# Data Methodology

This document covers our methodology for the following datasets:

- Electricity **generation** (TWh)
- Electricity **net imports** (TWh)
- Electricity **demand** (TWh)
- Installed power generation **capacity** (GW)
- **Emissions** from electricity generation (Mt $CO_2$e)

All data is available to download for free on the Ember website. It is provided on an 'as is' basis, and is assembled using the best data available to us at any given time. Every effort has been made to ensure accuracy, and where possible we compare multiple sources to confirm their agreement. We take no responsibility for errors.

If you notice an issue or have any suggestions, comments, or questions, please do contact us at data@ember-climate.org.

# Contents

# Definitions

## Datasets

Our core data covers the following subjects:
- Electricity **generation** (TWh), provided both by fuel type and aggregated
- Electricity **net imports** (TWh)
- Electricity **demand** (TWh), calculated as the sum of power production and net imports
- Installed power generation **capacity** (GW), broken down by fuel type
- **Emissions** from electricity generation (Mt $CO_2e$), calculated from IPCC emissions factors

## Fuel Types

In our global dataset, fuel data is mapped into nine generation types: *Bioenergy*, *Coal*, *Gas*, *Hydro*, *Nuclear*, *Other Fossil*, *Other Renewables*, *Solar*, and *Wind*. In our European dataset, *Coal* is further split into *Hard Coal* and *Lignite*. More information on mapping for different sources and countries is below.

| Demand | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Total Generation | | | | | | | | | |
| Clean | | | | | | | | | |
| Renewables | | | | | | Fossil | | | |
| Wind and Solar | | Hydro, Bioenergy and Other Renewables | | | | Gas and Other Fossil | | | |
| Wind | Solar[1] | Hydro[2] | Bioenergy[3] | Other Renewables[4] | Nuclear | Coal | Gas | Other Fossil[5] | Net Import |

[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] Bioenergy is classified as renewable, but caveats are attached. See below for details.

[4] Other Renewables generation includes geothermal, tidal and wave generation.

[5] Other Fossil generation includes generation from oil and petroleum products, as well as manufactured gases and waste.

*Bioenergy* has typically been assumed (by the IPCC, the IEA, and many others) to be a renewable energy source, in that forest and energy crops can be regrown and replenished, unlike fossil fuels. It is included in many governmental climate targets, including EU renewable energy legislation, and so Ember includes it in "renewable" to allow easy comparison with legislated targets.

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. Current bioenergy sustainability criteria, including those of the EU, generally 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. Given the availability of risk-free alternatives to generating electricity such as wind and solar, Ember advocates for countries to minimise or eliminate the inclusion of large-scale bioenergy in the power sector. For more information please see our reports: [Understanding the Cost of the Drax BECCS Plant to UK Consumers](#) (May 2021), [The Burning Question](#) (June 2020), and [Playing with Fire](#) (December 2019).

# Electricity Generation and Net Imports

## Overview

Ember releases time series data of power **generation**, broken down by fuel type, and power **imports**. These figures are then combined to produce a total power **demand** time series for each country. "% share" values refer to the share of generation (this does not include net imports) and not the share of consumption unless otherwise specified. We provide data for 215 countries from 2000 to 2021, and where possible have gathered 2022 data using national sources.

Compiling a full dataset from 2000 to 2022 requires using data at multiple timescales. Annual generation data is collected from both national and multi-country sources. For the most recent years, data is often not available. In these cases we use monthly data, which is reported on a shorter lag, to estimate the latest annual generation.

Power data is gathered in a wide variety of formats from multiple sources. In addition to this reconciliation, our data requires considerable cleaning and adjustment of the raw data reported. An overview of our methods is below.

## Methods

### Annual data

Annual data is generally available until 2021. It is gathered from the *Key Sources* described below.

Net imports are available until 2021 for all countries. In cases where generation data exists for 2022, but imports do not, imports are carried forward. Where net import data is not

available for any years, values are assumed to be zero: we note these cases in *Country-specific Methodology*.

## Monthly data

In several cases monthly data is reported on a lagged basis, or data may not be available. In these cases, incomplete months are projected based on both seasonal and interannual trends.

## Estimating latest yearly data

Monthly data does not always align well with annual data: different types of generation may be included in different scales, or coverage may differ. Where conflicts occur, annual data is generally more accurate. As such, we project latest generation data by applying absolute changes by fuel from available annualised monthly data to historical annual values. In the few cases where a specific fuel is not available in monthly data, it is treated as having shown no change in the annualised projection. As such, note that simply summing up monthly values **will not produce the same results** as our annual values for any given year.

## Thermal disaggregation

Some countries do not report disaggregated generation from fossil fuels; this disaggregation was performed by Ember. 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; this approach covers the majority of global generation. Finally, capacity ratios are used to disaggregate remaining countries.

## Captive power

Some countries have significant proportions of captive power generation, otherwise known as autoproducers. We include this capacity and generation in our data whenever possible; where we are aware of significant captive generation that is not reported, it is noted in country-specific methodology below.

