



Independent Statistics & Analysis

U.S. Energy Information
Administration

***International Energy Outlook 2021* Fact Sheet: International Coal Market Model**

We first integrated the International Coal Market Model (ICMM) into the World Energy Projection System (WEPS) in the *International Energy Outlook 2021* (IEO2021). The ICMM consists of three sub-modules that determine the production, import, export, and price of coal: the data processor module, the coal supply module, and the logistics module.

The components connect through a Python integration code to process data from external input files, to create and adjust coal supply curves through iterations, and to determine coal trade among regions.

The data processor starts the ICMM run by creating the input files needed to run the coal supply module and the logistics module. This process includes separating coal demand data into the four (or more) user-defined coal types and creating regions defined in the ICMM to calculate transportation rates, based on the trade-route data. The data processor also creates the ICMM outputs for the restart file and diagnostic tool at the end of the run.

The coal supply module creates the coal supply curves that the logistics module uses to determine the price per metric ton of coal produced. The coal supply module and the logistics module have an iterative relationship where the logistics module results are compared with the results from the previous iteration within the coal supply module, which adjusts the coal supply curve parameters accordingly. This process (the supply shift) allows regions to make decisions, based on the previous year, to adjust their production in the next year. We use the frequency of the adjustments as a convergence criteria, where convergence is met if the supply shift does not change the base production based on the logistics supply response output.

The logistics module is a linear profit maximizing optimization that solves the transshipment of coal from the supply region to the demand region. This module determines the price of the different coal commodities for the demand region, the trade quantities for each trade route (arcs), and the production based on the supply curve response. The profit maximization will determine arcs with the lowest transportation rate and supply regions with the lowest supply price to optimally satisfy demand with the lowest delivered price. The production determined by the logistics module is fed back to the coal supply module to determine new supply curves that the logistics module runs in the next iteration.

IEO2021 reflects the first step in building out the ICMM's modeling structure and data. The ICMM can be downloaded as part of the IEO2021 WEPS source package. The ICMM is written in AIMMS, Python, and uses Excel input files.