NUCLEAR DAYS 2019

NUCLEAR FOR CLIMATE:
OPPORTUNITIES AND CHALLENGES

Role of Nuclear Power Today: The Answer to Challenge of Decarbonisation

Trst, November 16, 2019

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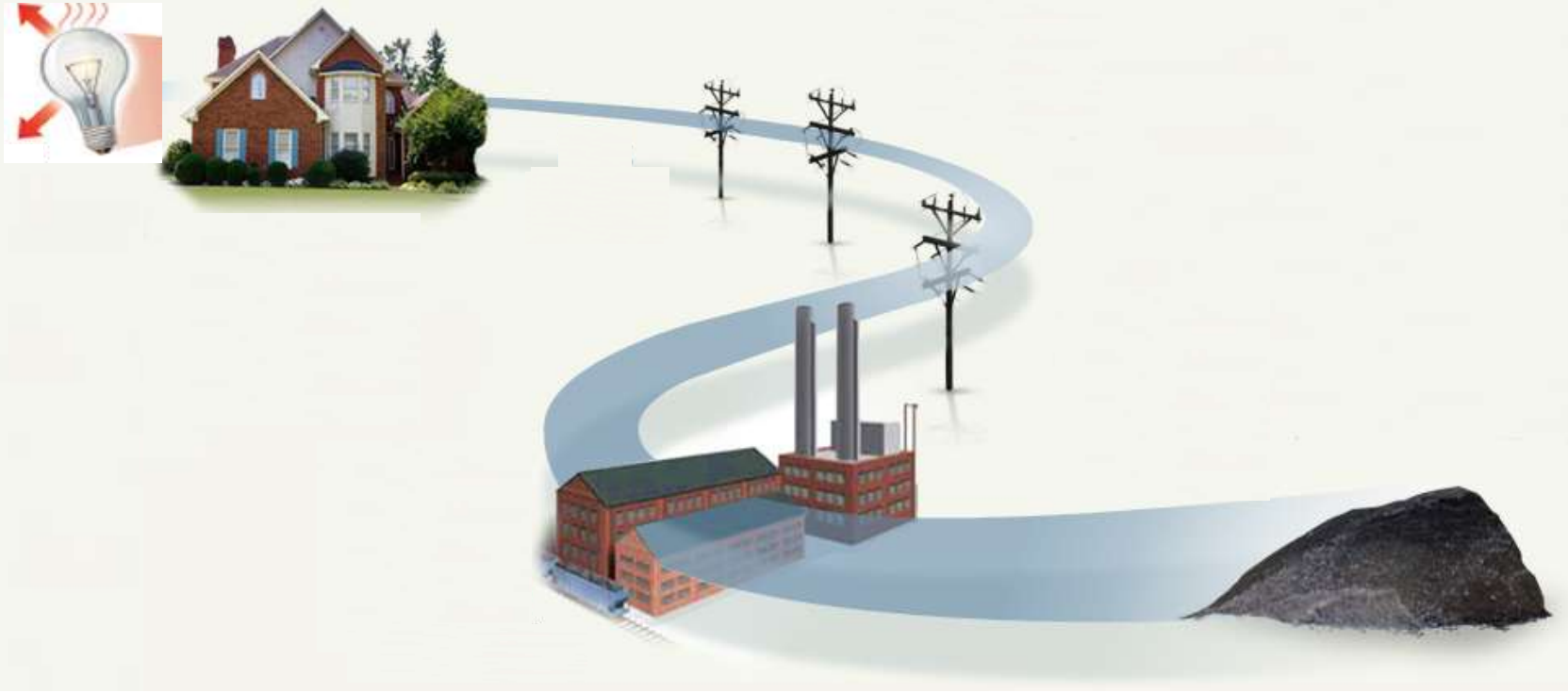
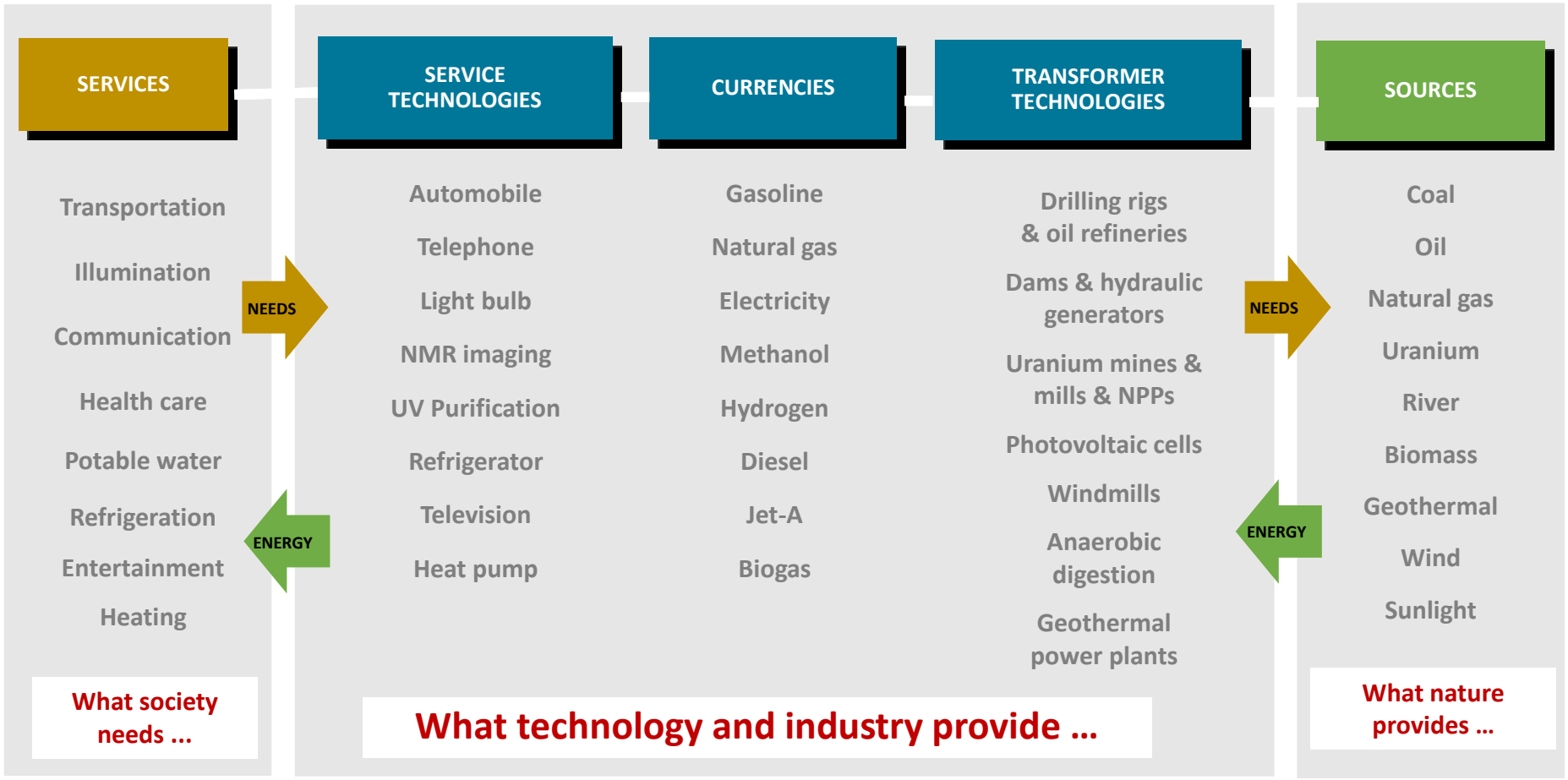
GEN energija d.o.o., Krško, Slovenia

