

# *Emission Trading in Context of Green Economy in Kazakhstan*

Sergey Inyutin\*, PhD  
Department of the IT Technologies  
"Turan-Astana" University  
Astana, Kazakhstan  
[s.inyutin@mail.ru](mailto:s.inyutin@mail.ru)

Gulzhamal Japarova, PhD  
Rector "Turan-Astana" University  
"Turan-Astana" University  
Astana, Kazakhstan  
[gulzhamal\\_a@mail.ru](mailto:gulzhamal_a@mail.ru)

**Abstract**— Transition to Green Economy is a part of political course followed by Kazakhstan since 2013, including implementation of Emission Trading Scheme (ETS), introduction of renewables into energy balance, energy efficiency measures (Expo "Future Energy", 2017). Green economy development is considered as result of its innovative industrialization according to world trends. The Green Concept covers three periods (2020/2030/2050) with a goal on decreasing of the greenhouse gases (GHG) emissions 15% by 2030 towards 2012 and 40% by 2050.

The aim is to update the ETS status in Kazakhstan specifically addressing the Marginal abatement cost curves approach and to analyze first quantitative suggestions for an ETS cap path in context of achieving the national goal to reduce GHG emissions for Green Growth. The analysis shown that ETS reduction obligations influence the overall efficiency of total abatement measures to be conducted in Kazakhstan. As a result, the further implementation of improved ETS will make a significant contribution to achieve the national target of Green Growth. The abatement options costing up to 143 euro per ton amounts to nearly 87 million tons of CO<sub>2</sub> eq. ,93.9 percent of which belong to the ETS. Transition to green economy by 2050 will increase employment of more than 450.000 jobs. The four key steps are recommended for Green Growth in Kazakhstan, including: strong political leadership; active government intervention; active public participation and mobilization of global and local partnership and investments.

**Keywords**—*emission trading, green economy, climate change*

## I. INTRODUCTION

The economy of the Republic of Kazakhstan is thus primarily based on energy-intensive industries. At the end of the third quarter of 2015 the total installed capacity of renewables amounts to 234 MW (solar: 57 MW, wind: 60

MW, small hydro plants: 118 MW, biogas: 0.4 MW). To encourage green investments, Kazakhstan is introducing fixed rates for 15 years on renewable energy and auctions. [1].

"Turan-Astana University" [2] in cooperation with SRC KAZHIMINVEST participated in "PROMITHEAS-4" Project implementation in Kazakhstan, hosted its final international seminar " Development of Mitigation/Adaptation in Climate Change Policy Portfolios for Kazakhstan" in June 2013 [3] and is a member of international community for cooperation related Green economy issues. Transition to Green Economy is a part of political course followed by Kazakhstan since 2013, including implementation of Emission Trading Scheme (ETS), introduction of renewables into energy balance, energy efficiency measures (2017 Expo, Green Bridge, Forum "Energy Future") coordinated by the Ministry of. Energy of the Republic of Kazakhstan [4].

The key economy sectors (water resources, agriculture, energy efficiency, power sector, air pollution and wastes utilization) were included into the "Green Economy" Concept of Kazakhstan [5], its implementation will raise the level and quality of life of the population, make the products more competitive by reducing energy costs, using alternative sources of energy and secondary processing, deficit of clean water will be covered.

Greenhouse gas (GHG) emissions reduction in power sector is one of priorities with the following targets: 15% decrease by 2030 and 40% decrease by 2050 [5]. Emission Trading Scheme (ETS) is one of the elements of Kazakhstan's innovative development and Green Growth Framework recommended at national level and presented to the international Community. Kazakhstan ETS was launched in 2013 and then was suspended until 2018 following complaints

from industry that the emission reduction demands under the system are too strict and the legal foundation too weak [6].

The aim is to update the ETS status in Kazakhstan specifically addressing the Marginal abatement cost curves (MACC) approach and to analyze first quantitative suggestions for an ETS cap path in context of achieving the national goal to reduce GHG emissions for Green Growth.

