AEC: Webinar

# AEC Methods and Models

2025-10-15

Prof.dr. Per J AGRELL
pja@sumicsid.com

# Outline

- Feedback from Stakeholder Consultation
- Feedback from Expert Group Review

- What are the challenges for TSOG now?
- What do the NRAs need to assess TSOG now?
- Which metrics fit the needs?
- Which models support the metrics?
- Which methods support the models?

- Which data is needed?
- How can it be made comparable?
- How can the data be made reliable?

- How can the process guarantee robust results?

# Stakeholder consultation highlights

TSOs

1. Critical to benchmarking
2. Transparency
3. Clear documentation
4. No mechanical application
5. Execution, not utilization
6. Multi-method (DEA+SFA)
7. Care about noisy data
8. Fear for complexity
9. Avoid black-box models

Users

1. Favorable to benchmarking
2. Transparency
3. Strict data validation
4. Dynamic models
5. Utilization models
6. Multi-method (DEA+SFA)
7. Service quality indicators
8. Environmental factors
9. Avoid black-box models

*AEC Response:*

- *Transparency on scaling functions,*
- *strong data validation,*
- *clear documentation,*
- *caveats for automatic use*
- *multi-method (DEA+SFA)*
- *simplified model structure*

# Expert Group Review highlights

Supports

1. Transparency
2. Multi-method DEA-SFA
3. Dynamic productivity analysis
4. Execution & utilization models
5. Model specifiation process
6. Data validation process
7. Outlier detection etc
8. Environmental factors
9. Totex

Recommendations

1. Multi-year results and data
2. Focus at Cost efficiency
3. No Scale efficiency, test for returns to scale and control for it
4. No primary/secondary methods
5. Differentiate 'dynamic models' from 'dynamic efficiency'
6. Decommissioning incentives
7. Use national WACC as extra run
8. Traceability of corrections

*AEC Response:*

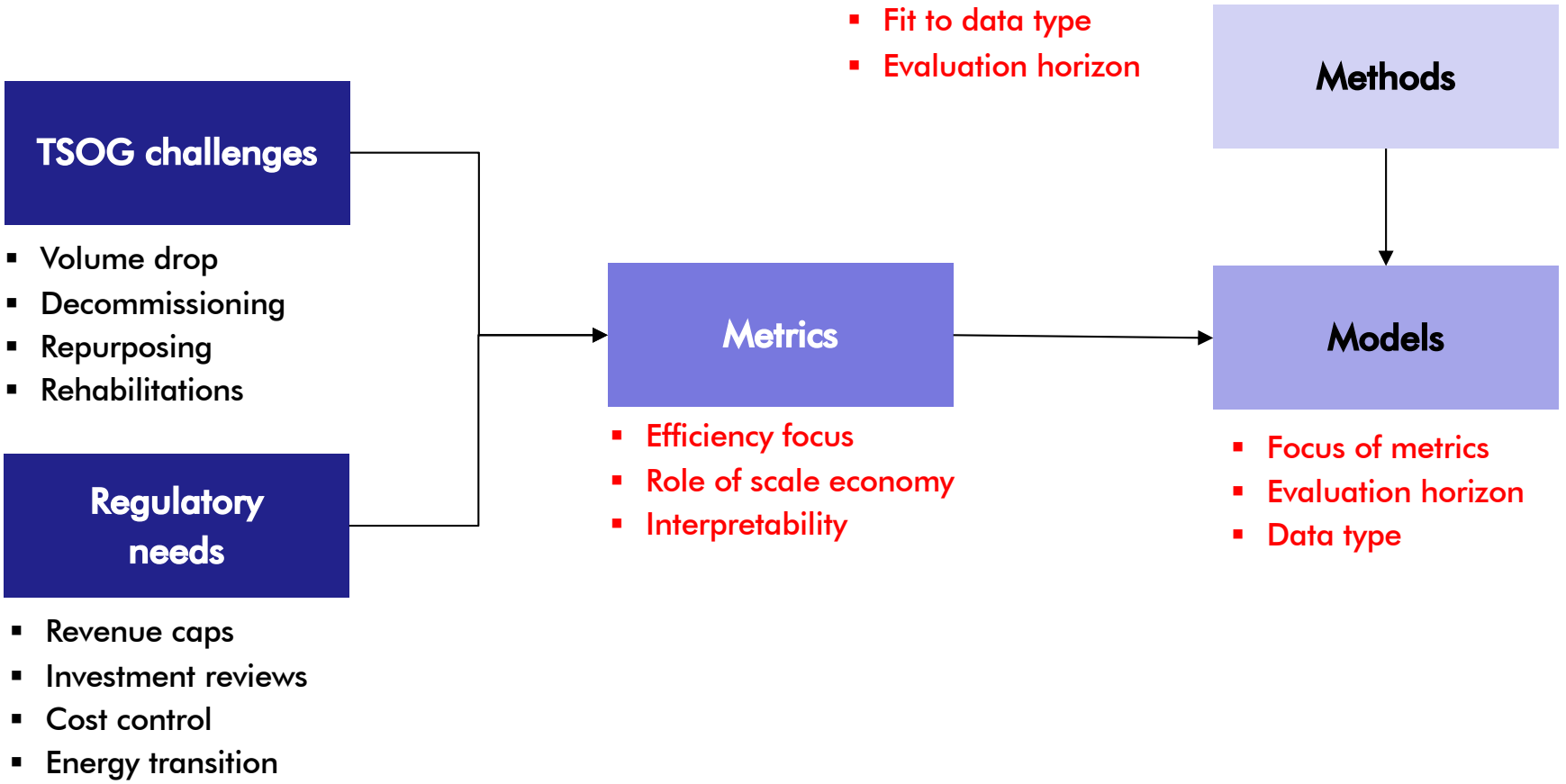
- *Simplified models (ES, ED, UD),*
- *no primary/secondary method,*
- *Multi-method use with examples*
- *Returns to scale test*
- *Decommissioning runs with incentives,*
- *WACC runs,*

# AEC

## ACER Efficiency Comparison (AEC)

Cost efficiency is the relation between the TSO total expenditure and the minimal total expenditure for structurally comparable unit(s) providing equal or higher levels of quality-corrected output.

