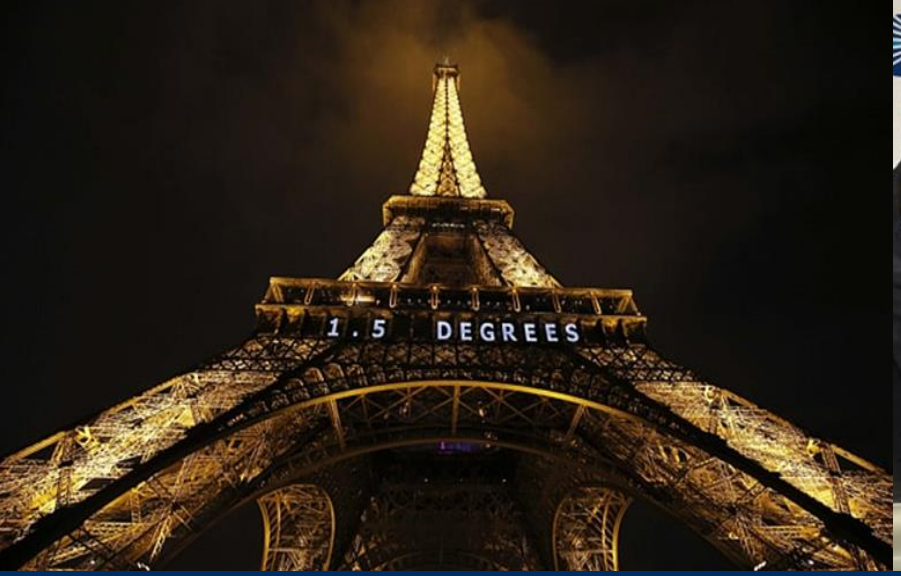


Russia in the Post-Paris World: New Energy Landscape?

MIT JOINT PROGRAM ON THE SCIENCE AND POLICY OF GLOBAL CHANGE

Massachusetts Institute of Technology

Igor Makarov
Higher School of Economics

Henry Chen
Sergey Paltsev
Massachusetts Institute of Technology

HIGHER SCHOOL OF ECONOMICS

Moscow, Russia
November 13, 2017

Setting

UN Paris Agreement Goal: "**Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.**"

Signed: 195 countries
Ratified: 169 countries

Russian INDC: submitted on April 1, 2015.

Russian goal: "**Limiting anthropogenic greenhouse gases in Russia to 70-75% of 1990 levels by the year 2030 might be a long-term indicator, subject to the maximum possible account of absorbing capacity of forests.**"

Russian Signature: April 22, 2016

Russian Ratification: not ratified yet

US Status

US Goal: 26-28% in 2025 relative to 2005.

Signed: April 22, 2016
Accepted (not Ratified): September 3, 2016

Withdrawal: June 1, 2017

Trump Reasons: costly for the U.S.; badly negotiated deal; U.S. emissions are decreasing anyway; does little for climate

Climate Policy and Fossil-Fuel Exporters

Not many direct studies of fossil-fuel producers, but many studies, where impacts on fossil-producing countries have stressed:

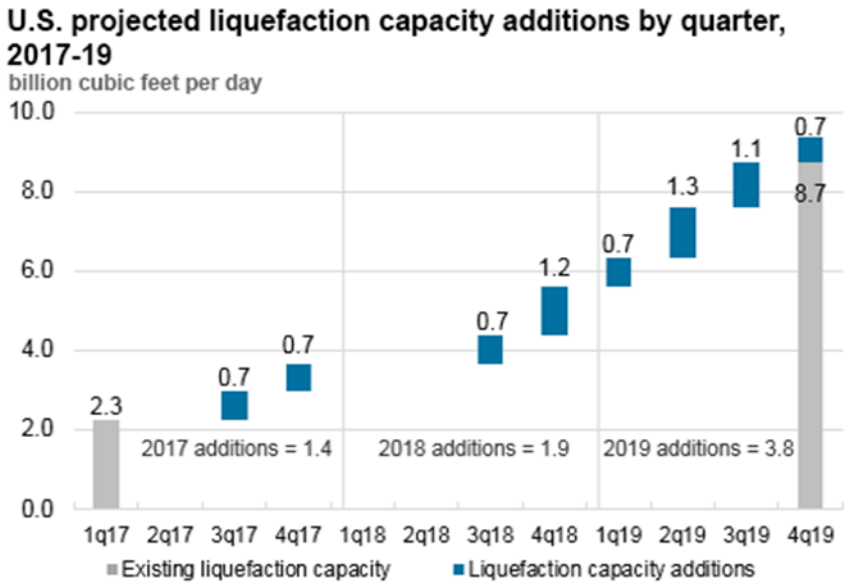
1) Cost of policy: more expensive energy

2) Loss of energy export revenue

3) Uncertainty with diversification directions

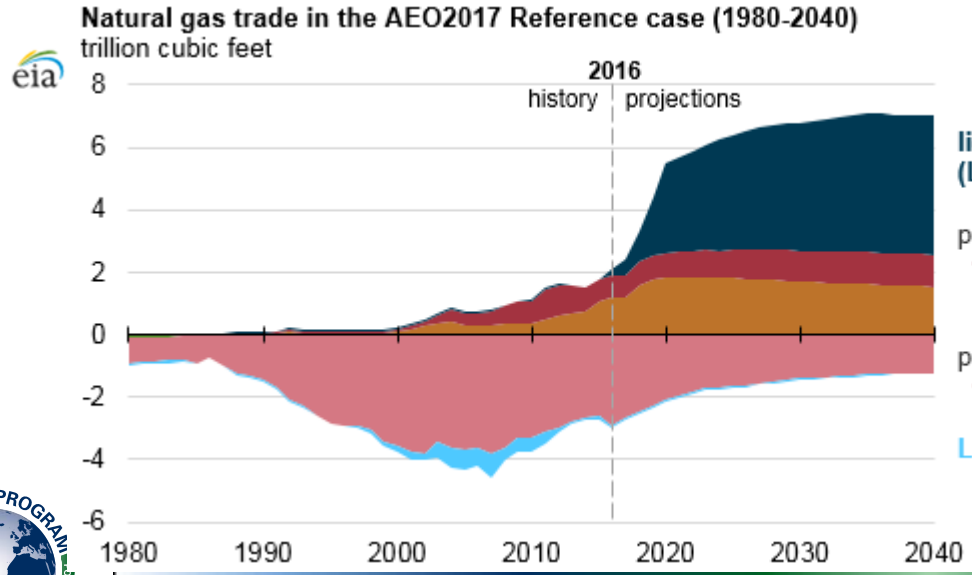
Regardless of climate policy: headwinds for oil and natural gas producers from U.S. shale gas and tight oil.

Regardless of Climate Policy: LNG Export Capacity from USA



U.S. LNG capacity:
2016: 2.3 Bcf/d = 0.8 Tcf = 24 bcm
2020: 9.4 Bcf/d = 3.2 Tcf = 97 bcm

Compare:
2016 Russian Exports to Europe – 166 bcm
2016 Russian Exports to Germany – 46 bcm



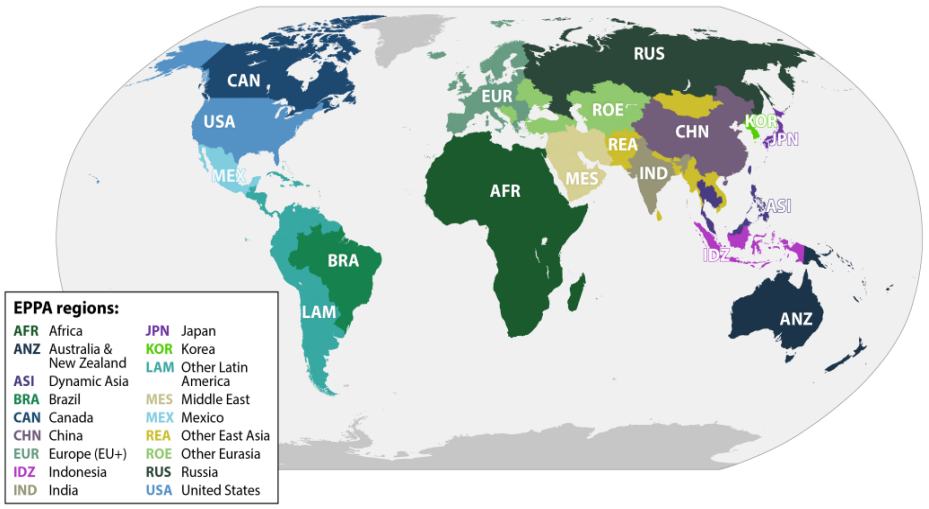
2016 - World
Pipeline trade – 740 bcm
LNG trade – 350 bcm

2020
Expected LNG Capacity:
Australia – 120 bcm
(currently – 60 bcm);
Qatar – 110 bcm
(lifted self-imposed
moratorium for expansion)

Tool for Analysis: MIT EPPA Model

Major goals:
Energy, economy, GHG and air pollutants projections.

Representation:
Global coverage,
All sectors of economy.



Non-Energy
- Crops
- Livestock
- Forestry
- Food
- Energy Intensive Ind.
- Manufacturing
- Services
- Industrial Transport
- Household Transport

Energy
- Crude oil
- Refined oil
- Liquid fuel from biomass
- Oil Shale
- Coal
- Natural gas (conv., shale, tight, CBM)
- Electricity
- Synthetic gas (from coal)

Vehicle Types
ICE (gasoline & diesel)
Plug-in Electric
Battery Electric

Biofuels
Current generation (Ethanol from Biodiesel)