Overall GHG emissions (excluding LULUCF) in Kazakhstan were 298.06 Mt CO<sub>2</sub> eq. (2015), including from energy sector (excluding Transport) 220.77 Mt CO<sub>2</sub>e. The overall GHG emissions reduction target is 5% reduction from 1990 GHG level by 2020 and 15% (unconditional) - 25% (conditional) by 2030 (Intended Nationally Determined Contributions of Kazakhstan) [7].

## II. METHODOLOGY

For the purpose of our analysis and cap-setting estimations, we used the MACC report developed for the EBRD in 2011 by NERA Economic Consulting jointly with Bloomberg New Energy Finance on request of the European Bank for Reconstruction and Development (EBRD) in 2011 (henceforth stated as “NERA/Bloomberg” or just “NERA”, one of authors was involved in this study) [8] and DIW Econ as baseline calculations provided in 2015 [9] and along with the status of ETS, targets of the Green Economy Concept were updated.

Marginal abatement cost curves (MACC) illustrate different options to abate emissions, ranking them by their abatement costs per unit of emission reduction. The abatement costs are determined as follows: the costs of implementing a technology (including investment costs and operational costs) are compared to the costs of an alternative technology with higher emissions. The difference in total costs between both alternatives are then divided by the difference in emissions, leading to the abatement costs per unit of emissions. The operational costs must be discounted. Approaches used for analysis are described below.

## III. UPDATE OF KAZAKHSTAN EMISSION TRADING SCHEME STATUS AND ANALYSIS OF CAP SETTING CONSIDERATIONS

### A. Update of Kazakhstan Emission Trading Scheme

Emission Trading scheme (ETS) in Kazakhstan is characterized as a cap and trade system, in 2013 (Phase I) it covered 147 Million tons of carbon dioxide equivalent plus 20.6 tons of carbon dioxide equivalent reserve. It entered into force according to the Amendments to the Ecological Code (2011) and covers enterprises emitting more than 20,000 t CO<sub>2</sub> per year in agriculture, transport, oil and gas, mining and metallurgy, the chemical sector, and the power sector [1]. The

ETS supporting regulation was developed and updated. JSC Zhasyl Damu, a state owned joint stock Company is involved into keeping ETS registry and other issues.

According to the approach applied the free allocations are determined on the basis of historical emissions, in particular, in the pilot phase I 100% free allocations are given based on the 2010 emissions. During Phase II (2014-2015): 2014: 155.4 Mt CO<sub>2</sub>; 2015: 153.0 MtCO<sub>2</sub>. This represents reduction targets of 0% and 1.5% respectively, compared to the average CO<sub>2</sub> emissions of capped entities in 2011-2012. Phase III (2018-2020) is characterized as the following: 485.9 Mt CO<sub>2</sub> (161.9 Mt CO<sub>2</sub> for each year). The cap is set at a 5% reduction by 2020 from 1990 levels. For the phase III free allocation is based on grandfathering and benchmarking. A new entrants reserve of 35.27 million allowances over the three-year period was created. All allowances, carbon units and domestic offsets are to be registered in the State registry. Allowances from the national ETS include Kyoto project based mechanisms units and the units from the domestic reduction projects within Kazakhstan [5]. Banking is allowed within one trading period; banking between trading periods is prohibited. Currently non-compliance penalty is approximately EUR 30/tCO<sub>2</sub>. Current legislation does not contain any carbon price control measures.

Monitoring, Reporting, Verification (MRV) issues while using ETS are important. The operator's participants of the ETS follow detailed monitoring and annual reporting procedures. As mentioned above the required reporting threshold is above 20,000 t CO<sub>2</sub> per year. Reporting is required for CH<sub>4</sub>, N<sub>2</sub>O and PFCs emissions also. The annual GHG inventory reports must be verified by independent accredited third-party organizations.