# AEC Objectives and Criteria



# Efficiency model

**Data standardization**

X Inputs → TSOG → Y Outputs

Totex = Opex + Capex

**Output modelling**

Transport work
Capacity provision
Service provision

Z Environment

**Structural (environmental) modelling**

- Geography, climate, soil type,
- Complexity, density, landcover
- Slope, humidity,
- …

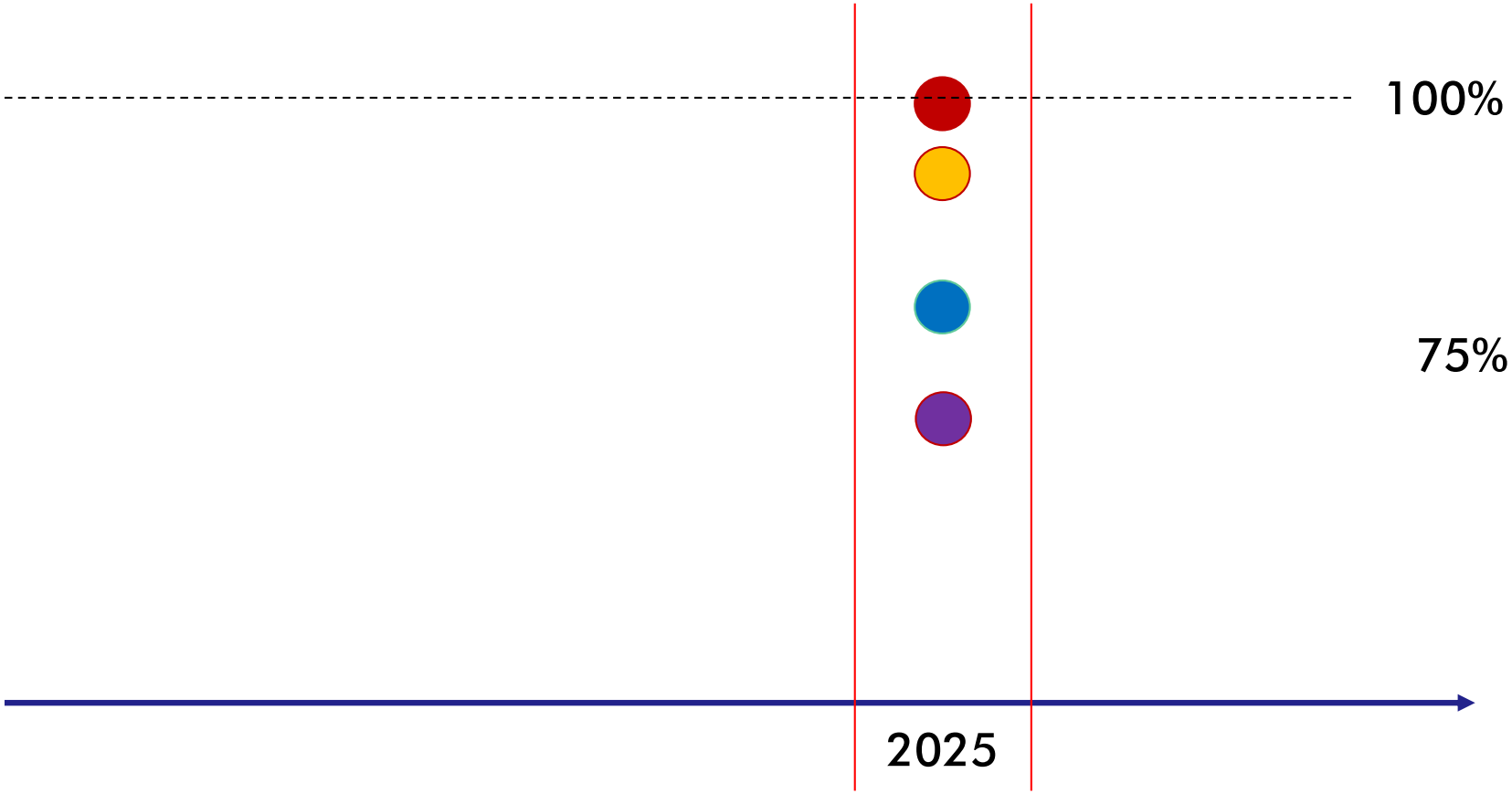
# Efficiency Metrics

1. Cost efficiency, CE – *whether costs are minimized at given output*
2. Cost efficiency (Capex, Opex), CE(2) – *decomposed*

