FUTURE ROLE OF GAS IN THE EU

GAZPROM'S VISION OF LOW-CARBON ENERGY FUTURE

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LOW-CARBON DEVELOPMENT TARGETS

THE PARIS AGREEMENT ON CLIMATE CHANGE

GHG EMISSION REDUCTION TARGETS (of 1990 levels)

2030 — REDUCE BY

25-30 % 

40 % 

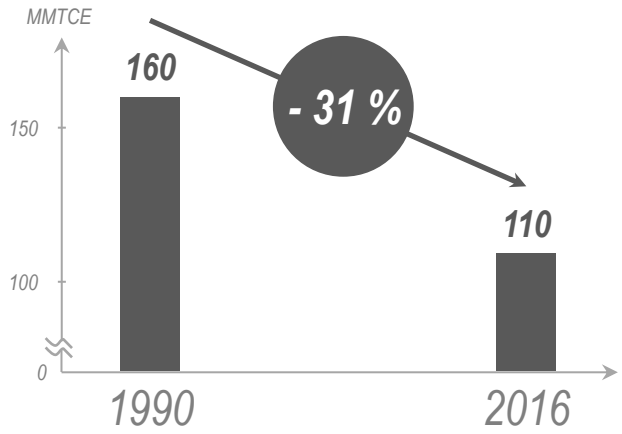
2050 — LONG-TERM DEVELOPMENT STRATEGIES WITH LOW GREENHOUSE GASES EMISSIONS

Source: UN FCCC (Nationally determined contributions for the EU and Russia)

RUSSIAN EXAMPLE OF LOW-CARBON DEVELOPMENT

THE RUSSIAN EXAMPLE OF DEVELOPMENT WITH LOW GHG EMISSIONS

COAL CONSUMPTION



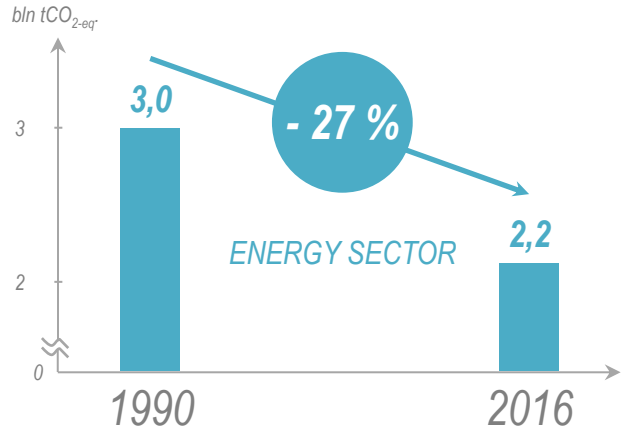
GASIFICATON

~1,9 %

THE ANNUAL RATE OF GAS INFRASTRUCTURE EXPANSION IN RUSSIAN REGIONS

(PJSC Gazprom Annual Report 2017 data)