Architecture of the Energy System

SERVICES | SERVICE TECHNOLOGIES | CURRENCIES | TRANSFORMER TECHNOLOGIES | SOURCES



Energy System – Fulfilling Society's Needs



Content

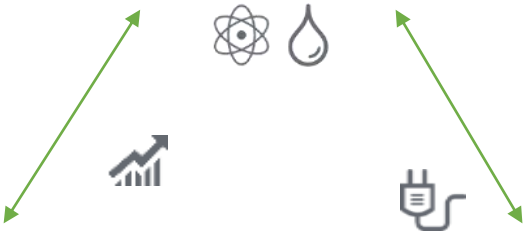
- Introduction / Architecture of the Energy System
- Today's Energy Systems
  - GEN group & Slovenia
  - World Energy Outlook
- Energy Systems of Tomorrow & Nuclear Energy
  - Global Challenge
    - Deep Decarbonisation **< 50 gCO_2/kWh**
  - Production of Nuclear Energy is Increasing Since 2012
- Conclusions

GEN Group
Decarbonised Generation

One of the biggest Slovenian energy groups

Electricity Generation







Investment and Development

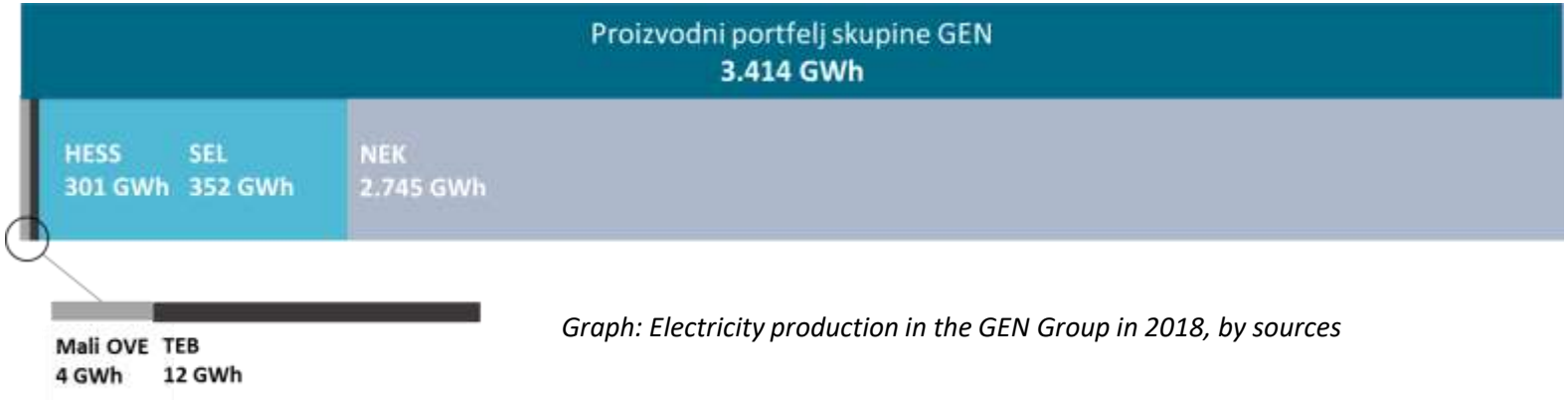
Trade and Retail
(electricity and gas)

Low-carbon Energy Generation

GEN Group = Reliability + Safety + Sustainability

Nuclear + Hydro

GEN supplying **99,7 % decarbonised electricity** in 2018



Graph: Electricity production in the GEN Group in 2018, by sources

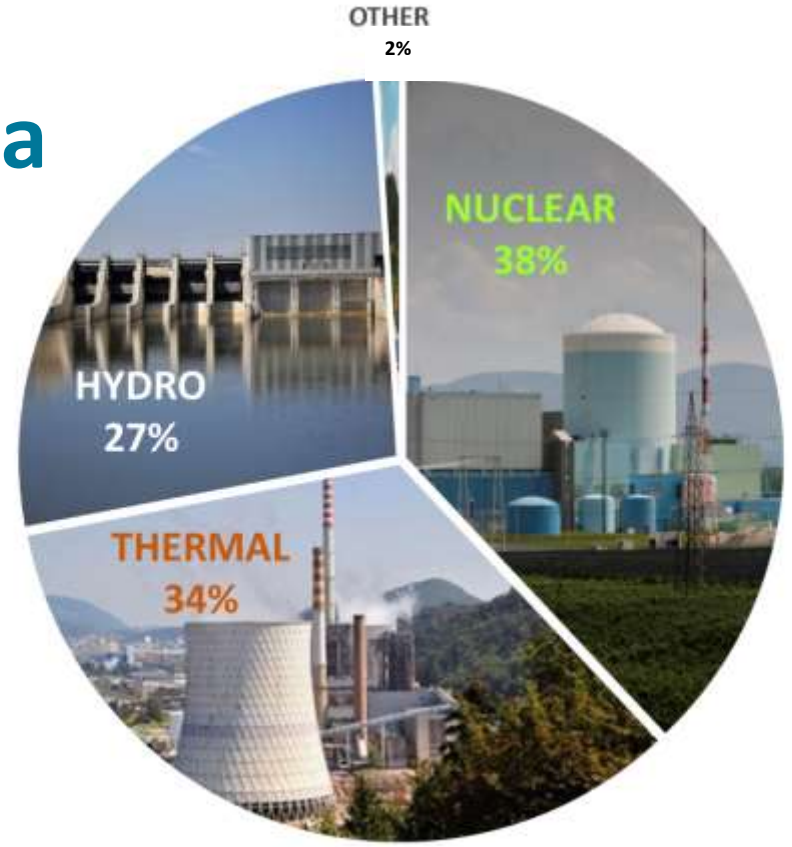
„Nuclear energy and renewable resources are key for Slovenia transition to low-carbon society.“

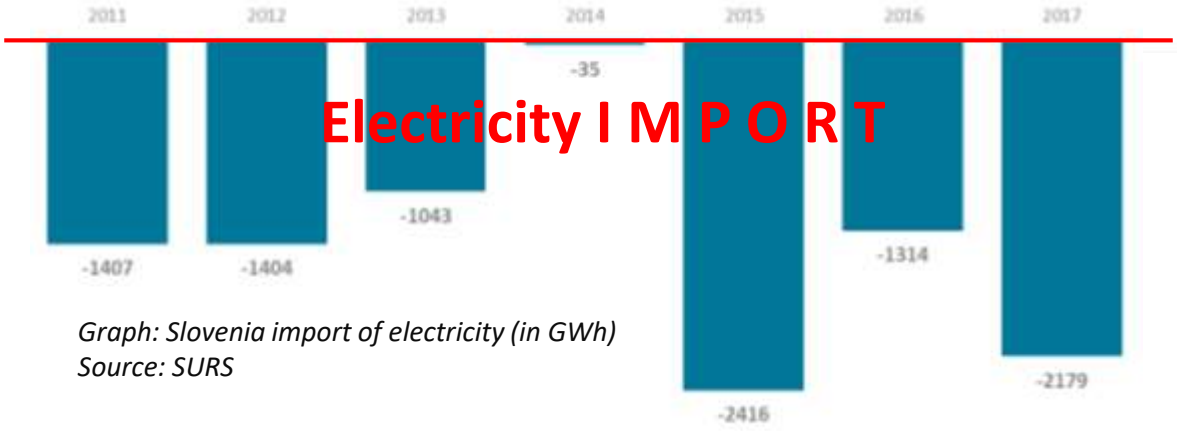
Source: ***Jedrska energija – nizkoogljična energija prihodnosti:***
https://www.gen-energija.si/files/materials/36/pdf/GEN_Pozicijski_dokument_web.pdf

