EMBER

Global Electricity Review H1-2021

Methodology

The [mid-year update to the Global Electricity Review](#) analyses electricity data from 63 countries representing 87% of electricity demand. It compares the first six months of 2021 (H1-2021) to the same period in 2019 (H1-2019), to show for the first time how the electricity transition has changed as the world rebounds from the impact of the pandemic in 2020.
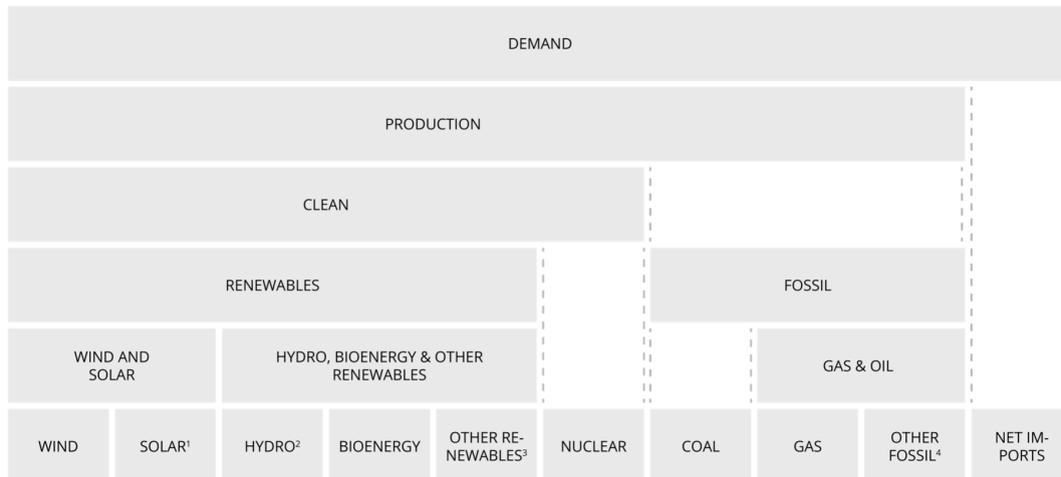
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Disclaimer

The data used in this report is provided on an 'as is' basis, and was assembled using the best available data at the time of publication. We take no responsibility for errors. Please do contact us if you spot any errors or have suggestions at info@ember-climate.org

Scope

This dataset comprises monthly electricity generation data from 63 countries over 30 months from January 2019 to June 2021. The data was collected using generation data from national sources such as transmissions system operators, government agencies and utilities.

Definitions

Generation data is mapped into nine generation types and net imports. More information on mapping for different sources and countries can be viewed below. For the purpose of analysis these generation types are aggregated into different groupings as follows

DEMAND									
PRODUCTION									NET IMPORTS
CLEAN						FOSSIL			
RENEWABLES					NUCLEAR	FOSSIL			
WIND AND SOLAR		HYDRO, BIOENERGY & OTHER RENEWABLES					GAS & OIL		
WIND	SOLAR¹	HYDRO²	BIOENERGY	OTHER RE-NEWABLES³	NUCLEAR	COAL	GAS	OTHER FOSSIL⁴	NET IM-PORTS

¹ Solar includes both solar thermal and solar photovoltaic generation, and where possible distributed solar generation is included.
² Where possible, hydro generation excludes any contribution from pumped hydro generation.
³ Other renewables generation includes geothermal, tidal and wave generation.
⁴ Other fossil generation includes generation from oil and petroleum products, as well as manufactured gases and waste.

For the purposes of this report, renewables are classified in line with the IPCC and include bioenergy. However, the climate impact of bioenergy is highly dependent on the feedstock, how it was sourced and what would have happened had the feedstock not been burnt for energy. The current EU bioenergy sustainability criteria do not sufficiently regulate out high-risk feedstocks and therefore electricity generation from bioenergy cannot be automatically assumed to deliver similar climate benefits to other renewables sources (such as wind and solar) over timescales relevant to meeting the commitments of the Paris Agreement. For more information please see Ember's reports: The Burning Issue (June 2020) and Playing with Fire (December 2019).

