



Platform-Scale Systems Modelling

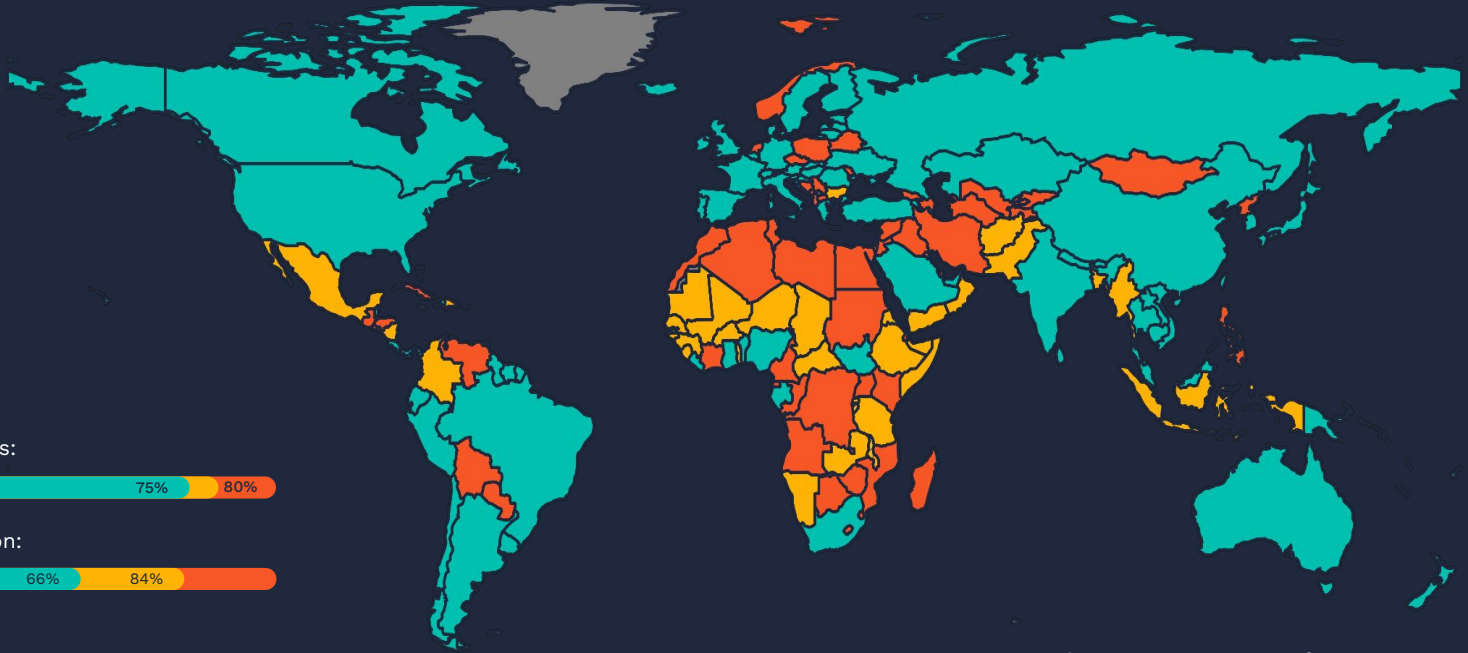
Lightning Talk

OpenMod Workshop
Lucas Kruitwagen, CTO
2024-03-27

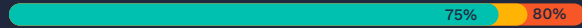
@transitionzero

Net zero ambition

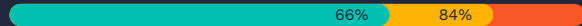
Most of the world now has pledged to be net zero



Coverage of Global Emissions:



Coverage of Global Population:

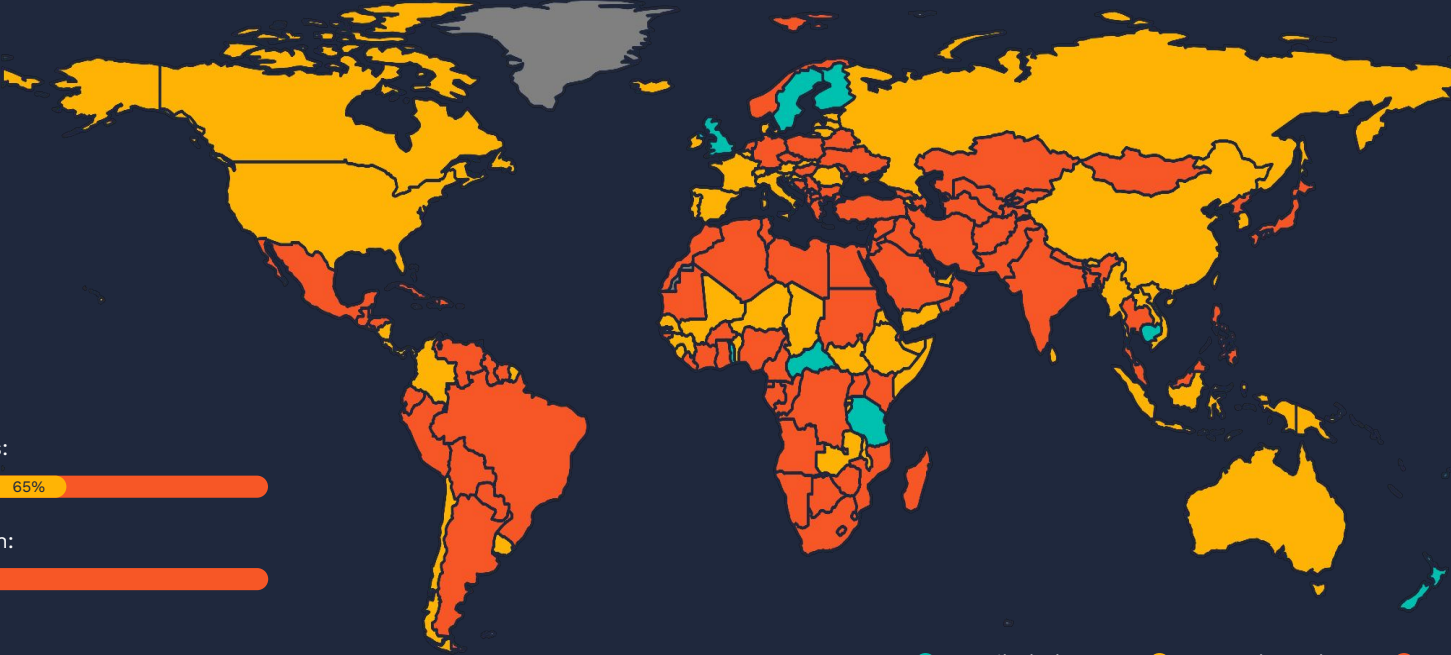


Data from Net Zero Scorecard (2023) Energy & Climate Intelligence Unit: [1]: "Declaration/pledge", "In Policy Document", and "In Law" categories; [2]: "Proposed/In Discussion" category; [3]: No data

● Implemented Policy¹ ● Proposed Policy² ● No Ambition³

Net zero reality

But most of the world doesn't have a plan for getting there



Coverage of Global Emissions:






Coverage of Global Population:



● Detailed Plan ● Incomplete Plan ● No Plan

Data from Net Zero Scorecard (2023) Energy & Climate Intelligence Unit

“Platform-scale” - solving 10,000s of models in parallel

Change the paradigm from  to  + 



Productisation

- Make systems modelling accessible to a whole new set of browser-based analyst users
- Build community and comparability
- No environments, no WOMM*, no data munging. A pleasant walled garden where things ‘just work’.