Electricity in Slovenia

Consumption ≈ 16 TWh
Generation ≈ 14 TWh

67 % non-fossile generation
19 % import

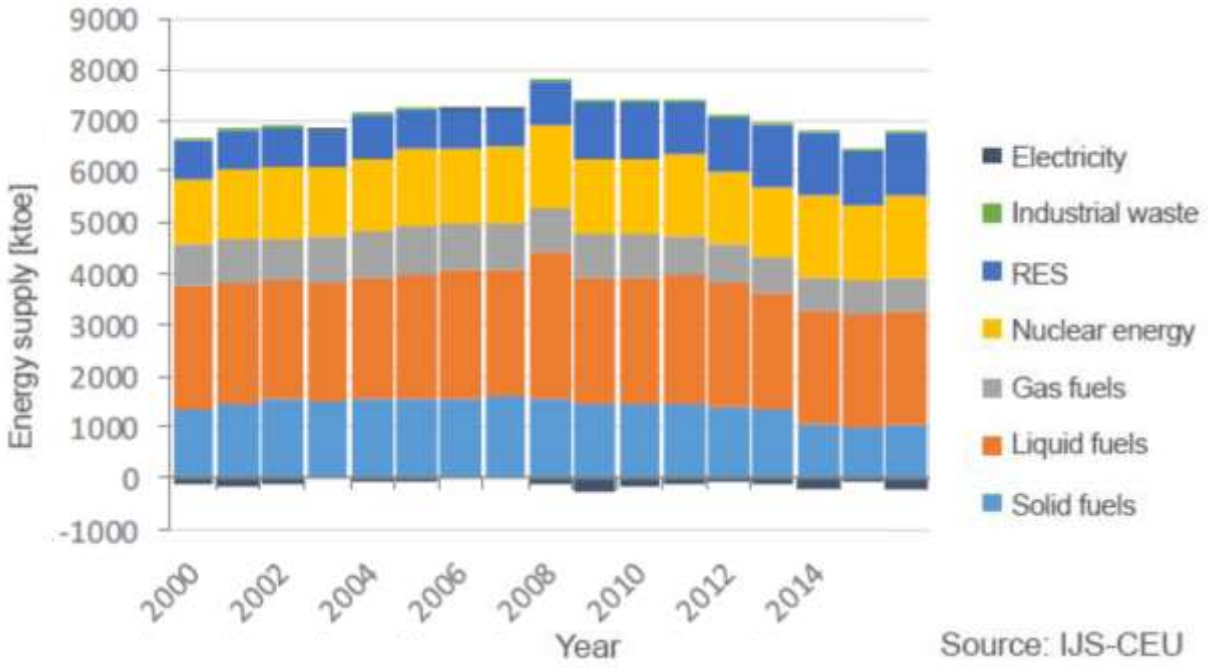




Graph: Slovenia import of electricity (in GWh)
Source: SURS

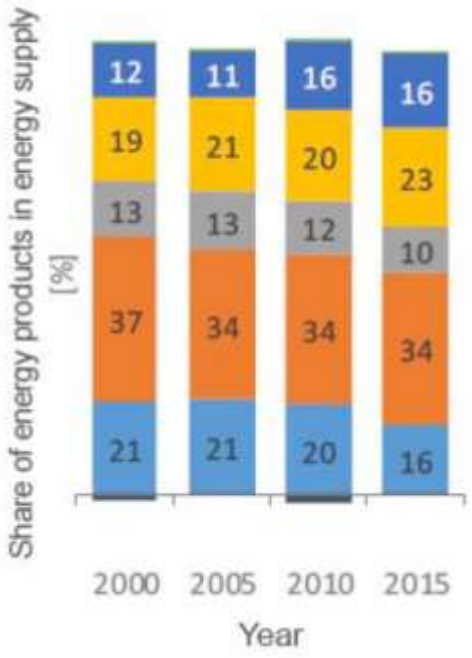
Total Energy Use in Slovenia

Energy supply by energy products from 2000 to 2015



Source: IJS-CEU

Share of energy products in 2000, 2005, 2010 and 2015

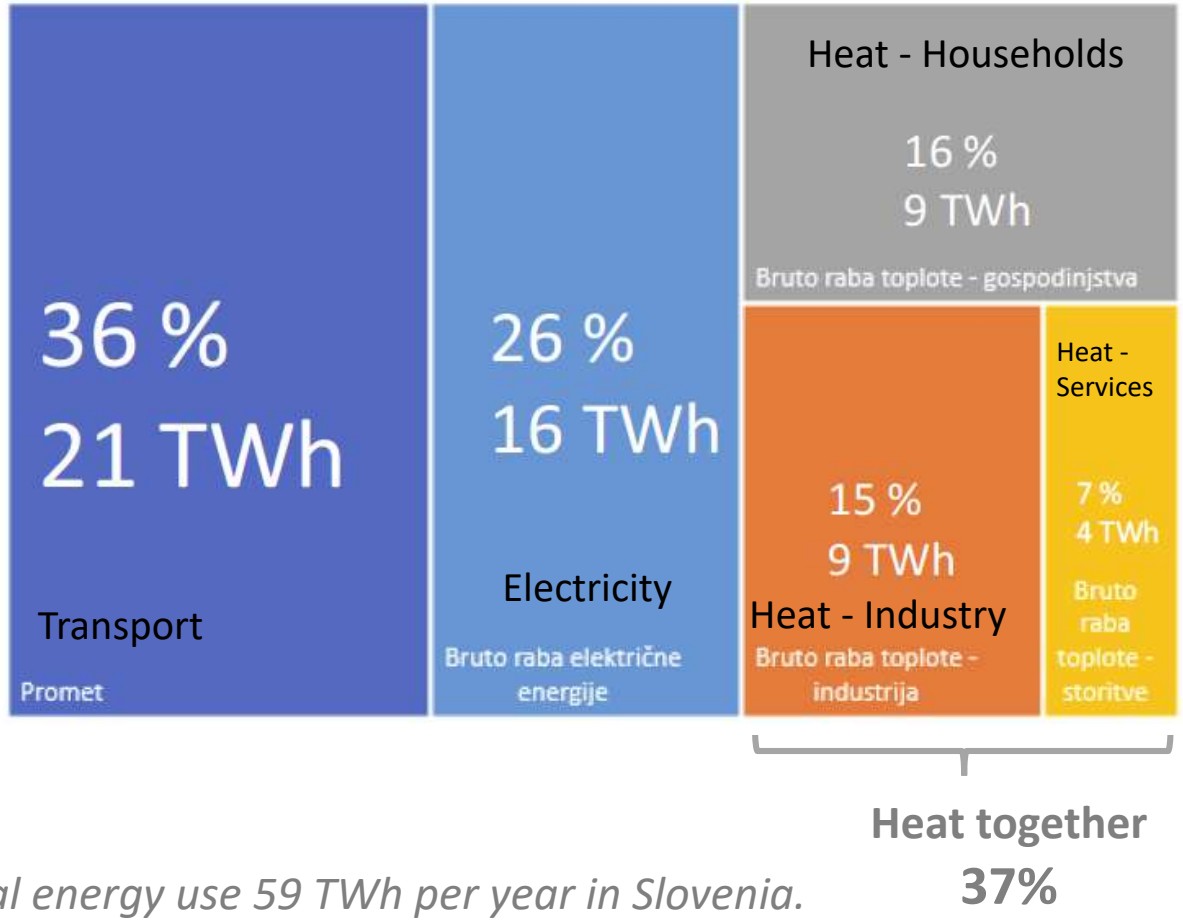


Units: ktoe – cca 5000 ktoe is 214 PJ is 60 TWh is 60 billion kWh (16 TWh electricity or 26% of total)