GHG EMISSIONS

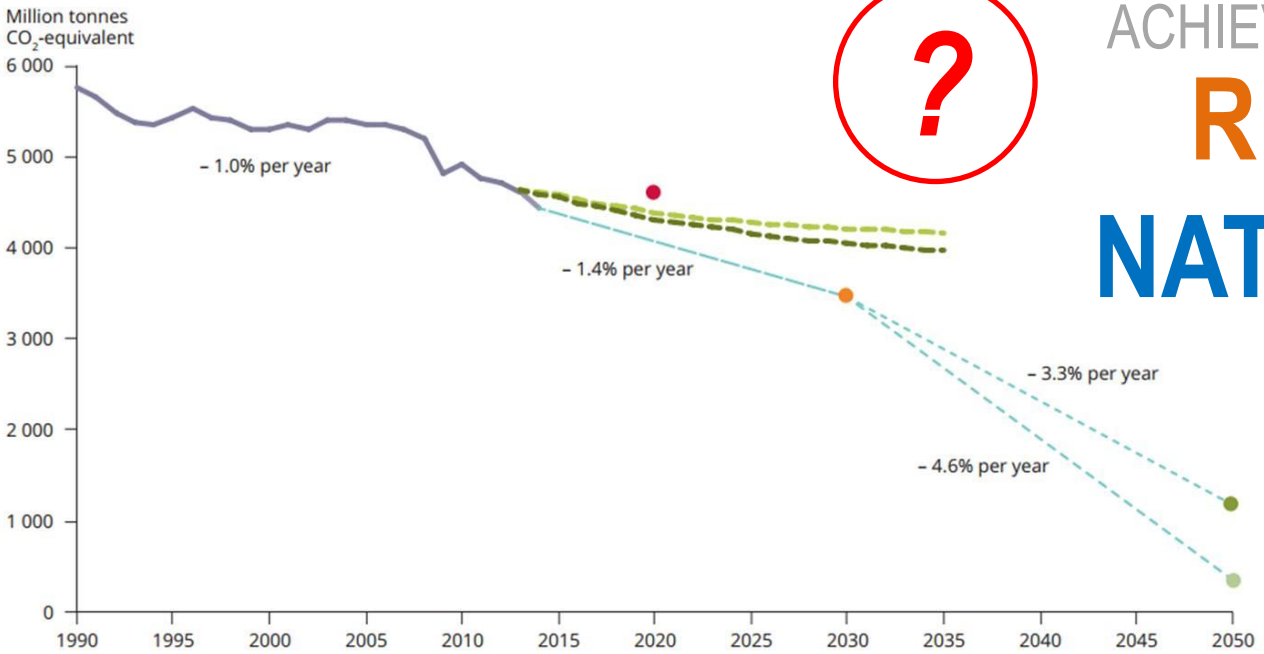


*Total GHG emissions reduced by **29.7 %***,*
Inter alia thanks to coal power stations switch to natural gas

Sources: IEA; 1990 – 2016 National report on the inventory of anthropogenic emissions by sources and GHG removals by sinks not controlled by the Montreal Protocol

** Ex LULUCF*

2050 EU CLIMATE TARGETS



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ACHIEVING THE TARGETS:

RES and/or

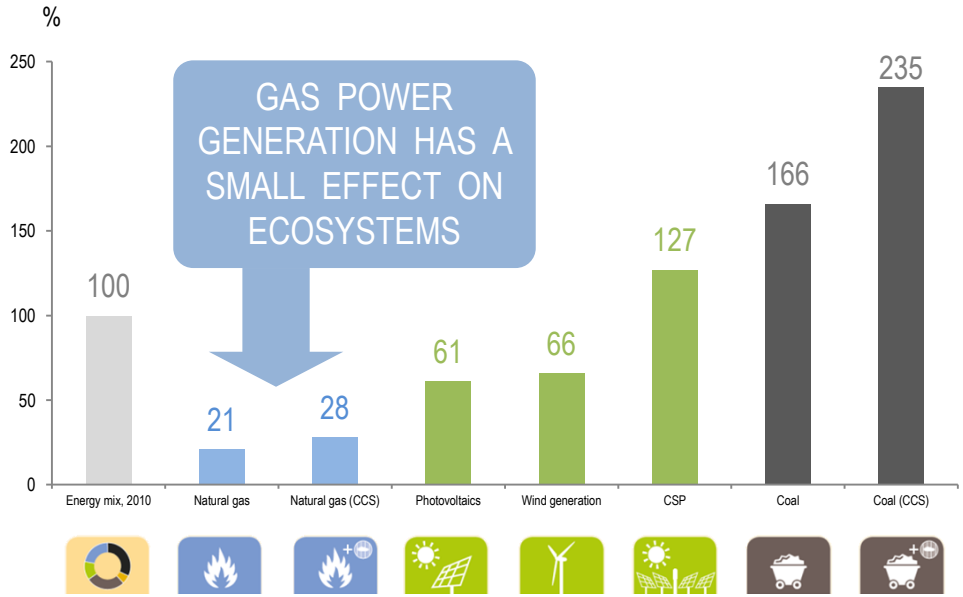
NATURAL GAS

Sources: EEA

ENVIRONMENTAL RISKS OF THE RES

IMPACT OF VARIOUS ENERGY SOURCES ON ECOSYSTEMS

(with respect to the Global Energy Mix 2010)



THE ADVERSE IMPACT OF WIND ENERGY ON WILDLIFE

ONSHORE

OFFSHORE

Wind turbines emit low frequency noise, including dangerous infrasound.
In the sea, these vibrations are transmitted to a distance of 50 km

Disorientation of animals and birds

CONSUMPTION OF VALUABLE RAW MATERIALS AND CHEMICAL ELEMENTS

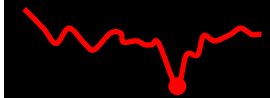
*In seeking to improve the solar energy efficiency, **valuable and rare** (rare-earth) materials are used, new materials are produced and consumed, many of which consist of **toxic substances**: solar panels are a source of 300 times more toxic waste than nuclear power plants.*