Advanced biofuel

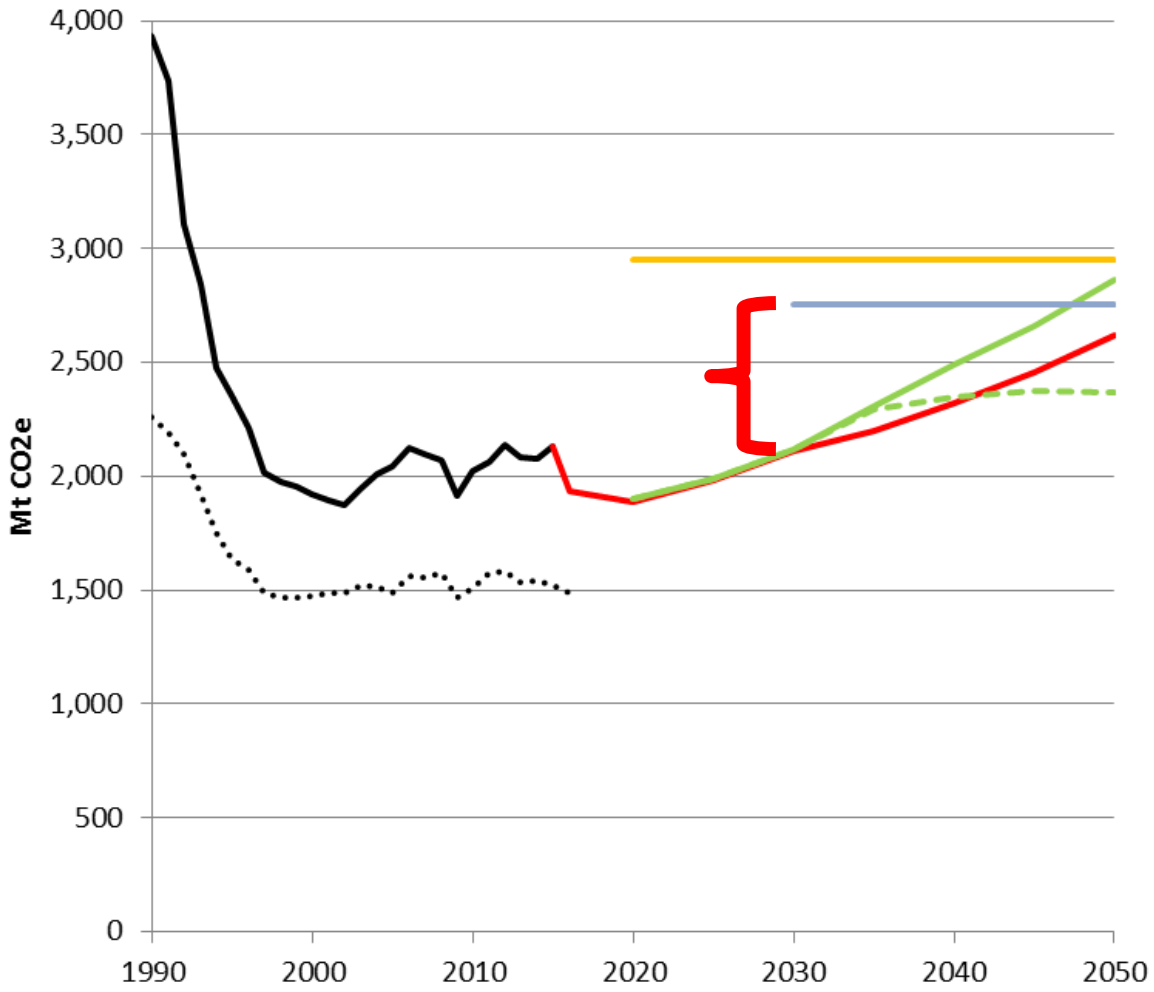
Technologies Included
Fossil (oil, gas, coal)
Advanced NG (NGCC)
Coal with carbon capture
Gas with carbon capture
Nuclear
Hydro
Wind and solar
Biomass

Features: Theory-based; Prices are endogenous; International Trade; Inter-industry linkages; Distortions (taxes, subsidies, etc); GDP and Welfare effects.
Trade-off: Aggregated representation of technologies.

Scenarios

- Reference (BAU, No Policy)
- “Paris Forever” (no additional policy after 2030)
- Paris to 2C
- Paris to 2C but Russia at BAU
- Diversification: Paris with Russia imposes 1%, 2%, or 3% tax on fossil fuel production (alt. carbon tax) to finance education investment and services sector

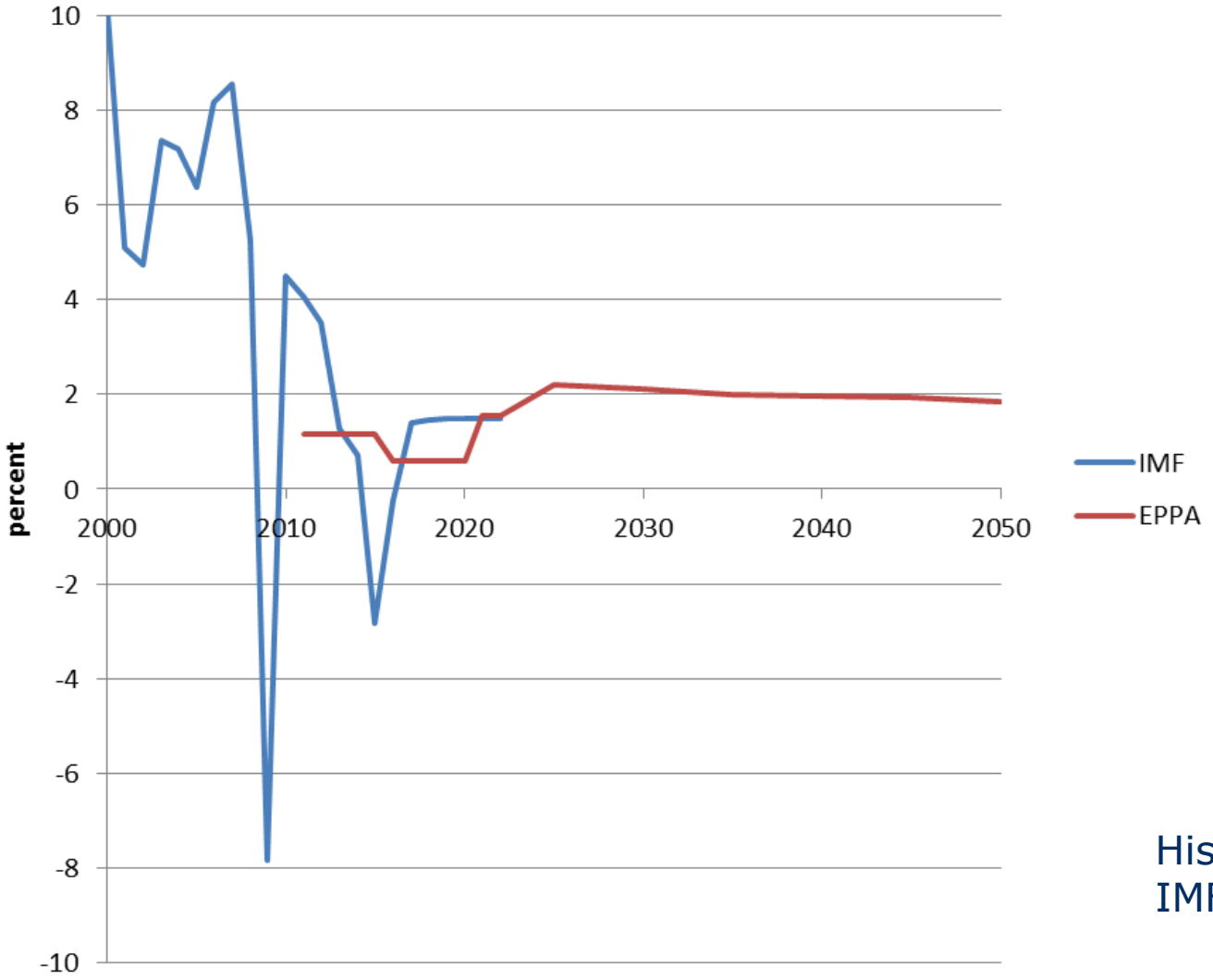
GHG Emissions



Paris targets are not binding for Russia

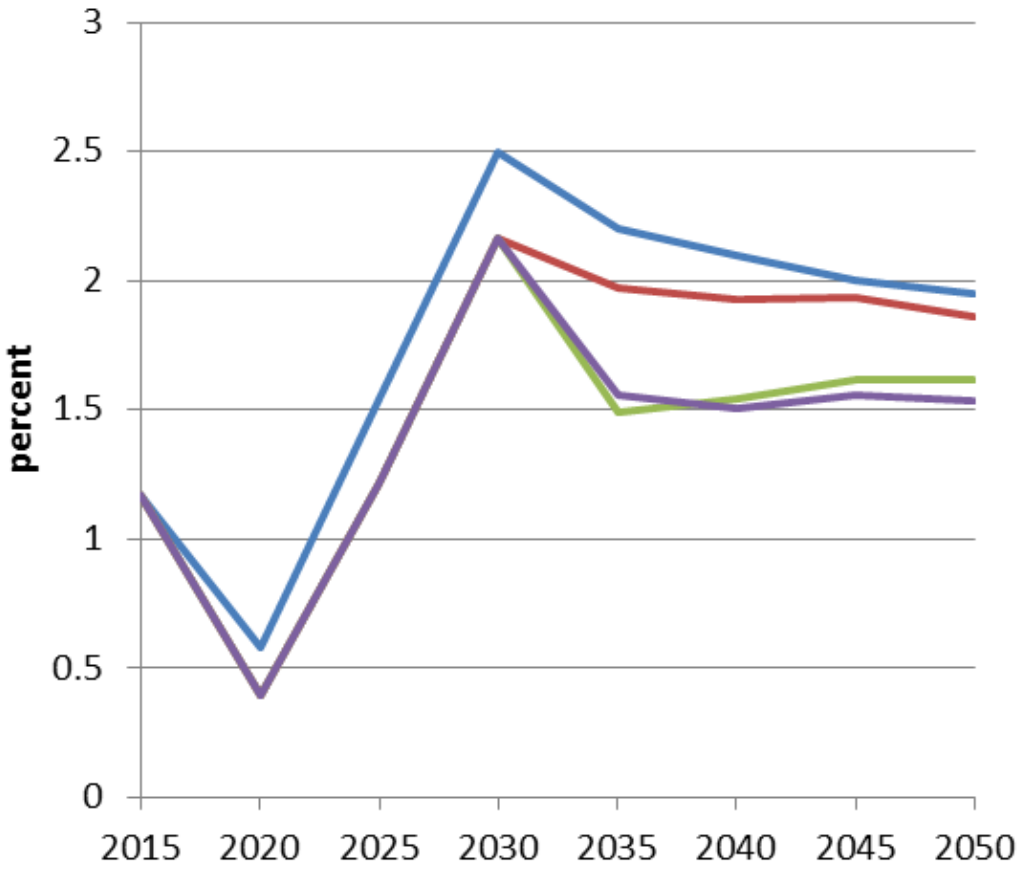
Historic data: UNFCCC (2017), BP (2017)
Projections: EPPA

Real GDP Growth Assumptions in the Reference Scenario



Historic data:
IMF (2017)

Impacts on the (5-year average) real GDP growth rates

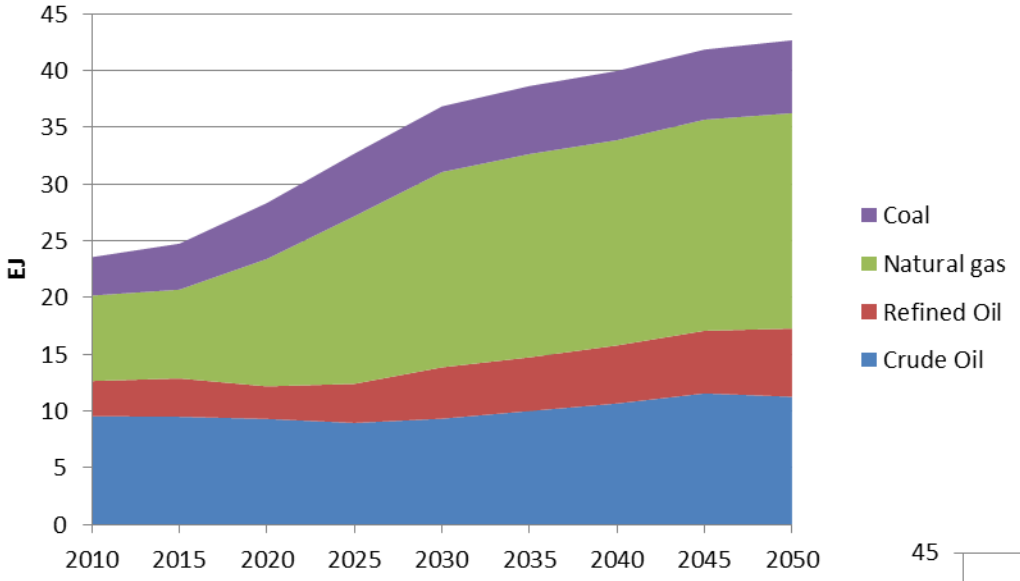


Projections: EPPA

Paris Agreement: Negative impact of 0.2-0.3 percentage points of GDP growth in 2020-2030.