### B. Analysis of Cap Setting Considerations

The analysis shown that the main difficulty in the development of each new national allocation plan was an absence of officially approved commitments to reduce emissions in the ETS. Additional allowances to new sources in existing companies and to capacity extensions were not given from the reserve but by increasing the overall allocation (increasing the cap up to about 33 million emission allowances). Benchmarks are still under the discussion with operators. The result of verified emissions reports from companies shows that the system is over-allocated. The MRV system should be transferred to electronic reporting. There is lack of experts and capacity to maintain the system. In this regards, the Ministry of Energy of the Republic of Kazakhstan and the World Bank launched in February 2018 for monitoring, reporting and verifying emission sources and greenhouse gases (GHG) [10].

The targets set in the Green Growth Economy Concept and in Intended Nationally Determined Contributions (INDCs) are in the focus of our analysis.

According to the Conference of Parties (COP) decision (1/CP.19) Kazakhstan presented its Intended Nationally Determined Contributions (INDCs) [7], with goals: minus 15

percent from 1990 in 2020 and 2030, i.e. 304 million tons of CO<sub>2</sub> eq. (GHG emissions in the base year 1990 were 357 million tons excluding LULUCF).

TABLE I. TARGETS OF THE GREEN ECONOMY CONCEPT

Indicator	2020	2030	2040
Energy efficiency (reduction of GDP energy intensity, 2008)	25%	30%	50%
Share of Renewables in electricity production	Not less than 3%	30%	50%
Share of gas power plants in energy sector	20%	25%	30%
<b>CO<sub>2</sub> emissions reduction</b>	<b>2012 level</b>	<b>-15%</b>	<b>-40%</b>
Expected electricity demand		136-145 TWh	186-206 TWh

(Source: DIW Econ (2015))

Here we analyzed MACC for Kazakhstan to identify the possibilities to reduce GHG emissions by ETS and non-ETS sectors to achieve the goal set in Green Concept (Table I). We examined two main scenarios suggested by NERA/Bloomberg: “Status Quo” and “Planned Policy” and DIW Econ business –as-usual scenario (Table II), with the following features:

1. Status Quo scenario: within this scenario, all the current policies and institutions continue working as they are in the year 2011. There are no new policies adopted to encourage the rational use of energy, use of renewable energy sources and other actions aimed to reduce the GHG emissions. However, market-driven investment in new, more efficient production capital, and market-driven uptake of new technologies are included, resulting in 40 million tons CO<sub>2</sub> lower emissions in 2030 (451 Mt).

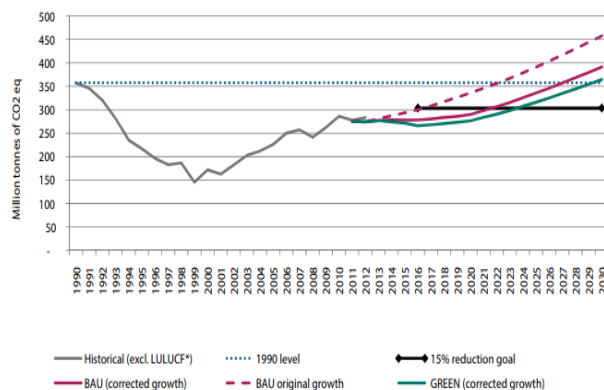
2. Planned Policy: in this scenario, the development of renewable electric power is supported by the government; improvement of the enforcement of energy-efficiency standards is introduced; and prices for the final heat consumers are made more transparent via more user-related tariffs.

3. DIW Econ offers its own viewpoint on the projection of GHG emissions until 2030 which takes into account the slowed down GDP growth as it started in 2014. As their business-as-usual (BAU) scenario with adjusted growth assumptions of GHG emissions from DIW Econ takes into account the current situation (i.e. slowed down GDP growth in Kazakhstan observed since 2014), the report presupposed that it is the most realistic choice. DIW Econ suggested in their National Action Plan (NAP) proposal identical percentage reductions for ETS and non-ETS sectors, compared to their respective business-as-usual emissions in 2030.

Figure 1 contains a further BAU scenario with “original growth” numbers based on IMF’s 2013 data, and a “GREEN”

scenario that covers policies included in the Kazakhstan Green Economy Concept.

