

Energy preprocessor

This is the approved revision of this page, as well as being the most recent.

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64 series are read into the energy preprocessor. Most energy data comes from: BGR, BP, EIA, and the IEA. There are some old WRI series that need to be either updated or the preprocessor needs to be adjusted. There are also some old series from the Oil & Gas Journal that need to be revisited. World Energy Council (WEC)

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Energy series pulled into preprocessor

DataDict

Table	Source	Last IFs Update	UsedInPreprocessorFileName
SeriesEnResorCoalBGRBBOE	BGR	2012/03/01	ENER
SeriesEnResorGasBGR	BGR	2016/03/05	ENER
SeriesEnReserCBMBGR	BGR	2016/03/05	ENER
SeriesEnReserGasBGR	BGR	2016/03/05	ENER
SeriesEnReserHeavyOilBGR	BGR	2016/03/05	ENER
SeriesEnReserOilBGR	BGR	2016/03/05	ENER
SeriesEnReserOilSandsBGR	BGR	2016/03/05	ENER
SeriesEnReserShaleGasBGR	BGR	2016/03/05	ENER
SeriesEnResorCBMBGR	BGR	2016/03/05	ENER
SeriesEnResorHeavyOilBGR	BGR	2016/03/05	ENER
SeriesEnResorOilBGR	BGR	2016/03/05	ENER
SeriesEnResorOilSandsBGR	BGR	2016/03/05	ENER
SeriesEnResorShaleGasBGR	BGR	2016/03/05	ENER
SeriesEnResorShaleOilBGR	BGR	2016/03/05	ENER
SeriesEnResorTightGasBGR	BGR	2016/03/05	ENER
SeriesEnReserShaleOilBGR	BGR	2016/03/05	ENER
SeriesEnReserOilBP	BP	2016/01/27	ENER
SeriesEnProdOilBP	BP	2016/01/27	ENER
SeriesEnProdGasBP	BP	2016/01/27	ENER
SeriesEnProdCoalBP	BP	2016/01/27	ENER
SeriesEnConHydroBP	BP	2016/01/27	ENER
SeriesEnReserCoalBP	BP	2016/01/27	ENER
SeriesEnReserGasBP	BP	2016/01/27	ENER
SeriesEnConNucBP	BP	2016/01/27	ENER
SeriesEnProdSolarPhotoIEA	International_Energy_Agency_(IEA)	2013/08/13	ENER
SeriesEnProdTideWaveOceanIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdWindIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdNatGasIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdBiodieselIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdOilIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnExportsNatGasIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdSolarThermIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnExportsCoalIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdHydroIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdGeothermIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnImportsNatGasIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnImportsOilProductsIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdBiogasIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnImportsTotalIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdCoalIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnImportsCoalIEA	International Energy Agency (IEA)	2013/08/13	ENER

SeriesEnExportsTotalIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnExportsPeatIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnExportsOilIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnExportsOilProductsIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnImportsOilIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnImportsPeatIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnProdNuclearIEA	International Energy Agency (IEA)	2013/08/13	ENER
SeriesEnResorGasUSGS	U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at: http://pubs.usgs.gov/dds/dds-060/index.html#TOP	2005/01	ENER
SeriesEnResorNGLUSGS	U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at: http://pubs.usgs.gov/dds/dds-060/index.html#TOP	2005/01	ENER
SeriesEnResorOilUSGS	U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at: http://pubs.usgs.gov/dds/dds-060/index.html#TOP	2005/01	ENER
SeriesGDPCurDol	World Development Indicators (WDI)	2015/07/14	ENER
SeriesEnConElec	World Development Indicators (WDI)	2014/06/11	ENER
SeriesEnReserGas	WEC; Oil and Gas Journal; 1960 estimated	02/25/2012	ENER
SeriesEnReserOil	WEC; Oil and Gas Journal; 1960 estimated	02/25/2012	ENER
SeriesEnReserHyd	World Resources Institute (WRI)		ENER
SeriesEnProdGas	World Resources Institute (WRI)		ENER
SeriesEnProdCoal	World Resources Institute (WRI)		ENER
SeriesEnProdOil	World Resources Institute (WRI)		ENER
SeriesEnConWind	World Resources Institute (WRI)	2002/11	ENER
SeriesEnConPhoto	World Resources Institute (WRI)	2002/11	ENER
SeriesEnProdSolar	World Resources Institute (WRI)	2002/11	ENER
SeriesEnProdTideWave	World Resources Institute (WRI)	2002/11	ENER
SeriesEnProdGeoTherm	World Resources Institute (WRI)	2002/11	ENER

Initialization of data

Production

Oil

Oil production is initialized using **SeriesEnProdOilIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Crude Oil Production
- **Country coverage:** 137 Countries, 1971-2011
- Source definition: Crude oil comprises crude oil, natural gas liquids, refinery feedstocks, and additives as well as other hydrocarbons (including emulsified oils, synthetic crude oil, mineral oils extracted from bituminous minerals such as oil shale, bituminous sand, etc., and oils from coal liquefaction). Crude oil is a mineral oil consisting of a mixture of hydrocarbons of natural origin and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperatures and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. It includes field or lease condensates (separator liquids) which are recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream. All IEA definitions

available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro>

If null use BP data: **SeriesEnProdOilBP**

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Data in Million Tonnes of Oil Equivalent
- **Country coverage:** 49 Countries, 1965-2014
- Source definition: Oil production data includes crude oil, tight oil, oil sands, and NGLS (the liquid content of natural gas where this is removed separately). The data excludes liquid fuels from other sources such as biomass and derivatives of coal and natural gas. World oil production tables are available in both thousand barrels daily and million tonnes. All BP definitions available at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

If still null use WRI data: **SeriesEnProdOil**

- **Source:** WRI CD 98
- **Definition:** Oil Production
- **Country coverage:** 156 Countries, 1960-1995 (last year with data)
- Source definition:

If still null then estimate as .02% of GDP:

If IsNull(COil) Then COil = CGDP(ICount%) * 0.002 * 0.1

Gas

Gas production is initialized using **SeriesEnProdNatGasIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Production of Natural Gas
- **Country coverage:** 137 Countries, 1960-2011.
- Source definition: Natural gas comprises gases, occurring in underground deposits, whether liquefied or gaseous, consisting mainly of methane. It includes both "non-associated" gas originating from fields producing only hydrocarbons in gaseous form, and "associated" gas produced in association with crude oil as well as methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas). Production represents dry marketable production within national boundaries, including offshore production and is measured after purification and extraction of NGL and sulphur. It includes gas consumed by gas processing plants and gas transported by pipeline. Quantities of gas that are re-injected, vented or flared are excluded. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro>

If null then use **SeriesEnProdGasBP**

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Gas (Natural) Production
- **Country coverage:** 49 Countries, 1970-2014
- Source definition: Gas production comprises marketed production and excludes gas flared or recycled gas. Includes natural gas produced for gas-to-liquids transformation. As far as possible, the data represents standard cubic meters (at 150 degrees Celsius and 1013 mbar. (May not necessarily equate with gas volumes expressed in national terms). Data given in both billion cubic meters and million tons equivalent for world natural gas production for world natural gas production tables. Data in excel workbook in billion cubic feet per day (bcf/d). All BP definitions available at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

Make sure it is not negative:

- $CGas = \text{MAX}(0, CGas)$

If still null then set as .02% of GDP:

$\text{If IsNull}(CGas) \text{ Then } CGas = CGDP(\text{ICount}\%) * 0.002 * 0.1$

Coal

Coal production initialized using **SeriesEnProdCoalIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Production of Coal Products
- **Country coverage:** 137 Countries, 1960-2011
- Source definition: Coal and peat includes all coal, both primary (including hard coal and lignite) and derived fuels (including patent fuel, coke oven coke, gas coke, BKB, gas works gas, coke oven gas, blast furnace gas and oxygen steel furnace gas). Peat is also included in this category. *Note: starting with 2011 edition, gas works gas is included here with coal. In prior years, gas works gas was included with natural gas.* All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

If null use BP data: **SeriesEnProdCoalBP**

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Coal Production
- **Country coverage:** 33 Countries, 1981-2014
- Source definition: Coal production includes data for commercial solid fuels only. Included in the hard coal category are bituminous and anthracite. Sub-bituminous coal includes lignite and brown coal. Other commercial solid fuels are also included. Data excludes coal converted to liquid or gaseous fuels but includes coal consumed in transformation processes. Coal production table: units in million tonnes oil equivalent (mtoe). Units in excel workbook: data million tonnes. All BP definitions available

at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

If still null use WRI data: **SeriesEnProdCoal**

- **Source:** WRI CD 98
- **Definition:** Coal Production
- **Country coverage:** 155 Countries, 1960-1995
- Source definition:

Make sure it is not negative:

$$\text{ENPCoal}(\text{ICount}\%) = \text{AMAX}(0.000001, \text{ENPCoal}(\text{ICount}\%))$$

If still null set as .04% of GDP:

$$\text{If IsNull}(\text{ENPCoal}(\text{ICount}\%)) \text{ Then } \text{ENPCoal}(\text{ICount}\%) = \text{CGDP}(\text{ICount}\%) * 0.002 * 0.2$$

Electricity

Initialize using **SeriesEnConElec**

- **Source:** World Development Indicators (WDI) 2014 May Batch Pull
- **Definition:** Electricity Consumption Total in BBOE
- **Country coverage:** 136 Countries, 1960-2011
- Source definition: Electric Power Consumption (kWh per capita): Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants. WDI definition available
at: <http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC>

If null then set as .02% of GDP:

$$\text{If IsNull}(\text{Elec}) \text{ Then } \text{Elec} = \text{CGDP}(\text{ICount}\%) * 0.002 * 0.1$$

Note: I'm pretty sure this (Elec) is not used anywhere

Hydro

Initialize using **SeriesEnProdHydroIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Potential and Kinetic Energy of Water Converted into Electricity in Hydroelectric Plants
- **Country coverage:** 137 Countries, 1960-2011
- Source definition: Hydro shows the energy content of the electricity produced in hydro

power plants. Hydro output excludes output from pumped storage plants. All IEA definitions available at:

<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >;

If null use BP Data: **SeriesEnConHydroBP**

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Hydro-Electricity Consumption. Data in Million Tonnes of Oil Equivalent
- **Country coverage:** 67 Countries, 1965-2014
- Source definition: The primary energy value of hydroelectricity generation has been derived by calculating the equivalent amount of fossil fuel required to generate the same volume of electricity in a thermal power station, assuming a conversion efficiency of 38% (the average for OECD Thermal Power generation). Data based on gross primary hydroelectric generation and does not account for cross-border electricity supply. All BP definitions available at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

If null then use **SeriesEnProdHydroIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Potential and Kinetic Energy of Water Converted into Electricity in Hydroelectric Plants
- **Country coverage:** 137 Countries, 1960-2011
- Source definition:
- Hydro shows the energy content of the electricity produced in hydro power plants. Hydro output excludes output from pumped storage plants. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >;

Note: *redundant*

If still null then set as .02% of GDP

If IsNull(hyd) Then hyd = CGDP(ICount%) * 0.002 * 0.01

Make sure it's not too small

If hyd < CGDP(ICount%) * 0.002 * 0.001 Then hyd = CGDP(ICount%) * 0.002 * 0.001

Nuclear

Initialize using **SeriesEnProdNuclearIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Energy Produced by Nuclear Fission or Nuclear Fusion
- Coverage: 137 Countries, 1960-2011
- Source definition: Nuclear shows the primary heat equivalent of the electricity produced

by a nuclear power plant with an average thermal efficiency of 33 per cent. All IEA definitions available at:

<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

If null use **SeriesEnConNucBP**

- **Source:** BP's Statistical Review of World Energy
- **Definition:** Nuclear-Electricity Consumption (in million tonnes of oil equivalent)
- Coverage: 67 Countries, 1965-2014
- Source definition: Data are based on gross generation, not accounting for cross-border electricity supply. The primary value of nuclear power generation has been derived by calculating the equivalent amount of fossil fuel required to generate the same volume of electricity in a thermal power station, assuming a conversion efficiency of 38% (the average for OECD thermal power generation). Data for the units are in million tonnes oil equivalent (mtoe) in the PDF. In addition, the data are available in the Excel workbook in terawatt-hours (twh). All BP definitions available at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

If still null then

- If IsNull(Nuc) Then Nuc = 0.00001

Geothermal

Initialize using **SeriesEnProdGeothermIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Energy Produced from Heat Emitted with Earth's Crust, Usually in the form of Hot Water or Steam
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Geothermal, solar, etc. shows production of geothermal, solar, wind and tide/wave/ocean energy and the use of these energy forms for electricity and heat generation. Unless the actual efficiency of the geothermal process is known, the quantity of geothermal energy entering electricity generation is inferred from the electricity production at geothermal plants assuming an average thermal efficiency of 10%. Other uses shown in this column relate to geothermal and solar heat. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

If null then use **SeriesEnProdGeoTherm**

- **Source:** WRI Earthtrends <http://earthtrends.wri.org/>
- Original Source: International Energy Agency (IEA) 2001. Energy Balances of OECD Countries (2001 Edition) and Energy Balances of non-OECD Countries (2001 Edition). <http://data.iea.org/ieastore/default.asp>. Paris: OECD.
- **Definition:** Energy Production, Geothermal

- **Coverage:** 125 Countries, 1960-1997
- Source definition:

If IsNull(Geo) Then Geo = 0.00001

Photovoltaic

Initialize using **SeriesEnProdSolarPhotoIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Electricity Production from Photovoltaic Cells
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Geothermal, solar, etc. shows production of geothermal, solar, wind and tide/wave/ocean energy and the use of these energy forms for electricity and heat generation. Unless the actual efficiency of the geothermal process is known, the quantity of geothermal energy entering electricity generation is inferred from the electricity production at geothermal plants assuming an average thermal efficiency of 10%. For solar, wind and tide/wave/ocean energy, the quantities entering electricity generation are equal to the electrical energy generated. Other uses shown in this column relate to geothermal and solar heat. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

If null then use **SeriesEnConPhoto**

- **Source:** WRI Earthtrends <http://earthtrends.wri.org/>
- Original Source: International Energy Agency (IEA) 2001. Energy Balances of OECD Countries (2001 Edition) and Energy Balances of non-OECD Countries (2001 Edition). <http://data.iea.org/ieastore/default.asp>. Paris: OECD.
- **Definition:** Energy Consumption, Photovoltaic Cells
- **Coverage:** 128 Countries, 1960-1999
- Source definition:

If IsNull(Photo) Then Photo = 0.000001

Wind

Initialize using **SeriesEnProdWindIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Electricity Generation by Wind Turbines
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Geothermal, solar, etc. shows production of geothermal, solar, wind and tide/wave/ocean energy and the use of these energy forms for electricity and heat generation. Unless the actual efficiency of the geothermal process is known, the quantity of geothermal energy entering electricity generation is inferred from the electricity

production at geothermal plants assuming an average thermal efficiency of 10%. For solar, wind and tide/wave/ocean energy, the quantities entering electricity generation are equal to the electrical energy generated. Other uses shown in this column relate to geothermal and solar heat. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >;

If null use **SeriesEnConWind**

- **Source:** WRI Earthtrends <http://earthtrends.wri.org/>
- **Original Source:** International Energy Agency (IEA) 2001. Energy Balances of OECD Countries (2001 Edition) and Energy Balances of non-OECD Countries (2001 Edition). <http://data.iea.org/ieastore/default.asp>. Paris: OECD.
- **Definition:** Energy Consumption, Wind
- **Coverage:** 128 Countries, 1960-1999
- Source definition:

If IsNull(Wind) Then Wind = 0.000001

Solar

Initialize using **SeriesEnProdSolarThermIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Energy Production from Solar Radiation used for Hot Water Production and Electricity Generation (Passive Solar for Direct Heating, Cooling, Lighting not Included). For solar thermal electricity technologies, a global efficiency of 33% is used for the transformation of heat into electricity (Stoffregen and Schuller, 2014). All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >;
- **Coverage:** 137 Countries, 1960-2011
- Source definition:

If null use **SeriesEnProdSolar**

- **Source:** WRI Earthtrends <http://earthtrends.wri.org/>
- **Original Source:** International Energy Agency (IEA) 2001. Energy Balances of OECD Countries (2001 Edition) and Energy Balances of non-OECD Countries (2001 Edition). <http://data.iea.org/ieastore/default.asp>. Paris: OECD.
- **Definition:** Energy Production, Solar
- **Coverage:** 128 Countries, 1960-1999
- Source definition:

If IsNull(Solar) Then Solar = 0.000001

Tidal/Wave

Initialize using **EnProdTideWaveOceanIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Electricity Generation Derived from Tidal Movement, Wave Motion, or Ocean Current
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Geothermal, solar, etc. shows production of geothermal, solar, wind and tide/wave/ocean energy and the use of these energy forms for electricity and heat generation. Unless the actual efficiency of the geothermal process is known, the quantity of geothermal energy entering electricity generation is inferred from the electricity production at geothermal plants assuming an average thermal efficiency of 10%. For solar, wind and tide/wave/ocean energy, the quantities entering electricity generation are equal to the electrical energy generated. Other uses shown in this column relate to geothermal and solar heat. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >;

If null use **SeriesEnProdTideWave**

- **Source:** WRI Earthtrends <http://earthtrends.wri.org/>
- Original Source: International Energy Agency (IEA) 2001. Energy Balances of OECD Countries (2001 Edition) and Energy Balances of non-OECD Countries (2001 Edition). <http://data.iea.org/ieastore/default.asp>. Paris: OECD.
- **Definition:** Energy Production, Tide, Wave, and Water
- **Coverage:** 124 Countries, 1960-1997
- Source definition:

If IsNull(TideWave) Then TideWave = 0.000001

Biodiesel

Initialize using **SeriesEnProdBiodieselIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Production of Biodiesel
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Biodiesels includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), bio-dimethylether (dimethylether produced from biomass), Fischer Tropsh (Fischer Tropsh produced from biomass), cold pressed bio-oil (oil produced from oil seed through mechanical processing only) and all other liquid biofuels which are added to, blended with or used straight as transport diesel. Other liquid biofuels includes liquid biofuels not reported in either biogasoline or biodiesels. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >;

If IsNull(BioDiesel) Then BioDiesel = 0.000001

Biogas

Initialize using **SeriesEnProdBiogasIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Production of Biogas (Derived from Anaerobic Fermentation of Biomass and Solid Wastes and Combusted to Produce Heat and/or Power).
- **Coverage:** 137 Countries, 1960-2011.
- Source definition: Biogasoline includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (methanol produced from biomass and/or the biodegradable fraction of waste), bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol; the percentage by volume of bio-ETBE that is calculated as biofuel is 47%) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol: the percentage by volume of bioMTBE that is calculated as biofuel is 36%). All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

If IsNull(BioGas) Then BioGas = 0.000001

Production growth rates

Need to update because of new data

Trade

Initialize total energy exports with **SeriesEnExportsTotalIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Total Energy Exports
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Electricity amounts are considered as imported or exported when they have crossed the national territorial boundaries of the country. If electricity is "wheeled" or transited through a country, the amount is shown as both an import and an export. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize coal exports using **SeriesEnExportsCoalIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Exports of Coal and Coal Products
- **Coverage:** 137 Countries, 1960-2011
- Source definition: Coal imports and exports comprise the amount of fuels obtained from or supplied to other countries, whether or not there is an economic or customs union between the relevant countries. Coal in transit should not be included. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Natural Gas Exports using '**SeriesEnExportsNatGasIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Exports of Natural Gas
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Oil and gas:** Quantities of crude oil and oil products imported or exported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination. **Natural Gas :** Natural gas comprises gases, occurring in underground deposits, whether liquefied or gaseous, consisting mainly of methane. It includes both "non-associated" gas originating from fields producing only hydrocarbons in gaseous form, and "associated" gas produced in association with crude oil as well as methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas). Production represents dry marketable production within national boundaries, including offshore production and is measured after purification and extraction of NGL and sulphur. It includes gas consumed by gas processing plants and gas transported by pipeline. Quantities of gas that are re-injected, vented or flared are excluded. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Crude Oil Exports using **SeriesEnExportsOilIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Crude Oil Exports
- **Coverage:** 137 Countries, 1971-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination. **Oil and gas:** Quantities of crude oil and oil products imported or exported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. **Crude Oil:** Crude oil comprises crude oil, natural gas liquids, refinery feedstocks, and additives as well as other hydrocarbons (including emulsified oils, synthetic crude oil, mineral oils extracted from bituminous minerals such as oil shale, bituminous sand, etc., and oils from coal liquefaction). Crude oil is a mineral oil consisting of a mixture of hydrocarbons of natural origin and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperatures and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. It includes field or lease condensates (separator liquids) which are recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Exports of Crude Natural Gas Liquids using **SeriesEnExportsOilProductsIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Exports of Crude Natural Gas Liquids
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination. **Oil and gas:** Quantities of crude oil and oil products imported or exported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. **Oil Products:** Oil products comprise refinery gas, ethane, LPG, aviation gasoline, motor gasoline, jet fuels, kerosene, gas/diesel oil, fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other oil products. Oil products are any oil-based products which can be obtained by distillation and are normally used outside the refining industry. The exceptions to this are those finished products which are classified as refinery feedstocks. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Exports of Peat using **SeriesEnExportsPeatIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Peat Exports
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Peat:** Peat is a combustible soft, porous or compressed, fossil sedimentary deposit of plant origin with high water content (up to 90 per cent in the raw state), easily cut, of light to dark brown colour. Peat used for non-energy purposes is not included. All IEA definitions available at:
[<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >]

Initialize Imports of Coal and Coal Products using **SeriesEnImportsCoalIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Imports of Coal and Coal Products
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Coal:** Imports and exports comprise the amount of fuels obtained from or supplied to other countries, whether or not there is an economic or customs union between the

relevant countries. Coal in transit should not be included. Coal and peat includes all coal, both primary (including hard coal and lignite) and derived fuels (including patent fuel, coke oven coke, gas coke, BKB, gas works gas, coke oven gas, blast furnace gas and oxygen steel furnace gas). Peat is also included in this category. *Note: starting with 2011 edition, gas works gas is included here with coal. In prior years, gas works gas was included with natural gas.* All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Imports of Natural Gas using **SeriesEnImportsNatGasIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Imports of Natural Gas
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Oil and gas:** Quantities of crude oil and oil products imported or exported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination. **Natural Gas:** Natural gas comprises gases, occurring in underground deposits, whether liquefied or gaseous, consisting mainly of methane. It includes both "non-associated" gas originating from fields producing only hydrocarbons in gaseous form, and "associated" gas produced in association with crude oil as well as methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas). Production represents dry marketable production within national boundaries, including offshore production and is measured after purification and extraction of NGL and sulphur. It includes gas consumed by gas processing plants and gas transported by pipeline. Quantities of gas that are re-injected, vented or flared are excluded. All IEA definitions available at:
<https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Crude Oil Imports using **SeriesEnImportsOilIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Crude Oil Imports
- **Coverage:** 137 Countries, 1971-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Oil and gas:** Quantities of crude oil and oil products imported or exported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination. **Crude Oil:** Crude oil comprises crude oil, natural gas liquids, refinery feedstocks, and additives