More stringent target (consistent with 2C): Additional negative impact of 0.3-0.5 percentage points of GDP growth in 2035-2050.

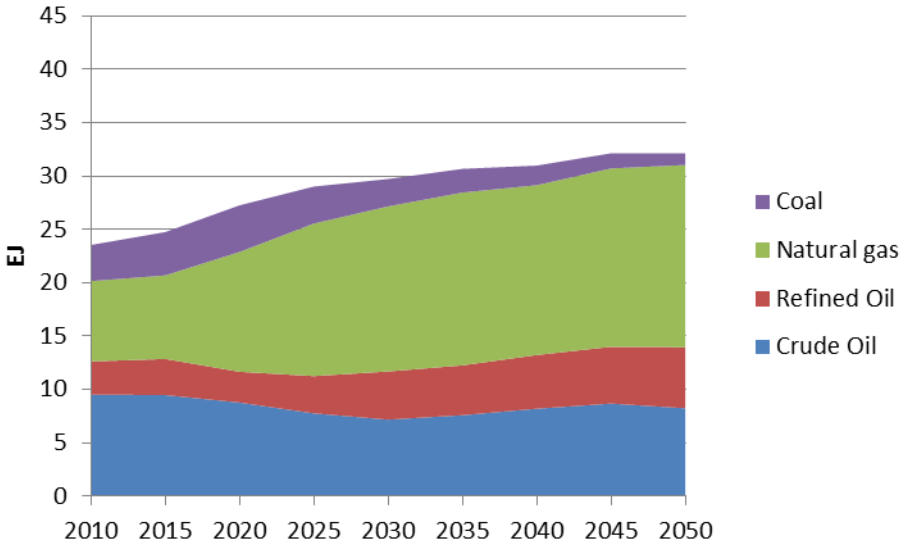
Fossil Fuel Exports (Paris vs Reference)



Reference

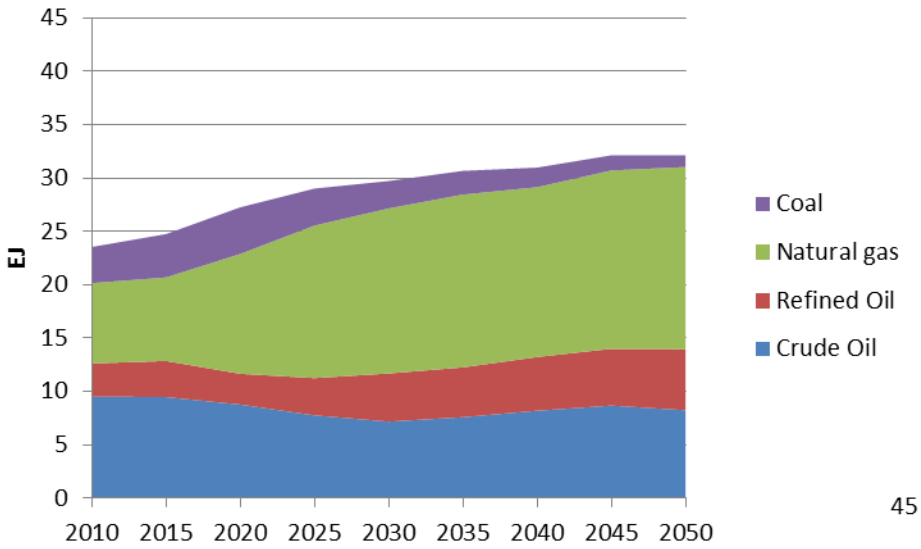
Projections:
EPPA

2030 impact on coal exports:
More than 50% reduction
relative to Reference



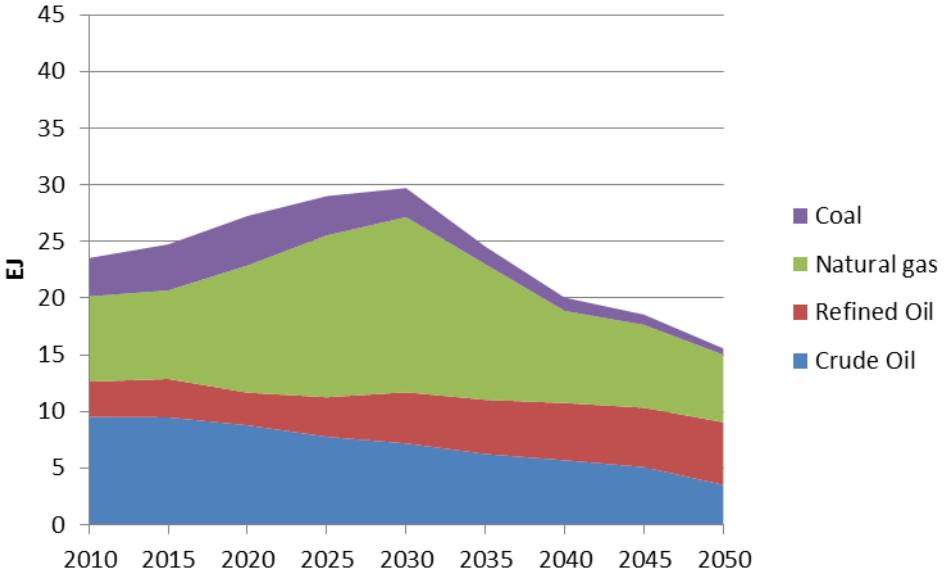
Paris Forever

Fossil Fuel Exports (2C vs Paris)



Projections: EPPA

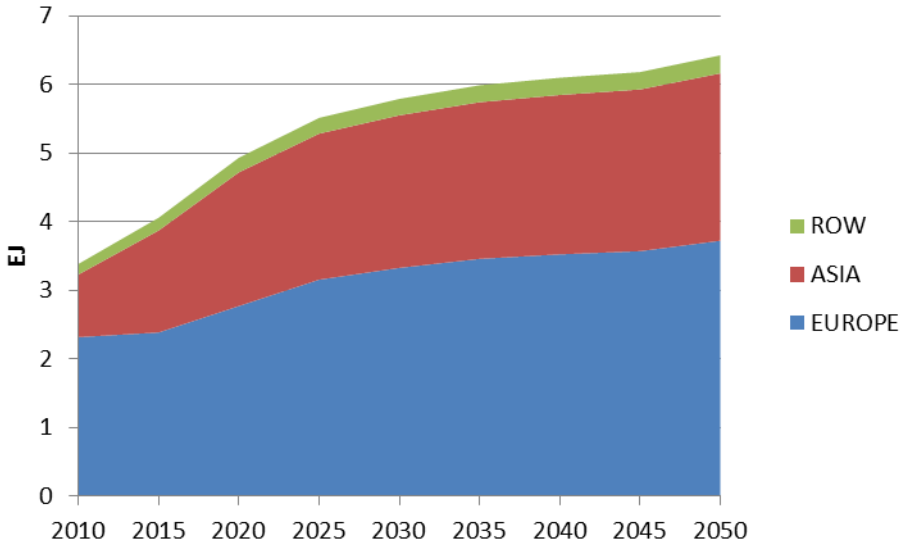
2050 impact on gas exports: More than 60% reduction relative to Paris



Paris Forever

Paris to 2C

Coal Exports



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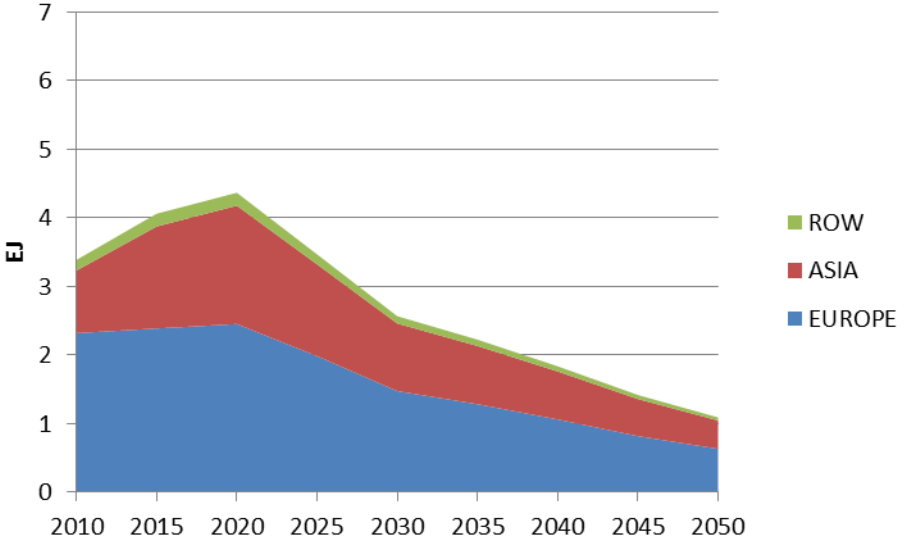
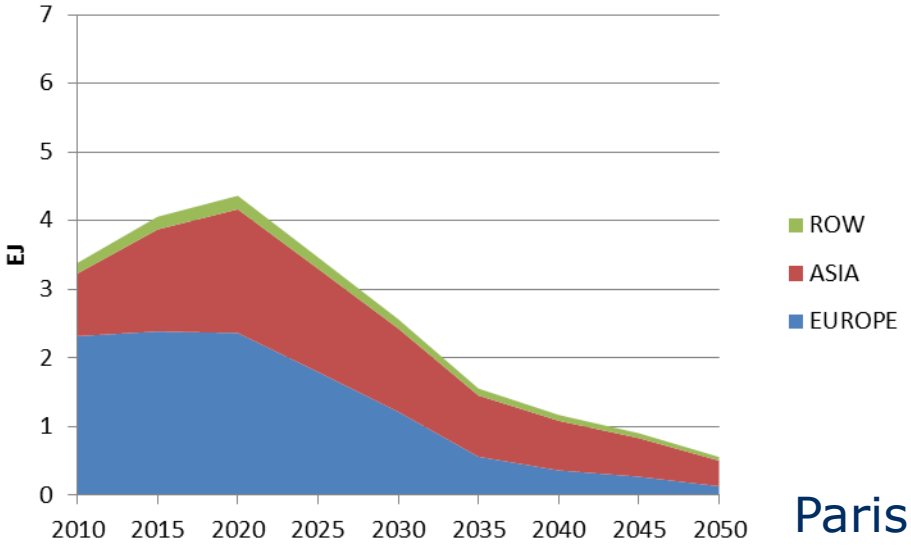