## Regional and world estimates

Although our data covers the vast majority of the world's electricity generation for 2022, data is not available for all countries. As such, regional and world figures for this year are estimated. The relative changes in included countries are applied to the latest complete datapoint for a given region and the world to arrive at the estimated value. Monthly regional estimates are calculated based on these annual figures. Electricity imports and exports are not included in estimates for regional or world values.

## Key Sources

### Eurostat

Annual European data up to the end of 2021 is taken from the European Comission's [Eurostat](#) annual data for most European countries included in our data. This data is thoroughly quality assured and represents *gross* generation, including auxiliary power used in generator function. Historical net import data is also acquired from Eurostat.

Eurostat also provides monthly generation data for most countries. In general we do not prefer this data, as it is reported with some delay and is of poorer quality than Eurostat annual data. It is used in a few cases, specified in *[Country-specific Methodology](#)*.

### European Network of Transmission Systems Operators for Electricity (ENTSO-E)

The bulk of our monthly European power data is sourced from the ENTSO-E [transparency platform](#), which provides hourly (or more frequent) generation by fuel type for most European countries. ENTSO-E reports *net* generation, excluding auxiliary power.

In some cases ENTSO-E data is unavailable, and in others there are known quality issues which make using another source necessary for some or all fuel types. Nationally reported sources are preferred; in three cases we use Eurostat monthly data and project several months forward. All European countries using any non-ENTSO-E sources or projections are described below.

### U.S. Energy Information Administration (EIA)

EIA data forms the backbone of our global historical annual data, including compiled generation by fuel type from a range of national sources. EIA data represents *net* generation.

Thermal generation is not disaggregated in this dataset; as such, we disaggregate it ourselves using the best available ratios (see methods).

# Installed Capacity

## Overview

Capacity represents the maximum nameplate output for different fuel types in a country. It is very rare for high quality capacity data to be available from national sources for all years. Additionally, national data tends to be aggregated by fuel type inconsistently across

countries, making it difficult to make comparisons. As such, we take our data from three main sources, detailed below.

Most fuel types are consistently available in our sources, but data for Other Fossil is less consistent and is taken from where it is of the highest quality. In a few cases, we are not able to gather any data of acceptable quality for Other Fossil capacity. As a result, our capacity ratios are incorrect; more detail is given in *Country-specific Methodology*.

# Key Sources

## Global Energy Monitor (GEM)

GEM maintains trackers containing their best knowledge of all current global coal and gas power plants with capacity greater than 50 MW, both operational and retired. We use these trackers to build capacity histories by country. This method is the most accurate we are aware of, but has caveats:
- GEM reports *gross* capacity, where other sources report *net* capacity for other fuel types. Capacity is therefore not perfectly comparable.
- GEM's gas tracker does not include plants which were retired before 2020, meaning that historical time series may be underestimated in some cases.
- Some countries have a substantial amount of co-firing capacity: plants which can burn either gas or some other fuel depending on necessity and availability. It is not possible to accurately disaggregate this capacity, as it varies by plant; we therefore take all co-firing capacity as being gas. This approach can lead to inaccuracies in a number of Middle Eastern countries, where these plants are common.

Where GEM reports no data for either Coal or Gas, we take all fossil fuel capacity reported in other sources to be Other Fossil.

## International Renewable Energy Agency (IRENA)

IRENA publishes detailed capacity data through the IRENASTAT portal, which we use for all non-fossil generation. Where possible, we also use IRENA data for Other Fossil capacity. Fossil capacity is not always well disaggregated, however, and has many inconsistencies and other quirks; in some cases it is not possible to take any fossil capacity from this dataset.

## World Resources Institute (WRI)

The WRI publishes a Global Power Plant Database, which currently contains capacity data for global power plants from 2000 to 2017. This dataset is incomplete, and does not contain enough information to build a precise time series. In some cases it is the only available source for Other Fossil capacity, and is used.

# Emissions from Electricity Generation

*Note that the below methodology is used only for our **global** emissions figures. In certain cases, such as our 2022 [European Electricity Review](#), other approaches may be used. This will be noted where it is the case, and specific methodologies will be made available for such datasets.*

## Overview

We report emissions values by fuel type, and emissions intensity by country. These values are calculated by multiplying our generation numbers by emissions factors taken from the [IPCC 5th Assessment Report Annex 3 (2014)](#). These figures aim to include full lifecycle emissions including upstream methane, supply-chain and manufacturing emissions, and include all gases, converted into $CO_2$ equivalent over a 100 year timescale.

The emissions intensities we use are below, in carbon dioxide equivalent emitted per kilowatt hour of electricity ($gCO_2eqkWh^{-1}$):
- *Coal*: 820
- *Gas*: 490
- *Other Fossil*: 700
- *Wind*: 11
- *Solar*: 48
- *Bioenergy*: 230
- *Hydro*: 24
- *Other Renewables*: 38 (in line with the IPCC's "geothermal")
- *Nuclear*: 12

## Caveats

IPCC figures still represent the most comprehensive attempt to estimate global fuel emissions intensities. Nonetheless, these emissions factors may differ from reality for a variety of reasons. Some of these are listed below:

### Fuel quality

Fuels used in different regions can have different characteristics and emissions profiles. Coal is one example: softer coal grades, such as lignite (brown coal), produce greater carbon emissions per kilowatt hour than harder grades like anthracite.

