

# The European Commission's science and knowledge service

Joint Research Centre



# The JRC-IDEES POWER GENERATION

Brussels, 12 Oct 2017

# JRC-IDEES

**I**ntegrated  
**D**atabase of the  
**E**uropean  
**E**nergy  
**S**ystem

# POWER PLANT TYPES – AGGREGATED LEVEL

- Nuclear
- Conventional thermal
  - Coal fired
  - Lignite fired
  - Gas fired
  - Derived gas fired
  - Refinery gas fired
  - Diesel oil fired
  - Fuel oil fired
  - Solid biomass and waste fired
- Wind
- Solar photovoltaics
- Solar thermal
- Geothermal
- Tide, wave and ocean
- Hydro
- Pump storage

*differentiating*

*electricity-only and CHP plants*

# WHAT CAN BE FOUND IN JRC-IDEES

## At aggregated level (fuel types):

- Gross and net capacities
- Gross electricity generation
- Net electricity generation
  - *Own consumption*
- Distributed heat production
  - *CHP*
  - *District heating*
- Transformation inputs, transfers  
*with co-firing contribution quantified*
- CO2 emissions
- Efficiencies
- Rate of use

# WHAT CAN BE FOUND IN JRC-IDEES

## At detailed level (technology types):

- Gross and net capacities
- Number of units
- Typical size of a power plant
- Total stock
- New investments
- Decommissioned power plants
- Decommissioning pathway for current stock

# POWER PLANT TYPES – DETAILED LEVEL

- Nuclear
- Conventional thermal
  - Each fuel-type split into 3-4 technologies:
    - Steam turbine
    - Fluidized bed combustion
    - Integrated gasification combined cycle
    - Supercritical steam turbine
    - Gas turbine
    - Gas turbine combined cycle
    - Internal combustion engine
  - up to 4 size classes
    - *Size limits vary among technologies*
    - *XS size group below ETS limit*
- Wind
  - On-shore / Off-shore
- Solar photovoltaics
- Solar thermal
- Geothermal
- Tide, wave and ocean
  - Tidal / Wave
- Hydro
  - Run-of river / Reservoirs (dams)
- Pump storage

228 power plant type groups

# ELECTRICITY AND HEAT GENERATION

- Source: Eurostat energy balances
  - Transformation input: from the sectoral detail
  - Transformation output (by fuel): from the detailed power statistics
- Some inconsistencies in generation:
  - questionable efficiencies
    - most cases can be solved with reallocation between electricity-only and CHP
  - *missing steam, low steam to electricity ratio*



# IDENTIFYING CO-FIRING QUANTITIES

- Power plant capacities
- Maximum operational conditions
- Actual generation



- Maximum generation



- Generation from other power plant type



- Generation from co-firing / input

Transformation input by plant type including co-firing (ktoe)	401 185
<b>Coal</b>	<b>118 670</b>
Hard coal and derivatives	115 954
Lignite, Peat and Derivates	-
Wood & Waste	2 716
<b>Lignite</b>	<b>89 379</b>
Lignite, Peat and Derivates	86 764
Hard coal and derivatives	24
Wood & Waste	2 590

# POWER PLANT CAPACITIES

## Power plant capacities:

- EPIC database
  - unit level inventory
  - including small power plants
  - extremely detailed for wind and solar