Source: ***National Energy and Climate Plan (NECP) Slovenia****, March 2019*

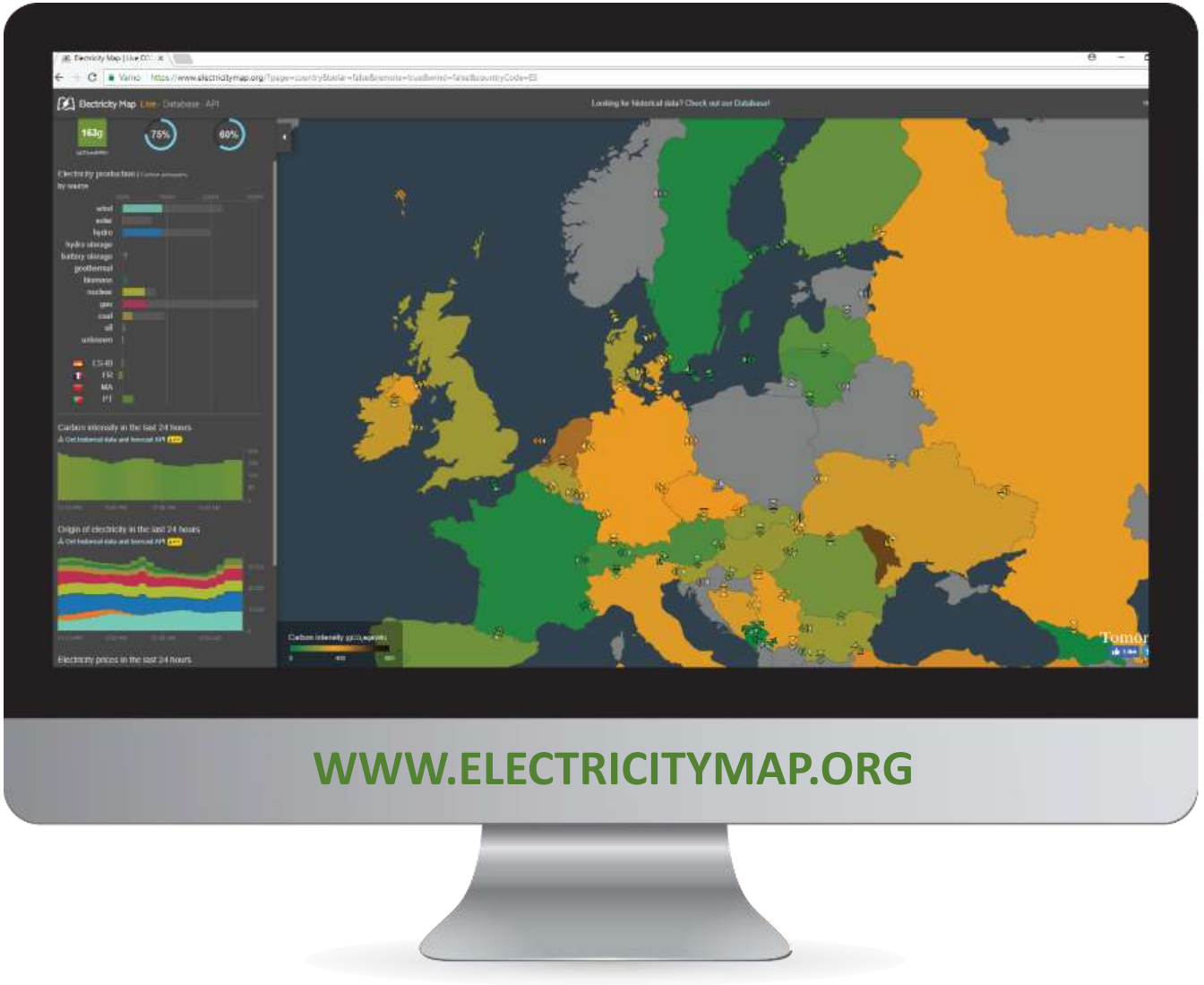
Share of Electricity is Increasing in Slovenia

Total energy use in Slovenia in 2017 by sector shares



Total energy use 59 TWh per year in Slovenia.

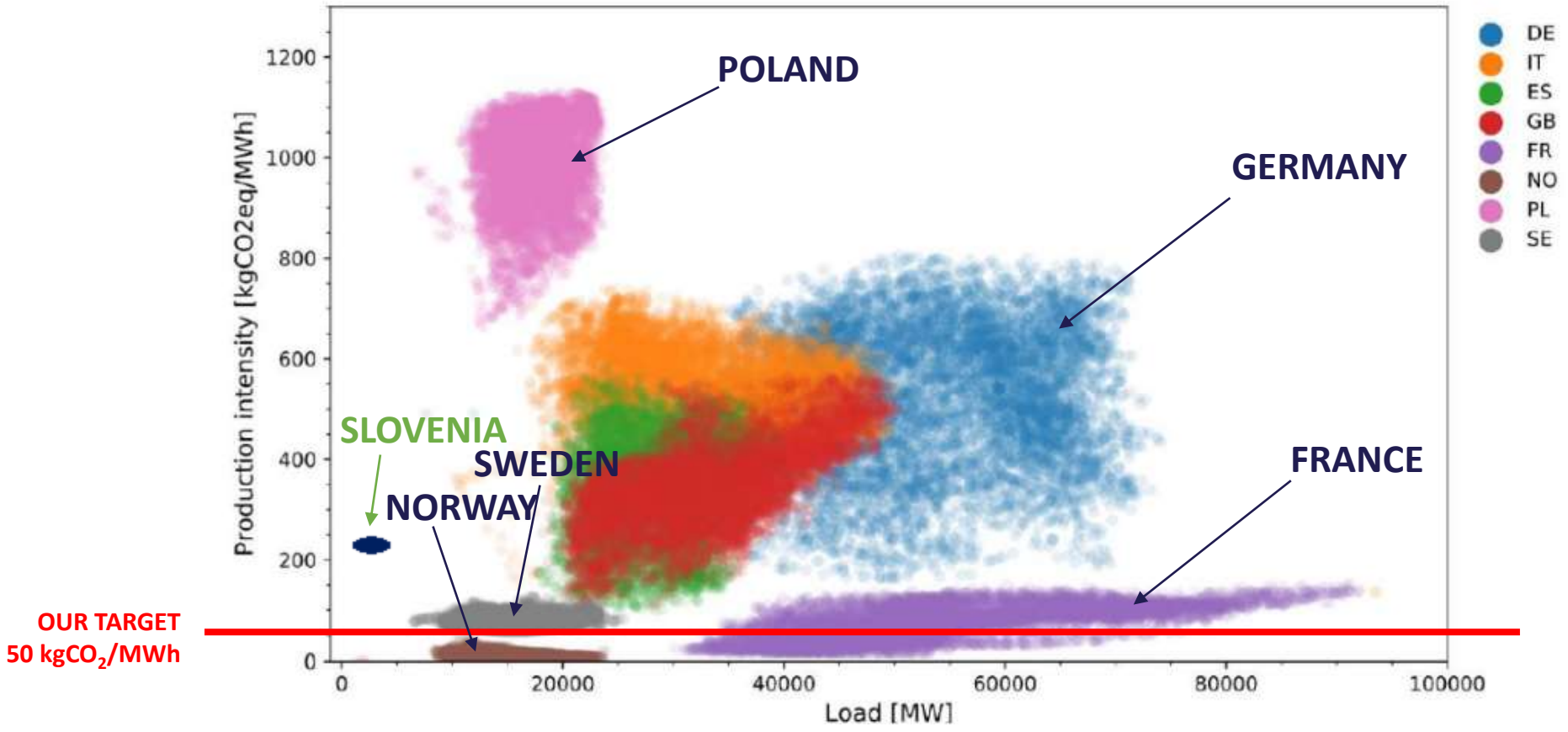
Source: ***National Energy and Climate Plan (NECP) Slovenia,*** *March 2019*