as well as other hydrocarbons (including emulsified oils, synthetic crude oil, mineral oils extracted from bituminous minerals such as oil shale, bituminous sand, etc., and oils from coal liquefaction). Crude oil is a mineral oil consisting of a mixture of hydrocarbons of natural origin and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperatures and pressure and its physical characteristics (density, viscosity, etc.) are highly variable. It includes field or lease condensates (separator liquids) which are recovered from associated and non-associated gas where it is commingled with the commercial crude oil stream. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Imports of Crude Natural Gas Liquids **SeriesEnImportsOilProductsIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Imports of Crude Natural Gas Liquids
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Oil and gas:** Quantities of crude oil and oil products imported or exported under processing agreements (i.e. refining on account) are included. Quantities of oil in transit are excluded. Crude oil, NGL and natural gas are reported as coming from the country of origin; refinery feedstocks and oil products are reported as coming from the country of last consignment. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination. **Oil Products:** Oil products comprise refinery gas, ethane, LPG, aviation gasoline, motor gasoline, jet fuels, kerosene, gas/diesel oil, fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke and other oil products. Oil products are any oil-based products which can be obtained by distillation and are normally used outside the refining industry. The exceptions to this are those finished products which are classified as refinery feedstocks. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

Initialize Peat Imports using **SeriesEnImportsPeatIEA**

- **Source:** IEA 2012 Batch Pull
- **Definition:** Peat Imports
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place. **Peat:** Peat is a combustible soft, porous or compressed, fossil sedimentary deposit of plant origin with high water content (up to 90 per cent in the raw state), easily cut, of light to dark brown colour. Peat used for non-energy purposes is not included. All IEA definitions available at: <https://www.iea.org/statistics/resources/balanceddefinitions/#hydro >

SeriesEnImportsTotalIEA

- **Source:** IEA 2012 Batch Pull

- **Definition:** Total Energy Imports
- **Coverage:** 137 Countries, 1960-2011
- Source definition: *Imports and exports* comprise amounts having crossed the national territorial boundaries of the country, whether or not customs clearance has taken place.

MISSING TRADE SERIES

Reserves

Oil reserves

Initialize oil reserves as the max of **SeriesEnReserOil**, **SeriesEnReserOilBP** and **SeriesEnReserOilBGR**.

SeriesEnReserOil

- **Source:** World Energy Council (WEC); Oil and Gas Journal; 1960 estimated
- **Definition:** Energy Reserve, Oil, in Billion Barrels
- **Coverage:** 97 Countries, 1952-2012
- Source definition: **Crude oil** is a naturally occurring mixture consisting predominantly of hydrocarbons that exists in liquid phase in natural underground reservoirs and is recoverable as liquids at typical atmospheric conditions of pressure and temperature. Crude oil has a viscosity no greater than 10 000 Pa.s (centipoises) at original reservoir conditions; oils of greater viscosity are included in Chapter 4 - Natural Bitumen and Extra-Heavy Oil. **Natural gas liquids** (NGLs) are hydrocarbons that exist in the reservoir as constituents of natural gas but which are recovered as liquids in separators, field facilities or gas-processing plants. Natural gas liquids include (but are not limited to) ethane, propane, butanes, pentanes, natural gasoline and condensate; they may include small quantities of non-hydrocarbons. If reserves/resources/production/consumption of NGLs exist but cannot be separately quantified, they are included (as far as possible) under crude oil. In the tables the following definitions apply to both crude oil and natural gas liquids: **Proved amount in place** is the resource remaining in known natural reservoirs that has been carefully measured and assessed as exploitable under present and expected local economic conditions with existing available technology. **Proved recoverable reserves** are the quantity within the proved amount in place that can be recovered in the future under present and expected local economic conditions with existing available technology. **Estimated additional amount in place** is the resource additional to the proved amount in place that is of foreseeable economic interest. **Speculative amounts** are not included. World Energy Council 2013 World Energy Resources: Annexes A.7 Estimated additional reserves recoverable is the quantity within the estimated additional amount in place that geological and engineering information indicates with reasonable certainty might be recovered in the future. All WEC definitions available at: https://www.worldenergy.org/wp-content/uploads/2013/09/WER_2013_Annexes.pdf

SeriesEnReserOilBP

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Oil Reserves (Data in thousand million barrels)
- **Coverage:** 49 Countries (1980-2014)
- **Source definition:** Total proved reserves of oil are those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and geological conditions. The data series has been compiled using a combination of primary official sources and third-party data. Oil reserves include field condensate and natural gas liquids as well as crude oil. Liquid hydrocarbon fuels from non-hydrocarbon sources, such as ethanol from corn or sugar or synthetic oil derived from natural gas (so-called GTL or gas-to-liquids), are not included in either the reserves or production series. Data are measured in thousand million barrels. R/P ratios represent the length of time that those remaining reserves would last if production were to continue at the previous year's rate. They are calculated by dividing remaining reserves at the end of the year by the production in that year. Reserves-to-production (R/P) ratios are available by country and feature in the table of oil reserves. All BP definitions available at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

SeriesEnReserOilBGR

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Crude Oil Reserves
- **Coverage:** 137 Countries, 2011-2013
- **Source definition:** Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Crude Oil:* Natural occurring mixture of liquid hydrocarbons. The liquid hydrocarbons such as natural gas liquids (NGL) and condensates co-produced from a natural gas well are also categorized as oil production. *Conventional Crude Oil:* Generally used to describe oil that can be produced by relatively simple methods and inexpensively thanks to its low viscosity and a density of less than 1 gm per cubic centimeter (heavy oil, light oil, condensate). *Non-Conventional Crude Oil:* Hydrocarbons that cannot be produced using "classic" methods, but which require more complicated technology to produce them from the ground. In the reservoir itself, this oil is either incapable of flowing or can only flow marginally because of its high viscosity and/or density (extra heavy oil, bitumen), or because of the very low permeability of the reservoir rock (crude oil in tight rocks, tight oil, shale oil). In the case of oil shale, the oil is still in the form of kerogen in an early maturation stage. *Original reserves: cumulative production plus remaining reserves. All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2
- Converted to BBOE using (*7.33 / 1000)

