Policy Options for Kazakhstan's Mid- and Long-term Emissions Pathways

Objectives of the project

- ***An impact analysis of the adopted policies (ETS, RES, EE) in fulfillment of international commitments*** *(2020 and INDC targets);*
- ***An impact analysis of the ETS on the economy:*** *business associations concerns, hybrid (soft linking) approach, the change in energy supply mix, impacts on GDP, sectoral value-added, wages and profits, economic welfare, gains and losses incurred to emitters by the ETS.*

Content

- **Current state of Kazakhstan's economy**
- Assumptions & scenarios
- Results of analysis
- Key findings & recommendations

Kazakhstan's economy is energy intensive

Indicators 2011	KZK	OECD	World
Population density (cap/sqkm)	6	36	13.5
Energy consumption (toe/cap)	4.7	2.9	1.9
CO2 emissions (tCO2/cap)	15	9.8	4.5

1) Coal based energy system
2) Economic development is driven by export of hydrocarbons
3) Technological Stock is outdated
4) Next 10-15 years opens a window of opportunities

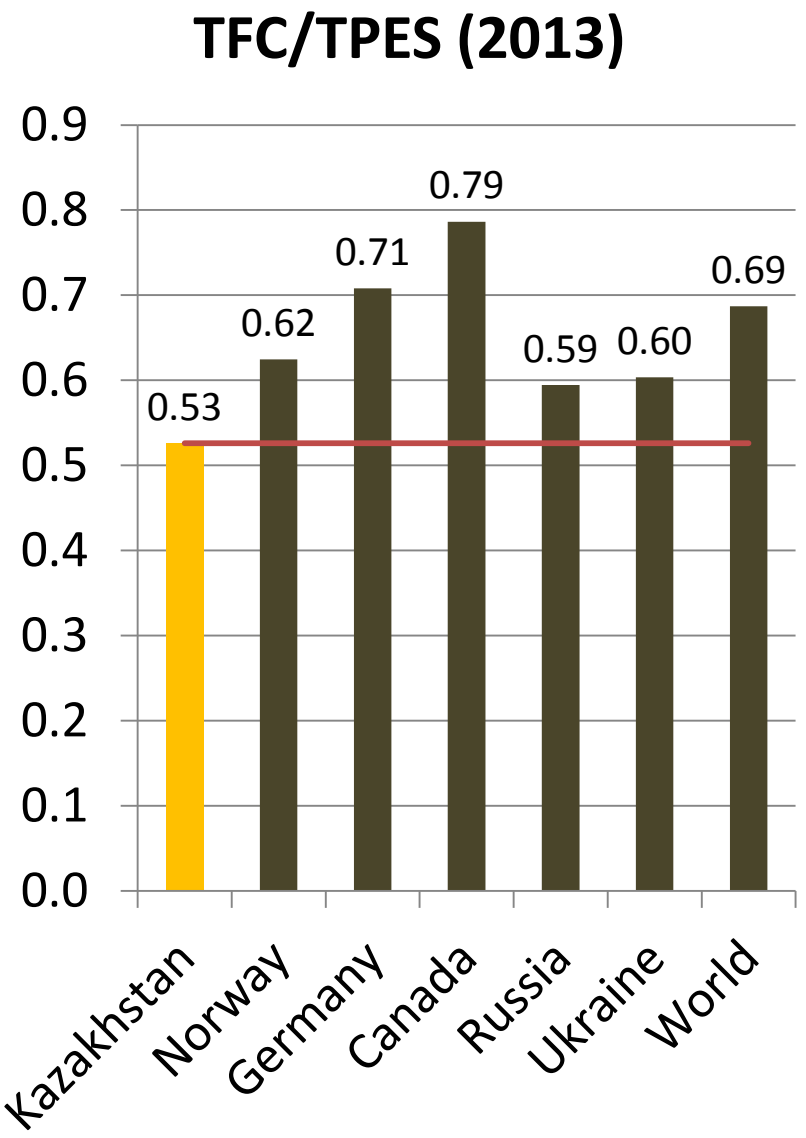
Energy efficiency potential

Reasons of inefficiencies:

Geographical: the continental climate, large territory and low population density;

Administrative and economic: above normative losses, opaque energy statistics, lack of metering for energy saving, low profitability;

Technical: high wear of the equipment in the energy intensive sectors, dilapidation of the housing stock.