Fig. 1. Scenarios from DIW Econ



(Source: DIW Econ scenario)

Analysis of the DIW Econ scenarios (Figure 1) shown that the BAU emission projections are not as high as those by NERA/Bloomberg and the gap is only 87 million tons of CO<sub>2</sub> eq. The national goals for GHG emission reductions are achievable at costs of up to 100 euro per ton of CO<sub>2</sub> eq., according to the MACC in NERA’s Planned Policy scenario and 143 euro per ton of CO<sub>2</sub> eq., according to the MACC for the Status Quo scenario (Table II). These MACC indicate that most of the reduction measures for achieving these 87 million tons are possible in the ETS sector (according to the Status Quo scenario).

TABLE II. ANALYZED INDICATORS: FORECASTS OF GHG EMISSIONS, THE GAP IN LEVELS OF EMISSIONS, NDC GOAL (MILLION TONS OF CO<sub>2</sub> eq.)

Years	NERA			DIW Econ (BAU)	INDC goal
	Historical emissions	Status Quo	Planned policy		
1990	357				
2010	286				
<b>2020</b>		<b>340</b>	<b>320</b>	<b>290</b>	<b>304</b>
2030		451	434	391	
<b>The Gap in levels of emissions</b>					
2020		34	14	-16	
2030		147	130	87	

(Source: DEHSI, NERA reports and own compilations)

Based on Table II the level of quantitative objective for Kazakhstan is approximately estimated at 315 million tons of CO<sub>2</sub> eq. As stated above, Kazakhstan made official statements at international level to reduce GHG emissions by 15 percent by 2020 and between 15 percent and 25 percent by 2030, i.e. the quantitative objective for Kazakhstan is at least to stabilize emissions from 2020 onwards at 304 million tons of CO<sub>2</sub> eq. (based on the -15 percent target) or 3,5% less than infrequency of two indicators. Using forecasts of GHG emissions up to

2020 and 2030, the difference (the “gap”) in emissions was determined, see Table 2.

Depending on the scenario from NERA/Bloomberg and the forecasts made by DIW Econ, the gap between the levels of emissions and the goal will be different. According to these figures Kazakhstan should take measures to reduce emissions until 2030 by an additional 87 to 147 million tons of CO<sub>2</sub>eq. compared to the business-as-usual development.

As in the Status Quo scenario, the major part of GHG emissions reductions (including measures with negative costs) also relates to sectors included in the ETS – 88.9 percent, so only 11.1 percent of potential reductions refer to sectors which are not included in the trading system. The implementation of new climate or energy policies in this scenario (not least, institutional measures leading to better enforcement of building regulations and better incentives for heat savings) resulted in more cost-efficient GHG emission reductions, leading to additional 17.1 million tons of CO<sub>2</sub> eq. reduced. Thus, achievement of the Green target (Table 1) in GHG emissions reduction the ETS sectors cover primary this potential.

In addition, the abatement volume in the Status Quo scenario is presented based on NERA estimates (Table III). More than 70% of abatement in ETS could be achieved at the prices up to 100 euro per ton CO<sub>2</sub> eq.

TABLE III. MARGINAL ABATEMENT VOLUME IN THE STATUS QUO SCENARIO

Abatement price euro per ton CO <sub>2</sub> eq.	Abatement in ETS	Abatement in non- ETS	Sum
1-40	42.05	2.53	44.58
41-100	29.06	1.11	30.71
1-1-120	7.40	1.05	8.45
121-143	2.61	0.63	86.90
Total	81/60	5.32	3.24
Share	93.90%	6.10%	100%

(Source: DEHS report)

#### IV. KEY FINDINGS

Kazakhstan established an ETS cap for enterprises from three larger emitters sectors using a bottom up method. Based on it the three national allocation plans have been developed and approved by the Government. Here we examined two main scenarios suggested by NERA/Bloomberg: “Status Quo” and “Planned Policy” and emissions projections for 2030 from DIW Econ. Depending on the scenario from NERA/Bloomberg and the forecasts made by DIW Econ, Kazakhstan should take measures to reduce emissions until 2030 by an additional 87 to 147 million tons of CO<sub>2</sub> eq. compared to the business-as-usual development.