## Methane

In IPCC figures, upstream methane emissions for gas and coal generation are calculated on a long-term basis assuming methane is x21 as potent as $CO_2$; the short-term impact of methane is actually four times higher, at x86 the potency of $CO_2$. See [this page](this page) for more information.

In recent years, interest in upstream methane leaks has also increased for both gas and coal, and IPCC figures may no longer reflect best understanding. These leaks also vary by fuel origin, increasing geographic differences in fuel quality.

## Thermal power plant efficiency

Coal and gas plants use several different technologies, with more recent plants generally being more efficient. The incidence of different technologies varies between countries, and over time within countries. In particular, new Chinese coal plants are generally more efficient than the ones they replace, leading to an emissions intensity reduction [through time](through time) that is not captured in our figures.

## Solar and wind

Recent efficiency improvements have seen Wind and Solar emissions intensity drop, as energy output has increased relative to emissions from manufacturing. IPCC numbers may therefore be higher than reality.

## Bioenergy

As mentioned in [*Definitions*](Definitions), the emissions intensity 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 IPCC figure we use is for dedicated energy crops and crop residues, rather than the more commonly used woody or forest biomass, which has been shown to carry [a greater risk of high-carbon outcomes](a greater risk of high-carbon outcomes). In certain cases, bioenergy can have a carbon intensity [significantly greater than coal](significantly greater than coal).

Bioenergy is also frequently cofired with fossil fuels; we have disaggregated these wherever possible, but in certain cases recorded bioenergy generation may include some co-firing. In these circumstances, actual emissions will be higher than we estimate.

## Gross versus net generation

IPPC emissions intensity factors are relative to net generation. For most countries we report net generation, but for European countries and certain others we report gross generation. Fossil emissions for such countries will be slightly high relative to the rest of our dataset. For

more detail on gross and net reporting, please see the *Generation Key Sources* and *Country-specific Methodology* sections.

### Combined heat and power (CHP)

In many cases, thermal power plants produce both heat and electricity; we have reported only the electricity produced by such plants, ignoring heat. IPCC factors assume that plants are dedicated electricity producers; it may not therefore be fair for our dataset to include all emissions attributed to co-firing plants, which actually have greater efficiency than reported when considering total useful energy output.

# Country-specific Methodology

Historical sources are reported for all countries in our dataset below, along with sources used for recent years where they exist. In almost all cases recent year sources are monthly data, combined with historical annual data according to the approach outlined in *Methods*; exceptions are noted. Any further relevant information is included on a per-country basis.

There are certain cases in which our historical generation estimates differ noticeably from other sources. These differences normally result from data not being available for Other Fossil capacity, leading to overestimates of Gas generation and missing estimates of Other Fossil generation. We are aware of such discrepancies in several countries, noted below. For this reason, we also include the source of our Other Fossil capacity data.

### Abbreviations

- *EIA*: U.S Energy Information Administration
- *ENTSO-E*: European Network of Transmission Systems Operators for Electricity
- *GEM*: Global Energy Monitor
- *IEA*: International Energy Agency
- *IRENA*: International Renewable Energy Agency
- *WRI*: World Resources Institute

## Afghanistan

### Sources

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Albania

**Sources**

Eurostat, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Algeria

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Algeria has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## American Samoa

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Angola

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Angola has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Antigua and Barbuda

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Argentina

**Sources**

EIA, Compañia Administradora Del Mercado Mayorista Eléctrico (CAMMESA), IEA, BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly generation and imports data from 2018 are taken from CAMMESA. Gas and Coal generation are aggregated in this data, so are disaggregated based on ratios of fossil generation from IEA monthly generation data.
- Argentina shares the Yacyreta Hydro power plant with Paraguay. Argentina's yearly generation data only includes generation that is attributable to Argentina and not the entire generation output of the plant, while monthly data includes the entire output.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Armenia

**Sources**

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- No source provides Other Fossil data of acceptable quality; we do not believe that any pure capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.
- Armenia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Aruba

### Sources

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Australia

### Sources

EIA, OpenNEM Project, BP, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data. Net imports are carried forward from the last year available in EIA data.
- Monthly electricity generation from 1998 is taken from OpenNEM, and includes data for both the National Electricity Market (NEM) as well as the South West Interconnected System (SWIS) in Western Australia.