Sources: UNEP, International Resource Panel, ENVIRONMENTAL PROGRESS

CSP – concentrated solar power

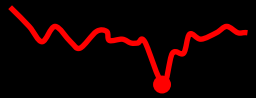
ENERGY DANGER OF RES

TIME AND AGAIN WE HAVE ALREDY FACED WITH THIS



GERMANY

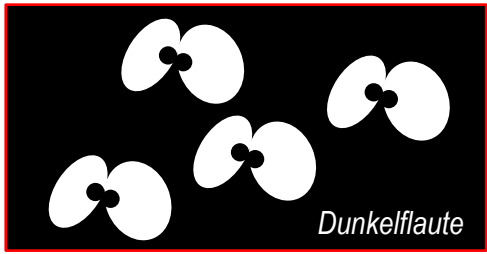
In January 2017 and 2018, power production from weather-sensitive RES reduced to a bare minimum



AUSTRALIA

In September 2016, 9 out of 13 wind parks were shut down due to the storm wind, leading to large-scale power outages

CLIMATE CHANGE – SHAKY FOUNDATIONS FOR RES → *MORE EXTREME WEATHER EVENTS* → ***MORE BLACKOUTS*** →



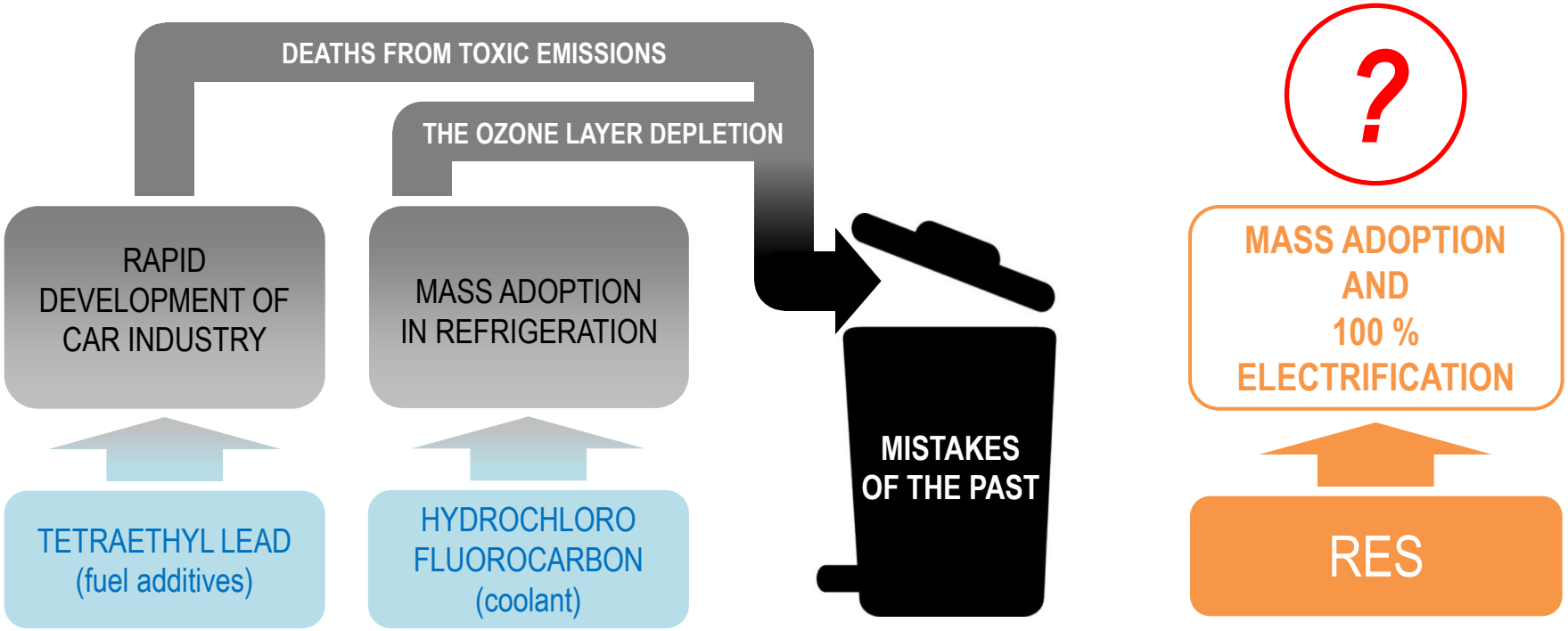
THE NEED FOR AN UNMANAGEABLE POWER GRID SYSTEM (the refusal of land owners)