3. Dynamic efficiency, TC and EC – *how efficiency changes over time*

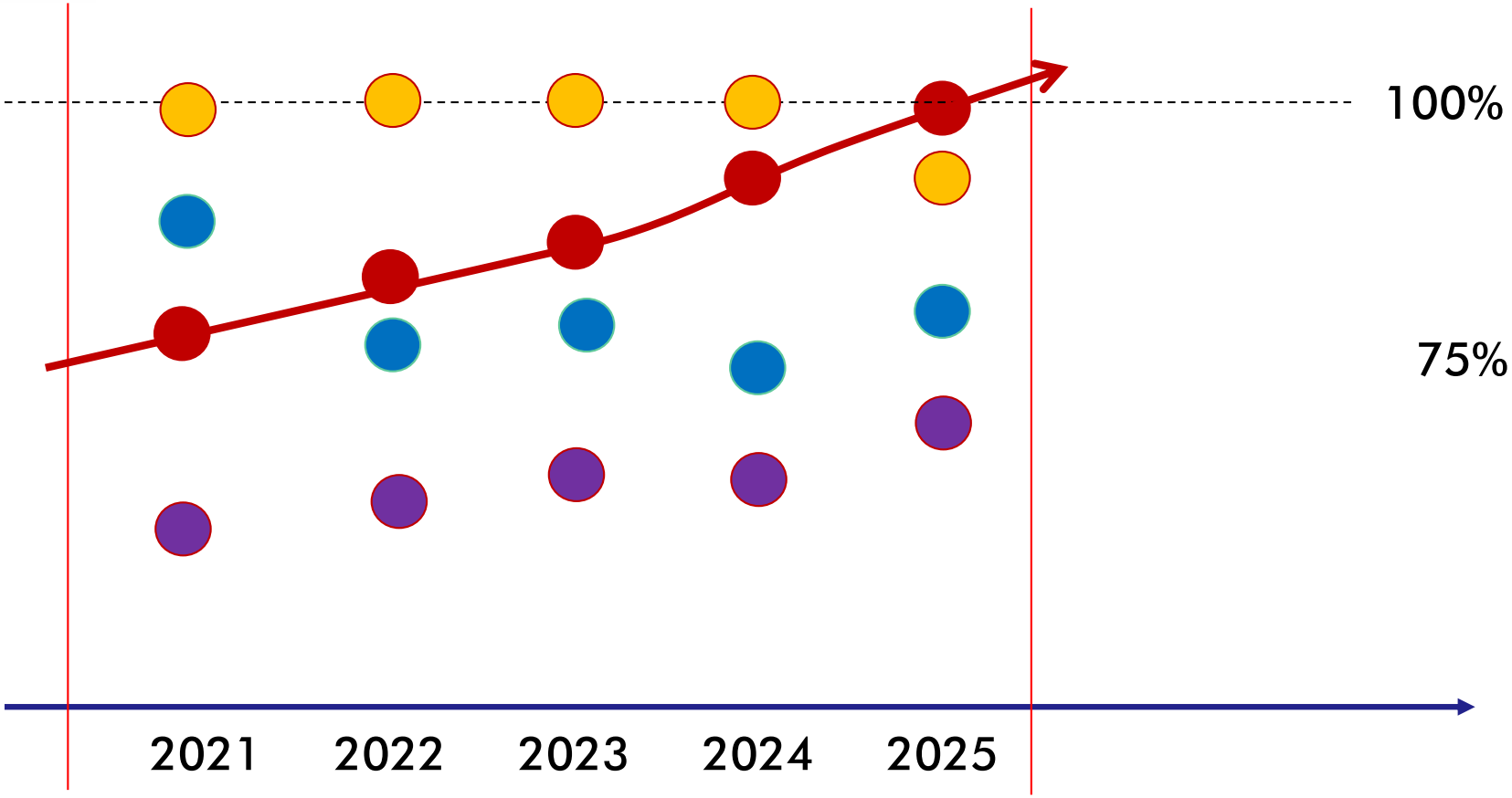
4. Scale efficiency, SE – *whether scale of operations is optimal*
5. Partial efficiency, unit cost UC – *cost per asset unit*

# Efficiency and time




Static efficiency = Compare TSO for a given year

# Efficiency and time




Dynamic efficiency = Compare a TSO over an horizon

# Focus

# Variables

Volume risk
Capacity risk

Utilization Dynamics UD
SFA
Time series
"How to do the right things"

Long Term

*Delivered gas volume*
*Peakload*
*Max capacity used*

Efficiency catch-up
Productivity progress

Dynamic Efficiency ED
DEA
Full horizon
*"How to improve over time"*

Medium Term

Timeseries analysis

Efficient investment
Efficient operations

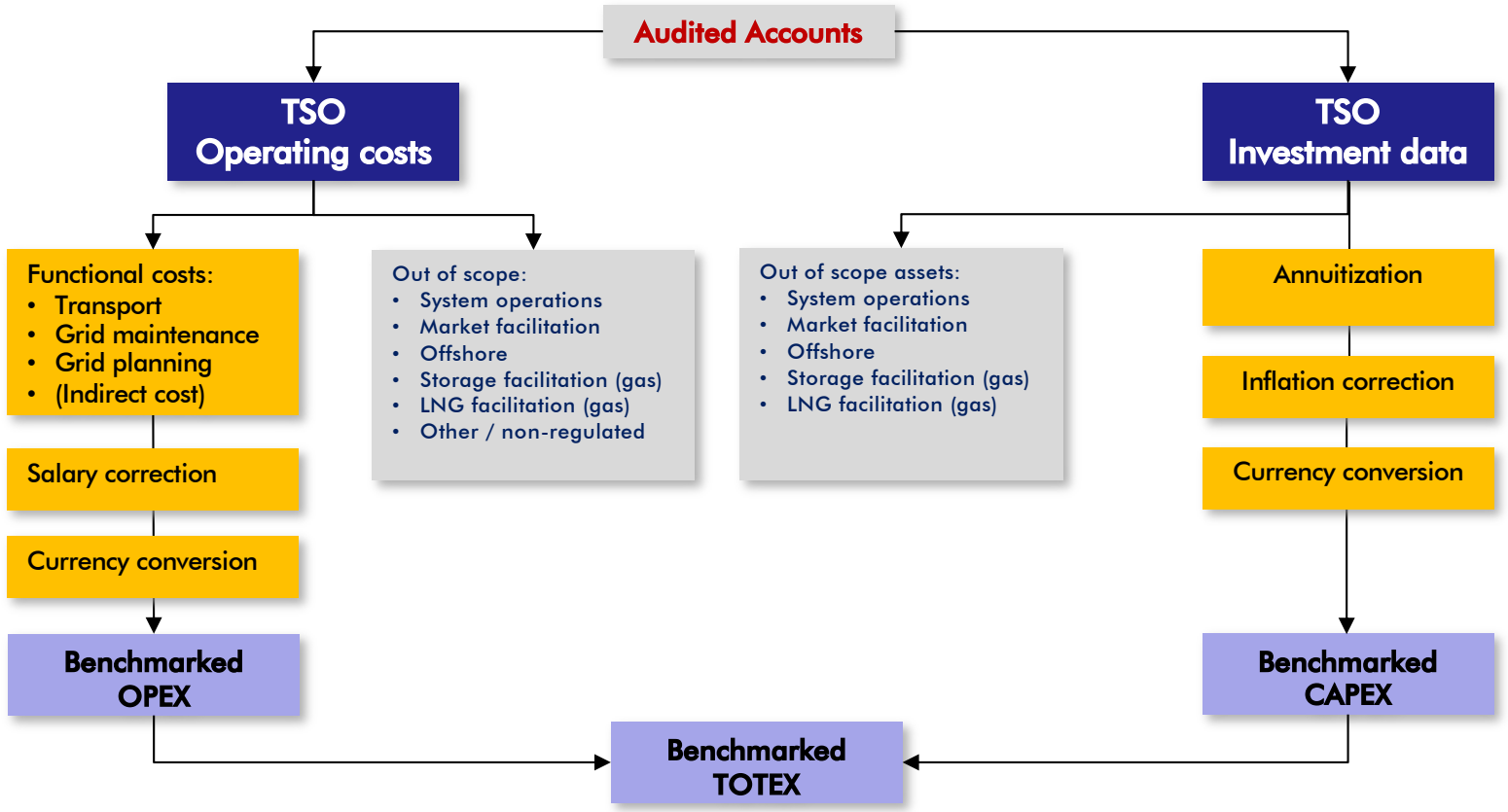
Execution Model ES
DEA + SFA
Single year
*"How to do things right"*