Electricity Map
Looking for historical data? Check out our Database!
163g
75%
60%
Electricity production
wind
solar
hydro
hydro storage
battery storage
geothermal
biomass
nuclear
gas
coal
oil
unknown
ES-IB
FR
MA
PT
Carbon intensity in the last 24 hours
Origin of electricity in the last 24 hours
Electricity prices in the last 24 hours
Carbon intensity gCO2eq/kWh
WWW.ELECTRICITYMAP.ORG

How Electricity Systems Performed in 2017?

Electricity Energy Systems in EU: Load [MW_e] vs. CO_2 Intensity [$kgCO_2/MWh$]

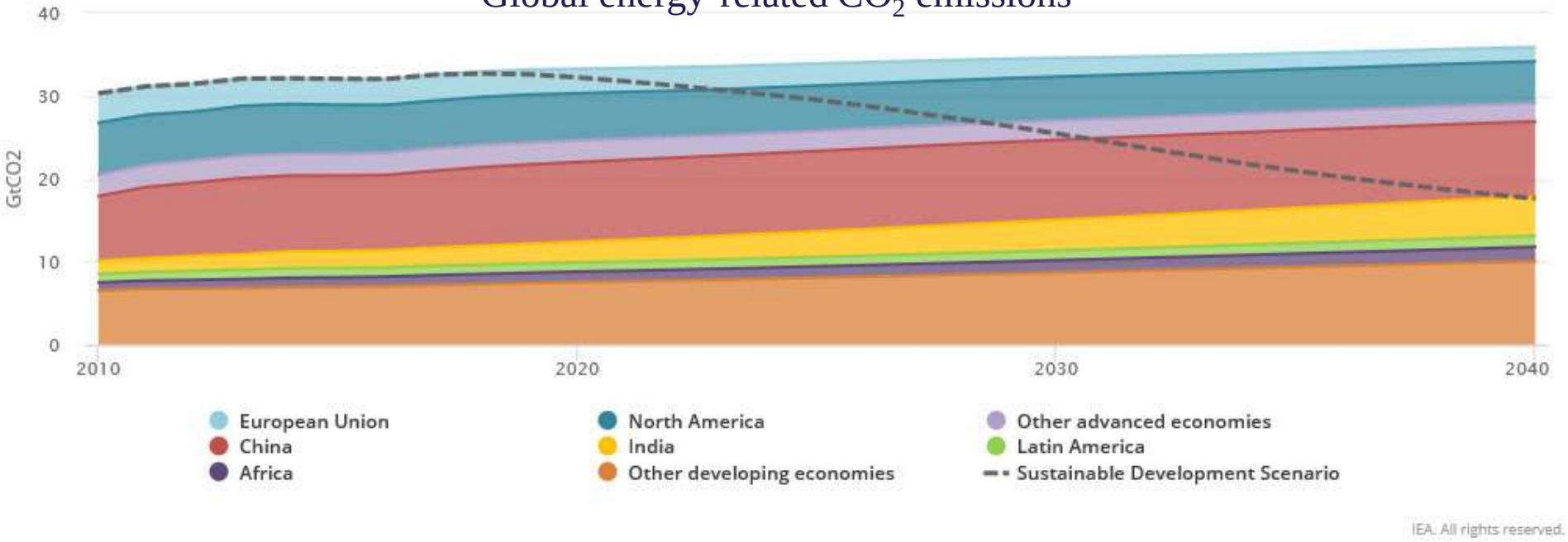
Data points on hourly basis (each data point is one hour in one country)



Source: ***National Grid Operators*** (data publically available): www.electricitymap.org

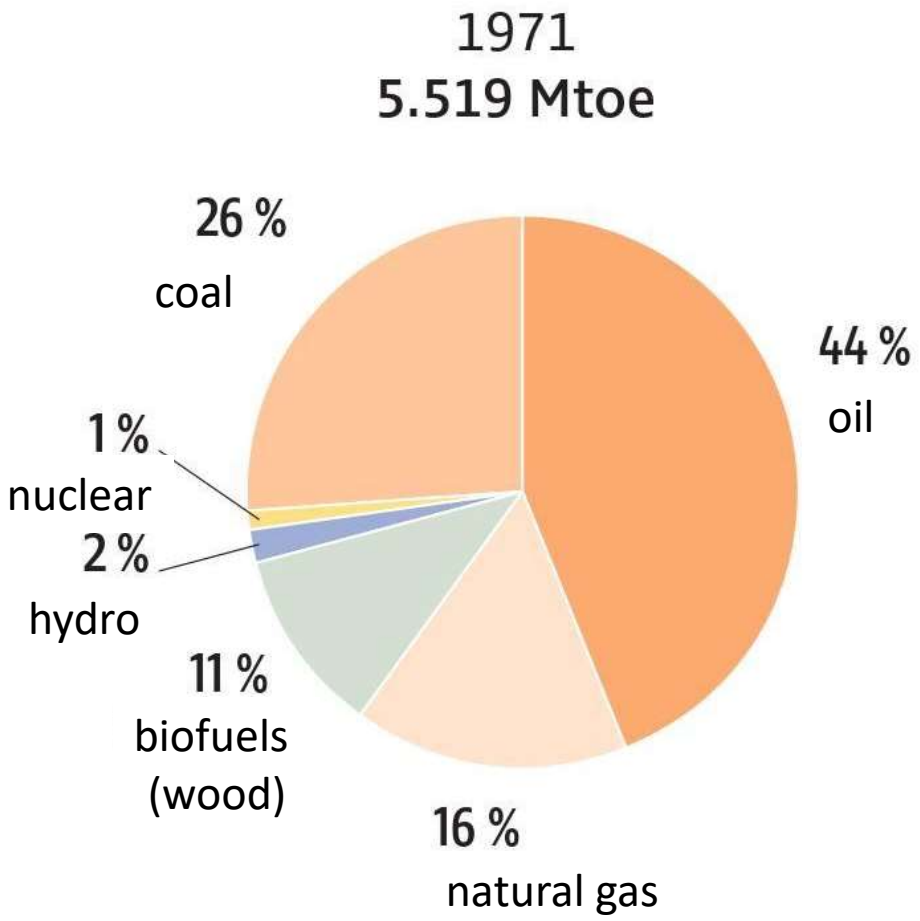
Global Emissions Increased in 2017 & 2018