Strategic targets

Name of the target	Value of the target	Baseline	ETS	ETS_HS	ETS_HS & ADJ	ETS_HS & CO2Tax	INDC
Share of gas power plants in electricity production, by 2030	25%	???	???	???	???	???	???
Reduction of energy intensity of GDP from levels of 2008, by 2050	50%	???	???	???	???	???	???
CO2 emissions reduction in Power sector, by 2050	from 1 kg/kWh till 0.35 kg/kWh	???	???	???	???	???	???
Share of alternative sources (solar, wind, hydro, nuclear) in electricity production, by 2050	50%	???	???	???	???	???	???
Reduction of current (2012) CO2 emissions in electricity production, by 2050	-40%	???	???	???	???	???	???

Overview

- As proposed in its INDC, Kazakhstan intends to achieve unconditionally 15% reduction in GHG emissions by 2030 compared to 1990;
- GHG emissions have grown with an average annual rate of 4% over the last ten years;
- Inventory data for 2013 has shown that the total GHG emissions already reached 302.6 MtCO2eq which is 19% less than in 1990
- Over the period of 2000-2007 the economy of the country experienced fast recovery mainly due to oil revenues: the GDP annual growth rate was in average 10%.
- In 2008-2009 the growth of economy slowed down to 1-3% due to economic crisis, with the recovery at the average of 6% later over 2010-2014.

Overview (cont..)

- In 2014 country has experienced a slow-down in economic growth due to falling oil prices and reduction of export volumes.
- The country's currency was devalued by 82% in 2015. IMF (2015) in its latest publication reconsidered GDP growth of Kazakhstan at 1.5% in 2015, 2.4% in 2016 and around 4% until 2020.
- Fuel combustion is responsible for 70% of GHG emissions, since the energy and industry sectors heavily depend on coal.
- Kazakhstan has significant mitigation potential at “relatively low cost”, due to the large inefficiencies in the energy system.
- The recent energy statistics show that in the period of 2007-2014, the GDP energy intensity of Kazakhstan declined by 14%.
- The benchmarking analysis shows that Kazakhstan still has high GDP energy intensity: almost two times of the level of Germany and Norway and 33% higher than the world average (IEA, 2016).

