Is energy transition feasible?
Modeling energy and material flows of projected world evolutions

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**STEER :** [https://files.inria.fr/steep/en/](https://files.inria.fr/steep/en/)  
“Sustainability, Transition, Environment, biophysical Economics and local Policies”  
- Global systemic risks  
- Sociotechnical alternatives

**The Shift project:** [https://theshiftproject.org/en/home/](https://theshiftproject.org/en/home/)  
French think tank advocating the shift to a post-carbon economy  
- Reports on sectorial decarbonations  
- French Economy Transformation Plan

**ISTerre :**  
- Olivier Vidal’s team on developing the MATER model on energy and material flows
Energy transition and MATER context

Society stakes:
• Energy based society
• Fossil based energy
• Crucial climate stakes

Uncertainties on transition:
• Need to build a new infrastructure, replacing 80% fossils in decades
• Risk of spike in emissions due to raw material needs

Need for scheduling deep evolutions:
• Great risks: Climate destructions, blackouts, net energy, material stresses...
• Need for credible dynamic models so policy makers have access to science-based tools in order to planify the transition
MATER - General process

Context
MATER model
MATER submodule

Consistency check

MATER
Estimating infrastructures of...

Inputs
Option 1.
Energy production path by source + energy consumption path by sector

Option 2.
GDP and population paths

Possibility to change default parameters

Outputs
Material consumption
CO2 emissions
Energy production and consumption paths by source & sector

Defaut parameters (from IEA scenarios)
- Energy intensity by technology
- Resource use intensity by technology
- CO2 emission intensity
- Technical progress path
MATER submodule objective:

Explore credible energy transition pathways in regard to five constraints

2 sub-objectives:

• Compute credible energy transition scenarios
• Evaluate weight of each constraint
Method

Context

MATER model

MATER submodule
Analysis

Simulations and interpretations

→ Toward sensitivity analysis

Example of simulation results (not to take as most relevant one nor final results):
Thank you

Real world constraints

Fast and easy energy transition

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