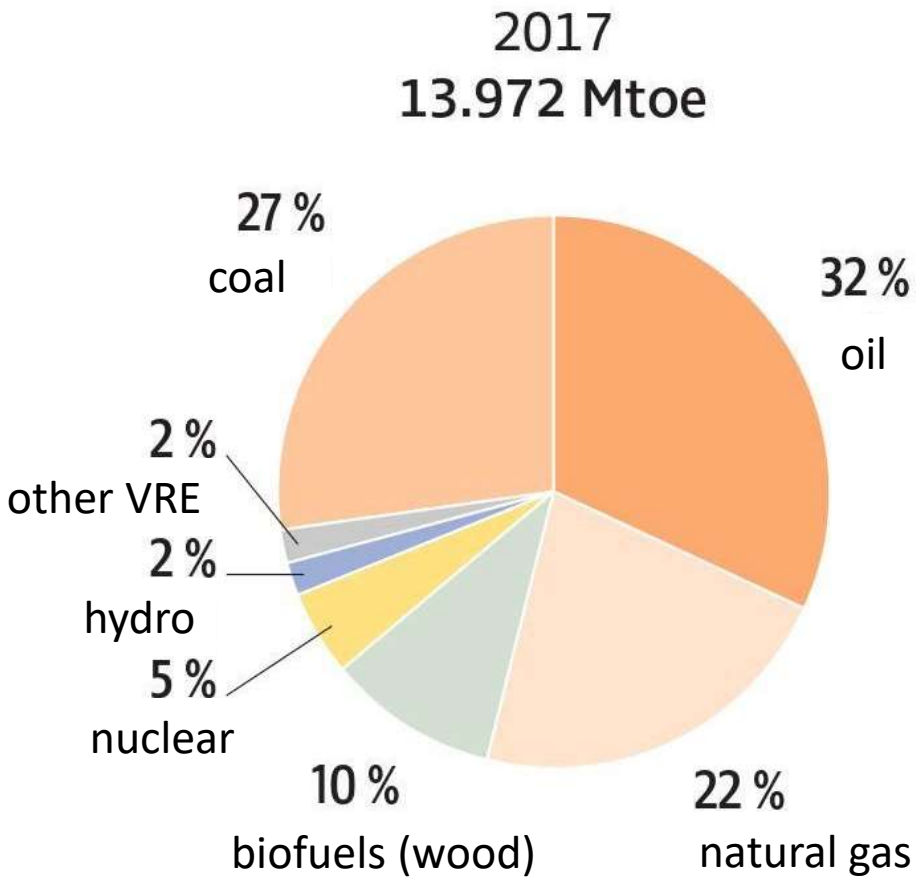
Despite need for early emission reduction, the world is not moving towards the Paris goals but rather away from them. According to International Energy Agency global energy-related CO_2 emissions increased in 2017 and 2018.



Source: OECD, IEA, ***World Energy Outlook 2018****:* www.iea.org/weo/

Total Energy Use - World

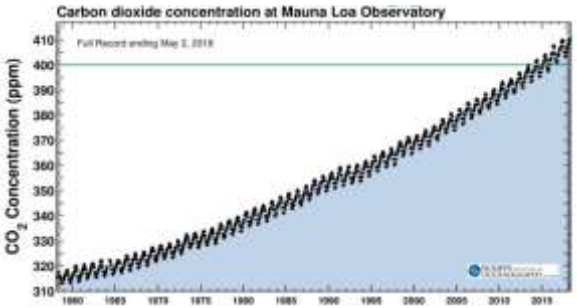




Too Many People Live Without Clean Energy

2.7 billion people do not have clean cooking facilities

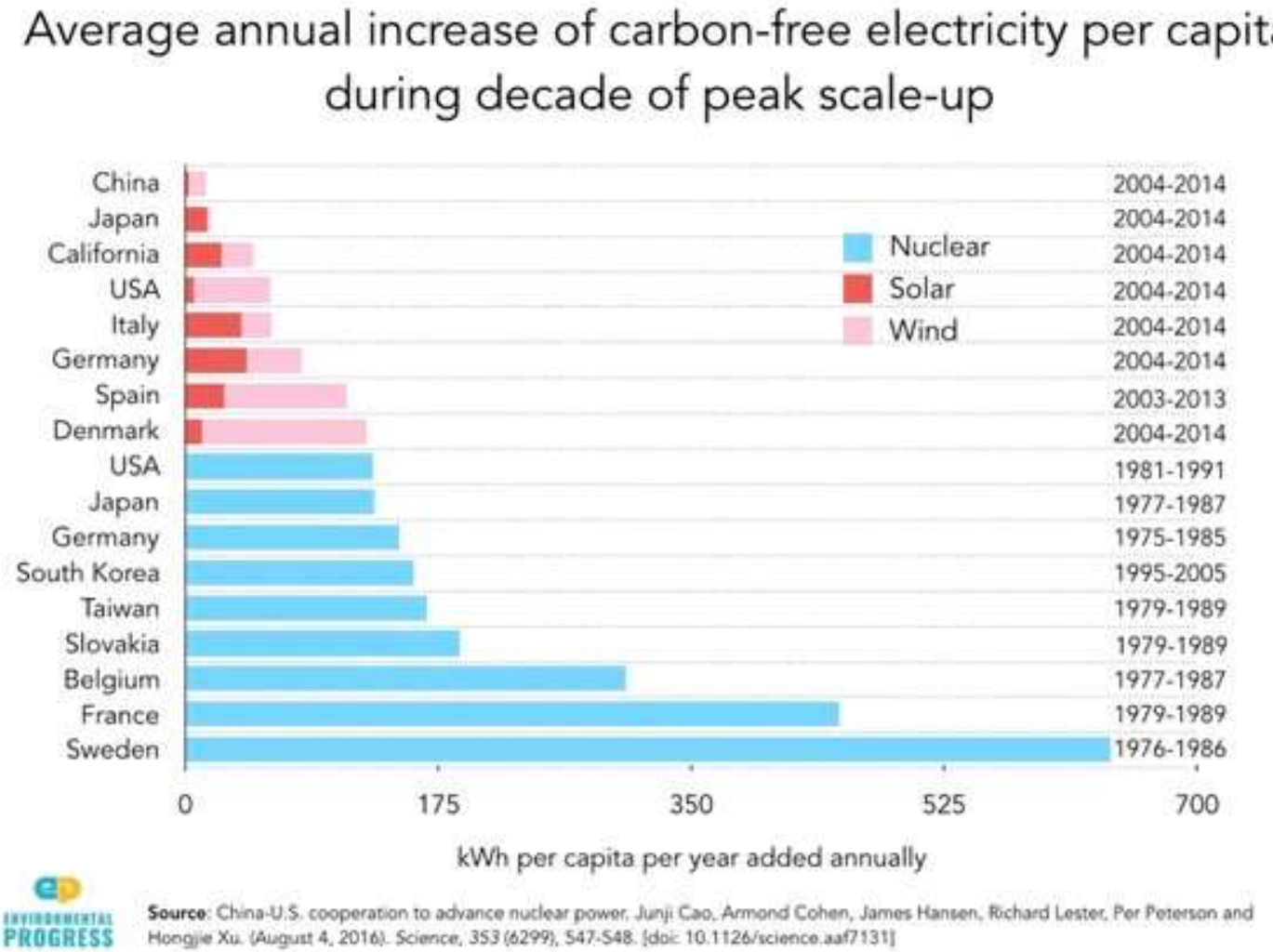
7 million people die each year due to air pollution