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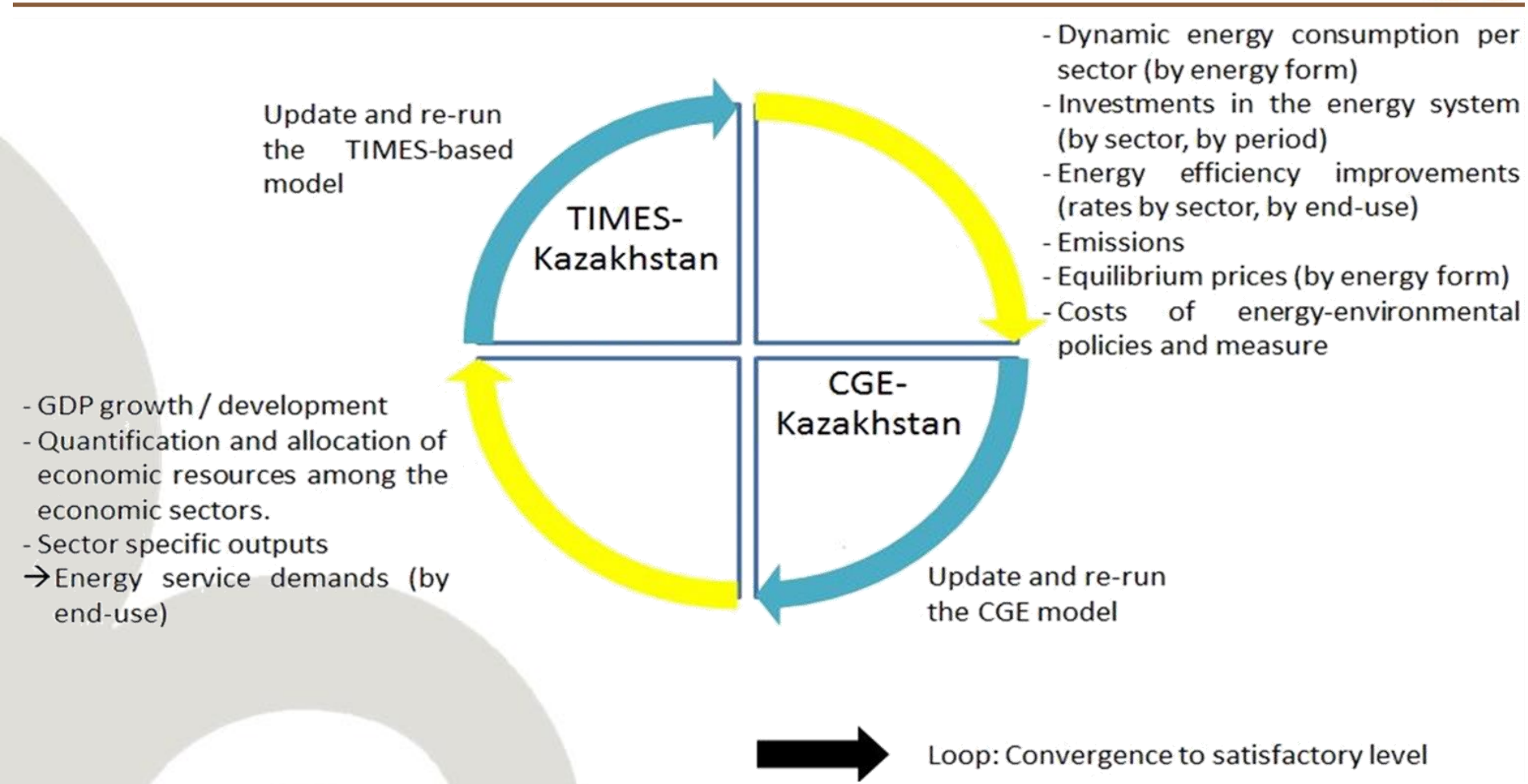
TIMES and CGE advantaged features



Hybrid model will capture the technologically reach representation of energy system of TIMES-KZ model developed by NURIS with macroeconomic completeness of general equilibrium CGE-KZ model developed by DIW Econ. Such model will allow to account for the impact of the climate change policies to the economy of Kazakhstan (GDP, sectoral development).

Common assumptions

- Nuclear power plant will not be constructed till 2050 (currently 3 GW of unused capacities)
- In 2030 oil peak will be reached in Kazakhstan: 115-120 million tons per year
- Current gasification will be continued according to forced scenario
- No import of natural gas in medium and long term
- Self-sufficiency in oil products in medium and long term

Baseline scenario

- No restrictions of GHG emissions till 2050
- Initial GDP growth rates according to IMF projections and Top-30 concept (4% annually in medium term)
- Projected share of renewables (solar + wind) is pessimistically low (1% by 2020 and 3% by 2030) because of current poor dynamics (current share of wind is 0.1%, solar also 0.1%)

INDC scenario

- Bounds national GHG emissions at the level of 1990 minus 15% (stabilization of emissions)
- According to last national inventory (for 2014) by the end of 2014 we were at the level of 1990 minus 19%, so practically INDC scenario means stabilization of emissions at current level.

ETS scenario

- ETS is designed as “Cap&Trade” approach.
- The ETS covers three sectors such as energy sector (public production and auto production of electricity and **no inclusion** of pure heat), oil and gas, coal and industry sector.
- The allocation of quotas till 2020 is calculated based on average value of enterprise emissions in 2013 and 2014 (base level).
- After 2020 and till 2050 cap is continued but with adding reserve quotas for new capacities. No free additional quotas are allowed (as it was during 2013-2015).

