

CoSEM Master's programme - Academic Year 2025/2026

Design of Integrated Energy Systems.

Model integration and application

Francesco Lombardi, Machteld van den Broek, Roelof Stam, Herbert van Even

Department of Engineering Systems and Services, Energy & Industry section,
Faculty of Technology, Policy and Management

Where we are.

By the end of this course, you will be able to:

L01. Conceptualise key processes that affect the performance of an integrated energy system and their interactions

L02. Develop a multi-model strategy for the design of integrated energy systems

L03. Apply multi-models to generate quantitative results on system design options

L04. Discuss the design space of integrated energy systems in light of uncertainty

L05. Reflect on aspects that lie outside the design space

Model integration and application.

Do you trust your model?



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Model integration and application.

Do you trust your model?

How reliable do you consider the results of each of these model categories?

Strongly unreliable

Strongly reliable

Demand simulation

3.48

Renewables simulation

3.3

System planning/ design

3.25

System operation

3.41

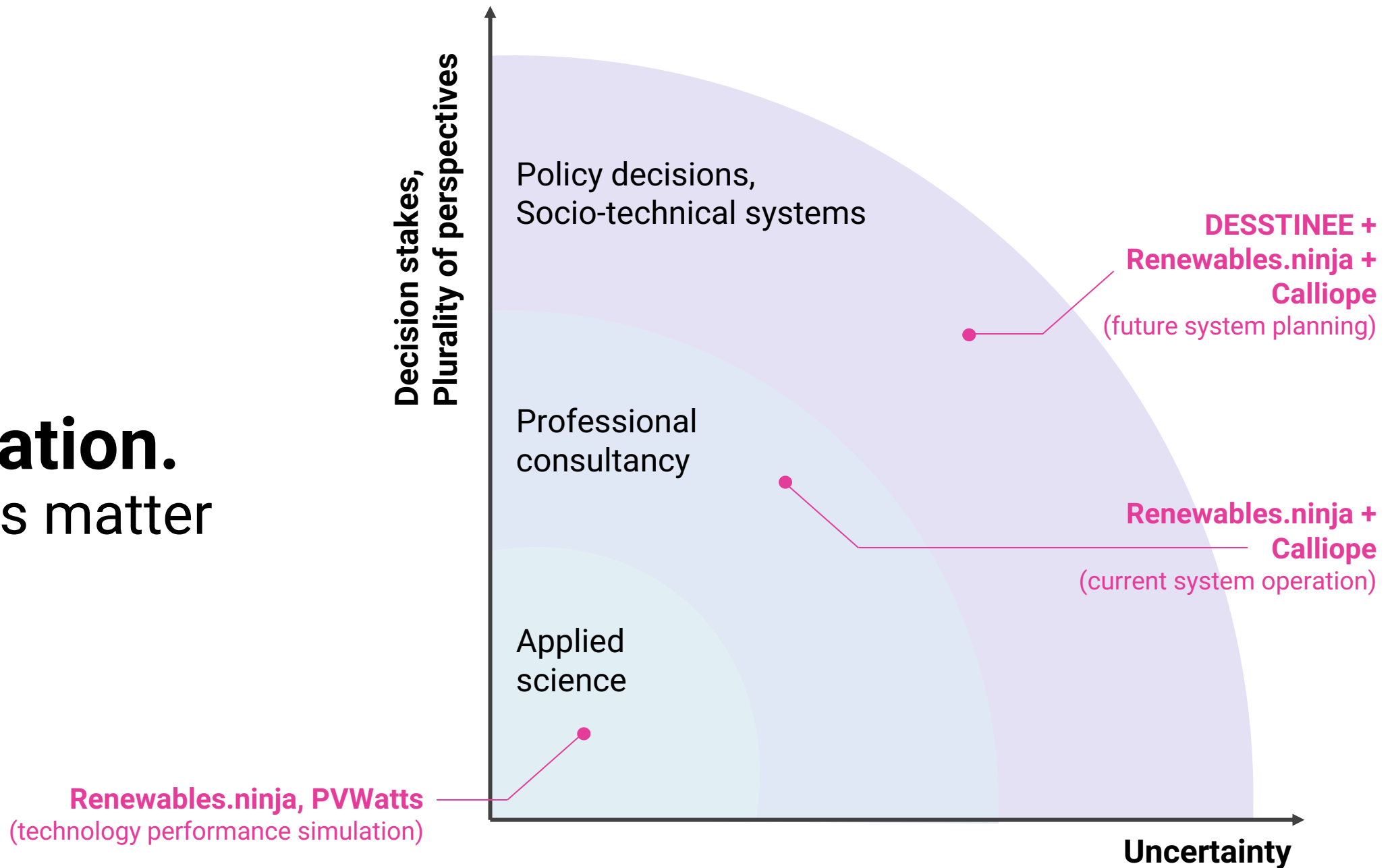
Market simulation

3.18

Environmental impact

3.46

Model application. Domains matter



Model application. What's the risk?

By applying a 'normal' science lense to socio-technical issues we risk:

- Conveying a **false/misleading sense of exactness**

'The cost of design option A is 53.350.567 million EUR by 2030'

- Producing **distrust** once the inexactness is revealed

'We are now in 2030 and the cost is 43 millions. Models are garbage'

- Assessing the **wrong problem** and producing **irrelevant conclusions**

'Actually, we wanted to know the relative merits of options A, B, C across technical, economic, social and environmental KPIs in light of uncertainty'

Can you still **trust the outputs** of a model that plays out in a **socio-technical / integrated domain**? If so, **how**?

**Model
application.**
Socio-technical
domain

**Discuss with who's sitting next to you
(groups of 2-4 people)**

5 minutes!

Model application.

What to do?

*Sounds familiar?
Look back at Week 2's
guest lecture.
More **next week!***

The **goal** should be to produce '**high-quality research**' instead of 'correct values'/'knowledge'. How?

- **Aiming for insights** more than precise numbers
- **Transparency** of assumptions
- **Replicability**, via open-access and open-source code. Let anyone re-run the analysis with their own assumptions
- **Embracing uncertainty**. Rather than hiding it, use it to understand which findings are robust and which ones are not
- **Integrating stakeholder perspectives** into an 'extended peer community'. They bring pieces of knowledge you/models can't have.

In your project, as a proxy, you can integrate models that offer different actors' perspectives