The world is not on track with the energy transition

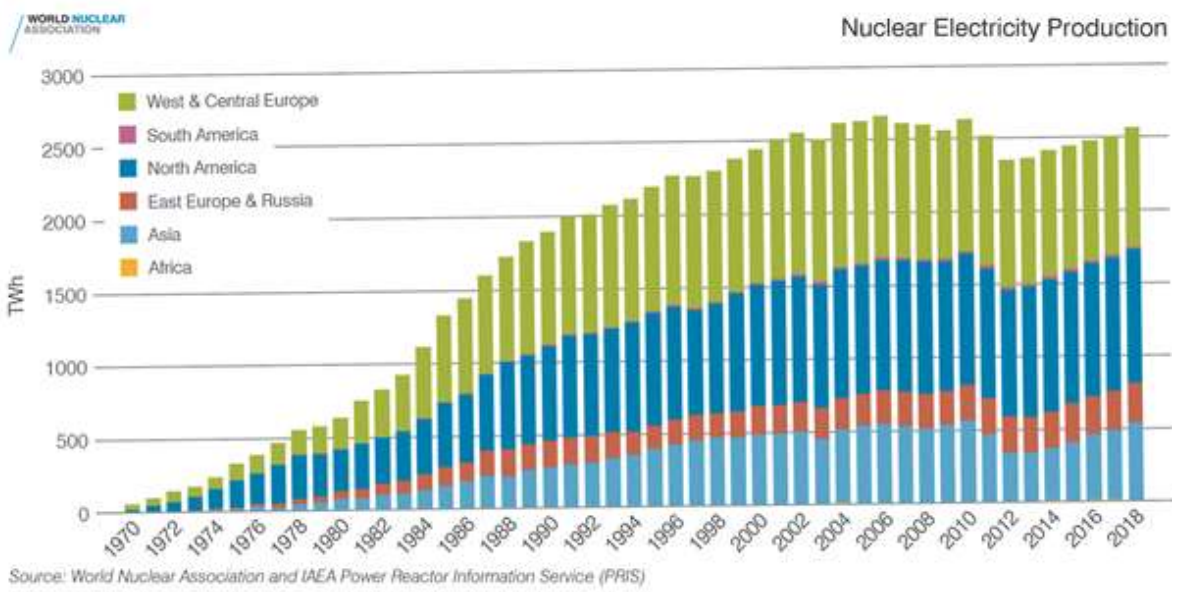
People Live Exposed to Polluted Air

Decarbonisation of Energy Systems

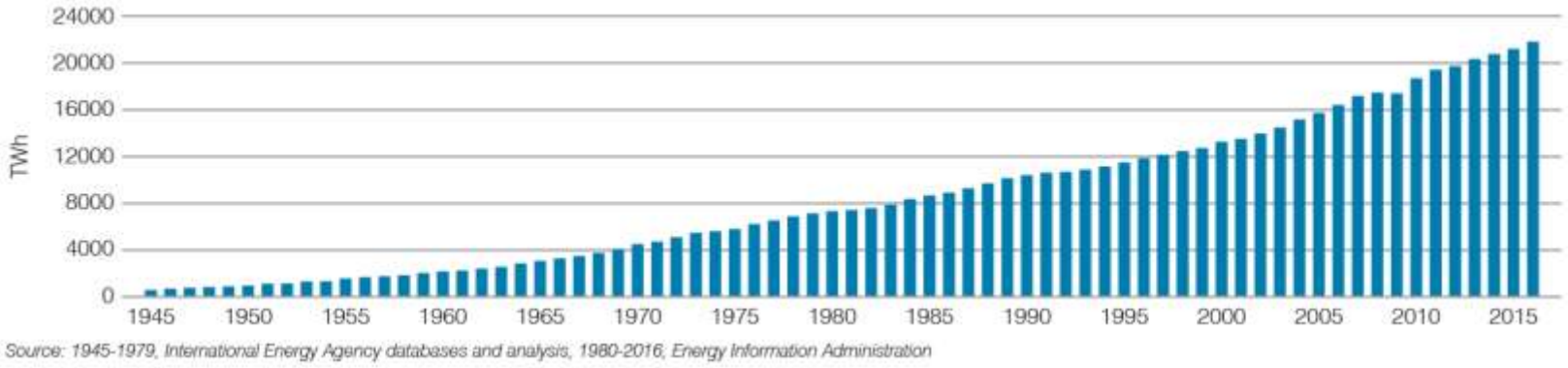


Nuclear Is Growing Since 2012

Nuclear growth is the fastest in 25 years but the industry has not kept pace with electricity demand globally