Short Term

*Pipeline system*
*Compressor system*
*Connections*

Static analysis

# Inputs X: cost standardization



# Comparability measures

**Assets**

- Function (scope)
- Techno-economic life
- Real interest rate
- Age analysis
- Activity level
- Ownership

**Cost**

- Function (scope)
- Overhead allocation
- Inflation
- Price index
- Labour cost index
- Currency
- Excl taxes, fees, land

**Investments**

- Function (scope)
- Inflation
- Price index
- Age
- Lifetime
- Cost of capital
- Investment cycle
- Currency
- Excl taxes, fees, land

- Upgrades
- Decommissioning
- Repurposing
- H2-ready

- Outsourced services
- Decommissioning

- Legacy investments
- National WACC
- Labour cost (cap)

New elements in AEC

# Comparing CAPEX: real annuities


Identical asset, reinvestment after 10 yrs
Same investment in real terms

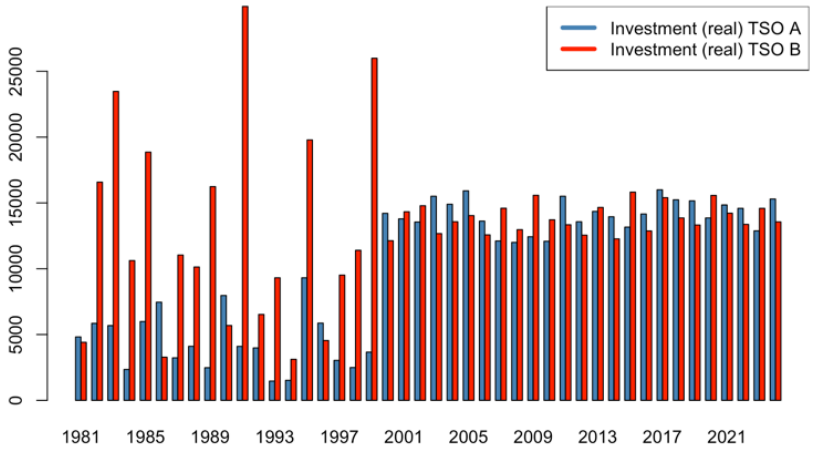
*Nominal analysis with depreciation – "Rollercoaster", efficient only at the end, jumping up at reinvestment!*

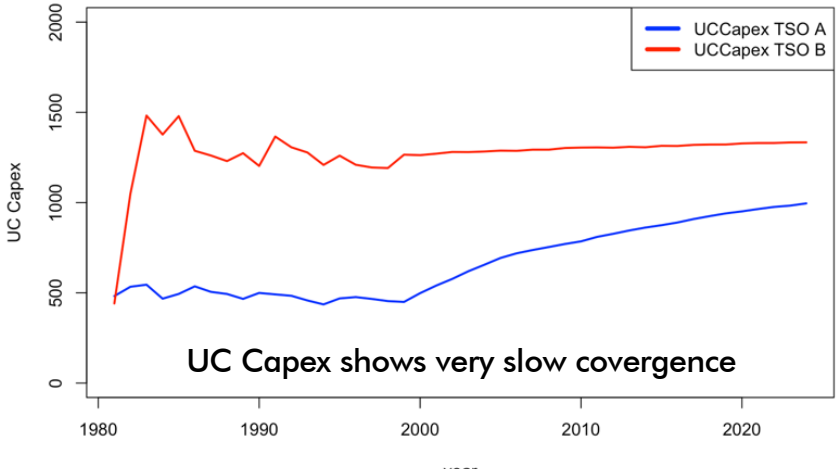
Real annuity
= same annual Capex each year