## Capacities cross-checked:

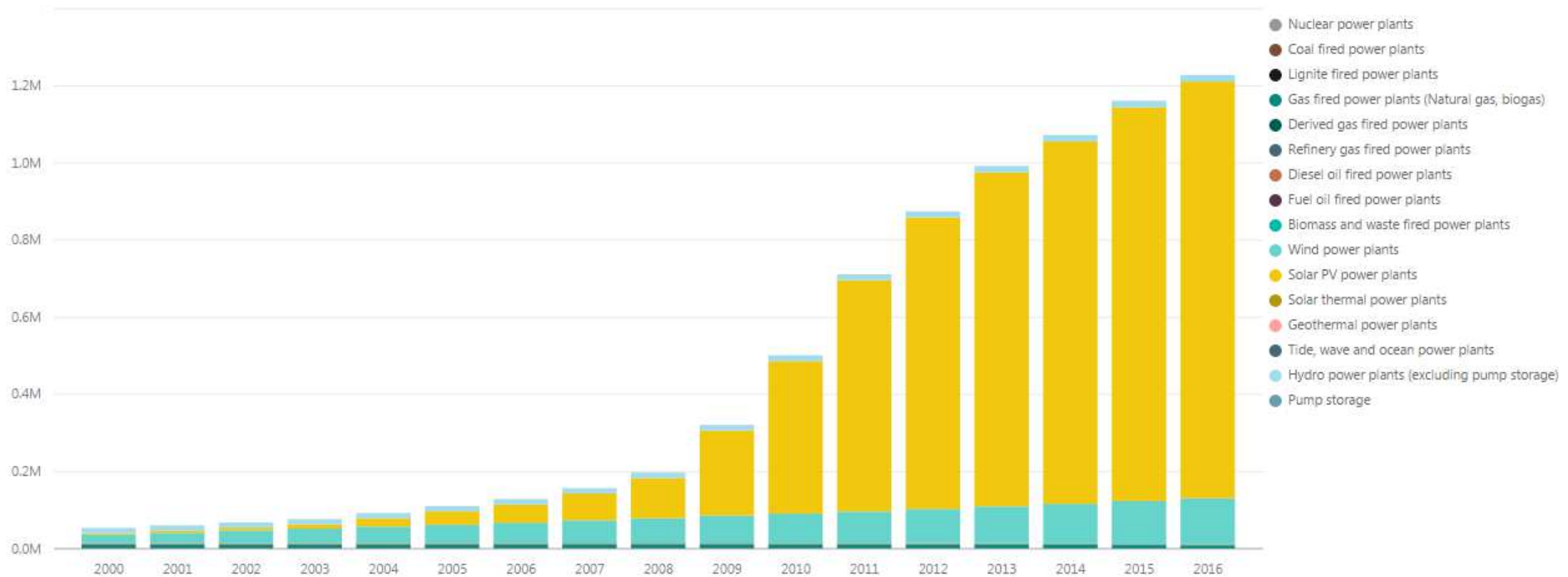
- Eurostat
- EurObserv'ER

# UNIT LEVEL POWER PLANT DATABASE

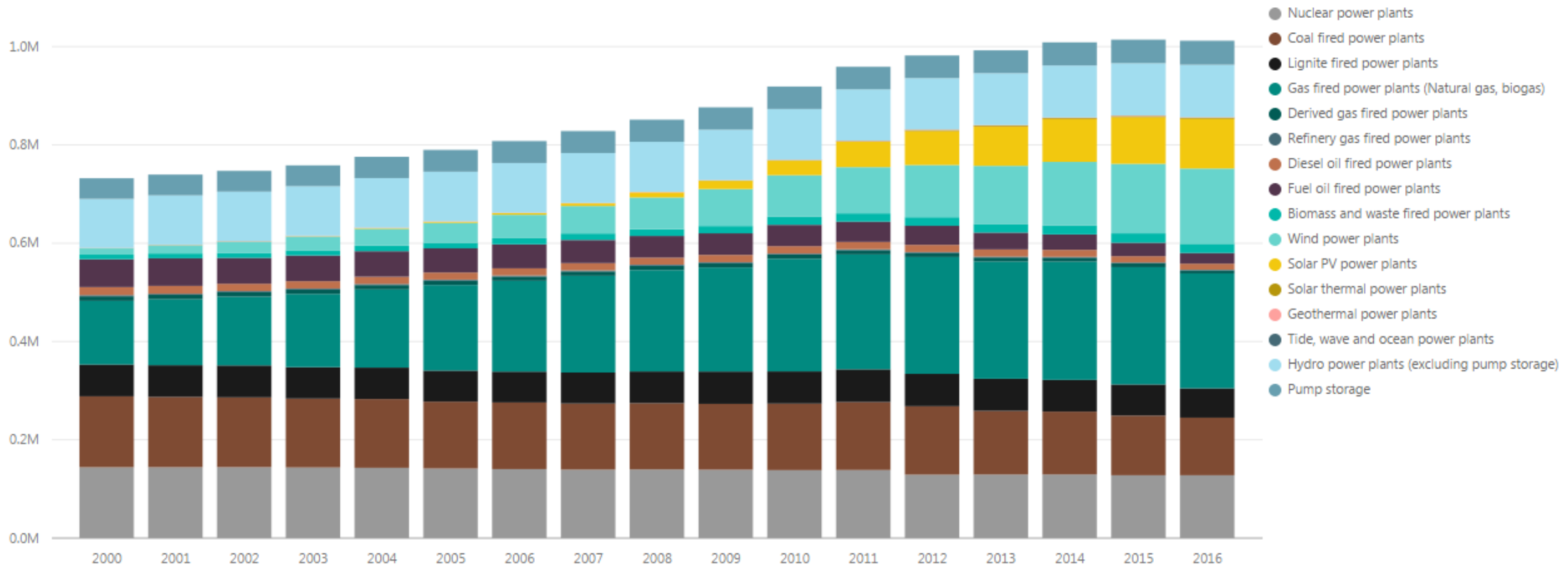
Detailed level of data is providing an aggregation of:

- 1 160 000 power plant units in 2015
  - 130 nuclear power plant units
  - 12 000 thermal power plant units
  - 110 000 wind turbine units
    - out of which 3200 off-shore*
  - 1 000 000 solar PV
    - out of which 619 000 with an average size of 22.6 kW*
  - 16 000 hydro units
    - out of which 1 570 reservoirs*
  - 470 pumped storage units
  - 58 geothermal
  - 51 solar thermal
  - 30 tidal/wave units

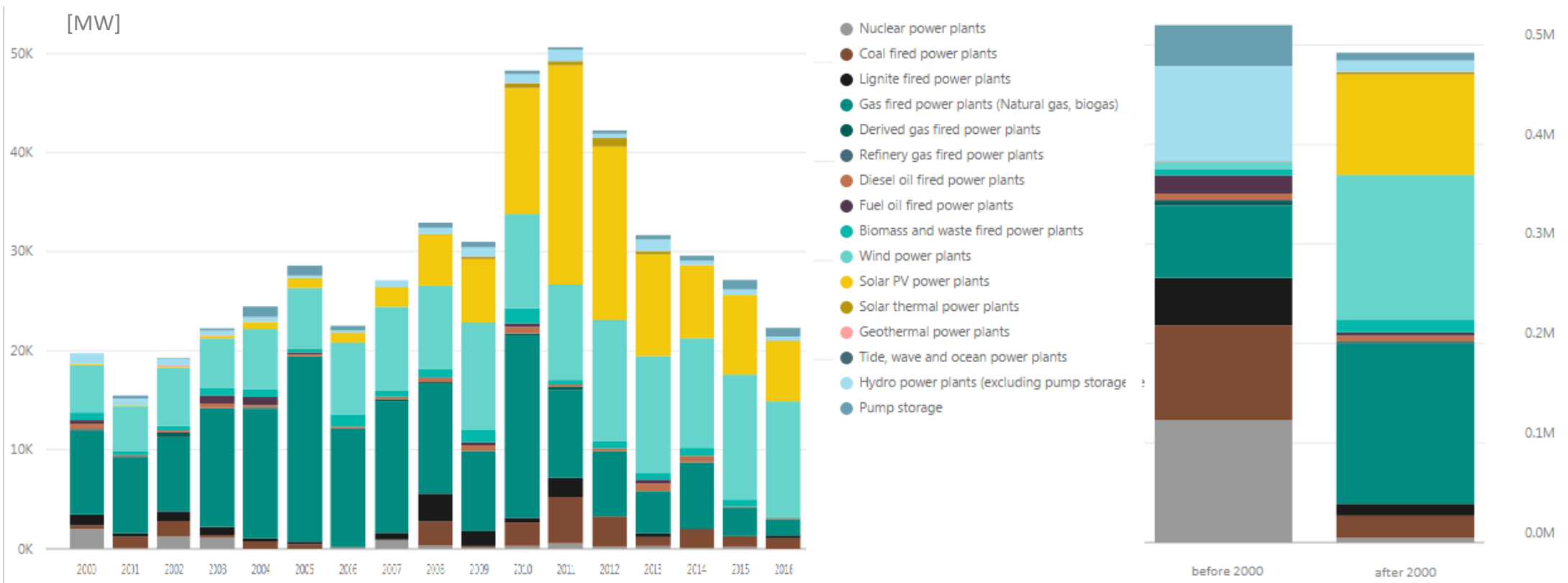
# NUMBER OF POWER PLANT UNITS



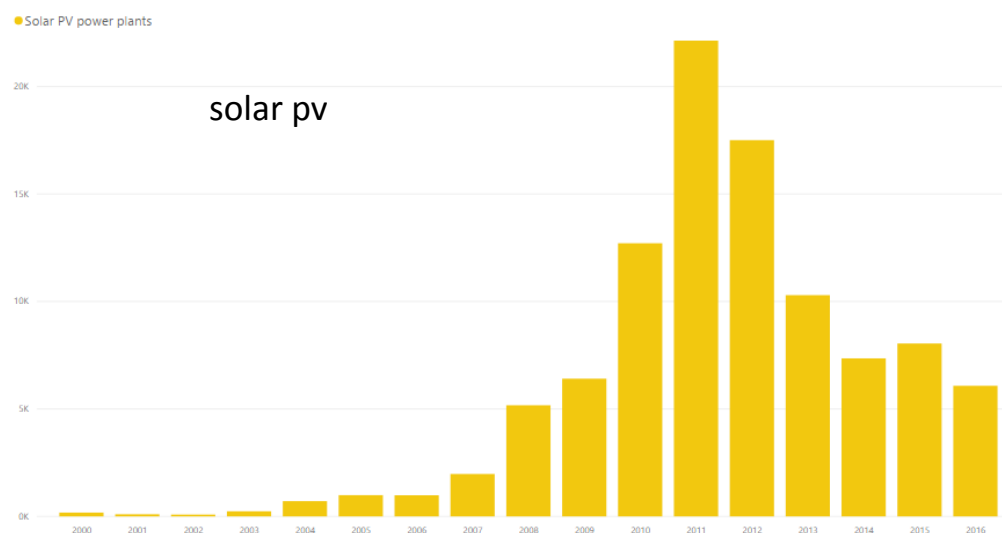
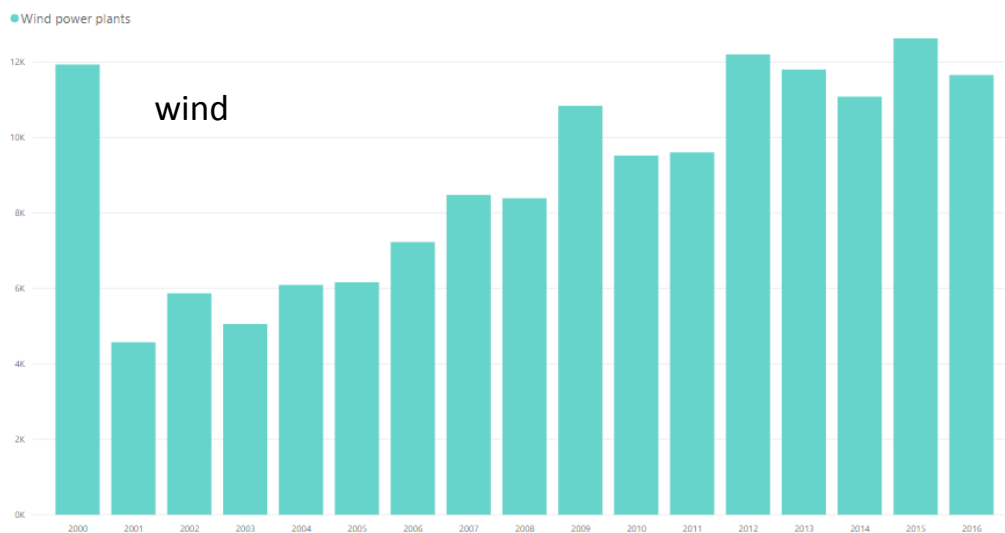
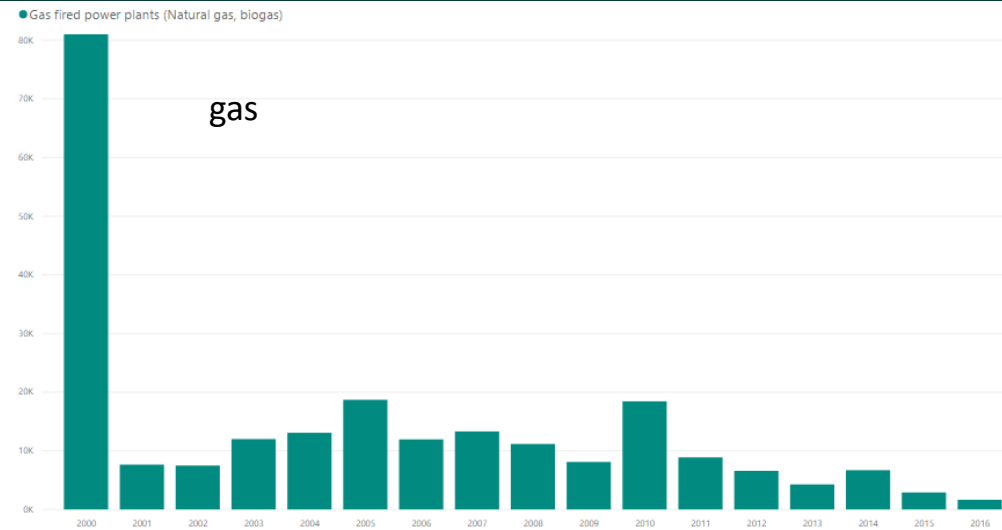
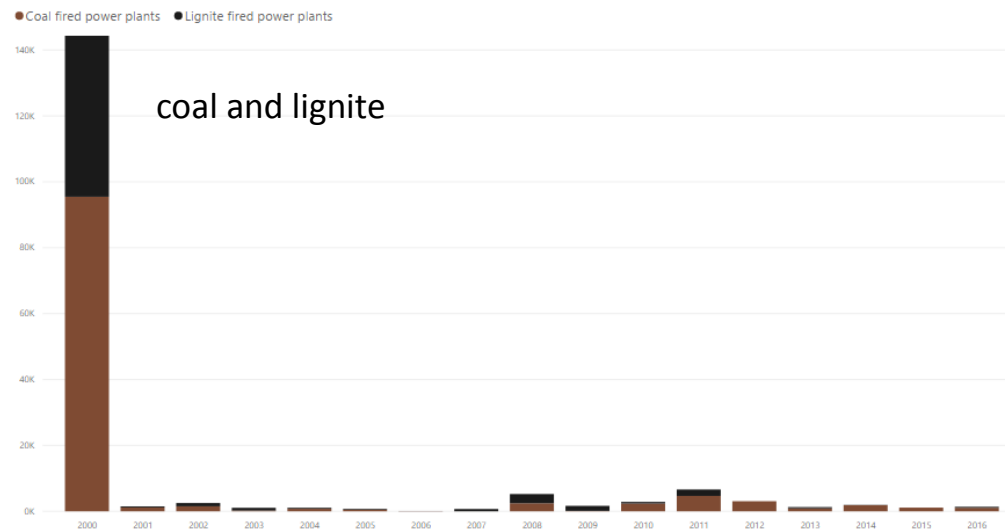
# GROSS CAPACITIES INSTALLED



