

International Energy Outlook 2023 Fact Sheet: International Renewable Storage Model

The International Renewable Storage Model (IREStore) is a supplemental model to the [International Electricity Market Model \(IEMM\)](#), that models the regions in the World Energy Projection System (WEPS) at a much higher time resolution. The IREStore model simulates the realistic economic and operational impact of energy storage technologies—such as diurnal batteries and pumped storage hydroelectric power plants—and ultimately informs the IEMM on more realistic capacity expansion and utilization for these energy storage technologies.

Structurally, IREStore is based on the IEMM. IREStore, however, uses more granular and chronologically aligned time slices than IEMM and does not allow trade between WEPS regions. IREStore efficiently dispatches electric-generating technologies given the storage capacity and time-specific availability of intermittent renewable generation technologies in the region. For storage, IREStore determines the time of day that different technologies should charge and discharge to minimize the cost of electricity generation.

IREStore arbitrages electricity, storing it in one time slice that has relatively low electricity cost or value so it can dispatch it at a higher-value time. The model evaluates the role of storage for the regional power grid and whether the cost of building and maintaining a storage unit is worth the services that it provides for energy arbitrage and capacity reliability reserve margins. We do not explicitly model many other ancillary services, such as operating reserves, frequency control, ramping support, and demand response.

IREStore also determines the most economical generating capacity additions—including the distribution of those additions between storage and intermittent renewable generation technologies—during the entire projection period. In addition to reserve margins, these build and operation decisions satisfy all modeled policies and laws, such as renewable portfolio standards and CO₂ emission targets. After solving, IREStore passes the generation capacities of solar, wind, coal, natural gas, battery, and pumped storage technologies, as well as capacity factors for battery and pumped storage technologies, into the IEMM.

Increasing temporal resolution through IREStore improves many aspects of our international electricity modeling, including more realistic load shapes, storage charge and discharge behavior, electricity price trends, curtailments during peak generation, and generation during peak load.