*No difference comparing in year 1, 2 or 25 , invariant to investment cycle*

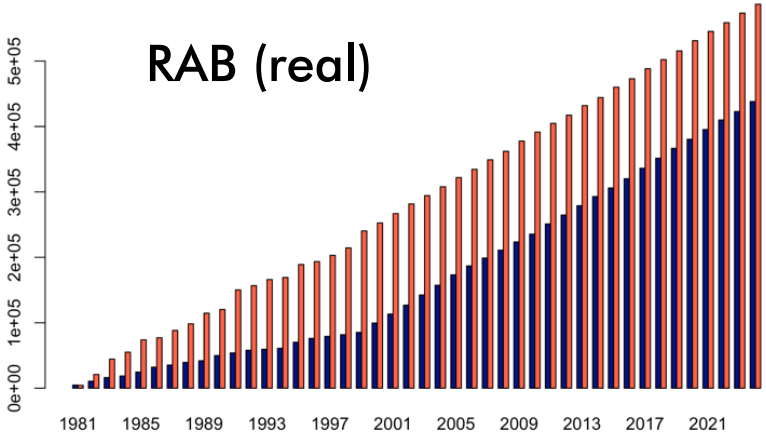
# Legacy investments

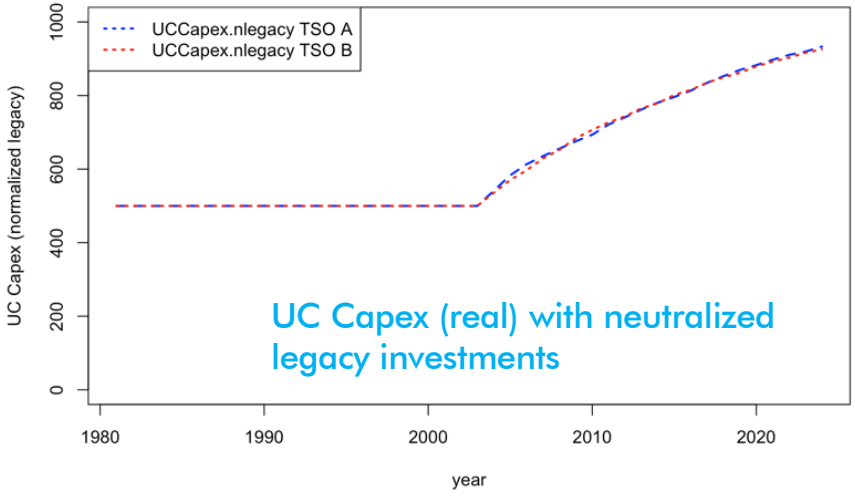
## Investments (real)