- Gas generation is significantly lower in monthly data than annual. The underreporting is largely concentrated on missing generation from Western Australia.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Austria

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Azerbaijan

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Other Fossil may be overestimated as the ratios used for disaggregation of generation are subject to poor data availability.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Azerbaijan has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Bahamas

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Bahrain

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Bangladesh

**Sources**

EIA, Power Grid Company of Bangladesh, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

- Monthly electricity generation and net imports from 2019 are taken from the Power Grid Company of Bangladesh.
- Electricity net import data for Bangladesh only includes net imports from India.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Barbados

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Belarus

**Sources**

EIA, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

- Belarus has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Belgium

**Sources**

Eurostat, ENTSO-E, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Belize

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Benin

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Bhutan

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Bolivia

**Sources**

EIA, Comité Nacional de Despacho de Carga (CNDC), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation data from 2019 is taken from CNDC. Thermal data is reported aggregated; known *Bioenergy* units are disaggregated from this, with other generation assumed to be *Gas*.
- Bolivia does not currently have any international power interconnectors, though initiatives to develop projects are ongoing. Net imports are as such assumed to be zero.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Bosnia Herzegovina

**Sources**

EIA, Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation and net imports from 2019 are taken from ENTSO-E. Data was not reported to ENTSO-e for a portion of 2022; Eurostat monthly data is therefore used from January to August 2022.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Botswana

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Brazil

**Sources**

EIA, Operador Nacional do Sistema Eléctrico (ONS), BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data. Net imports are carried forward from the last year available in EIA data.
- Monthly electricity generation from 2018 is taken from ONS.
- Brazil shares the Itaipu hydroelectric dam with Paraguay, with ownership of power produced split evenly between the two countries. In monthly data, each country instead reports the power they *consumed* from the dam.
- Bioenergy is underreported in monthly data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Brunei Darussalam

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Bulgaria

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality; to our knowledge, little such capacity exists. All other installed capacity data is gathered as described in *Installed Capacity*.

# Burkina Faso

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Burundi

**Sources**

EIA, Institut de Statistiques et d'Etudes Economiques du Burundi (ISTEEBU), IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation from 2018 is taken from ISTEEBU, and can be lagged by several months. Thermal generation is reported aggregated; as Burundi has no known Gas or Coal plants, this generation is all assumed to be Other Fossil.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Cabo Verde

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Cambodia

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Cameroon

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Canada

**Sources**

EIA, Statistics Canada (STATCAN), Canada Energy Regulator (CER), BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly electricity generation from 2010 is taken from STATCAN. Gas and Coal generation is reported by technology rather than fuel type, so requires some disaggregation. This is performed using ratios of fossil generation from IEA monthly generation data.
- Monthly net imports from 2019 are taken from CER.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Canada has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Cayman Islands

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Central African Republic

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Chad

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Chile

**Sources**

EIA, Coordinador Eléctrico Nacional (CEN), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from CEN.
- Monthly electricity generation from 2016 is taken from CEN.
- Until late 2022, Chile did not have any active international power interconnectors. Net imports are as such assumed to be zero.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# China

**Sources**

BP, National Bureau of Statistics of China (NBS), IEA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from BP. This data is based on annual data from the China Electricity Council, with some adjustments made to fossil generation.
- Annual net imports from 2000 are taken from the EIA.
- Monthly electricity generation from 2015 is taken from NBS. Thermal generation is disaggregated using IEA monthly generation data.
- NBS frequently adjusts its generation figures for past years and months, but does not publish the revised data. Revised figures for past years are calculated based on newly released values and year on year percentage changes for any given month.
- Wind and Solar generation have historically been underreported in monthly generation data. This is compensated by scaling using annual values.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Colombia

**Sources**

EIA, Compañía Expertos en Mercados (XM), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation from 2000 is taken from XM.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Colombia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Comoros

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Congo (DRC)

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Congo

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Cook Islands

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Costa Rica

**Sources**

EIA, Centro Nacional de Control de Energía (CNCE), IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation and net imports from 2019 are taken from CNCE. This data is unlikely to include rooftop solar generation, so may undercount *Solar*.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Côte d'Ivoire

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Côte d'Ivoire has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Croatia

### Sources

Eurostat, ENTSO-E, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2019 are taken from ENTSO-E.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Cuba

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Cyprus

**Sources**

Eurostat, ENTSO-E, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation from 2017 is taken from Eurostat monthly data, with recent months projected forward. Nationally reported data is available from the Cyprus Transmission System Operator (TSOC), but it is not sufficiently disaggregated by fuel type for our use.
- Monthly net imports from 2020 are taken from ENTSO-E.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Czechia

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality; to our knowledge, little such capacity exists. All other installed capacity data is gathered as described in *Installed Capacity*.

# Denmark

**Sources**

Eurostat, ENTSO-E, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Djibouti

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Dominica

Sources

EIA, IRENA

Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Dominican Republic

Sources

EIA, GEM, IRENA, WRI

Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Ecuador

Sources

EIA, Agencia de Regulación y Control de Energía y Recursos Naturales no Renovables (ARCONEL), GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation and net imports from 2019 are taken from ARCONEL.
- Thermal generation data is disaggregated in monthly data, but some plants have mixed combustion between gas and other fossil fuels. Consumption by fuel type is known for these plants; we split them using EIA conversion factors.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Egypt

**Sources**

EIA, Egyptera, BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Other Fossil may be overestimated in recent years, as the ratios used for disaggregation of generation are subject to poor data availability.
- Monthly generation data from 2016 is taken from Egyptera. Renewable generation is aggregated in this data, and is currently all assigned to solar.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Egypt has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# El Salvador

**Sources**

EIA, National Energy Council (CNE), IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation from 2019 is taken from CNE.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Equatorial Guinea

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Eritrea

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Estonia

**Sources**

Eurostat, ENTSO-E, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# eSwatini

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Ethiopia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Falkland Islands [Malvinas]

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Faroe Islands

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Fiji

**Sources**

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Finland

### Sources

Eurostat, ENTSO-E, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2017 are taken in part from ENTSO-E. Finnish data in ENTSO-E is known to undercount Bioenergy, and to show low volatility compared to expectation. We therefore take Bioenergy, Solar, Gas, Wind and Hydro from Eurostat monthly data.
- Data is also available in national Finnish Energy statistics, which Eurostat figures are taken from.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# France

### Sources

Eurostat, ENTSO-E, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- France has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# French Guiana

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# French Polynesia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Gabon

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Gambia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Georgia

**Sources**

EIA, Georgian State Electrosystem (GSE), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation and net imports from 2019 are taken from GSE.

