CONE results have been published (based on the available CONE studies)

CAPEX: capital expenditure
VOLL: Value of Lost Load
FOM: fixed operating and maintenance cost

CAPEX and FOM collected from published national CONE/VOLL methodologies

CAPEX (€/kW) Values

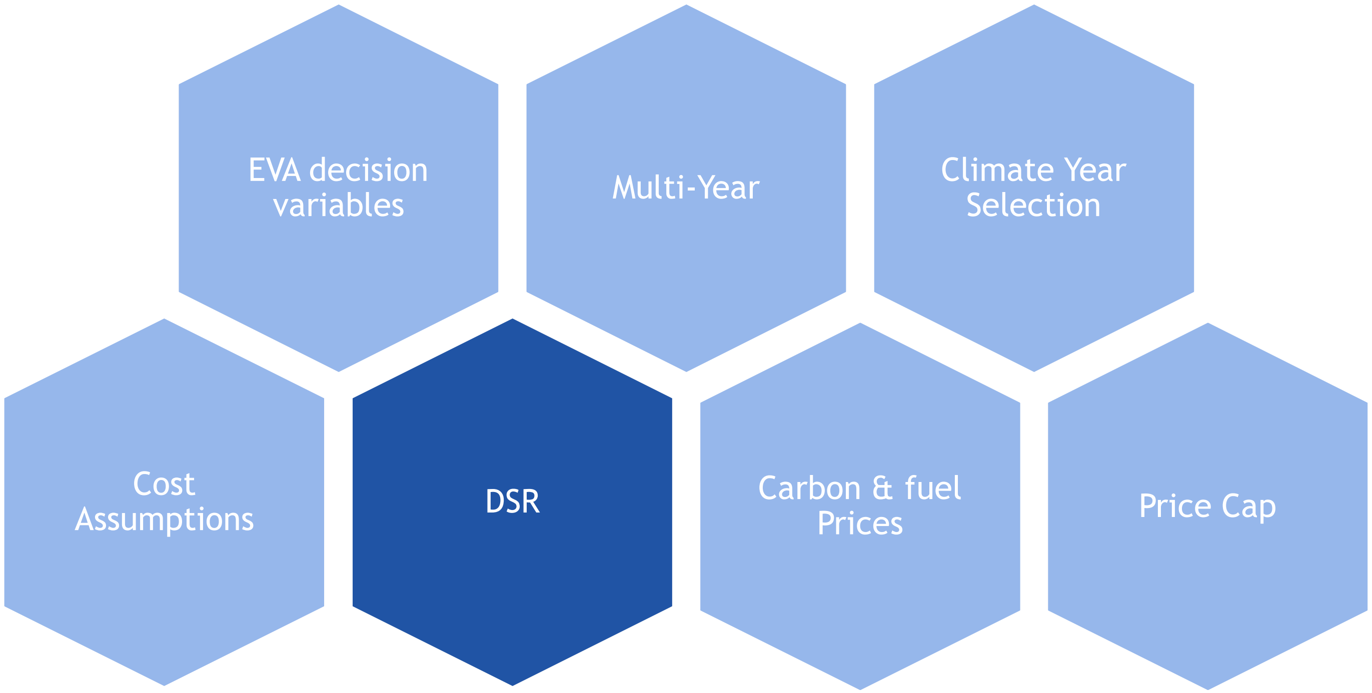
Ref. Tech	Belgium TY – 26/27	Italy TY - 22/23	Greece TY -22	Estonia TY - 20	Germany TY – 23/31
CCGT	600	683	450	N/A	*Underlying CAPEX assumptions not published, only total $CONE_{fixed}$ reported*
OCGT	400	475-575	350	520	
DSR (industry)*	0	N/A	25	N/A	
Battery**	100 (2hr)	430 (1hr)	250 (3hr)	N/A	*N/A*

FOM (€/kW/yr) Values

Ref. Tech	Belg. TY – 26/27	Italy TY - 22/23	Greece TY - 22	Estonia TY - 20	Germany TY – 23/31
CCGT	25	15	10	N/A	*Underlying FOM assumptions not published, only total $CONE_{fixed}$ reported*
OCGT	20	13	15	18	
DSR (industry)*	20	N/A	7	N/A	
Battery**	10 (2hr)	2.3 (1hr)	5 (3hr)	N/A	N/A

* There are other DSR sectors reported in CONE/VOLL studies of Greece and Germany.
** Battery types are:
Belgium → 2 hrs
Italy → 1 and 4 hrs
Greece → 3, 4 and 6 hrs

EVA Principles



EVA principles and cost assumptions: explicit DSR

CONE/VOLL studies

(including economic parameters and in which DSR potential is reported for the ERAA target horizon)

Other national studies

(including economic parameters and in which DSR potential is reported for the ERAA target horizon)