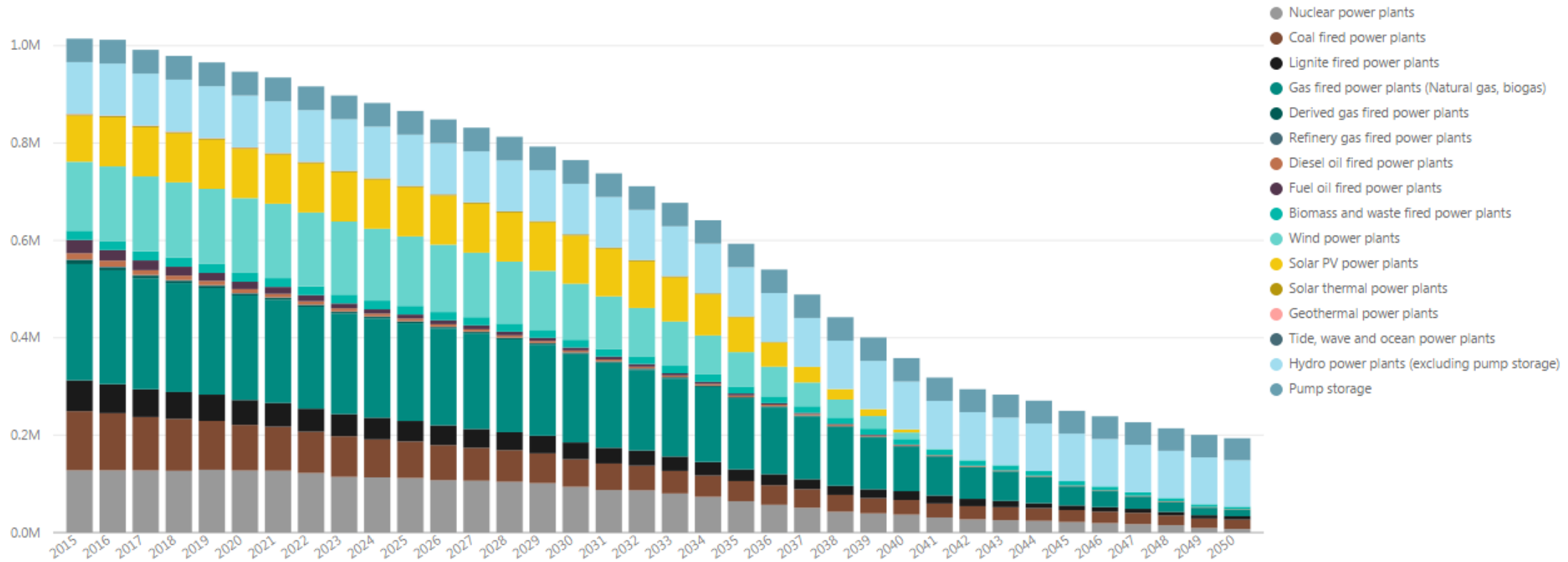
# NEW INVESTMENTS / AGE STRUCTURE OF STOCK