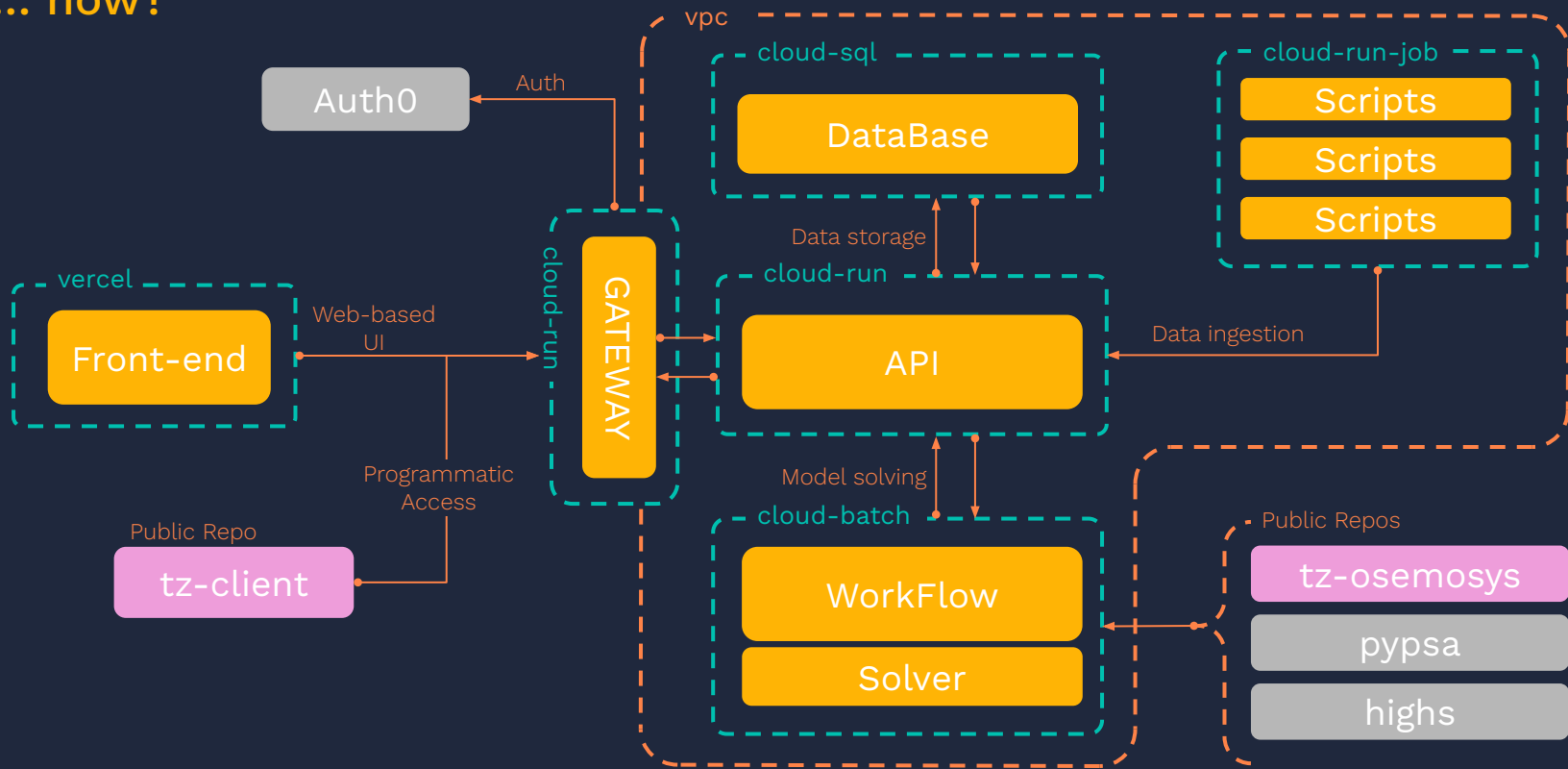


Research

- Scale-up hyperparameter search
- Facilitate boundary exploration (spatial, temporal, technology fidelity)
- Sensitivity analysis
- Solver tuning & ML-boosting