Simplified bottom-up approach (building on ERAA 2021)

for other countries where national studies not available

EVA Principles

- EVA decision variables
- Multi-Year
- Climate Year Selection
- Cost Assumptions
- DSR
- Carbon & fuel Prices
- Price Cap

Q&A

EVA principles: Price cap assumptions

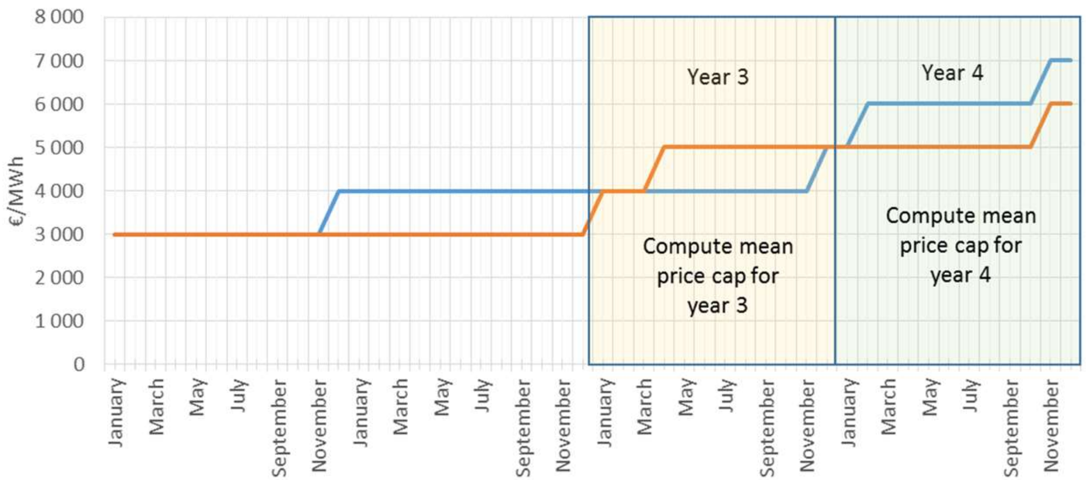
Price caps exist on markets according to the current European regulation.

- For Day Ahead, the current maximum clearing price is 3.000 €/MWh
- If the clearing price exceeds 60% of the harmonised maximum clearing price for SDAC, the latter shall be increased by 1000 EUR/MWh by NEMOs up to five weeks later.

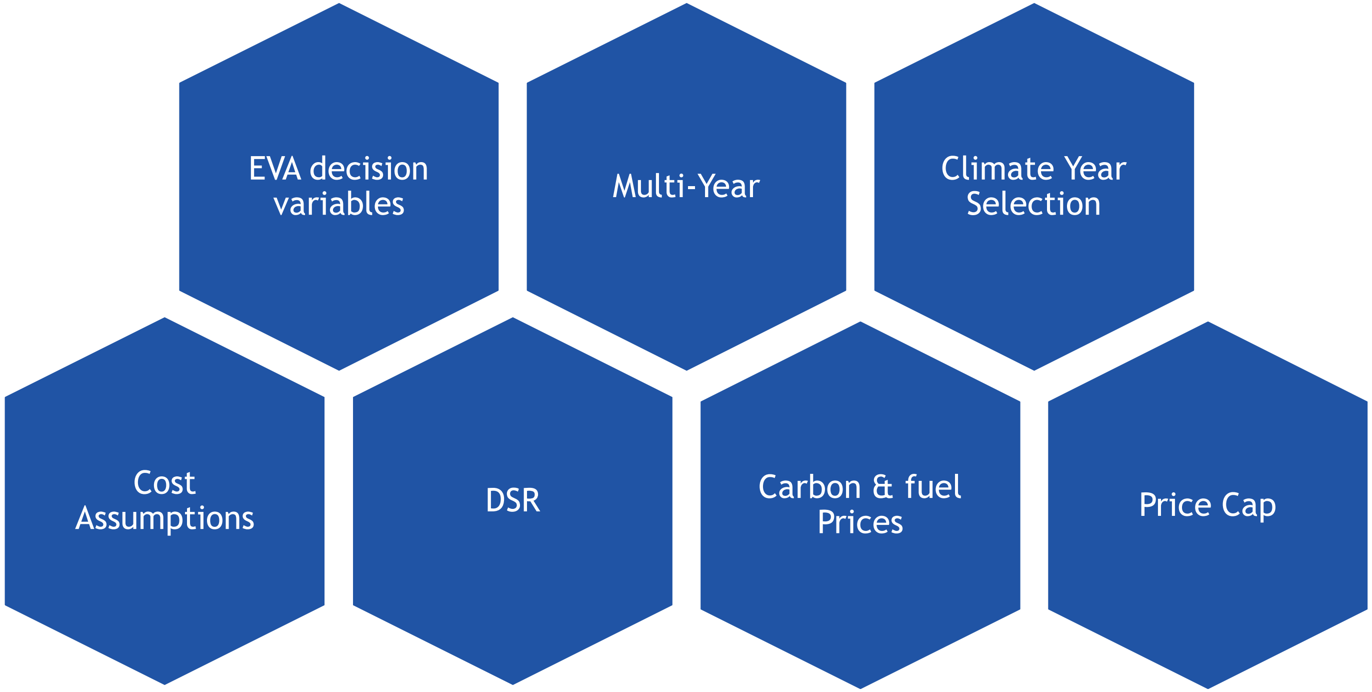
Dynamic Price Cap is under investigation, but not part of ERAA 2022.