# AGE STRUCTURE OF SELECTED CAPACITIES



# CAPACITY EVOLUTION OF CURRENT STOCK





# FILE STRUCTURE

Aggregated level		Detailed level - capacity data – all power plants		- electricity-only - CHP plants	
<i>OverviewPG</i>	Overview of the power generation sector	<i>Cap</i>	Gross capacities of power plants	<i>Cap_ElecOnly</i>	<i>Cap_CHP</i>
		<i>CapNet</i>	Net nominal capacities of power plants	<i>CapNet_ElecOnly</i>	<i>CapNet_CHP</i>
<i>Thermal</i>	Overview of conventional thermal power plants	<i>Num</i>	Number of power plant units	<i>Num_ElecOnly</i>	<i>Num_CHP</i>
		<i>Size</i>	Average gross capacity of power plant units	<i>Size_ElecOnly</i>	<i>Size_CHP</i>
<i>Thermal_ElecOnly</i>	Overview of electricity only thermal power plants	<i>CapNew</i>	Gross capacities of new investments	<i>CapNew_ElecOnly</i>	<i>CapNew_CHP</i>
		<i>CapNewNet</i>	Net nominal capacities of new investments	<i>CapNewNet_ElecOnly</i>	<i>CapNewNet_CHP</i>
<i>Thermal_CHP</i>	Overview of CHP thermal power plants	<i>NumNew</i>	Number of new investments	<i>NumNew_ElecOnly</i>	<i>NumNew_CHP</i>
		<i>SizeNew</i>	Average gross capacity of new investments per unit	<i>SizeNew_ElecOnly</i>	<i>SizeNew_CHP</i>
<i>DistHeat</i>	Overview of district heating plants	<i>CapOut</i>	Gross capacities of decommissioned units	<i>CapOut_ElecOnly</i>	<i>CapOut_CHP</i>
		<i>CapOutNet</i>	Net nominal capacities of decommissioned units	<i>CapOutNet_ElecOnly</i>	<i>CapOutNet_CHP</i>
		<i>NumOut</i>	Number of decommissioned units	<i>NumOut_ElecOnly</i>	<i>NumOut_CHP</i>
		<i>SizeOut</i>	Average gross capacity of decommissioned units	<i>SizeOut_ElecOnly</i>	<i>SizeOut_CHP</i>



# Thank you for your attention



JRC Science Hub –POTEnCIA:  
[ec.europa.eu/jrc/POTEnCIA](https://ec.europa.eu/jrc/POTEnCIA)

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