- If ReserOil is less than 0.01 then set it to 15 times oil production
- If ReserOil is less than 10 times oil production, set it to 10 times oil production
- **Need to justify**

Gas reserves

Initialize Natural Gas Reserves using the max of **SeriesEnReserGas**, **SeriesEnReserGasBP**, and **SeriesEnReserGasBGR**

SeriesEnReserGas

- **Source:** WEC; Oil and Gas Journal, 1960 estimated
- **Definition:** Energy Reserves, Gas
- **Coverage:** 102 Countries, 1960-2012
- Source definition: **Natural gas** is a mixture of hydrocarbon and small quantities of non-hydrocarbons that exists either in the gaseous phase or is in solution in crude oil in natural underground reservoirs, and which is gaseous at atmospheric conditions of pressure and temperature. **Natural gas liquids** (hydrocarbons that exist in the reservoir as constituents of natural gas but which are recovered as liquids in separators, field facilities or gas-processing plants) are discussed in Chapter 2 – Crude Oil and Natural Gas Liquids. **Proved amount in place** is the resource remaining in known natural reservoirs that has been carefully measured and assessed as exploitable under present and expected local economic conditions with existing available technology. **Proved recoverable reserves** are the volume within the proved amount in place that can be recovered in the future under present and expected local economic conditions with existing available technology. **Estimated additional amount** in place is the volume additional to the proved amount in place that is of foreseeable economic interest. Speculative amounts are not included. **Estimated additional reserves** recoverable is the volume within the estimated additional amount in place that geological and engineering information indicates with reasonable certainty might be recovered in the future. All WEC definitions available at: https://www.worldenergy.org/wp-content/uploads/2013/09/WER_2013_Annexes.pdf

SeriesEnReserGasBP

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Gas (Natural) Reserves (Data in million tonnes of oil equivalent)
- **Coverage:** 51 Countries, 1980-2014
- Source definition: Total proved reserves of natural gas are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions. Rather the data series has been compiled using a combination of primary official sources and third-party data. There is a time series of natural gas reserves. Data are measured in billion cubic metres. Although every effort is made to come up with a consistent series for reserves based on a common definition, in reality different countries use different methodologies and the data have varying levels of

reliability. R/P ratios represent the length of time that those remaining reserves would last if production were to continue at the previous year's rate. They are calculated by dividing remaining reserves at the end of the year by the production in that year. Reserves-to-production (R/P) ratios are available by country and feature in the table of gas reserves.

All BP definitions available at: <a

href="http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html"

alt="http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html"

title="http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-

energy.html">http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

SeriesEnReserGasBGR

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Natural Gas Reserves
- **Coverage:** 141 Countries, 2011-2013
- Source definition: Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Original reserves: cumulative production plus remaining reserves.* Natural Gas: Gas occurring naturally underground or flowing out at the surface. Combustible gases with variable chemical compositions. *Wet natural gas* contains methane as well as longer chain hydrocarbon constituents. *Dry natural gas* only contains gaseous components and mainly consists of methane. *Sour natural gas:* free natural gas or crude oil gas in structural or stratigraphic traps. *Natural gas from non-conventional deposits (in short: non-conventional natural gas):* Due to the nature and properties of the reservoir, the gas does not usually flow in adequate quantities into the production well without undertaking additional technical measures, either because it is not present in the rock in a free gas phase, or because the reservoir is not sufficiently permeable. These non-conventional deposits of natural gas include shale gas, tight gas, coal bed methane (CBM), aquifer gas and gas from gas hydrates. *All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2
- Converted to BBOE using (*6.6/1000)
- If ReserGas is less than 0.01 then set at 15 times gas production (ENPGas)
- If ReserGas is less than 10 times gas production, set at 10 times gas production
- **Need to justify**

Coal reserves

Initialize Coal Reserves using **SeriesEnReserCoalBP**

- **Source:** BP's Statistical Review of World Energy 2013
- **Definition:** Coal Reserves (Data in million tonnes of oil equivalent)
- **Coverage:** 33 Countries, 2007-2014
- Source definition: Total proved reserves of coal are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known deposits under existing economic and operating conditions. Total proved coal reserves are shown for anthracite and bituminous (including brown coal) and sub-bituminous and lignite. Coal reserve data is in million tonnes. Reserves-to-production (R/P) ratios represent the length of time that those remaining reserves would last if production were to continue at the previous year's rate. They are calculated by dividing remaining reserves at the end of the year by the production in that year. The R/P ratios are calculated excluding other solid fuels in reserves and production. R/P ratios are available by country and feature in the table of coal reserves. All BP definitions available at: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>
- If ReserCoal is less than 0.02 then set at 20 times coal production
- If ReserCoal is less than 30 times coal production, then set at 30 times coal production
- **Need to justify**

Hydro reserves

Initialize Hydro Reserves using **SeriesEnReserHyd**

- **Source:** WRI Annual
- **Definition:** Energy Reserves, Hydro
- **Coverage:** 141 Countries, 1960, 1999
- Source definition:
- Covert from installed MGW to BBOE by dividing by 474750
- If ReserHyd is less than 0.02 then set at 2 times hydro production (ENPHyd)
- If ReserHyd is less than 1.5 times hydro production then set at 1.5 times hydro production
- **Need to justify**

Resources

Oil resources

Initialize Oil Resources using **SeriesEnResorOilBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Crude Oil Resources
- **Coverage:** 137 Countries, 2011-2013
- Source definition: Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future.

Crude Oil: Natural occurring mixture of liquid hydrocarbons. The liquid hydrocarbons such as natural gas liquids (NGL) and condensates co-produced from a natural gas well are also categorized as oil production.

Conventional Crude Oil: Generally used to describe oil that can be produced by relatively simple methods and inexpensively thanks to its low viscosity and a density of less than 1 gm per cubic centimeter (heavy oil, light oil, condensate).