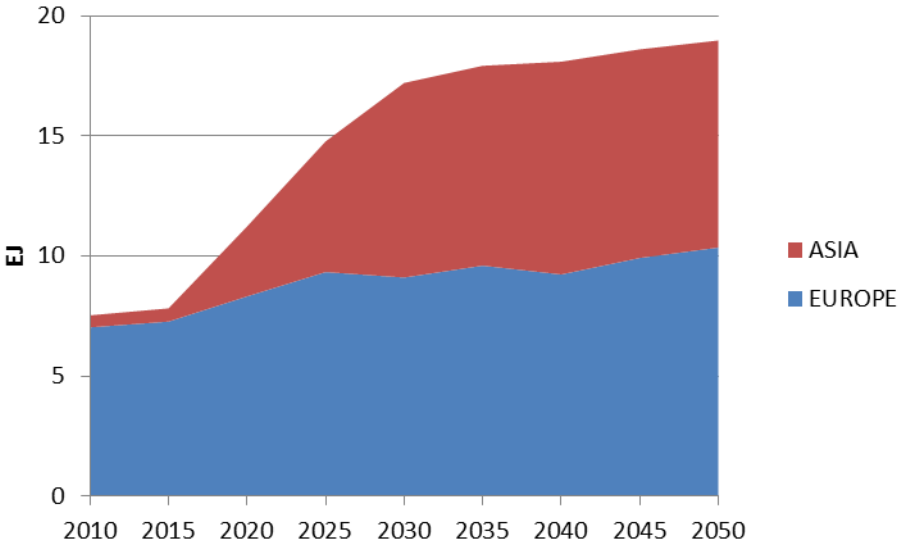
Paris Forever



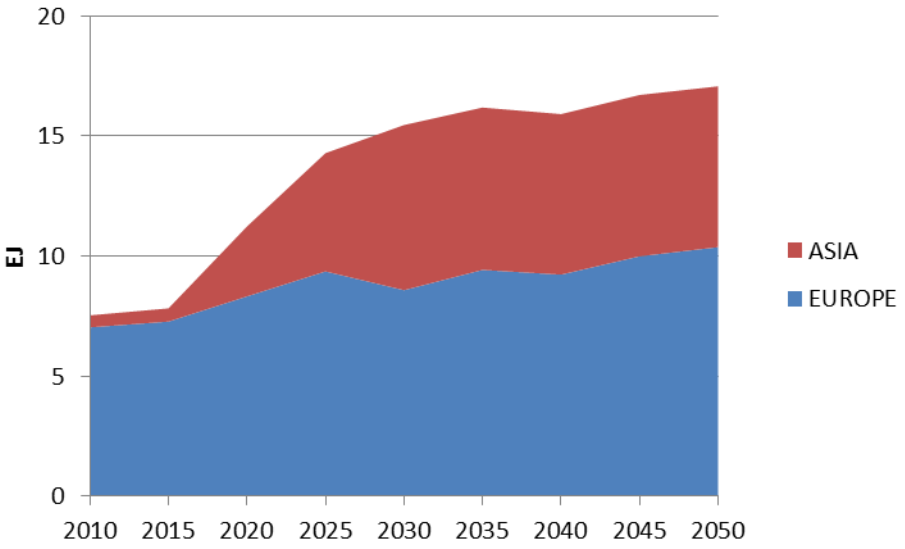
Projections:
EPPA

Paris to 2C

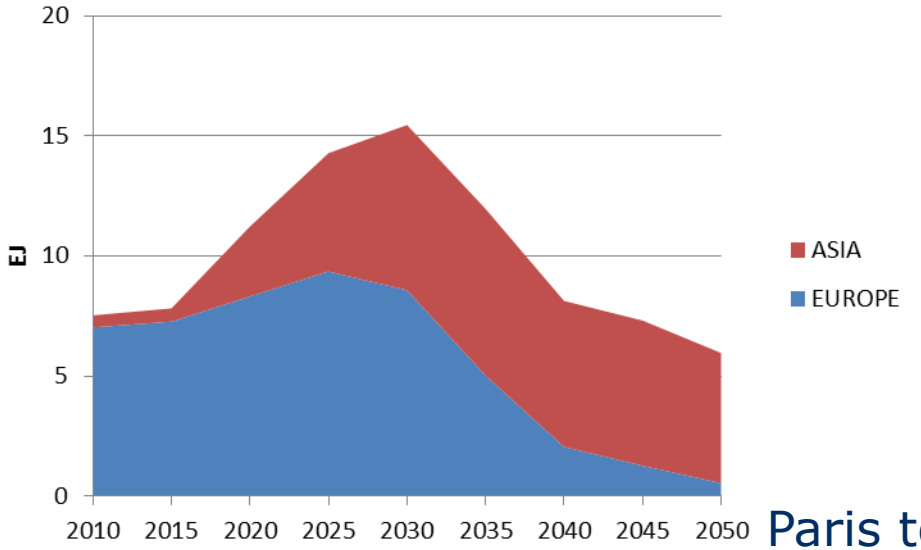
Natural Gas Exports



Reference



Paris Forever



Projections:
EPPA

Paris to 2C

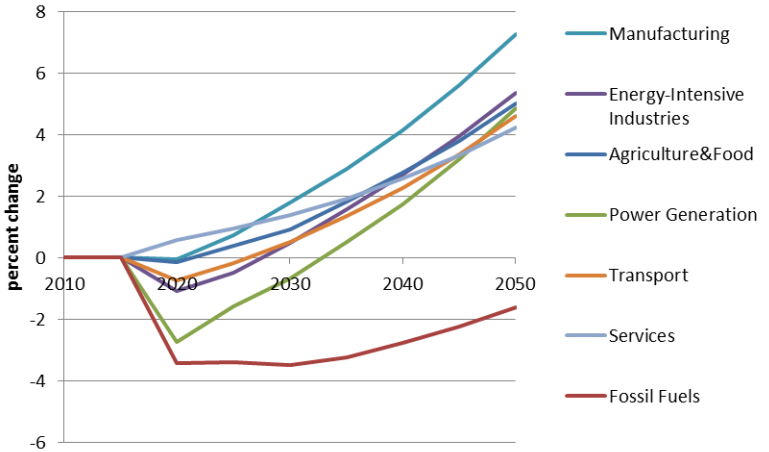
Diversification

An *illustrative* scenario: tax fossil fuel production => distribute revenue to education => increase in labor productivity of new workers => higher output => higher GDP growth.

Calibration: expenditure per student – OECD (2013),
education rate of return – 12% based Arabsheibani and Staneva (2012)
(i.e., for each additional representative year of support of education,
12% increase in labor productivity of a new worker).

Results: initial small decreases in GDP in 2020 (by 0.11%, 0.24%,
and 0.39% for 1%, 2%, and 3% tax, respectively), but then the robust
increases in GDP (by 2050 by 1.3%, 2.7%, 3.95% relative to
"no diversification").

Change in sectoral output



Concluding Remarks

The Paris Agreement affects Russia's prospects for fossil fuels exports (especially for coal exports, but natural gas exports might also be substantially affected by the further increase in the emission reduction goals).

Without diversification, the negative impact on real GDP growth of Russia is 0.2-0.7 percentage points.

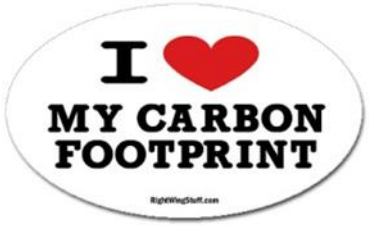
Potential non-ratification would not improve Russia's position (and likely to invite border carbon adjustment measures from other regions).

Diversification may help, but no clear path for its implementation.

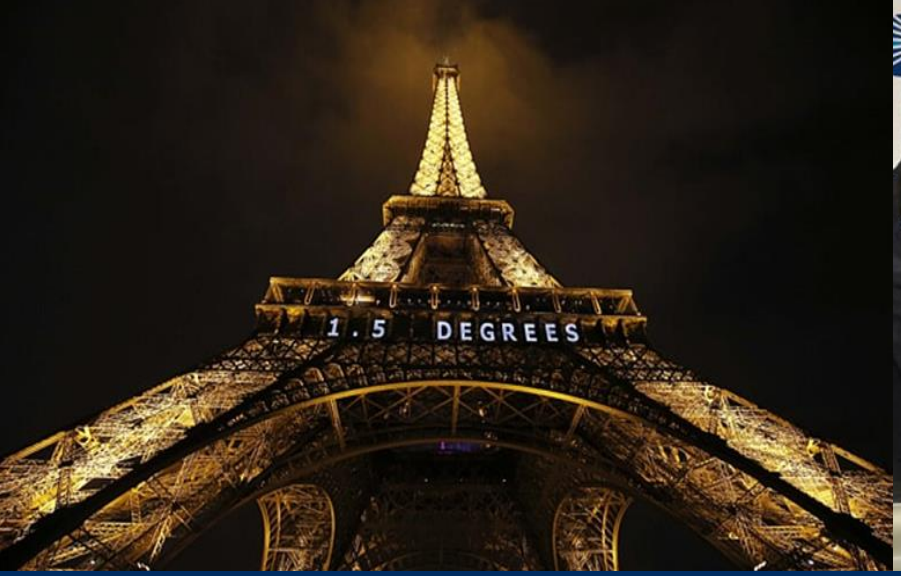
One potential scenario: tax fossil production and invest in education. It results in the long-term GDP gains (but short-term loses).

Thank you

Questions or comments?
Please contact Sergey Paltsev at paltsev@mit.edu



http://globalchange.mit.edu/



Последствия Парижского соглашения: Россия в новом энергетическом ландшафте

Игорь Макаров
НИУ ВШЭ

Хенри Чен
Сергей Пальцев
MIT

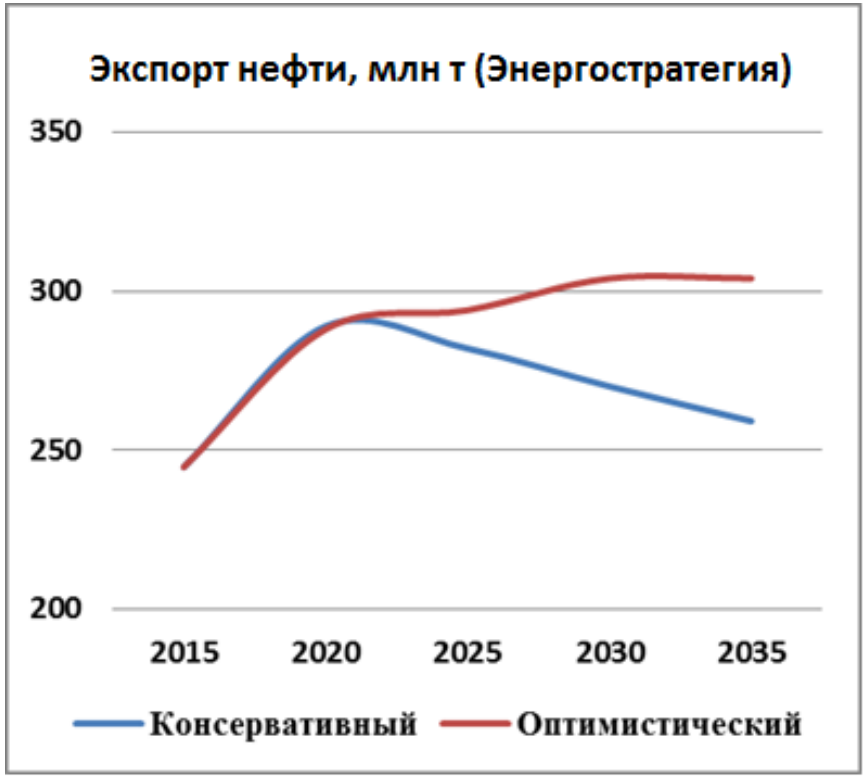
Москва
13 ноября 2017 г.