Proposed approach forward: Forecasted Price Cap Increase

- Simulate consecutive target years, under different CY conditions
- Post-process Day Ahead prices by applying ACER's rule on price cap increase
- Compute a new price cap for each target year in the future as the mean of the post processed price caps
- Use this new price cap as input value



EVA Principles - recap



Q&A with the audience

Don’t forget to post your questions on Sli.do:

Go to www.sli.do and enter **#781543**

or scan the following QR with your phone to login

4. Conclusions and next steps

Edwin Haesen, Head of System Development, ENTSO-E

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Reliable Sustainable Connected

Don’t forget to join us for the next public webinars & workshops

09 March

- Webinar on Preliminary input data
- Call for Evidence window opening

TODAY

Workshop on “ERAA 2022 Principles and Assumptions”

5 April

Call-for-Evidence window closure

May

Webinar on **“ERAA 2022 Methodological Insights”**

Preliminary topics (non-exhaustive):
- Flow based
- Curtailment sharing
- Reserves

November 2022

ERAA 2022 Publication

- Webinar on ERAA 2022 results
- Launching ERAA 2022 consultation

ERAA Implementation Roadmap

Stakeholder interaction

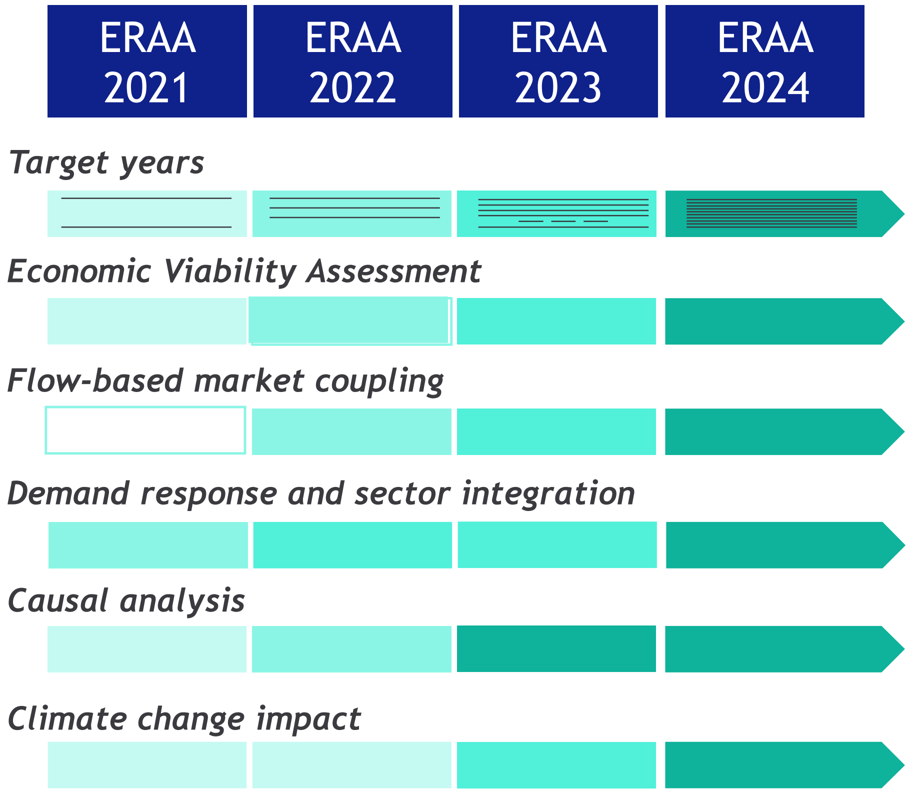
- *ERAA2021 views **feeding** into next ERAA*
- *Consultations and webinars on input data & assumptions*
- *International benchmarking*

Expanded methodology

- *Scenarios heading towards Fit for 55*
- *Enhanced EVA with four target years*
- *Flow-based in central reference scenarios*
- *Role of demand response and electrolysers*
- *Modelling of CHP heat revenues and maintenance*

Further proof of concepts

- *EVA for other sources incl. storage and renewables*
- *Improved climate change modelling*



Thank you for your attention

Don’t forget to visit www.entsoe.eu/outlooks/eraa for more information on the ERAAs, interactive data visuals, and stakeholder information

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