* Works On My Machine

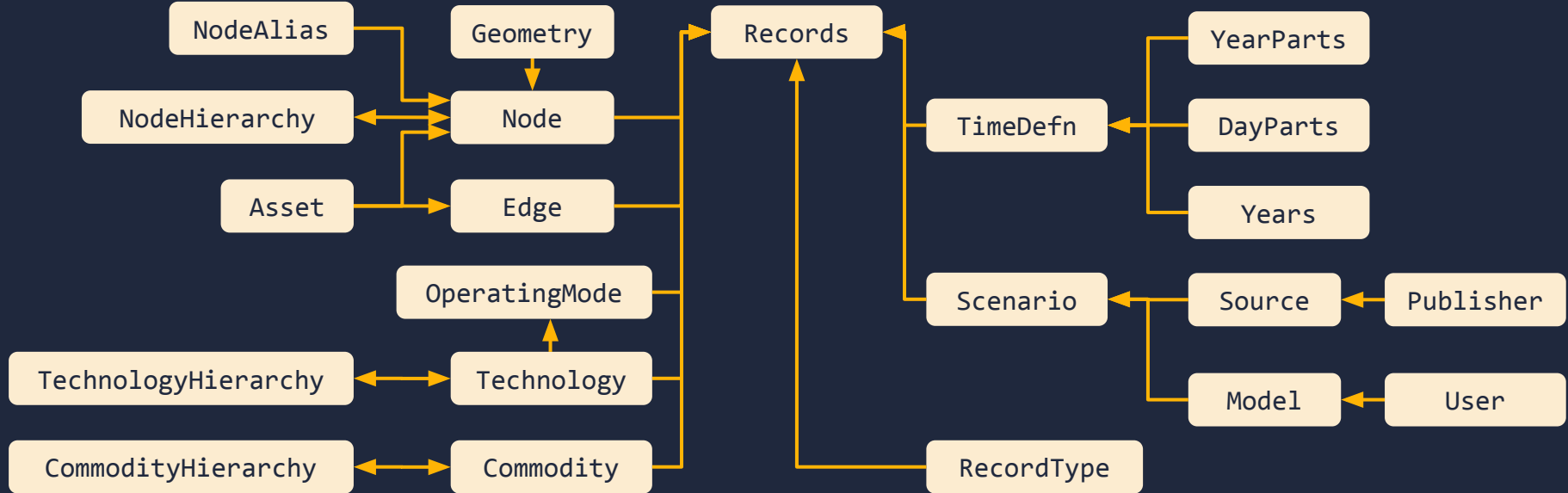
... how?



... not the hard part...

A framework-agnostic schema for systems transition

Resulting graph-based data model

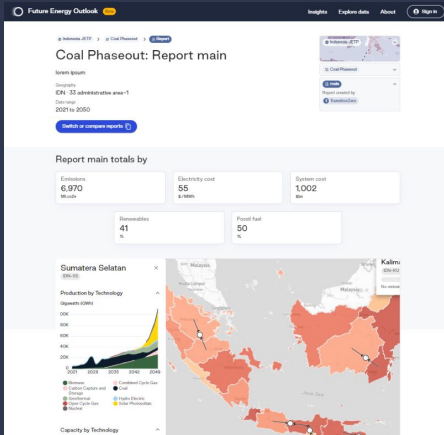


TransitionZero Platform Today



Results Viewer UI

<https://feo.transitionzero.org>



API & Python Client

`pip install tz-client`

Get Models V1

`get_models_v1_models__slug__get`

AUTHORIZATIONS: OAuth2PasswordBearer or APIKeyHeader

PATH PARAMETERS

NAME	TYPE	REQUIRED
slug	string (slug)	True

QUERY PARAMETERS

NAME	TYPE	REQUIRED
include	includes (string) or includes (null) (includes)	Default: ["EOL"]

SYSTEMS MODELLING

models

- Query Model V1
- Post Model V1
- Delete Model V1
- Get Models V1
- Patch Model V1
- Star Model V1
- View Models V1
- Check Model Slug