ETS_HS scenario

- ETS is designed as previous, but with **inclusion of pure heat sector to ETS scheme**
- The allocation of quotas till 2020 is calculated based on average value of enterprise emissions in 2013 and 2014 (base level).
- After 2020 and till 2050 cap is continued but with adding reserve quotas for new capacities. No free additional quotas are allowed (as it was during 2013-2015).

ETS_HS & ADJ scenario

- ETS is designed as previous, but with **additional inclusion of methane**
- The allocation of quotas till 2020 is calculated based on average value of enterprise emissions in 2013 and 2014 (base level)
- After 2020 and till 2050 cap is **adjusted in such a way** that INDC target in 2030 is achieved.

ETS_HS & CO2Tax scenario

- ETS is designed as previous, **but the CO2 emissions from commercial and residential sectors under Tax** which is equal to INDC mitigation costs
- The allocation of quotas till 2020 is calculated based on average value of enterprise emissions in 2013 and 2014 (base level)
- After 2020 and till 2050 cap is equal to **levels of GHG emissions in INDC scenario**.

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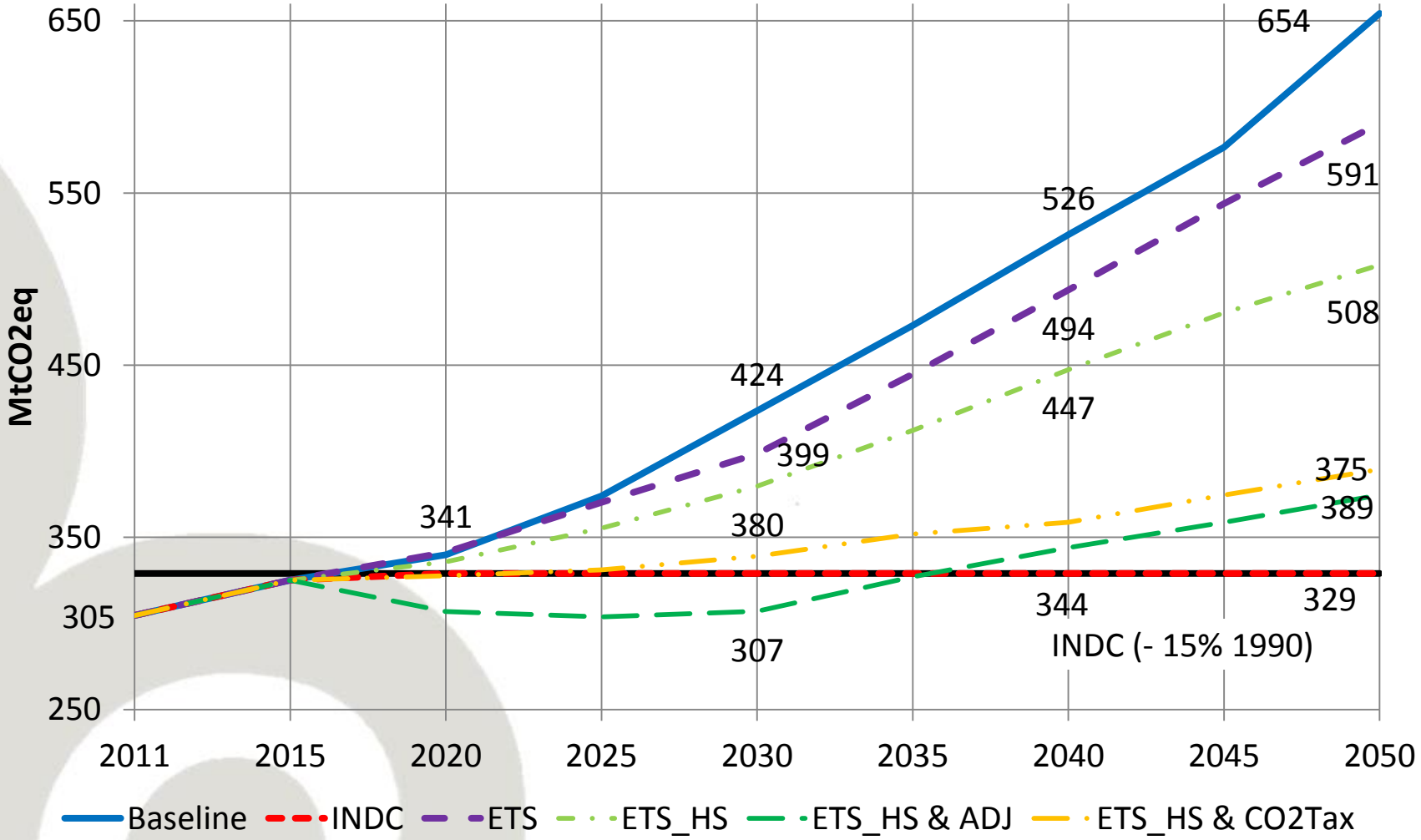
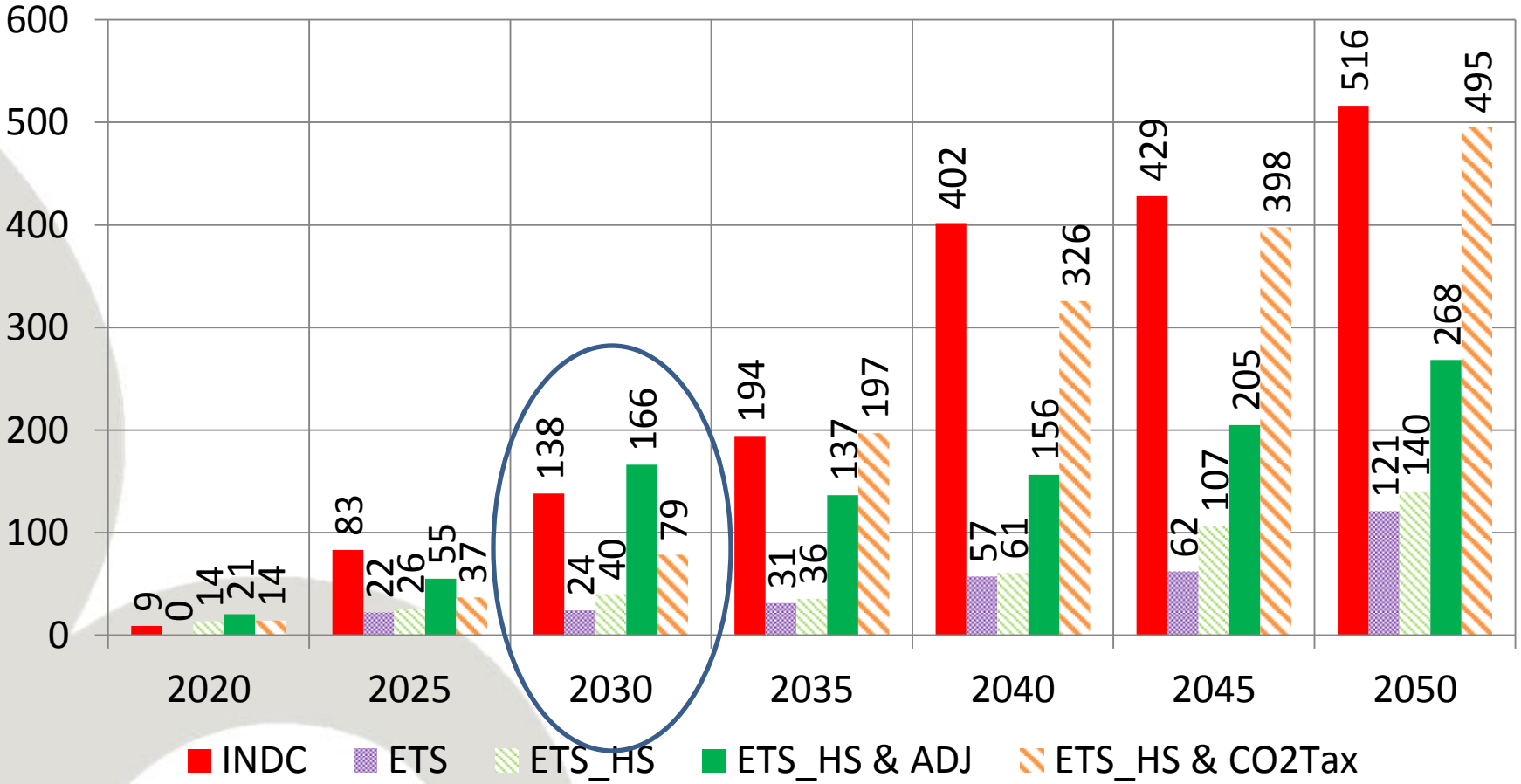
Total GHG emissions