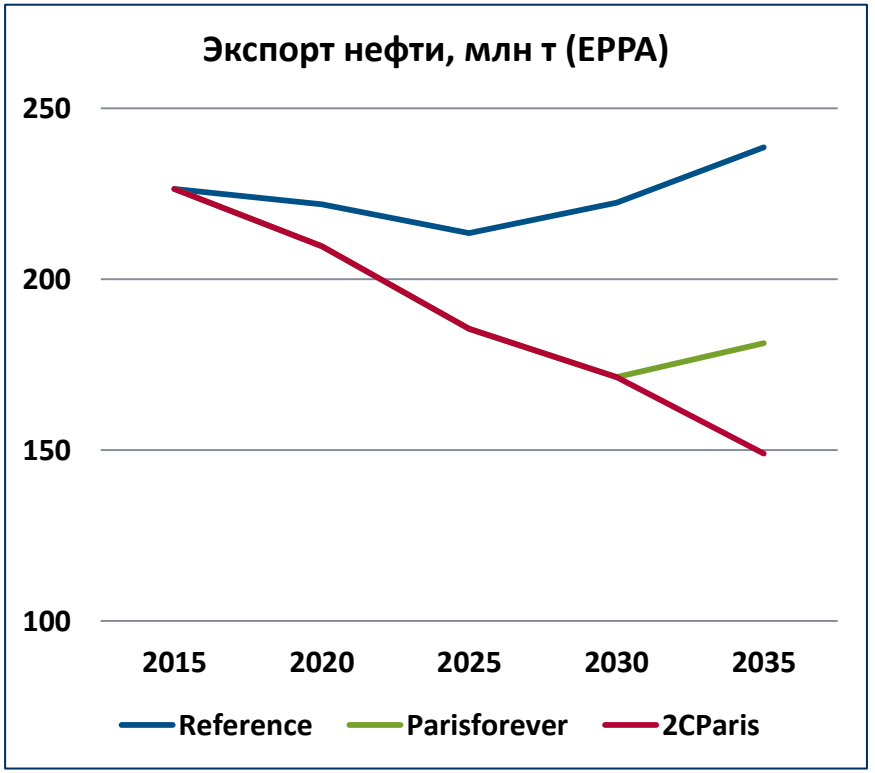
Восприятие Парижского соглашения в России

- Дискуссия по поводу ратификации
- Декабрь 2017 г.: Отчет с оценкой социально-экономических последствий ратификации Парижского соглашения
- В Энергетической стратегии РФ на период до 2035 г. Парижское соглашение упоминается один раз:

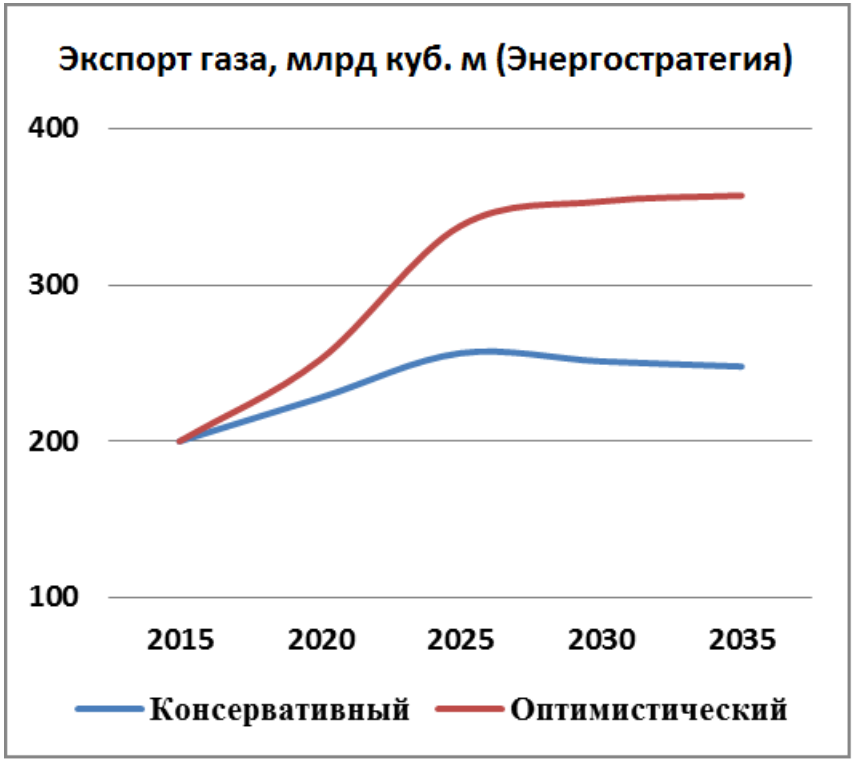
  «В 2016 году Российская Федерация подписала Парижское соглашение по климату, предусматривающее, в том числе, разработку до 2020 года стратегии социально-экономического развития с низким уровнем эмиссии парниковых газов на период до 2050 года. В целях минимизации возможных негативных последствий для российского ТЭК от реализации указанного соглашения необходим предельно взвешенный подход к принятию тех или иных дополнительных регуляторных мер по противодействию изменениям климата».
- Главные риски – не от собственных действий по сокращению выбросов, а от климатической политики других стран

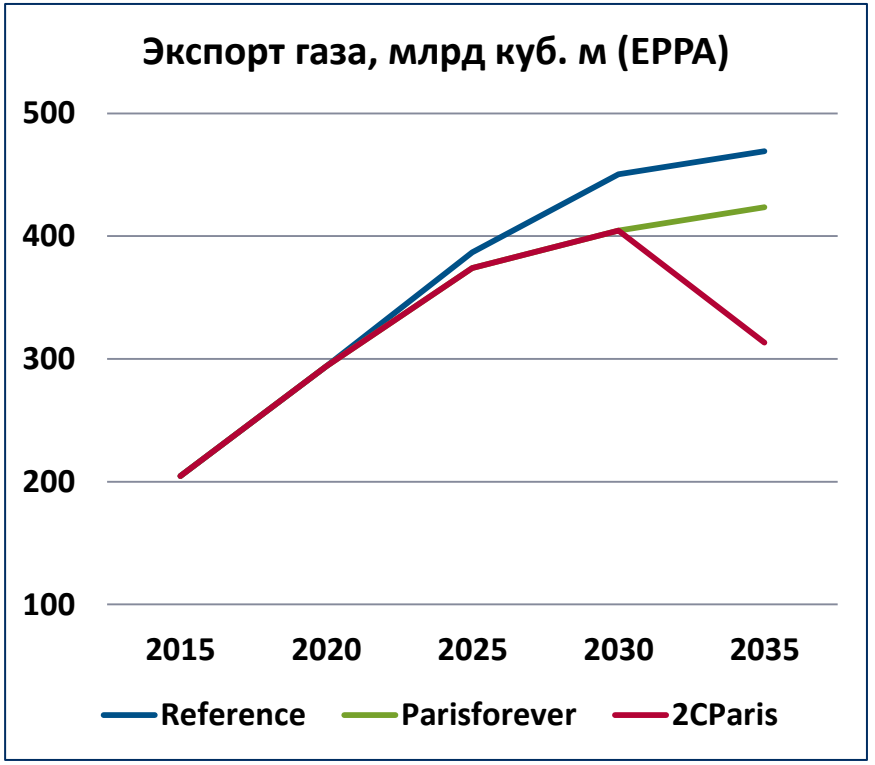
Экспорт нефти (Энергостратегия РФ vs EPPA)



