

OSeMOSYS Global

OSeMOSYS Global is a free, modelling tool that lets users identify least-cost pathways to decarbonize the global energy system. It is open-source, uses open-data¹, and is publicly accessible via <http://osemosys.global/> (**Figure 1**).

Unlike existing models, OSeMOSYS Global can create complete representations of energy systems for the entire globe or any user-defined country or region². Inter-connections between these can then be analysed. The level of detail and geographical scope are fully flexible and determined by the user.

What can OSeMOSYS Global do?

- **Model** the expansion of energy systems for any set of countries or regions.
- **Create** regional, national, or sub-national representations for 255 global geographic areas.
- **Choose** any combination of powerplant technologies, inter-connectors, and regions to build your model.
- **Interface** directly with typical utility power planning tools such as PLEXOS.
- **Visualize** investments, hourly electricity generation, costs, and trade flows in an interactive web platform.

OSeMOSYS Global in action: Unlocking electricity trade between India and the Gulf Region

As an example, we used OSeMOSYS Global to analyse the costs and benefits of installing a new electricity inter-connector between India to six Gulf Cooperation Council (GCC) countries via Oman³. We try to identify the conditions under which such an inter-connector would be both societally beneficial and financially viable.

What we modelled:

- An inter-connector with a maximum capacity of 25 Gigawatts that can be built between 2028 and 2050.
- Three potential sites for a solar PV farm that can be built with the interconnector.
- Existing renewable targets for India and emission reduction goals set in Nationally Determined Contributions.
- We aimed to minimize the total costs of the GCC and India's electricity systems from the present until 2050.

What we found:

- The societal case for a GCC-India inter-connector is clear: an inter-connector is part of the least-cost 'optimal' system in 64 of the 75 scenarios studied.
- The financial case for the GCC-India inter-connector is less clear. Of the above scenarios, only a small number are immediately investible.
- There is strong need to identify policy and market conditions to encourage such 'system-optimal' investments that are seen as risky from an investor's perspective



Figure 2

Current and future applications

OSeMOSYS Global is being used to analyse 'ZiZaBoNa', a set of electricity inter-connectors in Southern Africa between Zimbabwe, Zambia, Botswana, and Namibia. Similarly, it

will be used to explore the 'ASEAN Power Grid' in South-East Asia and the potential role for Laos in it. These are a key part of the support being provided to the 'Green Grids Initiative One Sun One World One Grid' (GGI-OSOWOG)⁴.

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¹ https://github.com/OSeMOSYS/osemosys_global

² OSeMOSYS Global is built using the fully open-source OSeMOSYS energy system model.

³ <https://www.researchsquare.com/article/rs-690329/v2>

⁴ <https://isolaralliance.org/work/osowog/>