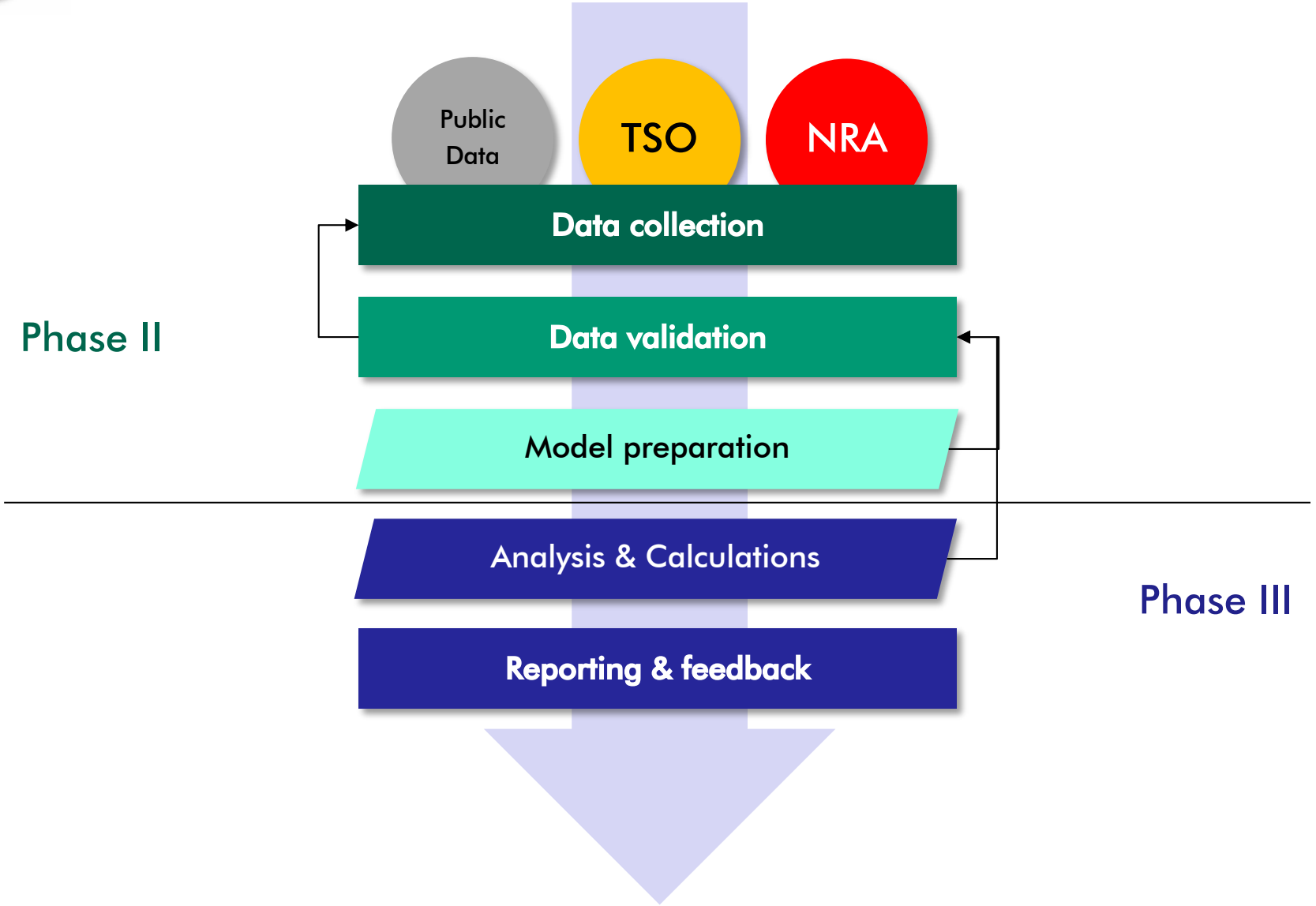




## RAB (real)

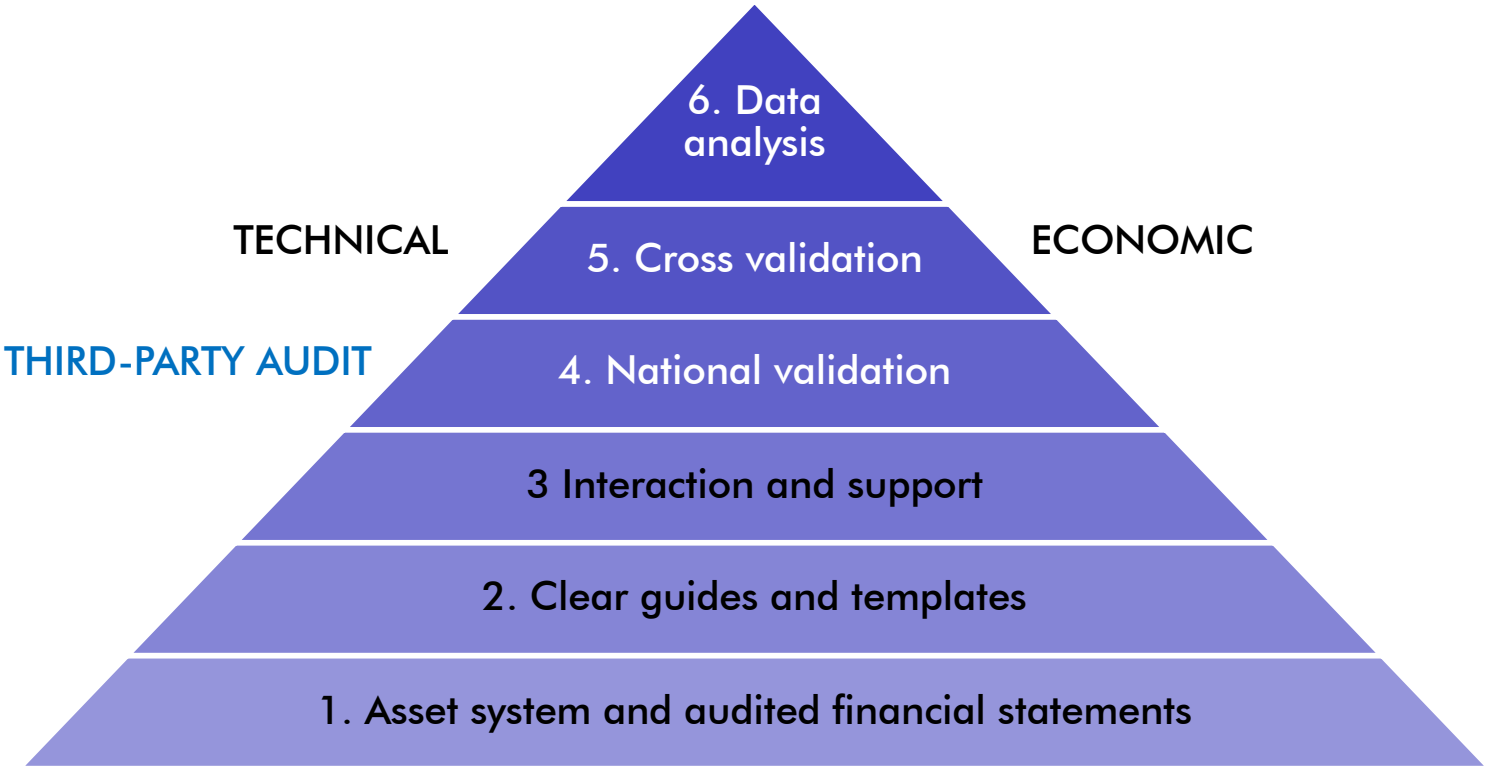


# AEC Process Flow



# Data quality strategy



# Inputs and outputs

| | X Inputs | → Y Outputs | | | | Z – Environment |
|---|---|---|---|---|---|---|
| | **Costs** | **Input-oriented, cost-oriented** | **Input-oriented, asset characteristics** | **Output-oriented, static** | **Output-oriented, dynamic** | **Structural Factors** |
| | | more endogenous/controllable outputs → more exogenous | | | | |
| Idea | Controllable costs as inputs for benchmarked activities | Normalized costs of asset structure as an output | Asset characteristics provided as an output | Capacity provided of TSO is justified and should serve as a benchmark | Demand of consumers is the competitive benchmark | Reflect unavoidable structural differences |
| Implicit assumption | (task: derive cost efficiency) | Assets are necessary, cost-weights of assets are applicable | Assets are necessary, no weighting | Fully acknowledge capacity provided even if not needed | Acknowledge requested outputs of consumers only | TSOs may have specific structural challenges |
| Examples | Totex, Opex, Capex | Normgrid<br>Normgrid Pipelines | Pipeline volume, pipeline length | Connections (also unused ones), Area served, transport capacity | Connections in operation, energy delivered, peakload, transport moment | Subsoil and topsoil characteristics |
| Sources | TSO financial data,<br>TSO asset data | TSO asset data<br>Engineering based weights | TSO asset data | TSO asset data<br>TSO GIS data | TSO indicators<br>TSO asset data<br>TSO GIS data | Public sources and/or TSO GIS data |
| Corrections | Currency, inflation, asset age structure, etc. | Own usage share, structural factors | Own usage share | | | |