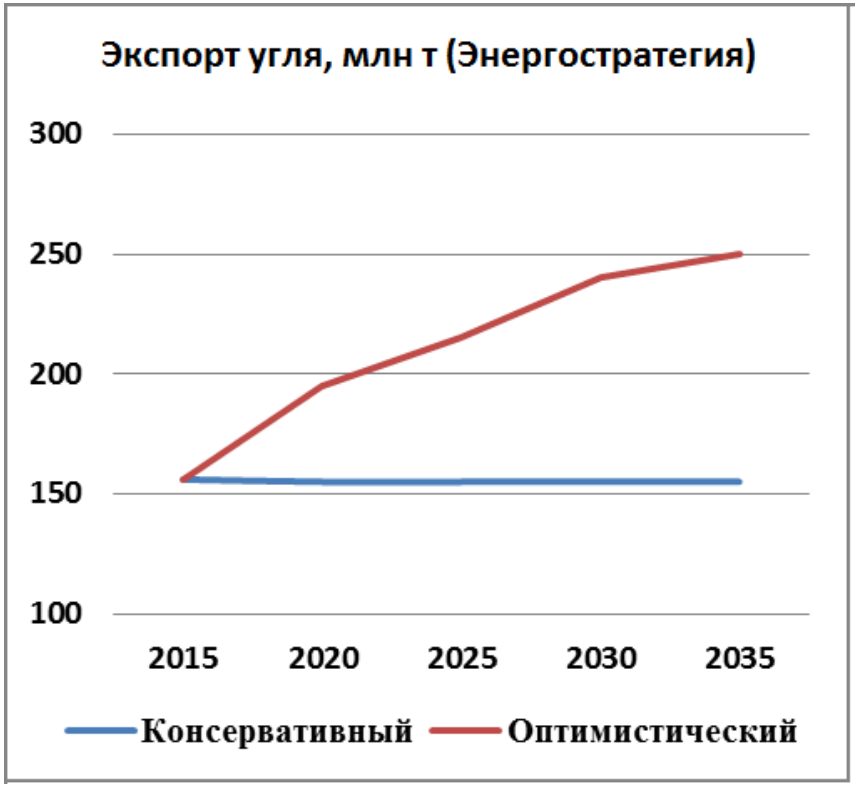


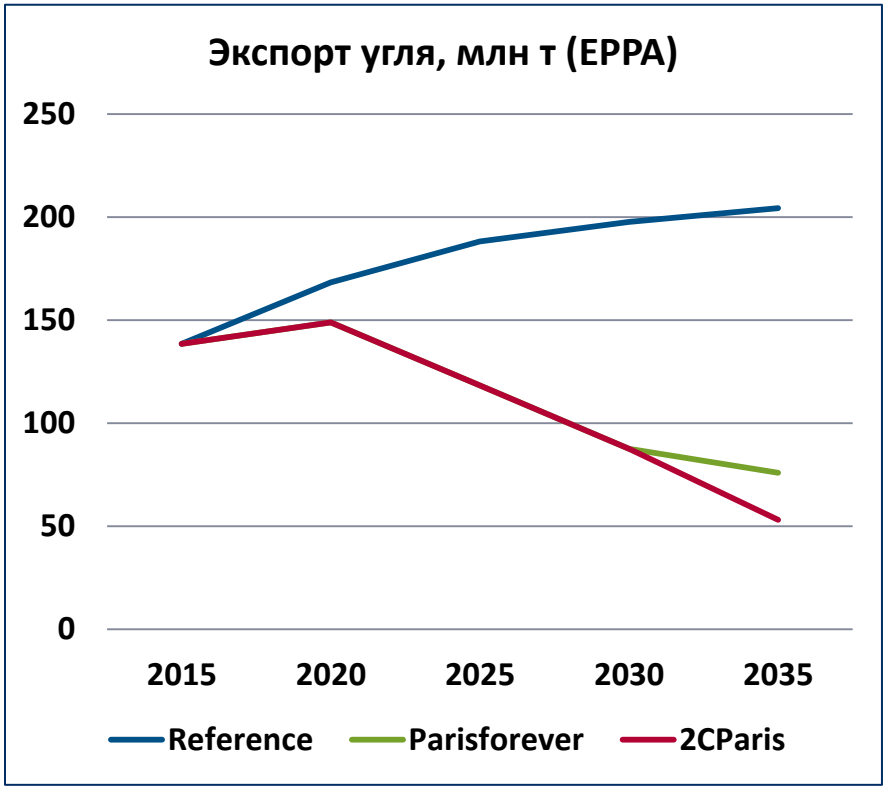
Экспорт газа (Энергостратегия РФ vs EPPA)



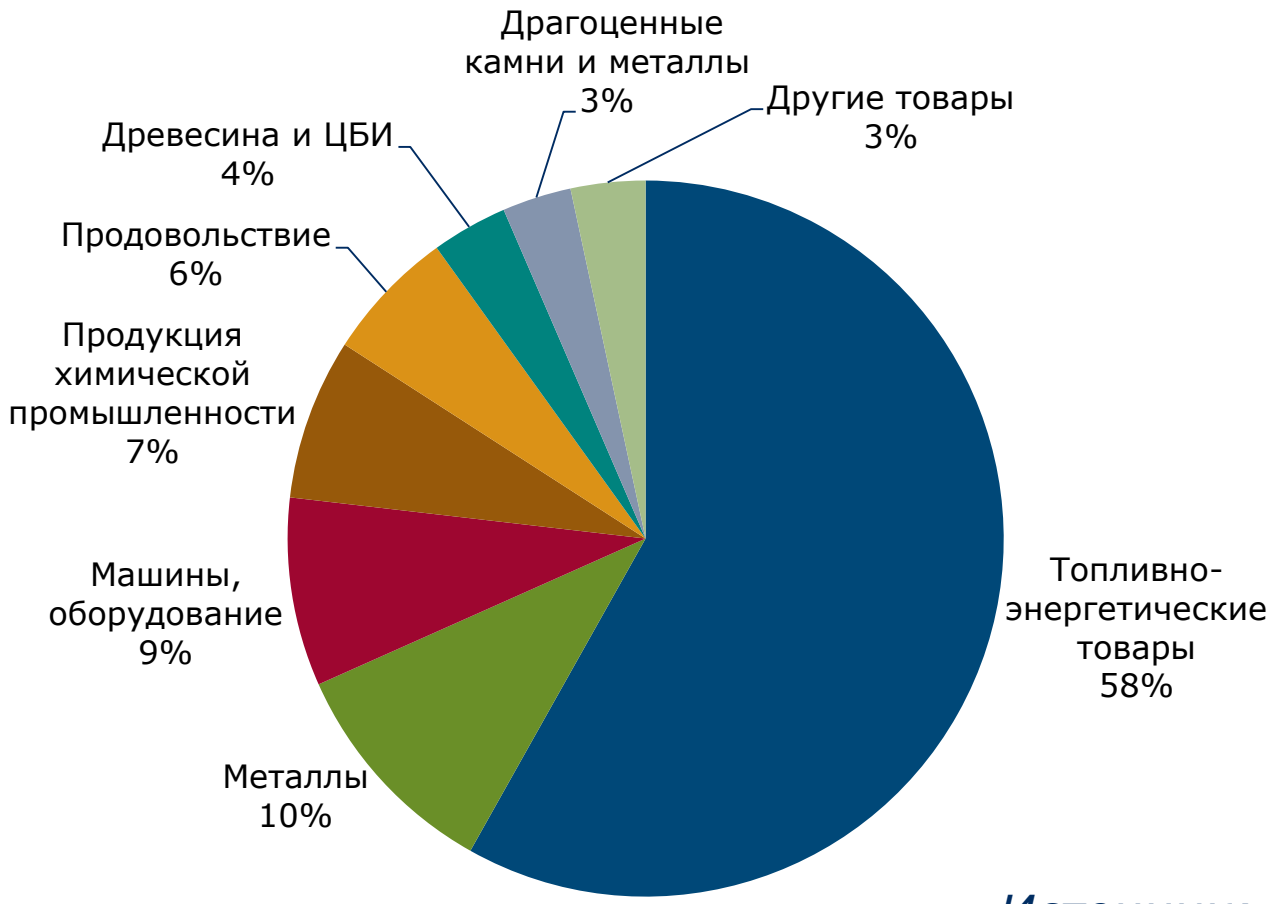


Экспорт угля (Энергостратегия РФ vs EPPA)





Российский экспорт

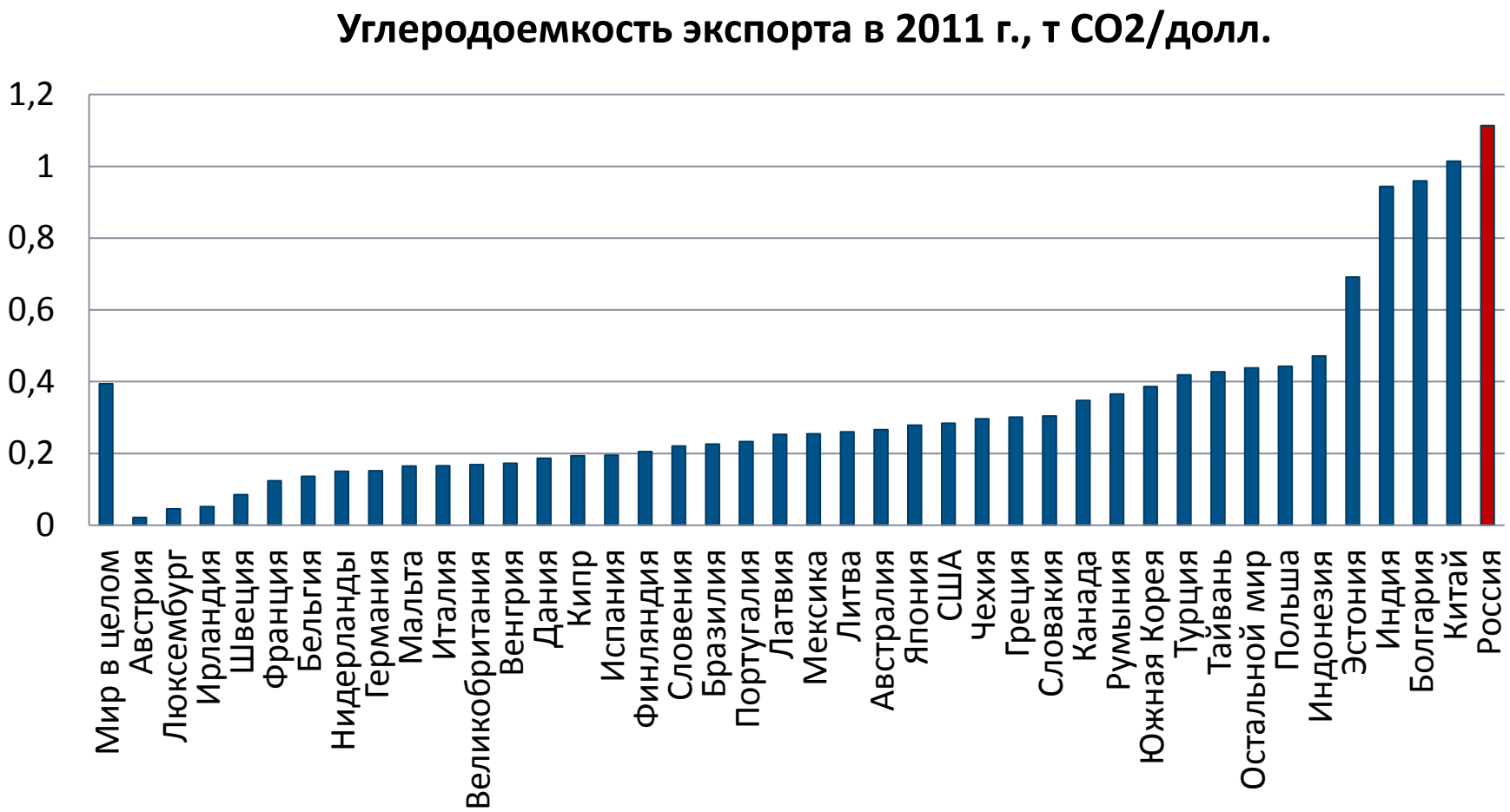


Источник: ФТС

Риски для энергоемкого экспорта

Источник: Макаров, Соколова (2013)

Риски для энергоемкого экспорта



Источник: Макаров, Соколова (2013)

Риски технологической отсталости

Развитие многих видов «зеленых» технологии остается вне стратегии экономического развития России

- Цель по ВИЭ: 4,5% производства электроэнергии к 2020 г. заменена на 2,5% и, вероятно, даже в таком виде не будет выполнена
- Цель по энергоемкости экономики: снижение на 40% между 2007 и 2020 гг. (заменена на снижение на 44% между 2005 и 2030 гг.) – финансирование свернуто
- Smart grids, электромобили – нет ни целей, ни стратегии развития

Что делать?