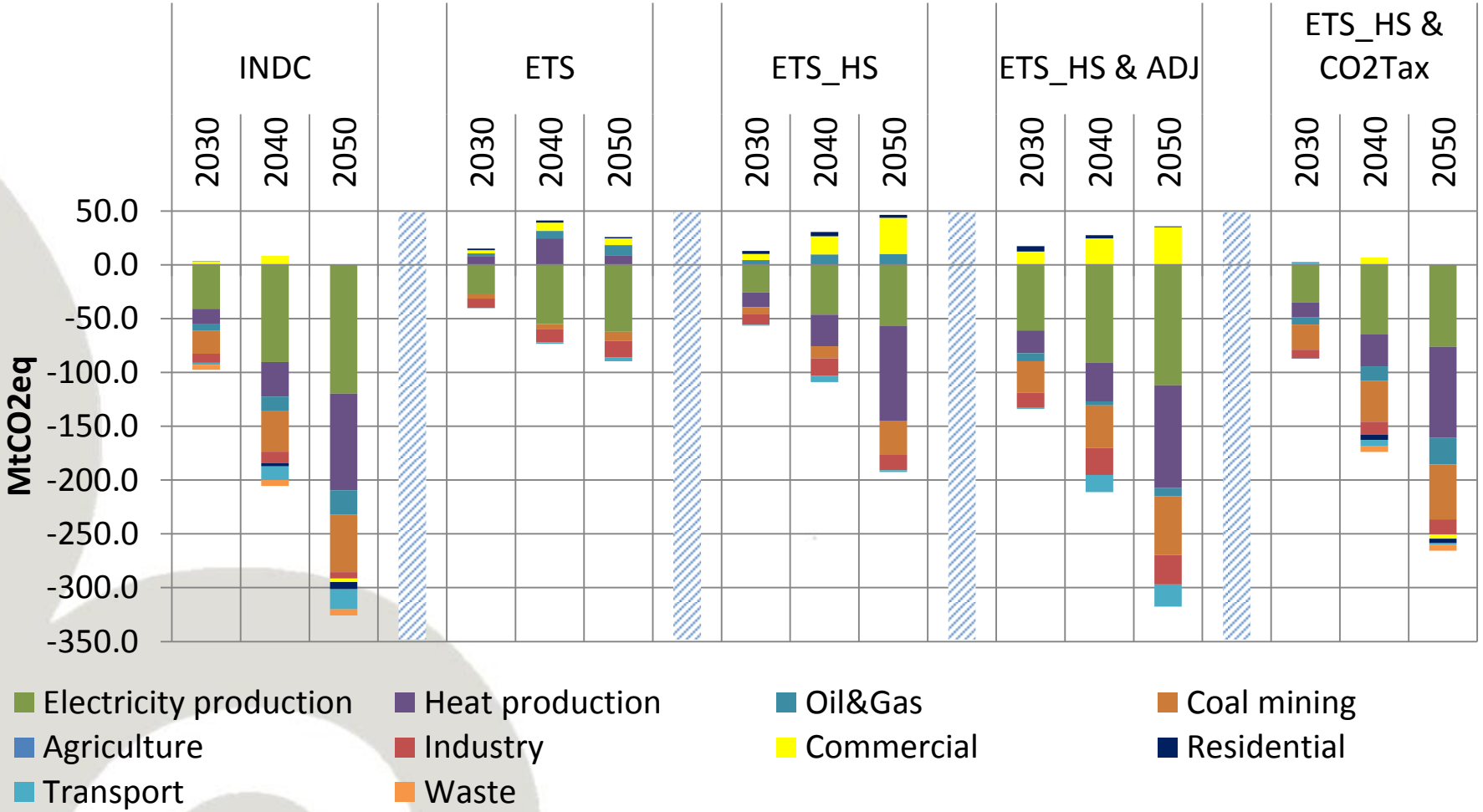
Sources (here and further on): NURIS and DIW-Econ

Abatement costs



INDC could be reached at relatively high price 100-140 USD per ton of CO2.