Based on the MACC from NERA/Bloomberg Status Quo scenario, total abatement for abatement options costing up to 143 euro per ton amounts to nearly 87 million tons of CO<sub>2</sub> eq., 93.9 percent of which belong to the ETS. With such a high proportion it is obvious that the ETS will play the main role to achieve the national target of Green Growth. MACC had been developed before Kazakhstan implemented the ETS and applied the policy of transition to the “Green Economy”.

We can see that the main potential GHG reductions set as a national goal in Green Concept and NDC come from the ETS for both scenarios: ETS and non-ETS sectors (Status-Quo) at the price up to 143 euro per ton CO<sub>2</sub> eq., while 70% of which could be achieved by supporting renewable energy and increasing requirements for the energy efficiency policy in building sectors. The abatement costs of different emission reduction options affect a cost-based effort sharing between ETS and non-ETS sectors.

Transition to green economy by 2050 will increase employment of more than 450.000 jobs, establish the new industrial and service sectors. The four key steps to Green Growth in Kazakhstan are recommended, including: strong political leadership; active government intervention; active public participation and mobilization of global and local partnership.

#### REFERENCES

- [1] Information provided by the Ministry of Energy of the Republic of Kazakhstan : <http://en.energo.gov.kz>
- [2] Turan-Astana University. *General Information*, <http://www.turan-astana.kz>
- [3] ROMITHEAS, 2013. *General Information. PROMITHEAS*, <http://www.promitheasnet.kepa.uoa.gr>
- [4] S. Inyutin, G. Japarova, L. Inyutina, “Transition to green economy a new vector of Kazakhstan’s innovative development”, PROMIHEAS-4: 6th International Scientific Conference on Energy and Climate, vol.1, pp.38, 2013
- [5] Ministry of Environment Protection of Kazakhstan, 2013."Concept to Green Growth Path of the Republic of Kazakhstan", <http://www.turan-astana.kz>
- [6] Carbon Pulse (2016, in press, <https://carbon-pulse.com/16179/>
- [7] Kazakhstan Intended Nationally Determined Contributions (INDCs), ([http://www4.unfccc.int/submissions/INDC/Published%20Documents/Kazakhstan/1/INDC%20Kz\\_eng.pdf](http://www4.unfccc.int/submissions/INDC/Published%20Documents/Kazakhstan/1/INDC%20Kz_eng.pdf))
- [8] NERA Economic Consulting, Bloomberg New Energy Finance (2011): The Demand for Greenhouse Gas Emissions Reduction Investments: An Investors’ Marginal Abatement Cost Curve for Kazakhstan. Prepared for

European Bank for Reconstruction and Development  
(EBRD),  
[www.ebrd.com/downloads/research/economics/.../Kazakhstan\\_MACC\\_report\\_ENG.ppt](http://www.ebrd.com/downloads/research/economics/.../Kazakhstan_MACC_report_ENG.ppt).  
[http://www.ebrd.com/downloads/research/economics/publications/specials/Kazakhstan\\_MACC\\_report\\_ENG.pdf](http://www.ebrd.com/downloads/research/economics/publications/specials/Kazakhstan_MACC_report_ENG.pdf)

[9] Dr. Marco Artavia, Dr. Petra Opitz ,DIW Econ  
(2015): Proposal for the National Allocation Plan 2016-2020 for Kazakhstan,  
[https://www.dehst.de/SharedDocs/downloads/EN/publications/country-study-kazakhstan.pdf?\\_\\_blob=publicationFile&v=2](https://www.dehst.de/SharedDocs/downloads/EN/publications/country-study-kazakhstan.pdf?__blob=publicationFile&v=2)

[10] Online Platform for Monitoring and Reporting Greenhouse Gases, in press,2018,  
<http://www.worldbank.org/en/news/press-release/2018/02/05/kazakhstan-launched-online-platform-for-ghg-reporting>