Non-Conventional Crude Oil: Hydrocarbons that cannot be produced using "classic" methods, but which require more complicated technology to produce them from the ground. In the reservoir itself, this oil is either incapable of flowing or can only flow marginally because of its high viscosity and/or density (extra heavy oil, bitumen), or because of the very low permeability of the reservoir rock (crude oil in tight rocks, tight oil, shale oil). In the case of oil shale, the oil is still in the form of kerogen in an early maturation stage. All current definitions of BGR available at: http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

- Convert to BBOE using the conversion ($*7.33 / 1000$)
- If null, set as oil reserves (ReserOil) $* 1.6$
- Make sure oil resources are at least 1.6 times reserves

Note: We no longer use oil resource data from the USGS

Initialize Undiscovered Energy Resources, Oil using **SeriesEnResorOilUSGS**

- **Source:** U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at: <http://pubs.usgs.gov/dds/dds-060/index.html#TOP>
- **Definition:** Undiscovered Energy Resources, Oil
- **Coverage:** 91 Countries, 2000
- Source definition: Undiscovered resources are those resources postulated from geologic knowledge and theory to exist outside of known fields. Undiscovered conventional resources can be allocated by volume percent among various land entities within the assessment unit. Undiscovered conventional resources are partitioned among various

land entities within the assessment unit, and also their offshore areas, using allocation percentages estimated by the assessment geologist. Geology and exploration/discovery history were characterized in terms of an assessment unit (AU), which was the basic entity for organizing data for the volumetric assessments of undiscovered oil and gas resources. Estimates of the number and sizes of undiscovered oil and gas fields greater than or equal to a minimum size and their coproduct ratios were recorded on assessment forms. Reserve growth of fields was considered in evaluating existing and undiscovered field sizes. The grown field sizes were plotted to provide a discovery-history field profile from which undiscovered field sizes were estimated. Definitions and discussions of the US Geological Survey methodology are available at:
<http://pubs.usgs.gov/dds/dds-060/index.html#TOP>

Gas resources

Initialize Natural Gas Resources using **SeriesEnResorGasBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Natural Gas Resources
- **Coverage:** 141 Countries, 2011-2013
- **Source definition:** Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. Natural Gas: Gas occurring naturally underground or flowing out at the surface. Combustible gases with variable chemical compositions. *Wet natural gas* contains methane as well as longer chain hydrocarbon constituents. *Dry natural gas* only contains gaseous components and mainly consists of methane. *Sour natural gas*: free natural gas or crude oil gas in structural or stratigraphic traps. *Natural gas from non-conventional deposits (in short: non-conventional natural gas)*: Due to the nature and properties of the reservoir, the gas does not usually flow in adequate quantities into the production well without undertaking additional technical measures, either because it is not present in the rock in a free gas phase, or because the reservoir is not sufficiently permeable. These non-conventional deposits of natural gas include shale gas, tight gas, coal bed methane (CBM), aquifer gas and gas from gas hydrates. All current definitions of BGR available at:
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Note: We no longer use gas resource data from the USGS

Initialize Undiscovered Energy Resources, Gas using **SeriesEnResorGasUSGS**

- **Source:** U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at:
<http://pubs.usgs.gov/dds/dds-060/index.html#TOP>
- **Definition:** Undiscovered Energy Resources, Gas

- **Coverage:** 91 Countries, 2000
- **Source definition:** Undiscovered resources are those resources postulated from geologic knowledge and theory to exist outside of known fields. Undiscovered conventional resources can be allocated by volume percent among various land entities within the assessment unit. Undiscovered conventional resources are partitioned among various land entities within the assessment unit, and also their offshore areas, using allocation percentages estimated by the assessment geologist. Geology and exploration/discovery history were characterized in terms of an assessment unit (AU), which was the basic entity for organizing data for the volumetric assessments of undiscovered oil and gas resources. Estimates of the number and sizes of undiscovered oil and gas fields greater than or equal to a minimum size and their coproduct ratios were recorded on assessment forms. Reserve growth of fields was considered in evaluating existing and undiscovered field sizes. The grown field sizes were plotted to provide a discovery-history field profile from which undiscovered field sizes were estimated. Definitions and discussions of the US Geological Survey methodology are available at:
<http://pubs.usgs.gov/dds/dds-060/index.html#TOP>

Initialize Undiscovered Energy Resources, Natural Gas Liquids using **SeriesEnResorNGLUSGS**

- **Source:** U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at:<http://pubs.usgs.gov/dds/dds-060/index.html#TOP>
- **Definition:** Undiscovered Energy Resources, Natural Gas Liquids (data in million barrels)
- **Coverage:** 91 Countries, 2000
- **Source definition:** U.S. GEOLOGICAL SURVEY WORLD PETROLEUM ASSESSMENT 2000 available at:<http://pubs.usgs.gov/dds/dds-060/index.html#TOP>. Undiscovered resources are those resources postulated from geologic knowledge and theory to exist outside of known fields. Undiscovered conventional resources can be allocated by volume percent among various land entities within the assessment unit. Undiscovered conventional resources are partitioned among various land entities within the assessment unit, and also their offshore areas, using allocation percentages estimated by the assessment geologist. Geology and exploration/discovery history were characterized in terms of an assessment unit (AU), which was the basic entity for organizing data for the volumetric assessments of undiscovered oil and gas resources. Estimates of the number and sizes of undiscovered oil and gas fields greater than or equal to a minimum size and their coproduct ratios were recorded on assessment forms. Reserve growth of fields was considered in evaluating existing and undiscovered field sizes. The grown field sizes were plotted to provide a discovery-history field profile from which undiscovered field sizes were estimated. Definitions and discussions of the US Geological Survey methodology are available at:
<http://pubs.usgs.gov/dds/dds-060/index.html#TOP>

Coal resources

Initialize Coal Resources using **SeriesEnResorCoalBGRBBOE**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2010"

Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2010

- **Definition:** Coal Resources
- **Coverage:** 87 Countries, 2009
- **Source definition:** Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. 'Coal Equivalent: Corresponds to the amount of energy released when burning 1 kg hard coal; cf: Conversion factors. Hard coal: Anthracite, bituminous coal, hard lignite with an energy content > 16,500 kJ/kg (ash-free). All current definitions of BGR available at:
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Unconventional resources

Oil unconventional resources

Initialize unconventional oil reserves as the sum of: **SeriesEnReserOilSandsBGR**, **SeriesEnReserShaleOilBGR**, **SeriesEnReserHeavyOilBGR**.

