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_2e)

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] *Other Renewables* generation includes geothermal, tidal and wave generation.

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

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. We provide data for 215 countries from 2000 to 2020, and where possible have gathered 2021 data using national sources.

Compiling a full dataset from 2000 to 2021 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 published with a significant lag, and is generally only available until 2019 or 2020. A number of countries report generation data in 2020 for most but not all fuels. Where this occurs, missing fuels are simply carried forward from the previous year.

For net imports, data for missing years is 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. Given the unusual nature of power generation during the COVID-19 pandemic, we use 2019 rather than 2020 as a point of reference.

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.

Regional and world estimates

Although our data covers the vast majority of the world's electricity generation for 2021, 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. 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 2019 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). For smaller countries, thermal values are not currently available for 2020; we therefore carry forward 2019 values in these cases. These missing values cover only a small percentage of global generation, and in most important cases are included in monthly data.

United Nations (UN)

The UN reports *gross* monthly total electricity production figures for certain countries, though this data is intermittent and not disaggregated at all by fuel type; as such, other sources are preferred whenever possible. Non-fossil generation is disaggregated based on carried forward fuel ratios from EIA data, with fossil generation then disaggregated as described in *Thermal disaggregation*. This approach is imprecise in cases where there are multiple fuels in the generation mix, as it assumes fuel ratios are identical to the previous year. It does, however, provide a useful picture in countries whose generation is dominated by one power source (for example hydropower). UN data is used for Armenia, Azerbaijan, Tajikistan, Tunisia, Belarus, Senegal, and Egypt.

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 2000-2021 inclusive. 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](#) 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](#) 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*](#), 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](#). In certain cases, bioenergy can have a carbon intensity [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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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 amount 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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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, 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 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 generation data only includes generation that is attributable to Argentina and not the entire generation output of the plant.

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*.

Armenia

Sources

EIA, UN, 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. Net imports have been carried forward from 2020.
- Monthly generation data from 2009 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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 have been carried forward from 2020.

- 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.
- SWIS monthly data provided by OpenNEM reports lower gas generation than we see in annual figures.

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, UN, 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. Net imports have been carried forward from 2020.
- Monthly generation data from 2009 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise.
- *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*.
- Azerbaijan has a significant amount of co-firing *Gas/Other Fossil* capacity. As a result, our capacity ratios for these fuels may be imprecise.

Bahamas (The)

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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, UN, 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 data from 2009 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise.
- Monthly 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*.
- Belarus has a significant amount 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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, 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.
- *Solar* generation is not included in ENTSO-E generation data. As such, 2021 values may be underestimated.

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. Net imports for 2020 have been carried forward from 2019.

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 for 2021 have been carried forward from 2020.
- 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.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- Monthly electricity generation from 2018 is taken from ISTEEBU. 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

Cayman Islands (The)

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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

Central African Republic (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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 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 2016 is taken from CEN. Thermal generation is disaggregated using IEA thermal ratios.
- Chile does not currently have any 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. Annual net imports from 2000 are taken from the EIA, and carried forward from 2019.
-   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, XM, 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 is usually taken from XM. At present, monthly data from XM is not available due to a change in the source's platform; we will update this as soon as possible.

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*.

Comoros (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Congo (The Democratic Republic of the)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Congo (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Cook Islands (The)

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. Fossil generation for 2020 has been carried forward from 2019.

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. Net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

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

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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

Cyprus

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 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

- 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](#)*.

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. 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Dominican Republic (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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, UN, 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. Net imports have been carried forward from 2019.
- Monthly generation data from 2019 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise. In particular, our *Solar* generation figure [conflicts](#) with a recent report from Egypt's New and Renewable Energy Authority (NREA).

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 has a significant amount 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), 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 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. Net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

Falkland Islands (The) [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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

Faroe Islands (The)

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Gambia (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Georgia

Sources

EIA, ESCO, 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 ESCO.

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*.

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.
- Our estimated coal value for 2021 differs from annual analysis performed by others; at present it is unclear why. It is possible that some ENTSO-E coal generation data in 2021 has been misclassified, with some reported generation in fact being gas rather than coal. However, we do not have clear evidence that this is the case at this time.