Methodology

Thermal disaggregation

Some countries do not report disaggregated generation from fossil fuels. This was performed by Ember using two methods. If possible, the split between fossil fuels was estimated using the ratios of fossil generation types in the IEA's monthly electricity generation statistics. If this was not available, we used the split between fossil fuels on an annual basis from BP's statistical review of world energy.

World data

World data is the sum of all available country data (63 countries). World data is estimated by summing generation for all countries where we have data for 30 months from H1-2019 to H1-2021. Together this comprises 87% of global generation. World data from this dataset is not scaled to align with annual data released by Ember, unless there are significant discrepancies where monthly data is systematically undercounting generation of a specific fuel type. In these cases, monthly generation data can be scaled with annual values. The methodology points out where this occurs. Monthly and annual numbers can therefore deviate in total generation and for fuel types.

CO2 Emission calculations

CO2 emissions calculations used the following standard emissions factors: fossil gas - 400gCO2/KWh, coal - 900gCO2/KWh, other fossil fuels - 900gCO2/KWh, bioenergy - 200gCO2/KWh. Emission calculations for European countries followed the calculations from Ember's European Electricity Review.

EU countries + UK + Turkey + Bosnia + Montenegro + Serbia

Source: Ember's European Electricity Generation data
Notes: More information on the Methodology for Europe can be found under the link above.

G20 countries (non EU)

Argentina
Source: Compañia Administradora Del Mercado Mayorista Eléctrico
Notes:
- Thermal generation data was disaggregated using IEA monthly data (coal and gas).
- Argentina shares the Yacyreta hydro power plant with Paraguay. Argentina's generation data only includes generation that is attributable to Argentina and not the entire generation output of the plant.

Australia
Source: OpenNEM Project
Notes:
- Assumed that net imports were zero in 2020.
- Data from OpenNem includes data for both the National Electricity Market (NEM) as well as the South West Interconnected System (SWIS) in Western Australia.
- SWIS data provided by OpenNEM is missing some gas generation. Monthly gas generation is therefore scaled based on 2019 annual numbers.

Brazil
Source: Operador Nacional do Sistema Eléctrico
Notes:

- Monthly data is undercounting thermal generation. Coal, gas and bioenergy are scaled using annual values.
- The latest data does not include net imports.
- Similar to Argentina, Brazil shares the Itaipu binacional dam (hydro) with Paraguay. The share of electricity generated by the dam that is attributed to Brazil is correctly represented in the data from the source.

Canada
Source: Statistics Canada, Canada Energy Regulator
Notes:
- 2021 data from Statistics Canada only covers generation data up to April at the time of publishing. Missing months were estimated based on average two year trends.
- Thermal generation is not disaggregated in data from Statistics Canada. Disaggregation is achieved by splitting Statistics Canada data using IEA thermal ratios for coal, gas, other fossil and biomass.
- Data on net imports is retrieved from the Canada Energy Regulator
- Solar data only includes installations with capacity over 100kw

China
Source: National Bureau of Statistics, China Electricity Council
Notes:
- Thermal generation was disaggregated using IEA thermal ratios
- Wind and solar generation are undercounted in NBS monthly data and are scaled using revised annual data from the CEC
- January and February are only reported as one cumulative value. This value is split equally to form January and February values.

India
Source: Central Electricity Authority, National Power Portal, Power System Operation Corporation
Notes
- Renewables data was taken from National Power Portal.
- Net imports data was taken from Power System Operation Corporation.
- All other data was taken from Central Electricity Authority.

Japan
Source: Agency for Natural Resources and Energy, Renewable Energy Institute
Notes:
- Data from the Agency for Natural Resources and Energy (Enecho) was only available up to April 2021 when the data was retrieved. Data from the Renewable Energy Institute (REI) was used to estimate data for May and June 2021.
- Latest thermal generation data from the Renewable Energy Institute was disaggregated using IEA monthly data (coal, gas and other fossil).
- Assumed that net imports were zero.