- Необходима разработка новой стратегии развития страны (пример – стратегия Vision 2030 в Саудовской Аравии)
  - Низкоуглеродное развитие
    - Механизмы стимулирования сокращения выбросов
    - Механизмы развития низкоуглеродных технологий
  - Адаптация к трем видам рисков:
    - Риски энергетического экспорта
    - Риски для экспортеров энергоемкой продукции
    - Риски технологического отставания
  - Диверсификация экономики
    - Поиск новых конкурентных преимуществ
    - Механизмы поддержки соответствующих производств

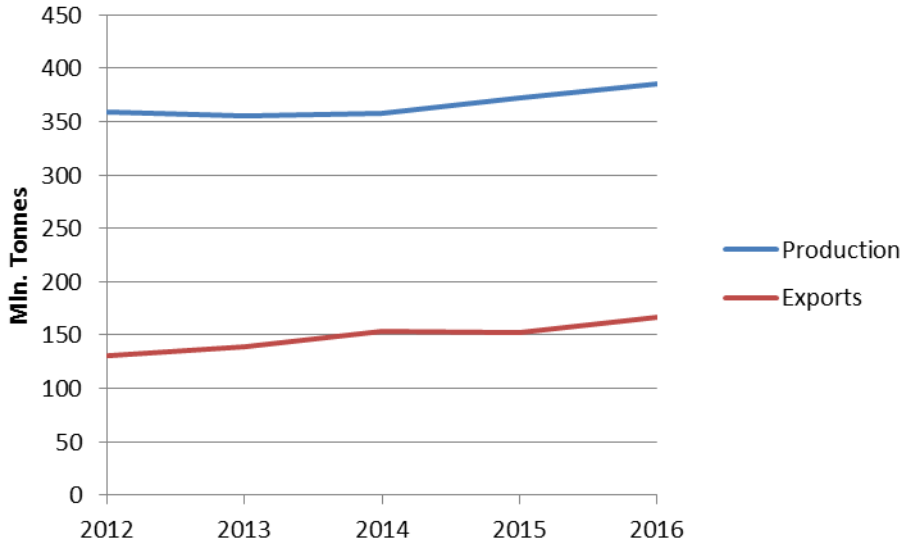
Спасибо за внимание!

imakarov@hse.ru

НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ

Supporting slides

Data Source: BP (2017), ITC (2017)



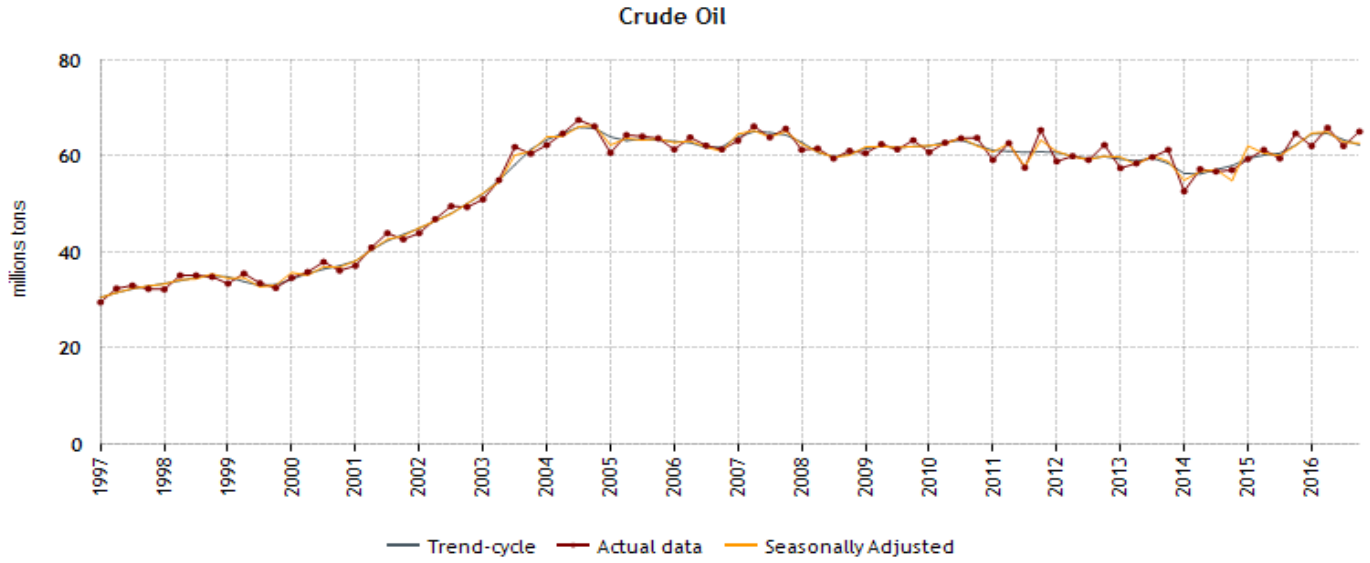
Major Impacts on Long-Term (20-30 years) Prospects: Switch to gas, EU demand, Asian demand, Russian transport infrastructure, Climate policies.

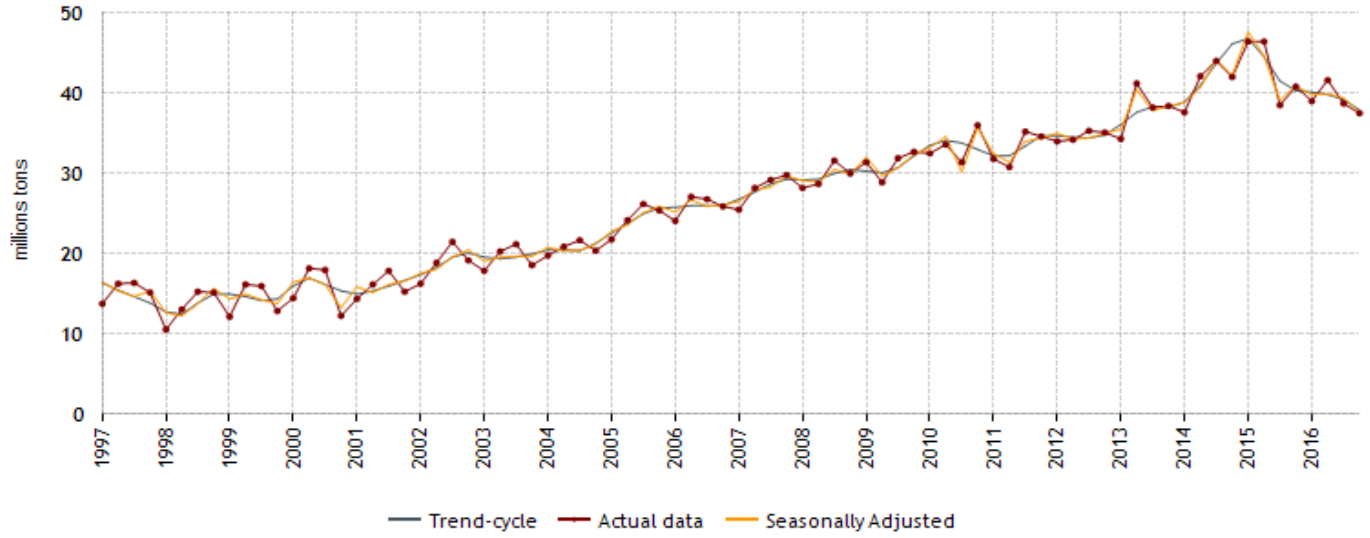
2016 Export Shares:

Korea – 15%, Japan– 11%; China – 10%, Turkey – 7%, UK – 7%, Ukraine – 6%, Netherlands – 6%, Germany - 5%, Taiwan – 5%.

EU as a bloc – 33%.

Source: ITC (2017)

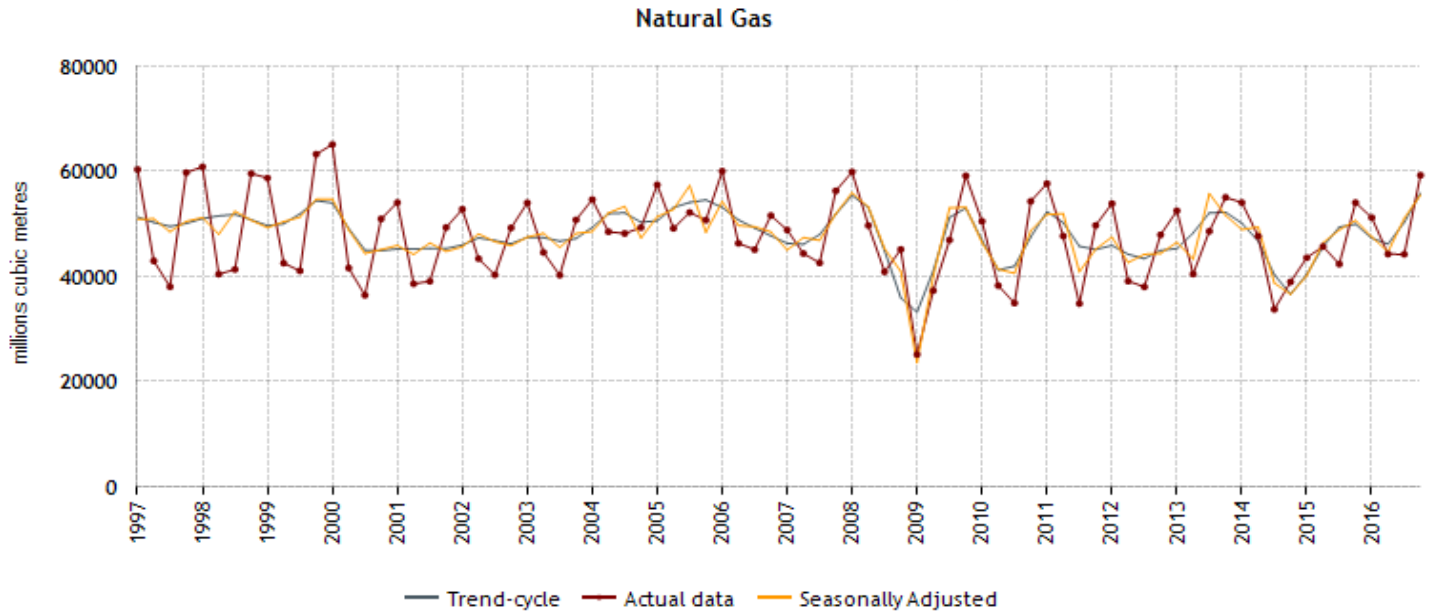




Figures Source: Central Bank of Russia (2017)

Major Impacts on Long-Term (20-30 years) Prospects: Russian reserves, Asian demand, Cost of US oil, Climate policies.

Figure Source: Central Bank of Russia (2017)



Major Impacts on Long-Term (20-30 years) Prospects: EU policy, LNG, Asian demand, Cost of US gas, Climate policies.