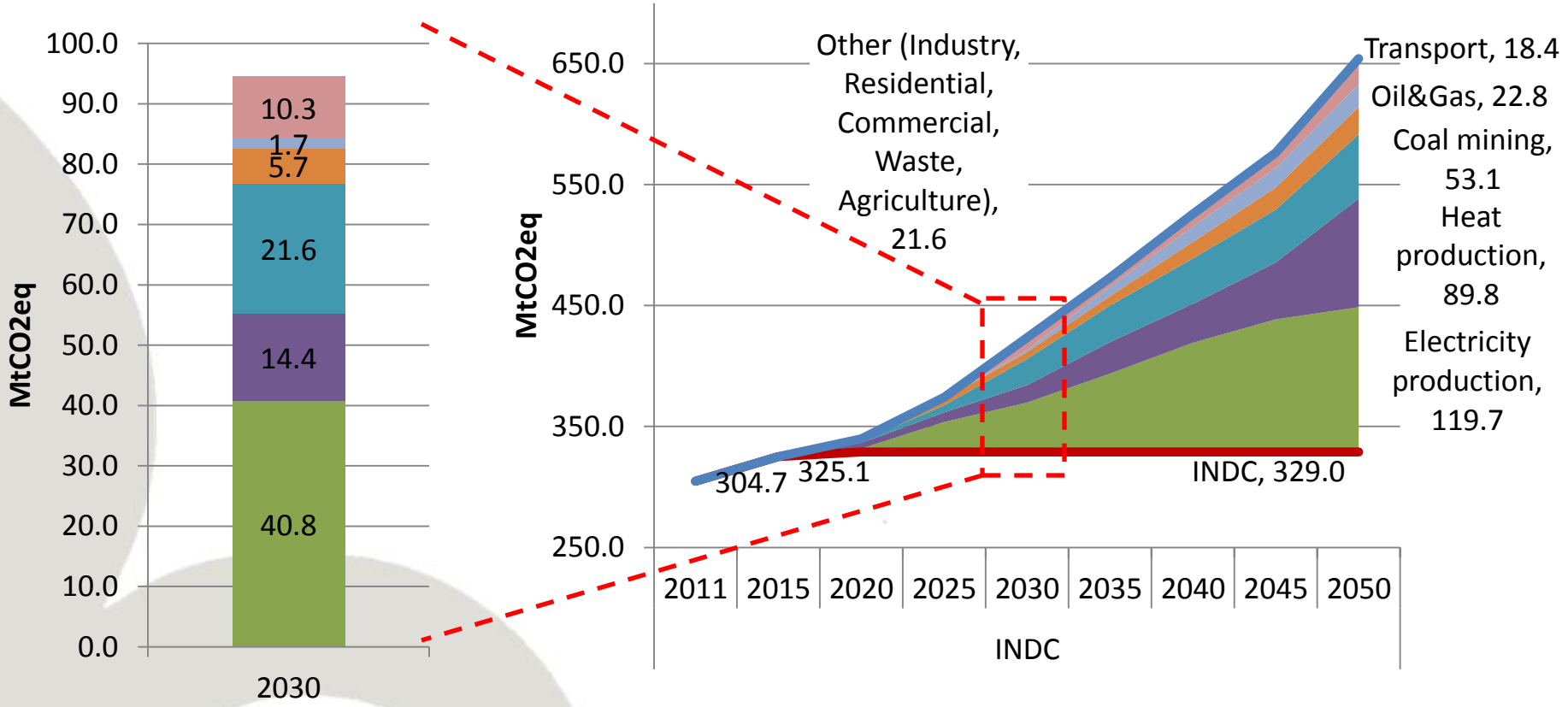
GHG differences compared to baseline



According to INDC the biggest potential for GHG mitigation is in sectors covered by ETS (electricity and heat production, coal mining and Oil&Gas).