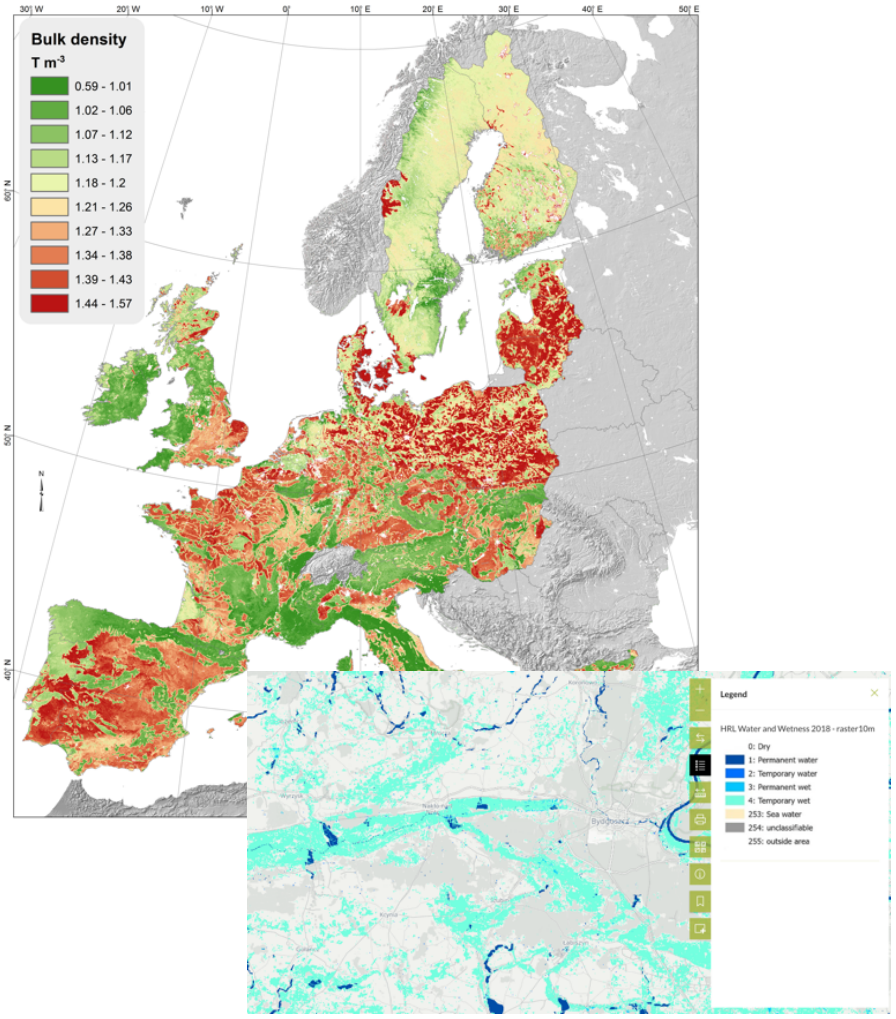
# Environmental factors

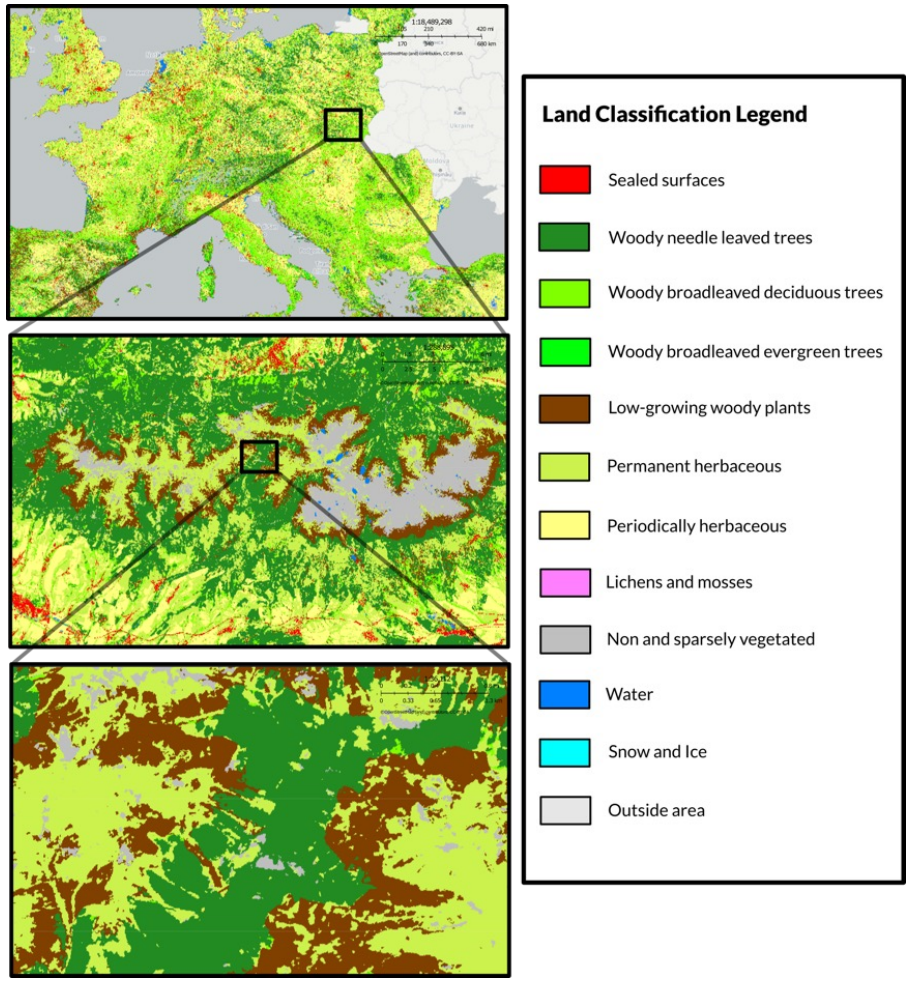
From public databases: open, updated and free

- Landuse cover (type, density, access),
- Topography (slope),
- Subsoil structure,
- Wetness and humidity,
- Subsoil water regime,
- Topsoil structure,
- Depth to rock,
- Climate,
- Population and connection density.