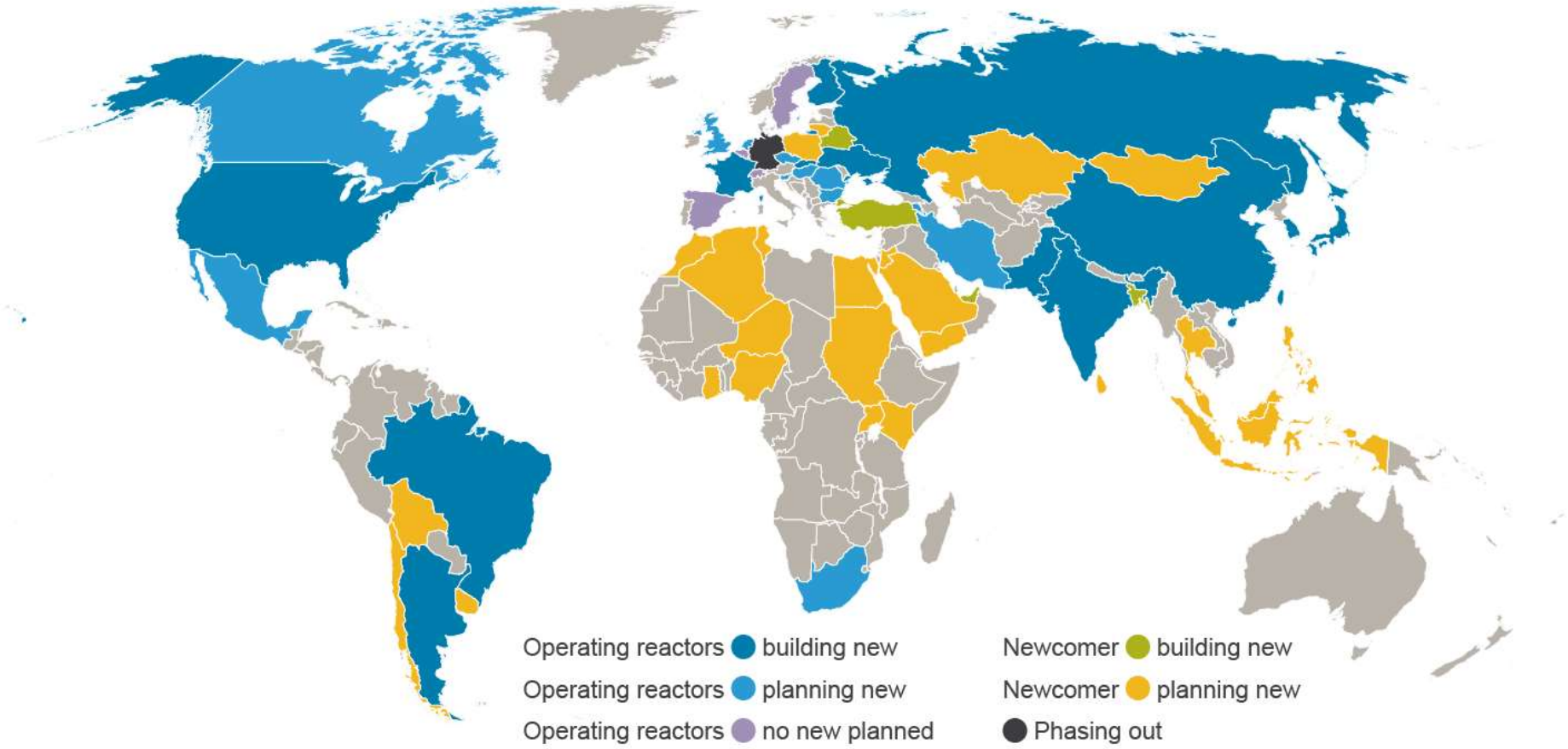


Total electricity



Source: WNA, London, 2018

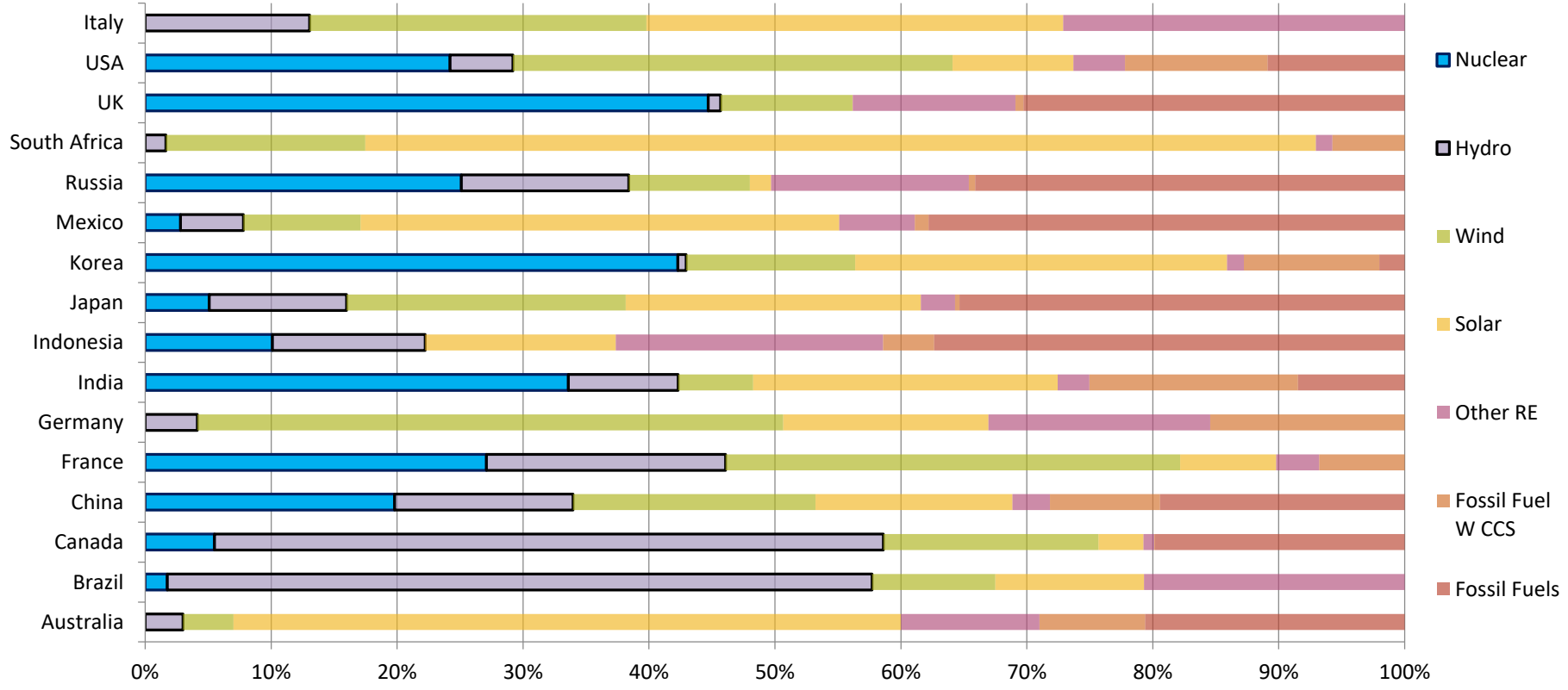
Global Nuclear New Build 2018



Source: WNA, London, 2018

Deep Decarbonisation Pathways to (2050)

- UN supported study, analysed several countries future energy policies
- Nuclear plays essential role in future decarbonised energy supply



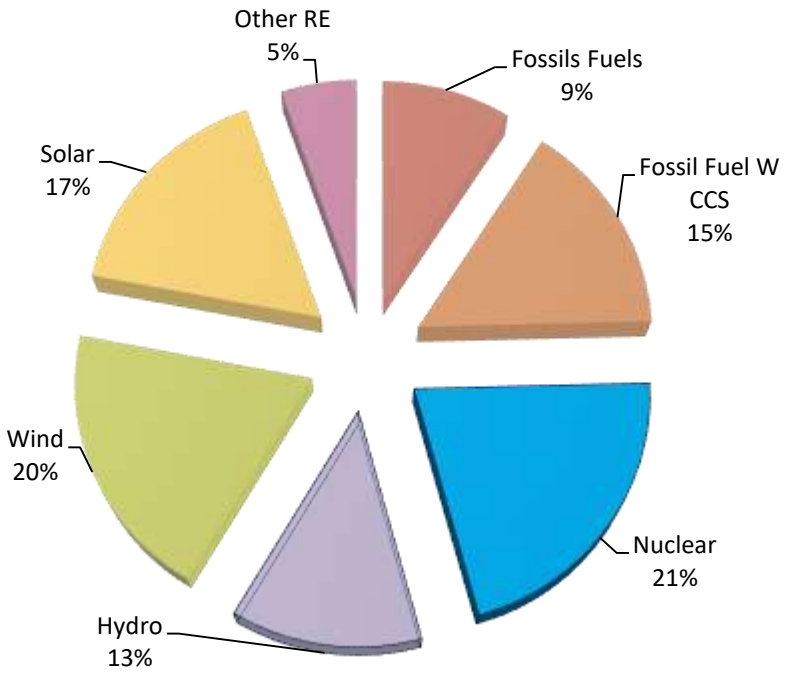
Source: Deep Decarbonization Pathways Project (2015) http://deepdecarbonization.org/wp-content/uploads/2016/03/DDPP_2015_REPORT.pdf
UN Sustainable Development Solutions Network (SDSN) and the Institute for Sustainable Development and International Relations

Deep Decarbonisation Pathways to 2050

Nuclear and hydro together are 1/3

Additional 1053 GW nuclear capacity required by 2050

Nuclear generation to increase from current 10% to 21%



Electricity Generation in 2050

Source: Deep Decarbonization Pathways Project (2015) http://deepdecarbonization.org/wp-content/uploads/2016/03/DDPP_2015_REPORT.pdf
UN Sustainable Development Solutions Network (SDSN) and the Institute for Sustainable Development and International Relations

„At climate conferences Emmanuel Macron always has a little advantage over me bacause he has so many nuclear power plants emitting so little CO_2!“

ANGELA MERKEL, Chancellor of Germany

Vir: la-croix.com, 22 januar 2019

"We need a secure and sustainable energy supply and I believe nuclear has an important role to play."

FATIH BIROL, General Director, IEA

Vir: world-nuclear.org, Katowice CC Conference, 7. december 2018

„Nuclear is ideal for dealing with climate change, because it is the only carbon-free, scalable energy source that‘s available 24 hours a day!“

BILL GATES, Founder, TerraPower

Vir: nucnet.org, 2. januar 2019

„Nuclear, together with renewables, will form the backbone of a carbon-free European power system.“

EUROPEAN COMMISSION

Vir: Strategija 2050: A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, 28 november 2018

European Commission