



MIT JOINT PROGRAM ON THE
SCIENCE AND POLICY
of **GLOBAL CHANGE**

Energy-at-Scale Project (ES-MIT) – Introduction

The Energy-at-Scale project (ES-MIT) of the MIT Joint Program on the Science and Policy of Global Change assesses the economic and environmental impacts of scaling-up low-carbon technologies.

Low-carbon energy sources require a very large deployment scale in order to make a substantial contribution to future global energy needs. (e.g., at a level of the current global contribution of natural gas of 100 or more EJ/year). The potential barriers for deployment (e.g. economic, technical, political and public opinion) and the potential impacts (e.g. environmental and health-related) are all interrelated and can be considerable even for the presumed more benign sources like wind, biomass and solar.

We explore these risks using our Integrated Global System Modeling (IGSM) framework that combines the Economic Projection and Policy Analysis (EPPA) model, MIT Earth System Model (MESM), as well as a portfolio of impact-assessment models that focus on life-sustaining resources (e.g., managed water systems, crop production, ecosystem/forest services, wind/solar/hydro power, and air quality). These linked computer models allow us to analyze a wide range of development pathways in the global energy, agricultural, transportation and other key sectors.

Our researchers have substantial experience identifying challenges, hazards, and potential barriers to low-carbon options deployed at continental to global scales, and can provide expert guidance on economically viable solutions. In doing so, this research will provide the foundation and frontiers of knowledge, strategies, and policies to identify the most viable deployment opportunities of low-carbon energy technologies. The unique opportunity is in galvanizing stronger connections across the threads of research shown in Our Current Initiatives (see box) that can result in more quantifiable feasibility studies and risk-based assessments.

As a sponsor of ES-MIT, you can support advancement of our energy projection systems that will include never-before-seen levels of integration between various human and natural systems. This will allow us to provide you with a stronger basis for more informed investment decisions. The membership of the Energy-at-Scale project is granted upon payment of the annual fee.



Our Current Initiatives

- Prospects for electrification (transportation, industrial use, and residential sectors)
- Impacts of backup requirements on deployment of renewables
- The economic and environmental consequences of large-scale deployment of nuclear energy, and carbon capture and storage (coal-, natural gas-, and biomass-based)
- Prospects for natural gas in different regions of the world
- Predictability & synchronicity of intermittent renewable energy (wind and solar)
- Evaluation of costs of alternative technologies or electricity generation
- Carbon capture and storage (CCS) in industrial applications (cement, iron & steel, refineries)
- Availability of water to cool thermoelectric generation and/or serve as hydropower
- Ability for managed water systems to meet irrigation demands for biofuels
- Scenarios of low-carbon future
- Energy and economic impacts of different policy instruments

Additional topics can be explored based on areas of mutual interest.

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