### Installed Capacity

- No source provides Other Fossil data of acceptable quality; we do not believe that any pure capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.
- Georgia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Germany

### Sources

Eurostat, ENTSO-E, Agora Energiewende, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation from 2015 is taken largely from ENTSO-E. German *Gas* and *Bioenergy* data is provided to Ember by Agora Energiewende.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Ghana

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Ghana has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

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# Greece

**Sources**

Eurostat, ENTSO-E, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.
- Other Fossil generation is not reported in monthly data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Greenland

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Grenada

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Guadeloupe

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality; we do not believe that any such capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.

# Guam

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Guatemala

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Guinea

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Guinea-Bissau

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Guyana

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Haiti

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Honduras

**Sources**

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Hong Kong

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- No data is available in our sources for *Other Fossil* capacity: as such, no generation has been assigned to this category, and *Gas* generation may be overestimated compared to other sources.

### Installed Capacity

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Hong Kong has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Hungary

### Sources

Eurostat, ENTSO-E, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.
- No ENTSO-E *Solar* data is available for Hungary until October 2019. We attach monthly Eurostat data for *Solar* before this point.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Iceland

**Sources**

Eurostat, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# India

**Sources**

BP, EIA, National Power Portal (CEA), Power System Operation Corporation (POSOCO), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from BP. Annual net imports from 2000 are taken from the EIA.
- Monthly electricity generation from 2019 is taken from CEA. The latest available months are initially published as tentative reports and are later revised with actual figures.
- Monthly electricity net imports from 2019 are taken from POSOCO.
- Monthly Coal generation data covers only power fed into the grid. It is therefore lower than annual data, which includes captive industrial generation.
- An overview of subnational data is available here.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Indonesia

**Sources**

BP, IRENA, [Ministry of Energy and Mineral Resources (ESDM)](), EIA, GEM

**Electricity Generation and Net Imports**

- Annual electricity generation for all fuels excluding Biomass and Other Renewables from 2000 are taken from BP.
- Annual generation from Biomass and Other Renewables from 2000 are taken from IRENA.
- ESDM publishes annual data each year. We use this for previous year data when it becomes available, as it is more up to date than other sources.
- Annual net imports from 2000 are taken from the EIA.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Indonesia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Iran

**Sources**

BP, [Tavanir](), EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from the BP.
- Annual net imports from 2000 are taken from the EIA.
- Monthly generation and import data from 2019 are taken from Tavanir. Fossil generation is reported aggregated in this data, and disaggregated using the ratios of reported fuel consumption for power generation. Wind, solar and nuclear generation cannot be disaggregated, so are excluded from monthly data and carried forward from the last year available in BP data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Iran has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Iraq

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Other Fossil may be underestimated as the ratios used for disaggregation of generation data are subject to poor data availability.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Iraq has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Ireland

**Sources**

Eurostat, ENTSO-E, Sustainable Energy Authority of Ireland (SEAI), GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Since early 2022, reporting to ENTSO-e has been erratic. Monthly electricity generation and net imports from 2010 are therefore taken from SEAI.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

## Israel

**Sources**

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- No data is available in our sources for Other Fossil capacity: as such, no generation has been assigned to this category, and Gas and Coal generation are overestimated compared to other sources.

### Installed Capacity

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Israel has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Italy

### Sources

Eurostat, ENTSO-E, Terna, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation from 2016 is taken largely from ENTSO-E. ENTSO-E reported *Other Fossil* is mapped to *Gas*. ENTSO-E reported *Bioenergy*, *Solar*, and imports are also known to be inaccurate, so we take data for these from the transparency platform of the Italian Grid Operator Terna.
- Net imports from 2016 are taken from Terna.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Jamaica

### Sources

EIA, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Jamaica has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Japan

### Sources

EIA, Agency for Natural Resources and Energy (ENECHO), Renewable Energy Institute (REI), BP, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly electricity generation from 2018 is taken largely from ENECHO. This source is reported on a lag, with recent months unavailable. REI data is therefore used to estimate ENECHO data for recent months, applying absolute changes to the most recent value in the same way as recent annual data is estimated.
- REI fossil data is aggregated. It is disaggregated using ENECHO data, with recent months using the most recent ENECHO ratio available.
- Net imports are assumed to be zero.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

## Jordan

### Sources

EIA, GEM, IRENA, WRI

Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Other Fossil may be underestimated as the ratios used for disaggregation of generation data are subject to poor data availability.

Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Jordan has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Kazakhstan

Sources

BP, EIA, Samruk Energy, GEM, IRENA

Electricity Generation and Net Imports

- Annual electricity generation from 2000 is taken from BP.
- Annual net imports from 2000 are taken from the EIA.
- Annual electricity generation and net imports from 2021 are taken from Samruk. Fossil generation in this data is disaggregated using thermal ratios from BP data.

Installed Capacity

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Kazakhstan has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Kenya

Sources

EIA, Kenya National Bureau of Statistics (KNBS), IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation and net imports from 2019 are taken from KNBS, and can be lagged by several months. Fossil generation is reported aggregated; it is disaggregated using thermal ratios derived from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Kiribati

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Korea (DPRC)

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- No data is available in our sources for Other Fossil capacity: as such, no generation has been assigned to this category, and Coal generation may be overestimated compared to other sources.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Kosovo

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2022 are taken from ENTSO-E. We do not yet have a long enough reported period of this generation to include in our annual data.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Kuwait

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- No data is available in our sources for Other Fossil capacity: as such, no generation has been assigned to this category, and Gas generation may be overestimated compared to other sources.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Kuwait has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Kyrgyzstan

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

## Lao

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Latvia

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Lebanon

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Other Fossil may be underestimated as the ratios used for disaggregation of generation data are subject to poor data availability.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Lebanon has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Lesotho

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Liberia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Libya

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Other Fossil may be underestimated as the ratios used for disaggregation of generation data are subject to poor data availability.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Libya has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Lithuania

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Luxembourg

**Sources**

Eurostat, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Luxembourg generally does not report to ENTSO-E. As such, monthly generation and net imports from 2018 are taken from Eurostat monthly data, with recent months projected forward.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Macao

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality; we do not believe that any pure capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.

- Macao has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Madagascar

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Malawi

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Malaysia

**Sources**

BP, Grid System Operator (GSO), Sarawak Energy (SE), EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation for all Malaysia is taken from BP.
- Previous year generation for peninsular Malaysia is taken from GSO.
- Previous year generation for Sarawak is carried forward from the most recently available annual report from SE.
- Data is not available for Sabah.
- Annual electricity imports are taken from the EIA and carried forward.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Maldives

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Mali

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Malta

**Sources**

Eurostat, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly generation and net imports are taken from Eurostat. This data excludes solar generation, which is carried forward from the last year available in annual data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Martinique

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Mauritania

**Sources**

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

## Mauritius

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Mexico

### Sources

EIA, Centro Nacional de Control de Energía (CNCE), IEA, BP, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly generation data from 2019 is taken from CNCE. Thermal generation is aggregated in this data, so is disaggregated based on ratios of fossil generation from IEA monthly generation data.

**Installed Capacity**

-   IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Moldova

**Sources**

EIA, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

-   Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data. Eurostat data exists for this period, but differs from other sources due to the exclusion of generation originating in Transnistria.
-   Monthly electricity generation and net imports from 2020 are taken from ENTSO-E.

**Installed Capacity**

-   No source provides Other Fossil data of acceptable quality; we do not believe that any pure capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.
-   Moldova has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Mongolia

**Sources**

EIA, General Statistical Database Mongolia (GSDB), GEM, IRENA

**Electricity Generation and Net Imports**

-   Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
-   Monthly generation data from 2000 is taken from GSDB. Thermal generation is reported aggregated, and is assumed all to be *Coal*. Renewable generation is similarly aggregated, and is assumed all to be *Wind*.
-   No monthly data on net imports is available. These are therefore assumed to be zero.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Montenegro

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2005 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality; we do not believe that any such capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.

# Montserrat

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Morocco

**Sources**

EIA, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Mozambique

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Mozambique has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Myanmar

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Namibia

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Nauru

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Nepal

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Netherlands

**Sources**

Eurostat, Statistics Netherlands (CBS), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- ENTSO-E renewables data seems to contain significant double counting. Monthly generation data from 2015 is therefore taken from the CBS API, with recent months projected.
- Monthly net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# New Caledonia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# New Zealand

**Sources**

EIA, Electricity Authority Te Mana Hiko (EMI), GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation data from 2010 is taken from EMI. This data excludes solar generation.
- New Zealand has no electricity imports.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Nicaragua

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Niger

**Sources**

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Nigeria

### Sources

EIA, Transmission Company of Nigeria (TCN), GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation from 2019 is taken from TCN. All thermal power generation is assumed to be gas.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## North Macedonia

### Sources

Eurostat, ENTSO-E, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2016 are taken from ENTSO-E.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Norway

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 is taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Oman

**Sources**

EIA, National Centre for Statistics and Information (NCSI), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- No data is available in our sources for Other Fossil capacity: as such, no generation has been assigned to this category.
- Aggregated monthly electricity generation data from 2014 is taken from NCSI. We assume this generation to be entirely gas.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Oman has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Pakistan

**Sources**

EIA, National Electric Power Regulatory Authority (NEPRA), GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation data from 2019 is taken from NEPRA.
- Gas may be overestimated, and Other Fossil underestimated, as the ratios used for disaggregation of generation data are subject to poor data availability.
- No data on net imports is available. These are assumed to be zero.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Pakistan has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Palestine, State of