Responses

200 Successful Response

RESPONSE SCHEMA: application/json

NAME	TYPE	REQUIRED
slug	string (slug)	True
description	Description (string) or Description (null) (Description)	False
version	string (Version)	True
time_scope	object (Timescope-Output)	True



TZ-OSeMOSYS

`pip install tz-osemosys`

TransitionZero

TZ-OSeMOSYS - a modern long-run systems modelling framework

License: GPL v3 | Contributor Covenant | Tests: 100% | Coverage: 94% | Python: 3.11 | Under construction

OSeMOSYS is an open source modelling system for long-run systems analysis and planning. It has been employed to develop energy systems models from the scale of the globe, continents, countries, regions, and villages. OSeMOSYS is extremely flexible - it can be used for high-fidelity representations of power systems, rich with technological detail; medium-fidelity representations of all energy systems including upstream energy supply, final energy demand, and climate policies; or low-fidelity nexus problems including commodities like materials, energy, and financing, and a range of environmental and social impacts.

OSeMOSYS is entirely open-source and can be used with a variety of programming languages and solvers.

OSeMOSYS with the Future Energy Outlook

TransitionZero has rebuilt OSeMOSYS as a pip-installable Python package. This implementation of OSeMOSYS underlies our Future Energy Outlook capacity expansion model builder. We have added the following features:

- Pydantic-based model construction and validation
- Linopy-based numerical optimisation and solving
- Reverse-compatibility with OSeMOSYS-otble

Documentation

[TZ-OseMOSYS](#)

Examples

Coming Soon

Model Builder UI

- Build models with full selection of geographic, spatial, and sectoral fidelity.
- ‘Fork’ existing scenarios, and/or use TZ’s default assumptions.
- Add key targets and assumptions.
- Trigger runs right from the UI. Make yourself a tea while you wait.
- Publish the results and share with other users.

The screenshot displays the 'Model Builder' interface. At the top, there is a navigation bar with 'Model Builder' on the left and 'Dashboard', 'System Models', 'About', and 'Create new' on the right. Below the navigation bar is a progress indicator with six steps: 'Select scenario', 'Name scenario', 'Targets', 'Assumptions' (the current step, highlighted with a blue circle and '1'), 'Interconnectors', and 'Review and confirm'. The main content area is titled 'Assumptions' and contains the following text: 'Edit the pre-filled default assumptions – or alternatively skip this section to use default values provided by TransitionZero. All default values have been specifically calculated for your selection of geographies.' Below this text is a blue button labeled 'Skip section >'. The 'Technology capital costs' section is expanded, showing a title, a dropdown arrow, and a paragraph: 'Review and edit the capital costs for each technology. You can keep the default value provided by TransitionZero. For more information, read the TransitionZero [technology capital costs explainer](#).' Below the paragraph is another paragraph: 'If you would like to set your own cost curves for the different technologies, use the **Advanced** dropdown and adjust the nodes on the chart.' There are three input fields, each with a dropdown menu set to 'Advanced' and a 'Reset' button. The first field is 'The capital cost of a gas plant will equal 800 \$/kW in [end year] across [country name/all geographies]'. The second field is 'The capital cost of a solar farm will equal 800 \$/kW in [end year] across [country name/all geographies]'. The third field is 'The capital cost of an onshore wind farm will equal 800 \$/kW in [end year] across [country name/all geographies]'. Below the input fields is a line chart with a blue curve and four orange dots. The y-axis is labeled '100 \$/kW' and '50', and the x-axis is labeled '2020', '2030', and '2040'. The dots are positioned at approximately (2020, 50), (2025, 80), (2030, 75), and (2040, 30). Below the chart is a legend: 'Move the orange dots to adjust the curve.' At the bottom of the section is a link: 'Show 11 more default assumptions >'. The overall background of the interface is white, and the text is in a dark grey font.



Stay Tuned!

Public beta June/July

Reach out at:

lucas@transitionzero.org