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*.

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.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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, 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. Net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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, 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.

Installed Capacity

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

Indonesia

Sources

BP, 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.

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 amount of co-firing *Gas/Other Fossil* capacity. As a result, our capacity ratios for these fuels may be imprecise.

Iran (Islamic Republic of)

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. Net imports for 2020 have been carried forward from 2019.

Installed Capacity

- No source provides *Other Fossil* data of acceptable quality. All other installed capacity data is gathered as described in *Installed Capacity*.
- Iran has a significant amount 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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- *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 amount of co-firing *Gas/Other Fossil* capacity. As a result, our capacity ratios for these fuels may be imprecise.

Ireland

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*.

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*.

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

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

- *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 amount of co-firing *Gas/Other Fossil* capacity. As a result, our capacity ratios for these fuels may be imprecise.

Kazakhstan

Sources

BP, 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 2020 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*.

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. 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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

Korea (The Democratic People's Republic 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. Fossil generation for 2020 has been carried forward from 2019.
- 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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- 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 amount 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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 People's Democratic Republic (The)

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. Net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- *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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

- *Other Fossil* capacity is taken from IRENA. 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- *Other Fossil* may be 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*.
- Libya has a significant amount 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 such capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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.
- No acceptable monthly data could be gathered for Malta. Eurostat data does not include *Solar*, while national data is published on too long a lag to be useful. In this case, 2019 annual data has been carried forward.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Net imports for 2020 have been carried forward from 2019.

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. Net imports for 2021 have been carried forward from 2020.
- 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 such capacity is present. All other installed capacity data is gathered as described in *Installed Capacity*.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Niger (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Nigeria

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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, 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, 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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- 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*.
- Oman has a significant amount 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.
- 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 amount 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

Qatar

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

Russian Federation (The)

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
- 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 amount 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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, and carried forward from 2020.
- Annual electricity generation from 2020 is estimated based on data from the KAPSARC Energy Balance dashboard.

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 amount of co-firing *Gas/Other Fossil* capacity. As a result, our capacity ratios for these fuels may be imprecise.

Senegal

Sources

EIA, UN, 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. Annual net imports are carried forward from 2019.
- Monthly generation from 2009 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise.

Installed Capacity

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

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, 2021 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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

Sudan (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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.

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*.

Syrian Arab Republic (The)

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

Taiwan (Province of China)

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, UN, 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. Net imports for 2021 have been carried forward from 2019.
- Monthly generation data from 2012 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise.

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*.

Tanzania, The United Republic 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Tunisia

Sources

EIA, UN, 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. Net imports for 2021 have been carried forward from 2019.
- Monthly generation data from 2009 is taken from the UN. All fuels are aggregated in this data, so are disaggregated based on the most recent available ratios of fuels from EIA generation data. As such, 2021 values should be treated as indicative rather than precise.

Installed Capacity

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

Turkey

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.
- Turkey 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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 (The)

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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 [currently unavailable], GEM, IRENA

Electricity Generation and Net Imports

- Annual electricity generation from 2000 is taken from the Eurostat.
- Ukraine does not report generation to ENTSO-E. Monthly electricity generation from 2020 is taken from UKRENERGO. Monthly net imports from 2020 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*.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.
- 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 amount 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 continues to report generation to ENTSO-E. This data is combined with ESPENI data to produce an aggregate value for the UK.

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 of America

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 amount of co-firing *Gas/Other Fossil* capacity. As a result, our capacity ratios for these fuels may be imprecise.

Uruguay

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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

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 amount 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. Fossil generation for 2020 has been carried forward from 2019.

Installed Capacity

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

Venezuela (Bolivarian Republic 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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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

Viet Nam

Sources

EIA, Viet Nam Electricity (EVN), 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 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

- *Other Fossil* capacity is taken from IRENA. 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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Fossil generation for 2020 has been carried forward from 2019.

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. Net imports for 2020 have been carried forward from 2019.

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. Fossil generation and net imports for 2020 have been carried forward from 2019.

Installed Capacity

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