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Palestine has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Panama

### Sources

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Papua New Guinea

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Paraguay

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Peru

**Sources**

EIA, [Comité de Operación Económica del Sistema Interconectado](#) (COES), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation and net imports from 2019 are taken from COES.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Philippines

**Sources**

EIA, [National Grid Corporation of the Philippines](#) (NGCP), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation and net imports from 2017 are taken from NGCP. Both "Biogas" and "Renewable (Biomass)" as reported from the source are classified as *Bioenergy*.
- Gas may be underestimated, and Other Fossil overestimated, as the ratios used for disaggregation of generation data are subject to poor data availability.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Poland

**Sources**

Eurostat, [Instrat](#), GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- ENTSO-E seems to underreport several fuel types, including Gas, Bioenergy, Lignite, and historically Solar. Monthly electricity generation from 2015 is therefore taken from the Instrat dashboard, which aggregates data from the electricity statistics provider ARE.
- Monthly net imports from 2015 are taken from ENTSO-E.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Portugal

### Sources

Eurostat, ENTSO-E, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Puerto Rico

### Sources

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Qatar

**Sources**

EIA, Planning and Statistics Authority (PSA), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly electricity generation from 2018 is taken from PSA. All generation is assigned to gas.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality; we do not believe that any pure capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.

# Réunion

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Romania

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Russia

**Sources**

EIA, Russian Power System Operator (SO-UPS) [currently unavailable], BP, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly generation from 2019 is taken from SO-UPS. Monthly fossil generation data is disaggregated using ratios of fossil fuels from annual BP generation data. Data has not been published since September 2022.
- Monthly net imports from 2015 are taken from ENTSO-E. Russian net imports therefore do not include trade with Asian countries.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Russia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Rwanda

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

-   Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

-   Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Saint Kitts and Nevis

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

-   Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

-   Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Saint Lucia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

-   Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Saint Pierre and Miquelon

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Saint Vincent and the Grenadines

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Samoa

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Sâo Tome and Principe

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Saudi Arabia

**Sources**

BP, King Abdullah Petroleum Studies and Research Centre (KAPSARC), GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from BP. Annual net imports from 2000 are taken from the EIA.
- Annual electricity generation for the previous year was previously estimated based on data from the KAPSARC Energy Balance dashboard. This is no longer available.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

- Saudi Arabia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Senegal

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Senegal has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Serbia

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2017 are taken from ENTSO-E.
- *Solar* and *Wind* generation are not included in ENTSO-E generation data. As such, 2022 values may be underestimated.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Serbia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Seychelles

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Sierra Leone

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Singapore

**Sources**

EIA, Energy Market Authority (EMA), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

- Monthly generation data from 2009 is taken from EMA, with thermal data provided partially aggregated. Our fuel mapping excludes Bioenergy and Coal in monthly data, as these provide only a very small proportion of generation.
- Singapore currently has no power imports, though has recently announced several RFPs to build interconnectors. Net imports are therefore assumed to be zero.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Slovakia

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.

# Slovenia

**Sources**

Eurostat, ENTSO-E, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2016 are taken from ENTSO-E.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Slovenia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Solomon Islands

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

## Somalia

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

## South Africa

**Sources**

EIA, Eskom, Statistics South Africa (STATSSA), BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly generation data from 2018 is taken mostly from Eskom. Coal generation is undercounted in Eskom data; load data from STATSSA is therefore used to supplement the missing generation.
- Monthly net imports from 2018 are taken from STATSSA.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# South Korea

**Sources**

EIA, Korea Electric Power Corporation, BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly generation data from 2019 is taken from the Korea Electric Power Corporation. Fossil generation for monthly data is reported by fuel and does not need to be disaggregated.
- Net imports are assumed to be zero.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# South Sudan

**Sources**

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2012 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Spain

### Sources

Eurostat, ENTSO-E, Spanish System Operator Information System (eSIOS), GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation from 2015 is taken from ENTSO-E.
- Spanish import data is incomplete in ENTSO-E, as it does not include trade with non-EU countries such as Morocco. It is provided by eSIOS.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Sri Lanka

### Sources

EIA, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Sri Lanka has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Sudan

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Suriname

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Sweden

**Sources**

Eurostat, ENTSO-E, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2015 are taken from ENTSO-E. ENTSO-E reported *Other Fossil* is mapped to *Bioenergy*.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Switzerland

**Sources**

Eurostat, ENTSO-E, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Monthly electricity generation and net imports from 2017 are taken from ENTSO-E.
- Hydropower is significantly underreported in monthly data.

**Installed Capacity**

- In the absence of any known Coal or Gas capacity, all IRENA fossil capacity is assumed to be Other Fossil. All other installed capacity data is gathered as described in *Installed Capacity*.

# Syria

**Sources**

EIA, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Syria has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Taiwan

### Sources

EIA, Government of Taiwan, TAIPower, BP, GEM, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Both the government and taipower report the same data. Monthly generation data from 2020 is taken from the Government of Taiwan. Data is provided by power plants. These then need to be mapped to fuel types and aggregated.
- Net imports are assumed to be zero.

### Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Tajikistan

### Sources

EIA, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

## Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Tajikistan has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Tanzania

## Sources

EIA, GEM, IRENA

## Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

## Installed Capacity

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Thailand

## Sources

EIA, Department of Alternative Energy Development and Efficiency (DEDE), Electricity Generating Authority of Thailand (EGAT), BP, GEM, IRENA

## Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- Monthly generation data from 2019 is taken from the DEDE and EGAT. EGAT covers all fossil and hydropower generation, but includes aggregated renewables. DEDE breaks down renewables into Solar and Wind; we compare these values with EGAT total renewables to derive Bioenergy.
- Monthly net imports from 2019 are taken from DEDE.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Thailand has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Togo

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Togo has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Tonga

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Trinidad and Tobago

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

## Tunisia

**Sources**

EIA, Statistiques Tunisie, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation data from 2020 is taken from Statistiques Tunisie monthly bulletins, which can be lagged by several months. Net imports are carried forward from the last year available in EIA data.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Tunisia has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

## Türkiye

**Sources**

Eurostat, Energy Exchange Istanbul (EPIAS), EPIAS Energy Markets Reports (RAPOR), GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from Eurostat.
- Türkiye does not report to ENTSO-E. Monthly generation and net imports from 2018 are downloaded through the EPIAS API. EPIAS solar data is incomplete and instead is taken separately from RAPOR.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Turkmenistan

### Sources

EIA, GEM, IRENA, WRI

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

### Installed Capacity

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Turks and Caicos Islands

### Sources

EIA, IRENA

### Electricity Generation and Net Imports

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Uganda

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Ukraine

**Sources**

Eurostat, UKRENERGO, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from the Eurostat.
- Ukraine reports electricity generation to UKRENERGO, and in early 2022 began reporting to ENTSO-E. Monthly net imports are taken from ENTSO-e. For security reasons, data has not been published since November 2022.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Ukraine has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# United Arab Emirates

**Sources**

EIA, BP, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from BP generation data.
- No data is available in our sources for Other Fossil capacity: as such, no generation has been assigned to this category.

**Installed Capacity**

- No source provides Other Fossil data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- The UAE has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# United Kingdom

**Sources**

Eurostat, Elexon Sum Plus Embedded Net Imports (ESPENI), GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from the Eurostat.
- Since Brexit, Great Britain no longer reports generation data to ENTSO-E. Monthly generation and net imports since 2015 are taken from the monthly ESPENI publication by the University of Birmingham Energy Informatics Group.
- Northern Ireland continued to report generation to ENTSO-E until early 2022; this data was previously combined with ESPENI data to produce an aggregate value for the UK. Since early 2022, this reporting has been erratic, and Northern Ireland has been removed from our UK data.
- Monthly data excludes captive generation. This generation is significant for both bioenergy and gas.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# United States

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA.
- Monthly generation and imports since 2001 are taken from the EIA. The EIA reports monthly generation data in two separate datasets: Monthly data for all 50 states and monthly data for the lower 48 states (excludes Hawaii and Alaska). Data for all 50 states is reported on a 3 month lag whereas data for the lower 48 states is reported without lag. Missing months from the data for all 50 states is estimated using the recent changes observed in data from the lower 48 dataset.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- The USA has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Uruguay

**Sources**

EIA, Usinas y Transmisiones Eléctricas (UTE), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Monthly generation and imports from 2019 are taken from UTE.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Uruguay has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Uzbekistan

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.
- Uzbekistan has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Vanuatu

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Venezuela

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.
- Gas may be overestimated, and Other Fossil underestimated, as the ratios used for disaggregation of generation data are subject to poor data availability.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.
- Venezuela has a significant proportion of co-firing Gas/Other Fossil capacity. As a result, our capacity ratios for these fuels may be imprecise.

# Viet Nam

**Sources**

BP, EIA, Viet Nam Electricity (EVN), GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation from 2000 is taken from BP.
- Annual net imports from 2000 are taken from the EIA.
- Monthly generation data from 2019 is taken from the EVN, but is reported inconsistently, with substantial missing data. Interpolation is therefore required to produce a monthly time series. This process produces adequate results for most fuel types, but wind data should be treated with caution due to intermittent reporting.
- Monthly net imports cannot be calculated, and are assumed to be zero.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Virgin Islands (British)

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Virgin Islands (U.S.)

**Sources**

EIA, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Yemen

**Sources**

EIA, GEM, IRENA, WRI

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- IRENA Fossil capacity is insufficiently disaggregated, so Other Fossil capacity is taken from WRI. All other installed capacity data is gathered as described in *Installed Capacity*.

# Zambia

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.

# Zimbabwe

**Sources**

EIA, GEM, IRENA

**Electricity Generation and Net Imports**

- Annual electricity generation and net imports from 2000 are taken from the EIA. Fossil generation for this data was disaggregated using thermal ratios from capacity data.

**Installed Capacity**

- Other Fossil capacity is taken from IRENA. All other installed capacity data is gathered as described in *Installed Capacity*.