Comparison of modelling options for Energy Community contracting parties

Workshop: Modelling options for NECPs in the Energy Community

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Driving questions

1. Where can scenario analysis be applied?
2. What requirements and recommendations exist for scenarios for the NECPs?
3. What modelling tools could be used to perform this scenario analysis?
4. What criteria can be used to distinguish between the approaches?
5. How do different modelling tools compare to each other within this framework?

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Where can scenario analysis be applied?

Examples:

- National Energy and Climate Plans (NECPs)
- Biennial Transparency Reports to the UNFCCC
- Nationally Determined Contributions to the Paris Agreement
- Long Term Strategies for the UNFCCC
- National planning and goals

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What requirements and recommendations exist for NECP scenarios?

Timeframe	• Until 2030, with a perspective until 2050
Scope	• Energy system • Greenhouse gas (GHG) emissions
Scenario types	• Reference scenario • Policy scenarios assessing impacts of policies and measures proposed
Should account for:	**From the policy guidelines** (Recommendation 2018/01/MC-EnC): • Macroeconomic context (i.e. GDP and population growth) • Structural changes to the economy likely to impact the energy system and GHG emissions • Global energy trends (i.e. fossil fuel price developments) • Carbon prices • Cross-border grid interconnections • Technology costs
Should pay particular attention to:	**From the governance regulation** (EU Regulation 2018/1999): the EU-wide targets from the 2030 Framework for Climate and Energy for: • GHG emission reductions • renewable energy • energy efficiency • electricity interconnection

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What modelling tools could be used to perform this scenario analysis?

Selected tools*:

	TIMES	PRIMES	POTEnCIA	LEAP	PROSPECTS+
Model type	Bottom-up partial equilibrium	Hybrid	Hybrid	Bottom-up accounting	Bottom-up accounting
Developer name	IEA – ETSAP	E3MLab	JRC – European Commission	Stockholm Environment Institute	NewClimate Institute and Climate Action Tracker
Tool description (direct quote)	"Technology rich, bottom-up model generator… to produce a least-cost energy system."	"Simulates the European energy system and markets."	"Tool for the EU energy system…analysis of both technology-oriented policies and behavioural change."	"Tool for energy policy analysis and climate change mitigation assessment"	"Sector-level, bottom-up Excel tool…to track and project overall and sectoral GHG emissions trends"

*Non-exhaustive list. Others modelling tools could also be suitable.

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What criteria can be used to distinguish between the approaches?

Technical:

- Sectoral coverage
- Gases covered
- Ability to assess impacts of relevant EU directives and targets
- Ability to model national policies

User requirements:

- Input data requirements
- Time needed for training
- Availability of training and support
- Modelling environment
- Licensing requirements

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Suitability for NECP scenarios

Criteria	NECP needs	TIMES	PRIMES	POTEnCIA	LEAP	PROSPECTS+
Sectors covered	*All major emitting sectors*	**Energy supply** **Energy demand**	**Energy supply** **Energy demand**	**Energy supply** **Energy demand**	**Energy supply** **Energy demand** *Non-energy sector emissions can be added*	**All major emitting sectors except LULUCF**
Gases covered	*All GHGs*	Energy-related CO_2	Energy-related CO_2	Energy-related CO_2	Energy-related CO_2 plus optional others	All GHGs (as tCO_2e)
Costs/investment needs included	*Yes*	Yes	Yes	Yes	Yes	No

Ability to assess impacts of relevant EU directives

Criteria	NECP needs	TIMES	PRIMES	POTEnCIA	LEAP	PROSPECTS+
Energy efficiency directive	*Yes*	Yes	Yes	Yes	Yes	Yes
Renewable energy directive	*Yes*	Yes	Yes	Yes	Yes	Yes
Energy performance of buildings directive	*Yes*	Yes	Yes	Yes	Yes	In combination with buildings plug-in
Electricity interconnection target	*Yes*	Yes	Yes	Yes	No	No
GHG reduction target	*Yes*	Energy-related CO_2 emissions only	Energy-related CO_2 emissions only	Energy-related CO_2 emissions only	As pertains to GHG emissions from sectors that LEAP covers	Yes, excluding LULUCF

User priorities

Criteria	TIMES	PRIMES	POTEnCIA	LEAP	PROSPECTS+
Time needed for training	Days to a few weeks			Days	~1 day
Availability of training materials/courses	Documentation and biannual courses	Documentation	Documentation	Documentation, training materials, courses, discussion groups, and help resources	Documentation, training materials, courses
Input data requirements	Medium	High	Medium	Low-High	Low-Medium.
Modeling environment	Spreadsheet based input. Code in GAMS.	Code in GAMS		Proprietary software. Runs on Windows.	Excel
Licensing requirements and costs	License can be purchased for a one-time fee of ~$5000 (varies for different types of institutions).	License cannot be purchased. E3MLab would be contracted to build and update the model.		License required. Licensing fees vary, but are available for free to government agencies in lower and lower-middle income countries.	Freely available

Main takeaways

- A framework for comparing modelling tools should take account not only of NECP requirements and recommendations, but also national planning needs, other reporting requirements (e.g. UNFCCC), and user preferences
- Energy sector optimisation models like TIMES, PRIMES, or POTEnCIA are necessary to fulfill the NECP requirements and recommendations, but need to be complemented with additional analysis to cover other sectors and gases
- Spreadsheet-based tools like PROSPECTS+ could be used in tandem with an optimisation model to increase sectoral coverage, but would not fulfill the NECP requirements and recommendations on their own
- LEAP is the only tool that allows for energy sector optimisation and accounting for other sectors within one framework, but is not as sophisticated of an energy sector modelling tool as TIMES, PRIMES, or POTEnCIA, and represents other sectors in a simple way