THE NEED FOR SUBSTANTIAL ENERGY STORAGE CAPACITY

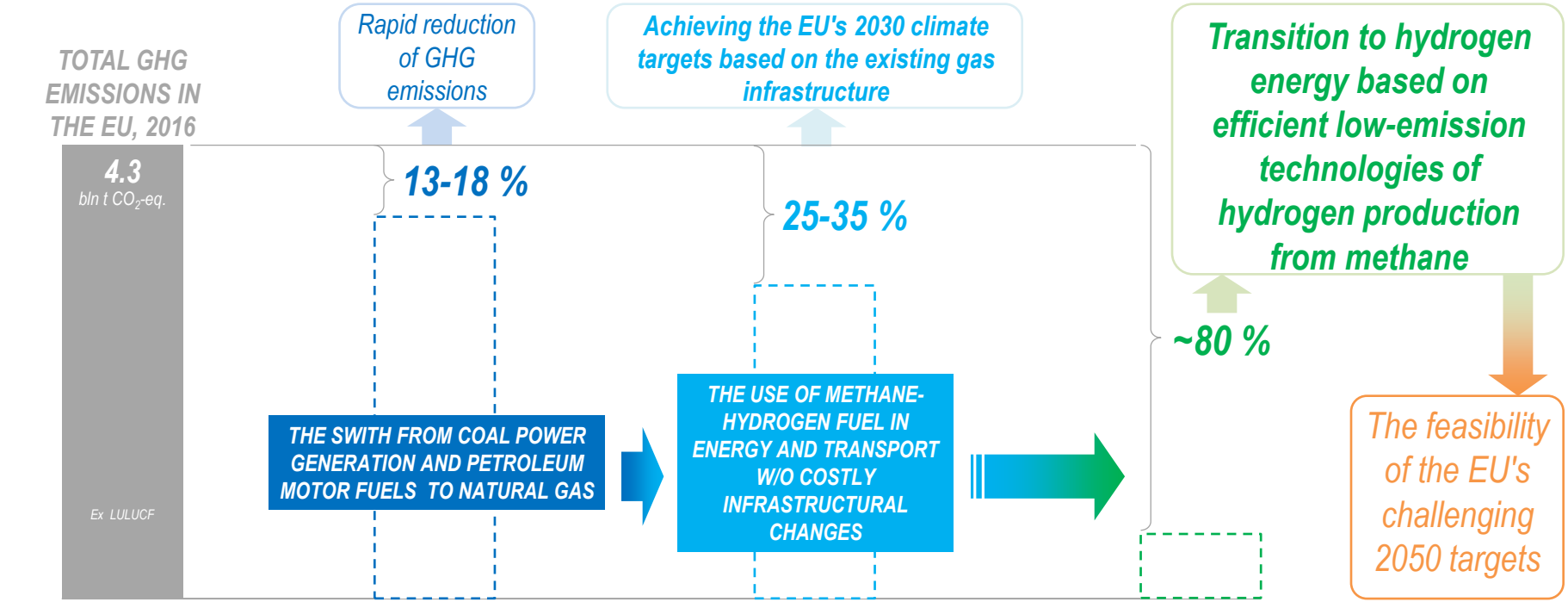
Illustrated by Germany's example: full electrification will require energy storage systems with the capacity of approx. 35 TWh. For comparison, the current capacity of all electricity storage systems in Germany is about 0.04 TWh. The need to increase is more than ***800 times.***

Source: Fraunhofer, FNB Gas e.V. (THE IMPORTANCE OF THE GAS INFRASTRUCTURE FOR GERMANY'S ENERGY TRANSITION), пиктограммы – Clean Edge research

THE IMPORTANCE OF THE CHOICE OF STRATEGY



METHANE-HYDROGEN SCENARIO FOR LOW-CARBON DEVELOPMENT OF THE EU



The expert assessment is made on the basis of data on:

- *Carbon intensity from different fuels (U.S. Energy Information Administration estimates);*
- *Carbon footprint of various motor fuels (European Natural gas Vehicle Association report, 2014-2015);*
- *EU GHG emissions (1990 – 2016 National report on the inventory of anthropogenic emissions by sources and GHG removals by sinks not controlled by the Montreal Protocol , IEA)*

