Exploring the sensitivity of a TIMES-based electricity sector model to different choices of regional aggregation

For

International Energy Workshop
June 20, 2018 | Gothenburg, Sweden

By

David Daniels* (EIA), Augustine Kwan (EIA), Evelyn Wright (Sustainable Energy Economics), and Amit Kanudia (KanORS)
The World Energy Projection System (WEPS) is the model used for EIA’s International Energy Outlook (IEO)
The International Electricity Market Module (IEMM) is a new WEPS module, to be introduced in IEO2019.
IEMM takes a Knowledge-Based Modeling approach…

New strategy behind IEMM: Knowledge-Based Modeling (KBM) – separates data from solution algorithms

Data sources
- Structured database
- Text documents
- Remote API
- Expert judgment

Knowledge Base
- Data
- Recipes

Model Instance Generator

Model
- Module A
- Module A’
- Module B
- Module C
- Module D

No knowledge of model structure

User inputs

No knowledge of data structure

Model outputs

Note: Example information flows
…using TIMES as its modeling platform

KBM implementation for IEMM

Michelle Bowman, Washington, DC, July 11, 2017
Research Question

Research question: How can one characterize the uncertainty in model results associated with the choice of geographic regionality?

Caveat: Results presented in this analysis are preliminary research results and do not reflect official EIA statistics.
This analysis considers “Europe” at four levels of geographic aggregation

Hypothesis: Lack of internal structure (i.e., transmission constraints) will allow unrealistic high levels of intermittent renewable capacity at coarser regionalities
Total of 8 IEMM runs were made

• Common to all runs
  – Fixed demands
  – Fixed fuel prices

• Differences across runs
  – Geographic regions: EUR-45, EUR-36, EUR-5, EUR-1
  – Carbon price: either $0/ton – or – $50/ton in 2020 + 3%/year real (2015$)

• Results aggregated to top level for ease of comparison

Caveat: Results presented in this analysis are preliminary research results and do not reflect official EIA statistics
Results: Electricity generation

Caveat: Results presented in this analysis are preliminary research results and do not reflect official EIA statistics.
Results: Electric generating capacity

Caveat: Results presented in this analysis are preliminary research results and do not reflect official EIA statistics
For more information

U.S. Energy Information Administration (EIA) | https://www.eia.gov/

EIA Outlooks | https://www.eia.gov/analysis/projection-data.php


International Electricity Market Model (IEMM) | https://www.eia.gov/outlooks/documentation/workshops/