2016 Exports:

***Russia – 205 bcm**, Qatar – 125 bcm, Norway – 116 bcm; Canada – 83 bcm, USA – 65 bcm, Australia – 57 bcm.*

2016 Production:

*USA – 749 bcm, **Russia – 580 bcm**, Iran - 202 bcm, Qatar – 181 bcm, Canada – 152 bcm, China – 138 bcm, Norway – 117 bcm, Saudi Arabia – 109 bcm.*

Source: BP (2017)

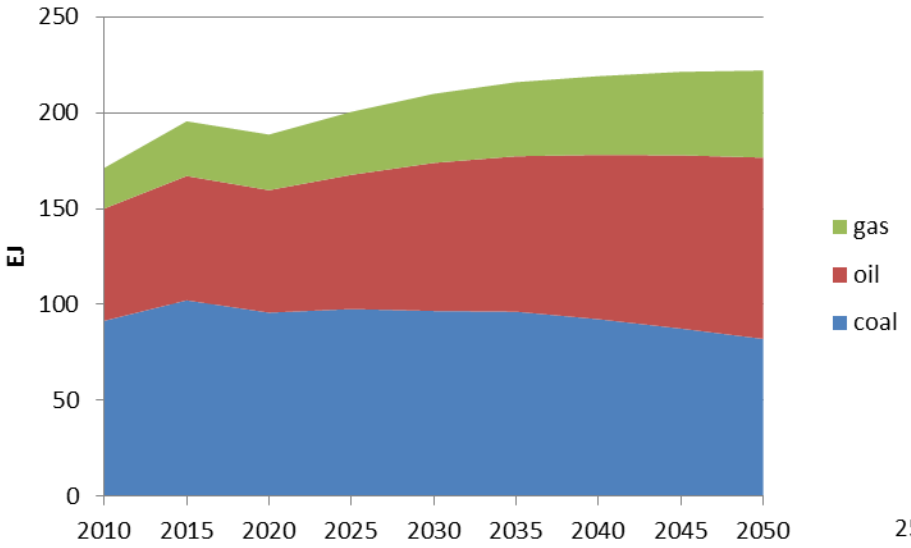
Projections:
EPPA

Oil Price
$/barrel

	2015	2020	2025	2030	2035	2040	2045	2050
Reference	52	57	62	66	70	73	76	79
Paris Forever	52	55	58	59	62	65	66	68
Paris to 2C	52	55	58	59	59	58	57	55

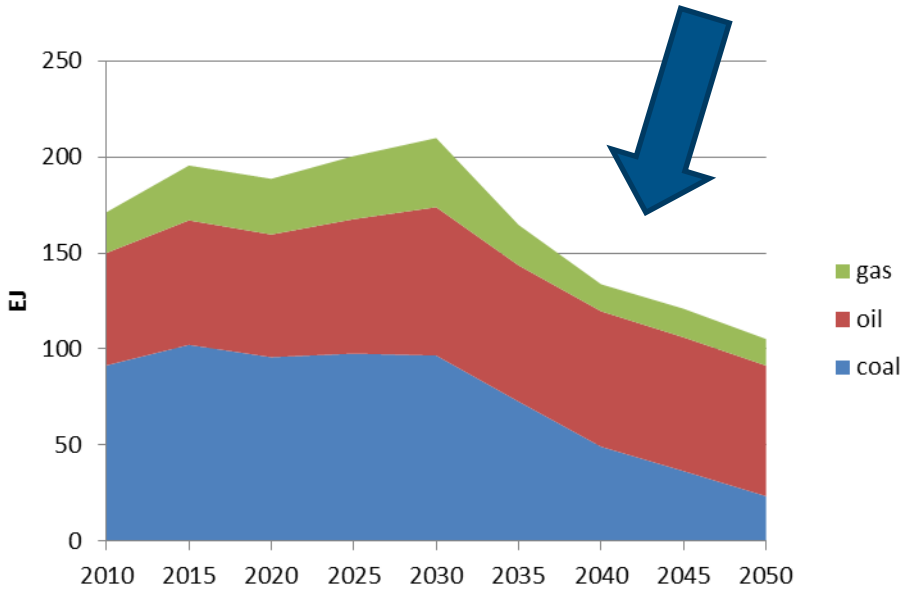
Percent change in GDP relative to Reference

	2020	2025	2030	2035	2040	2045	2050
ParisForever	-0.92	-2.47	-4.05	-5.12	-5.92	-6.22	-6.64
Paris2C_RussiaBAU	-0.92	-2.47	-4.05	-7.32	-9.82	-11.49	-12.94
Paris2C_RussiaPolicy	-0.92	-2.47	-4.05	-7.02	-9.68	-11.62	-13.42

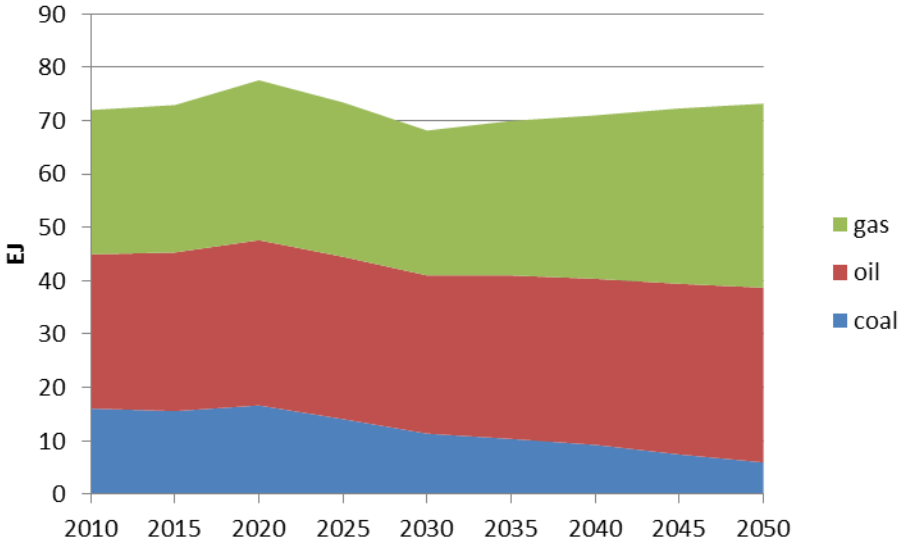


Paris Forever

The remainder is provided by non-fossil energy: hydro, nuclear, wind, solar, bio, etc.

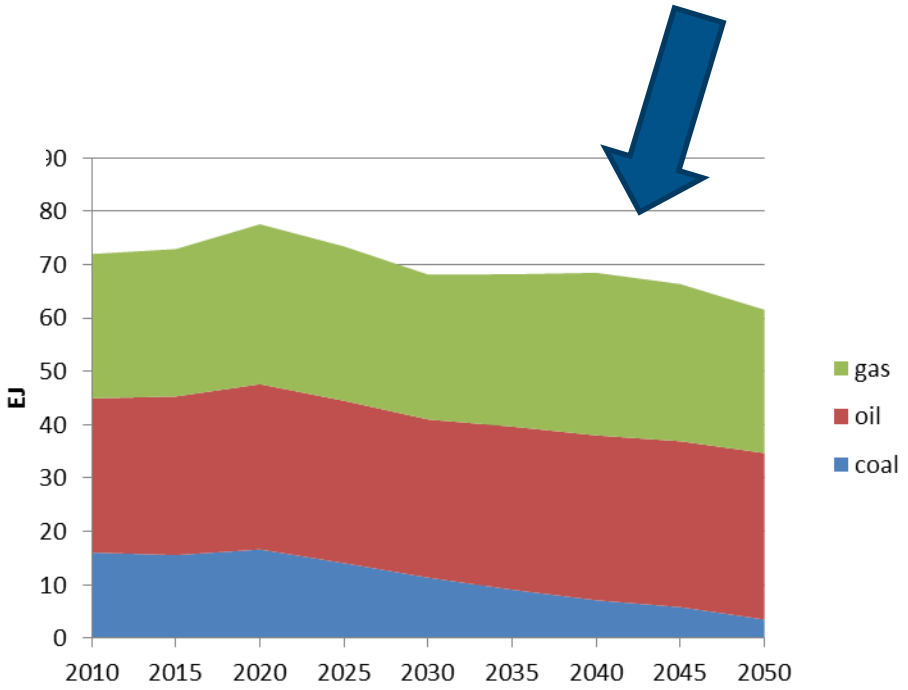


Paris to 2C

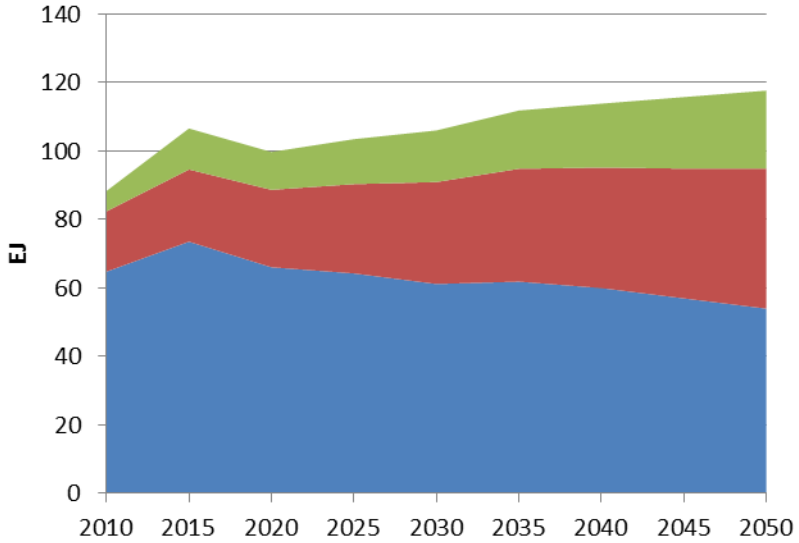


Paris Forever

The remainder is provided by non-fossil energy: hydro, nuclear, wind, solar, bio, etc.



Paris to 2C



Paris Forever

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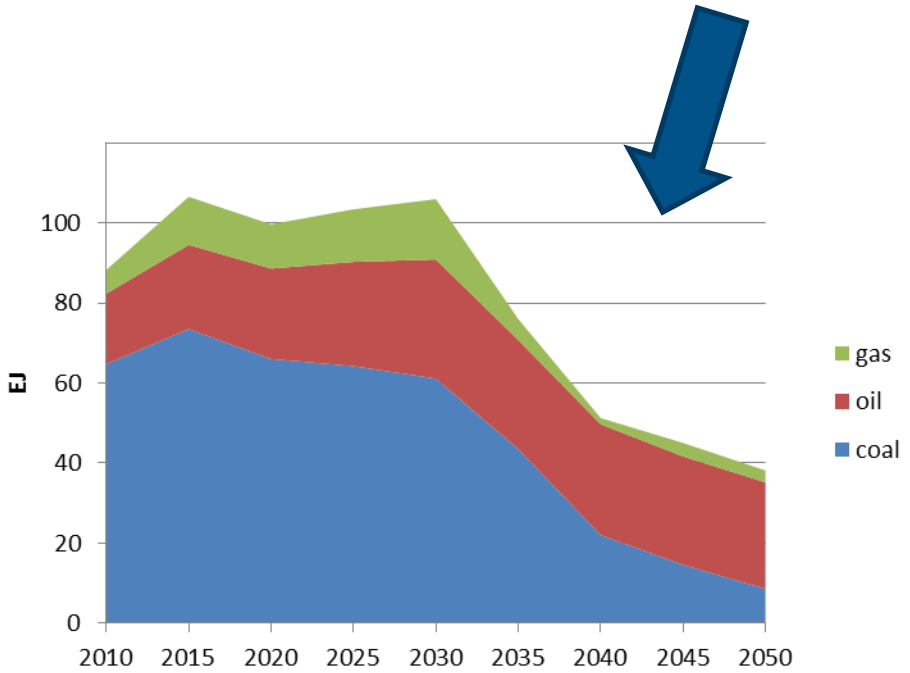

Paris to 2C