Initialize unconventional oil resources as the sum of unconventional oil reserves and: **SeriesEnResorOilSandsBGR**, **SeriesEnResorShaleOilBGR**, and **SeriesEnResorHeavyOilBGR**

Initialize Oil Sands Reserves using **SeriesEnReserOilSandsBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Oil Sands Reserves
- **Coverage:** 21 Countries, 2011-2013
- **Source definition:** Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Oil sands* are classified as unconventional deposits. *Original reserves: cumulative production plus remaining reserves. All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Initialize Shale Oil Reserves using **SeriesEnReserShaleOilBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Shale Oil Reserves

- **Coverage:** 21 Countries, 2011-2013
- **Source definition:** Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Non-Conventional Crude Oil:* Hydrocarbons that cannot be produced using "classic" methods, but which require more complicated technology to produce them from the ground. In the reservoir itself, this oil is either incapable of flowing or can only flow marginally because of its high viscosity and/or density (extra heavy oil, bitumen), or because of the very low permeability of the reservoir rock (crude oil in tight rocks, tight oil, **shale oil**). In the case of oil shale, the oil is still in the form of kerogen in an early maturation stage. *Original reserves: cumulative production plus remaining reserves. All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Initialize Heavy Oil Reserves using **SeriesEnReserHeavyOilBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Heavy Oil Reserves
- **Coverage:** 18 Countries, 2011-2013
- **Source definition:** Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Conventional Crude Oil:* Generally used to describe oil that can be produced by relatively simple methods and inexpensively thanks to its low viscosity and a density of less than 1 gm per cubic centimeter (**heavy oil**, light oil, condensate). *Original reserves: cumulative production plus remaining reserves. All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Initialize Oil Sands Resources using **SeriesEnResorOilSandsBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Oil Sands Resources
- **Coverage:** 23 Countries, 2011-2013
- **Source definition:** Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. **'Oil sands are classified as unconventional deposits. All current definitions of BGR available at:**
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Initialize Shale Oil Resources using **SeriesEnResorShaleOilBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Shale Oil Resources
- **Coverage:** 23 Countries, 2011-2013
- Source definition: Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. '**Non-Conventional Crude Oil: Hydrocarbons that cannot be produced using "classic" methods, but which require more complicated technology to produce them from the ground. In the reservoir itself, this oil is either incapable of flowing or can only flow marginally because of its high viscosity and/or density (extra heavy oil, bitumen), or because of the very low permeability of the reservoir rock (crude oil in tight rocks, tight oil, shale oil). In the case of oil shale, the oil is still in the form of kerogen in an early maturation stage.**All current definitions of BGR available at:
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Initialize Heavy Oil Resources using **SeriesEnResorHeavyOilBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Heavy Oil Resources
- **Coverage:** 23 Countries, 2011-2013
- Source definition: Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. *Conventional Crude Oil:* Generally used to describe oil that can be produced by relatively simple methods and inexpensively thanks to its low viscosity and a density of less than 1 gm per cubic centimeter (**heavy oil**, light oil, condensate). *All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Gas unconventional resources

Initialize unconventional gas reserves as the sum of: **SeriesEnReserShaleGasBGR** and **SeriesEnReserCBMBGR**

Initialize unconventional gas resources as the sum of unconventional gas reserves and: **SeriesEnResorShaleGasBGR**, **SeriesEnResorCBMBGR**, and **SeriesEnResorTightGasBGR**

Initialize Shale Gas Reserves using **SeriesEnReserShaleGasBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012"
- **Definition:** Shale Gas Reserves
- **Coverage:** 20 Countries, 2011-2013
- Source definition: Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Original reserves: cumulative production plus remaining reserves.* Shale gas: Natural gas from fine-grained rocks (shales). *All current definitions of BGR available at: http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2*

Initialize Coalbed Methane Reserves **SeriesEnReserCBMBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012"
- **Definition:** Coalbed Methane Reserves
- **Coverage:** 21 Countries, 2011-2013
- Source definition: Reserves: Proven volumes of energy resources economically exploitable at today's prices and using today's technology. *Original reserves: cumulative production plus remaining reserves.* Coal-bed methane (CBM): gas contained in coal, including methane. *All current definitions of BGR available at: http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2*

Initialize Shale Gas Resources using **SeriesEnResorShaleGasBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Shale Gas Resources
- Coverage: 23 Countries, 2011-2013
- Source definition: Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. Shale gas: Natural gas from fine-grained rocks (shales). *All current definitions of BGR available at: http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2*

Initialize Coalbed Methane Resources using **SeriesEnResorCBMBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Coalbed Methane Resources
- **Coverage:** 23 Countries, 2011-2013

- Source definition: Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. Coal-bed methane (CBM): gas contained in coal, including methane. *All current definitions of BGR available at:*
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

Initialize Tight Gas Resources using **SeriesEnResorTightGasBGR**

- **Source:** BGR; "Reserves, Resources and Availability of Energy Resources 2012" Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover; Annual Report. Reserves, Resources and Availability of Energy Resources 2012
- **Definition:** Tight Gas Resources
- **Coverage:** 23 Countries, 2011-2013
- Source definition: Resources: Proven amounts of energy resources which cannot currently be exploited for technical and/or economic reasons, as well as unproven but geologically possible energy resources which may be exploitable in the future. '*Tight Gas*: Natural gas from tight sandstones and limestones. All current definitions of BGR available at:
http://www.bgr.bund.de/EN/Themen/Energie/Downloads/energiestudie_2015_en.pdf;jsessionid=674E3D3801CF68D1747AF72C614A72CB.1_cid284?__blob=publicationFile&v=2

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