Mexico

Source: [Centro Nacional de Control de Energía](#)

Russia
Source: [System Operator of the Unified Energy System](#), [Entso-E](#)
Notes:
- Thermal generation includes generation from industry.
- Thermal generation for 2020 is disaggregated using thermal ratios derived from BP data (coal, gas and other fossil).
- Net imports data for 2020 is estimated using data from Entso-E.

South Africa
Source: [Eskom](#), [statssa](#)
- Coal generation is undercounted in Eskom data, and was scaled using monthly electricity production values from statssa.

South Korea
Source: [Korea Electric Power Corporation](#)
Notes:
- KEPCO generation data was only available until May 2021 when data was accessed. June data was estimated based on average two year trends.
- Assumed that net imports were zero in 2020.

United States
Source: [Energy Information Administration](#)
Notes:
- Solar generation includes small-scale solar generation
- Net imports data was only available up to April 2021 when data was accessed. It was assumed that data for May and June 2021 was the same as April 2021.

Other countries

Bangladesh
Source: [Power Grid Company of Bangladesh](#)

Bolivia
Source: [Comité Nacional de Despacho de Carga](#)
Notes:
- Generation is missing small amounts of generation from bioenergy and other fossil fuels
- Assumed the net imports were zero.

Chile
Source: [Coordinador Eléctrico Nacional](#)
Notes:

- Coordinador Eléctrico Nacional generation data was only available until May 2021 when data was accessed. June data was estimated based on average two year trends.
- Assumed that net imports were zero
- Split between other fossil and coal generation is likely to be underestimating coal generation - we aim to improve this in future releases

Colombia
Source: XM (2020)

Costa Rica
Source: Centre Nacional de Control de Energía
Notes:
- Data is unlikely to include rooftop solar generation

Ecuador
Source: Agencia de Regulación y Control de Electricidad
Notes:
- Thermal generation data is disaggregated, but some plants have mixed combustion between gas and other fossil fuels. Amount of fuel burned by fuel type is known for these plants. The split was performed using eia conversion factors.
- 2021 data only covers generation data up to May at the time of publishing. Missing months were estimated based on average two year trends.

El Salvador
Source: Consejo Nacional de Energía

Georgia
Source: National Statistics Office of Georgia, ESCO

Kazakhstan
Source: Samruk Energy
Notes:
- Disaggregation of fossil fuel generation was performed using thermal ratios derived from BP data.
- Assumed the net imports were zero.

Mongolia
Source: General Statistical Database Mongolia
Notes:
- No data on net imports is available
- Thermal generation is not disaggregated. Entire fossil generation is mapped to coal
- Renewables generation is not disaggregated. Entire renewables generation is mapped to wind

Norway
Source: [Statistics Norway](#)

Pakistan
Source: [National Electric Power Regulatory Authority](#)
- Data for February is missing and is estimated based on average two year trends

Paraguay
Source: [Viceministerio de Minas y Energía](#)
Notes:
- Entire generation is mapped to hydro

Peru
Source: [Comité de Operación Económica del Sistema Interconectado](#)

Singapore
Source: [Energy Market Authority](#)
Notes:
- Thermal generation data from EMA is mapped entirely to gas
- Assumed that net imports were zero.

Taiwan
Source: [Taiwan Power Company](#)
Notes:
- Data from Taiwan Power Company for 'Cogen' is mapped as coal generation.
- Assumed that net imports were zero.

Thailand
Source: [Energy Policy and Planning Office, Ministry of Energy (EPPO)](#), [Department of Alternative Energy Development and Efficiency (DEDE)](#)
- EPPO 'renewables' data was disaggregated using Wind, Solar and Bioenergy data from DEDE.
- EPPO generation data was only available until May 2021 when data was accessed. June data was estimated based on average two year trends.

Ukraine
Source: [Ukrenergo](#)

Uruguay
Source: [Ministerio de Industria Energía y Minería](#)

Vietnam
Source: [Vietnam Electricity (EVN)](#).
Notes:
- Missing data points were estimated using adjacent months and previous year's data