ADIABATIC METHANE CONVERSION

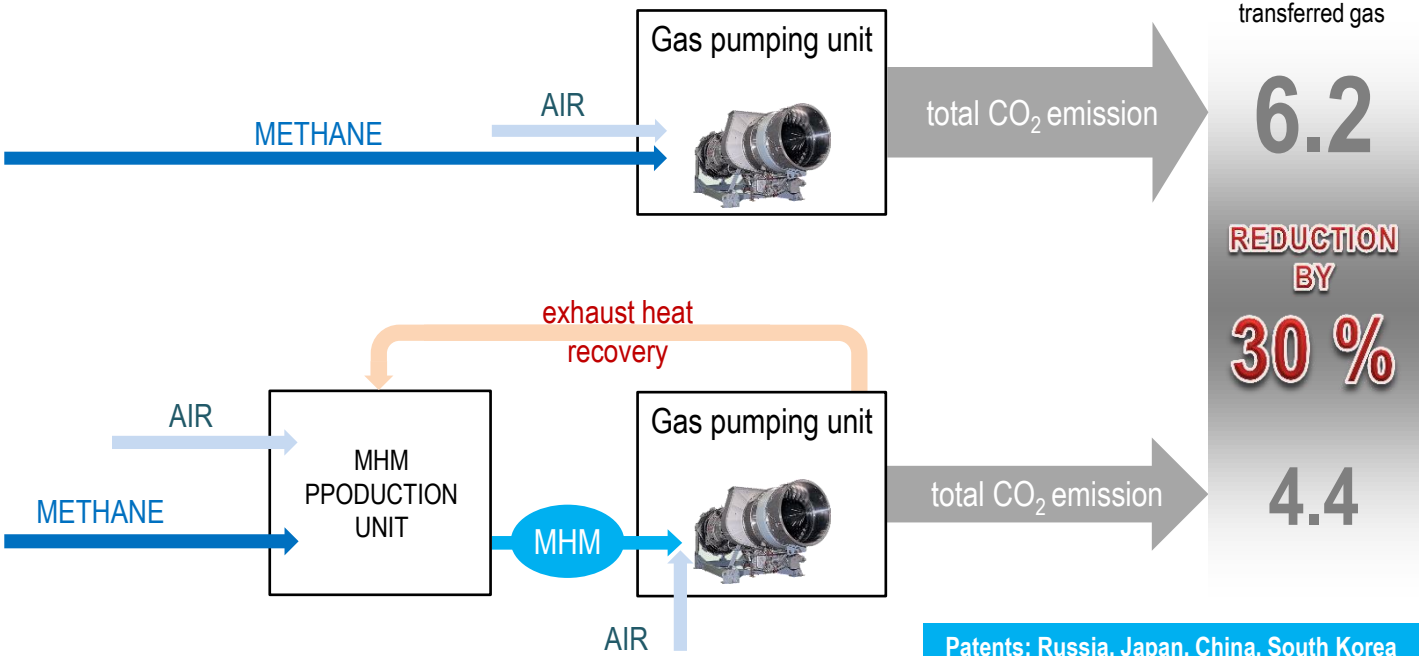
CONVENTIONAL TECHNOLOGY

Methane as fuel gas in gas pumping units

NEW TECHNOLOGY

ADIABATIC METHANE CONVERSION (AMC)

Methane-hydrogen mix (MHM) as fuel gas in gas pumping units

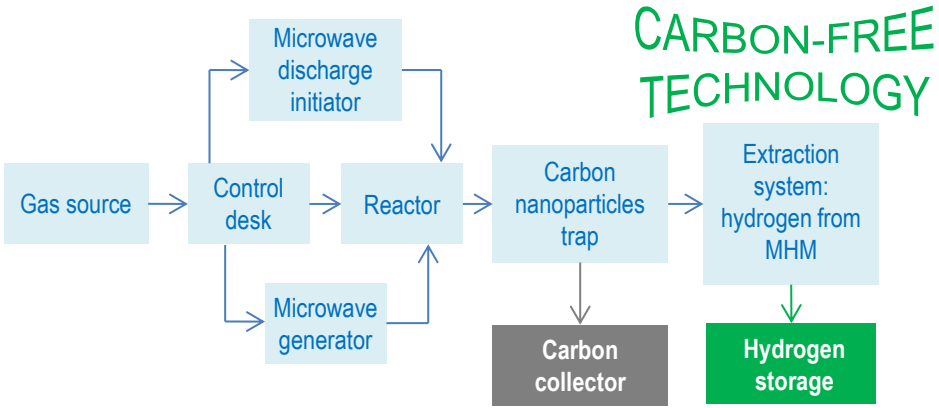


Patents: Russia, Japan, China, South Korea

Expert review by the Center for Integrated Development of Technologies and Energy Technology Systems (KORTES Center LLC), Gazprom-Geotekhnologii LLC