All draw on asset location data for each TSO

# Environmental factors (Example CORINE)



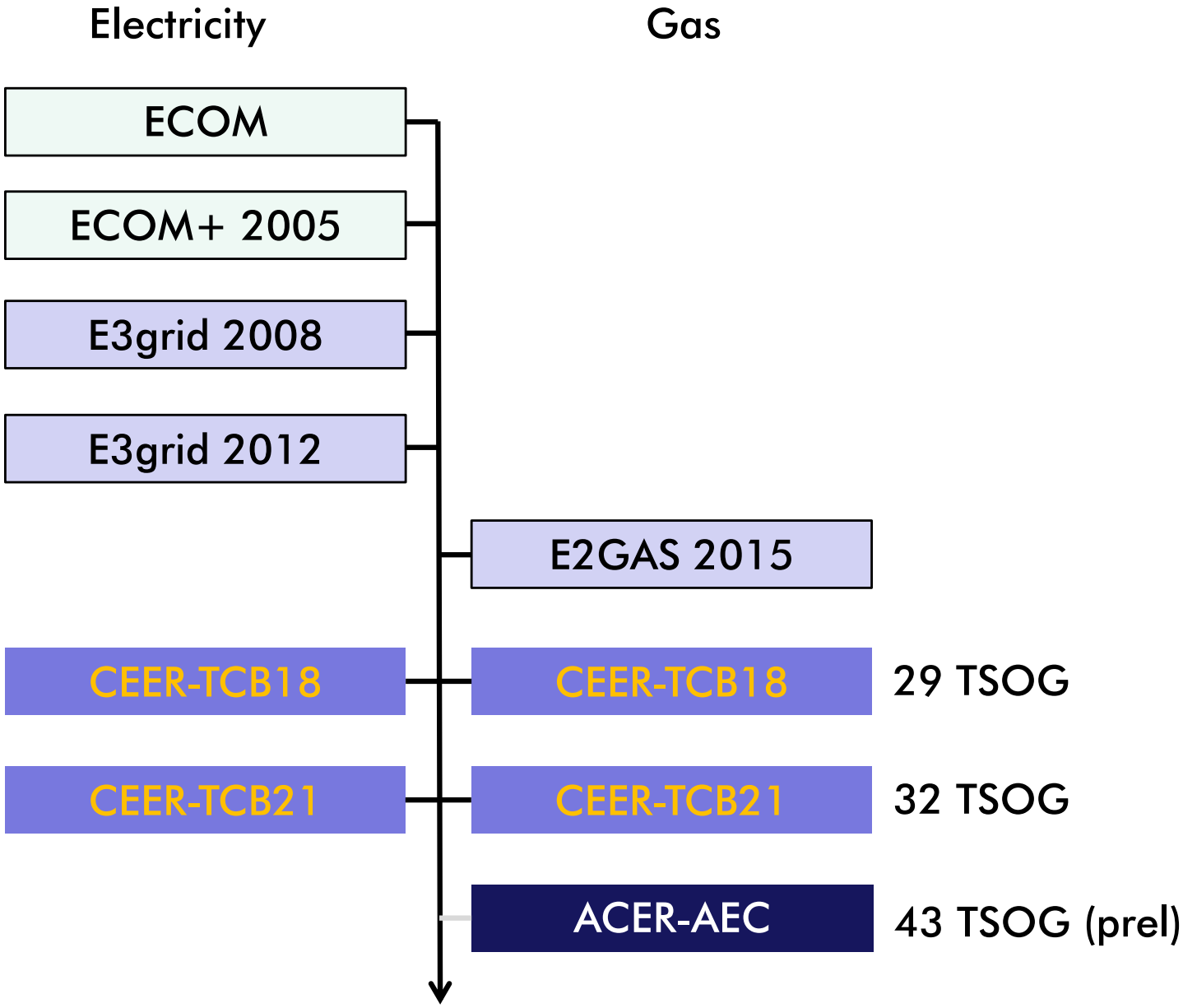
# Deliverables: Runs

| ID-R | Name | Parameter values |
|---|---|---|
| R1 | Base case | Base case |
| R2 | Base incl environmental corrections | Environmental corrections |
| R3 | Base excl legacy investments | Legacy investments |
| R4 | Base with premium decommissioning | Flat deduction for decommissioned assets |
| R5 | Base with national WACC | WACC replaces standard interest rate |

New elements in AEC

# Deliverables: Sensitivity analyses

| ID-SA | Parameter/variable | Range/series |
|---|---|---|
| SA-PI | Inflation index PI | Alternative PI |
| SA-LC | Labour cost index LCI | Alternative LCI |
| SA-RA | Interest rate, r | 0.5% … 5% |
| SA-OA | Overhead allocation key | Alternative keys |
| SA-AP | Asset ages: pipelines | 10… 50 years |
| SA-AC | Asset ages: compressors | 0… 30 years |
| SA-NG | NormGrid weights | Pipeline/compressor |
| SA-EN | Environmental factors | Inclusion/exclusion |
| SA-MS | Alternative output var | Inclusion/exclusion |


Electricity
Gas
ECOM
ECOM+ 2005
E3grid 2008
E3grid 2012
E2GAS 2015
CEER-TCB18
CEER-TCB18
29 TSOG
CEER-TCB21
CEER-TCB21
32 TSOG
ACER-AEC
43 TSOG (prel)

# AEC seen as "best practice regulation"

Table 5-20 Best practice index for regulatory benchmarking (Haney and Pollitt, 2009, 2011).

| Dim | Indicator | Pts | Score AEC |
|---|---|---|---|
| 1 | Current use of DEA, COLS, SFA and/or process/activity benchmarking; 0.5 for concrete plans to use one or more of these techniques | 1 | 1 |
| 2 | Use of more than one of above benchmarking techniques in most recent review | 1 | 1 |
| 3 | Totex modeling (i.e. total expenditure: operating costs plus capital costs) | 1 | 1 |
| 4 | Use of panel data | 1 | 1 |
| 5 | Dealing with uncertainty: full score for DEA, SFA, COLS or process/activity if tests for well-behaved functional form, CIA or specific adjustment | 1 | 1 |
| 6 | Incorporation of environmental factors | 1 | 1 |
| 7 | Use benchmarking techniques and have either ≥ 30 companies, or 30 companies and use of international data (large dataset) | 1 | 1 |
| 8 | Mixture of both external and internal analysis =1; sophisticated internal analysis (i.e. using advanced techniques) = 0.5; external analysis only = 0 | 1 | 0-1 |
| | **Total best practice score (max)** | **8** | **7-8** |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swiss
economics