We can observe carbon leakage in ETS to unregulated sectors.

Reduction of GHG by sectors – INDC



The biggest potential in GHG emissions reduction is in the sectors covered by ETS.
Electricity and heat production accounts for 68% of the potential.
Coal mining and Oil&Gas accounts for another 25%.

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Findings

- Current measures are not enough to fulfill the INDC (-15% by 2030);
- INDC is going to be reached under relatively high price (around 100-130 USD per ton of CO2 by 2030);
- To stabilize GHG emissions on INDC level till 2050 the share of renewable and alternative energy sources (Hydro, CCS, Biofuel, RES) should reach 58%. Remaining share should be attributed to gas fired PP.
- INDC scenario showed biggest GHG reduction potential in ETS sectors; the energy sector has the most potential. Power plants will become the main beneficiaries of the trading scheme.
- Voluntary target (minus 15% by 2020) could be reached almost without efforts. This threshold will be exceeded only by 2018-2019 (if economic growth will be as projected till 2020).
- There are no CO2 prices in ETS scenario till 2020 because of low projected (expected) growth in metallurgy, electricity generation and oil&gas production till 2020. It also means that current design of ETS cap is not ambitious.
- To reach INDC without nuclear generation in 2030 natural gas share in generation should increase up to 46% (Green economy target is 25%)

Findings (cont..)

- INDC scenario will allow to meet most of the targets of the Green Economy Concept and the target for Top 30 Concept.
- Natural gas transportation and coal mining have significant GHG mitigation potential through CH4 in INDC. CH4 from waste management sector could be utilized using biogas technology.
- Implementation of ETS schemes as a single measure will lead to carbon leakage to small boiler houses, commercial sector and residential sector.
- In INDC electricity consumption decreases in 2030 and increases in 2050 compared to baseline. In 2030 the carbon intensity of produced electricity is high whereas in 2050 with significant share of alternative generation it becomes efficient to use electricity for the heat pumps in both heating and cooling.
- Investments in coal generation is dramatically lower in INDC and appear in 2020-2025. These assets are stranded in INDC after 2040.

Strategic targets

Name of the target	Value of the target	Baseline	ETS	ETS_HS	ETS_HS & ADJ	ETS_HS & CO2Tax	INDC
Share of gas power plants in electricity production, by 2030	25%	27%	38%	37%	62%	49%	50%
Reduction of energy intensity of GDP from levels of 2008, by 2050	50%	45%	49%	52%	55%	56%	57%
CO2 emissions reduction in Power sector, by 2050	from 1 kg/kWh till 0.35 kg/kWh	714	595	589	317	344	295
Share of alternative sources (solar, wind, hydro, nuclear) in electricity production, by 2050	50%	13%	26%	28%	44%	47%	58%
Reduction of current (2012) CO2 emissions in electricity production, by 2050	-40%	89%	18%	24%	-39%	2%	-1%

No regret recommendations

- Energy efficient vehicles should be promoted. (tax on motor fuel, nonmonetary support to small individual vehicles)
- Dual devices providing space heat and hot water together should be promoted
- Commercial lighting should become more efficient. (ESCO contracts with PPP support)
- Boiler houses should be refurbished. (ESCO)

Recommendations to meet INDC

- Current policy of electricity tariff regulation should be revised
- Gasification should be continued according to forced scenario
- ETS should be relaunched using benchmarking approach
- ETS should be extended by including pure heat plants (boiler houses) of smaller size (decrease the threshold, internal projects mechanism for regulated entities)
- The practice of issuing additional free quotas should be stopped
- CH4 should be included in ETS
- ETS should be accompanied with other measures (eg. CO2 tax) to prevent carbon leakage to residential, commercial sector and to pure heat sector
- Biogas technology should be promoted in waste management sector
- Heat pumps should be promoted in residential and commercial heating and cooling
- CCGT technology should be promoted in energy supply side

Thank you !

For specific questions, please contact:

Mr. Aidyn Bakdolotov
aidyn.bakdolotov@nu.edu.kz