HYDROGEN PRODUCTION IN A LOW-TEMPERATURE NON-EQUILIBRIUM PLASMA

The impact of low-temperature non-equilibrium microwave-induced plasma on hydrocarbon gas molecules



CARBON-FREE TECHNOLOGY

PROTOTYPE PLANT

CARBON MATERIAL

CAPACITY OF:
- hydrogen – up to 1 м3/h;
- carbon material – up to 80 g/h

The hydrocarbon gas conversion takes place in a closed plasma-chemical flow reactor **in the absence of oxygen** and at ambient pressure

Source: NATIONAL RESEARCH TOMSK POLYTECHNIC UNIVERSITY

PROPOSITIONS TO THE EU STRATEGY FOR LOW EMISSIONS

1. **NATURAL GAS**
2. **MHM**
   METHANE-HYDROGEN ENERGY SOURCE
3. **HYDROGEN**

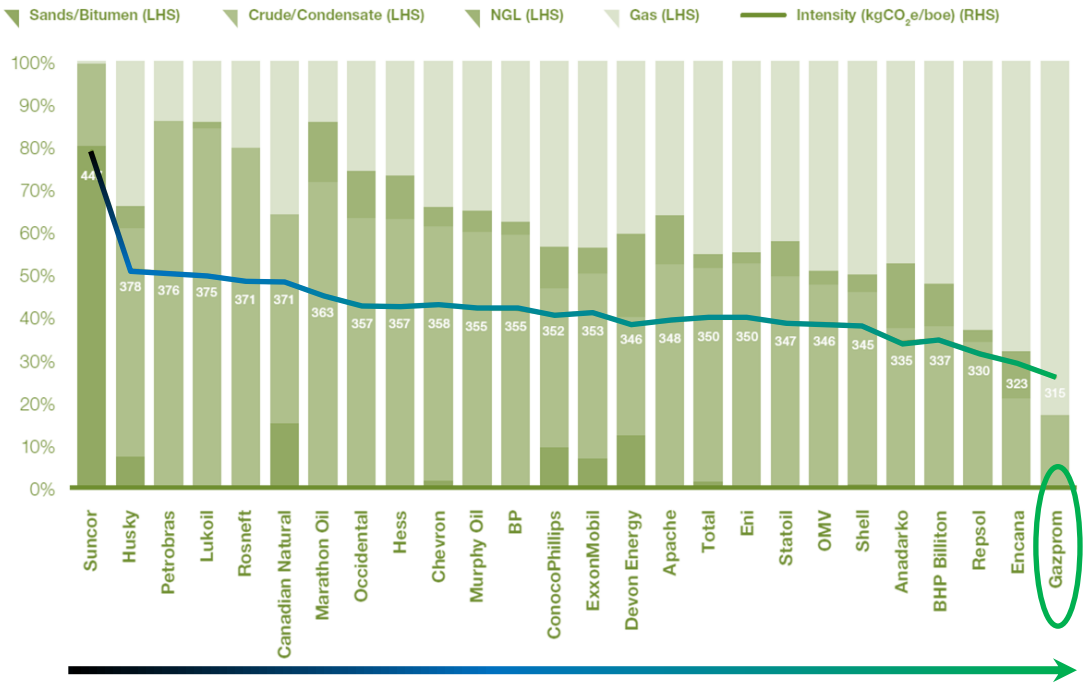
DECARBONISATION OF EU ENERGY AND TRANSPORT SECTORS BY NEARLY 2 TIMES

ACHIEVEMENT OF EU CLIMATE TARGETS FOR 2030

ESTABLISHING OF ACCEPTABLE CONDITIONS FOR THE DEVELOPMENT OF HYDROGEN ENERGY FROM NATURAL GAS

RANKING ENERGY COMPANIES ON CLIMATE

The Carbon Majors Database
CDP Carbon Majors Report 2017



! the best

GAZPROM

THANK YOU FOR YOUR ATTENTION !