IAM activities in Belarus

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IAM framework in Belarus:

- NAS projects
- IVL project

Ideology: step by step (by pollutants, by task etc)

Base model: GAINS

Goals:

- IAM basis in Belarus strengthening for air legislation improvement and new air abatement programs elaboration
- scientific provision of negotiations on Gothenburg and HM Protocols
- support to EGTEI etc.

Actual tasks:

1. Input data for IAM preparation: data collection, gaps identification, gaps filling
2. Abatement technology analysis
3. Costs effectiveness analysis
4. Impacts assessment.

Included into presentation:

1. Input data (scenarios, pathways, abatement strategies etc.) improvement
2. Analysis of CIAM emission scenarios vs. national
3. Analysis and review of the GAINS parametrisation
4. Technical document to EGTEI (outline)
5. Ways forward: new scenarios for 2015-2030

1. Scenarios and pathways

1.1 Identification and discussion on data gaps and inconsistencies in economic scenarios (pathways)

Gaps classification
Analysis of gaps closure possibilities

Gaps impact (on modeling results) analysis

WEO 2009 **INM 2010**

An example of economic pathway table check: in conditions of lack of statistical data a lot of assumptions/extrapolations to be made which increase uncertainty

1.2 Control strategies review

Industry Processes and Combustion

Sector	Technology	CIAM 2011 baseline	INM 2010	BAU 2020
Combustion (Fuel production & conversion, power plants)				
CON_COMB, PP_..., IN_..., PP_NEW	NSC_PM	-	10	
	IN_CYC	-	85	60
	IN_ESP1, ESP1	50	5	20
	ESP2	50	-	10
INDUSTRY PROCESSES				
PR_BRICK	VSBK	40	-	--
	TK_EOF	60	-	-
PR_CAST	PR_WSCRB	-	90	0
	PR_ESP2	100	-	0
PR_COKE	PR_CYC	40	-	40
	PR_ESP1	59	-	59
PR_CEM	PR_ESP2	100	-	3
	PR_HED	-	95	97
PR_EARC	NSC_PM	-	5	
	PR_CYC	50	10	5
	PR_HED	49	90	95
PR_FERT	NSC_PM	-	5	
	PR_CYC	5	15	10
	PR_HED	95	80	90
PR_LIME	PR_ESP1	99	100	10
	PR_HED	-	-	90
PR_GLASS, PR_REF	NSC_PM	1	80	10-40
	PR_CYC	50	20	40-70
	PR_ESP1	49	-	20
PR_SMIND_F	PRF_GP1	60	-	50
	PRF_GP2	-	99	10

2. Analysis of emission scenarios

2.1 CIAM 2011 scenarios of different levels of ambition for Gothenburg protocol revision in relation to Belarus

Methods:

detailed study of the input data and parameterization including :

- economic pathways;
- control strategies and approaches to its development;
- abatement option parameterization

comparison with national scenarios;

expert assessment of key measures impact using variable data

Extra analysis methods:

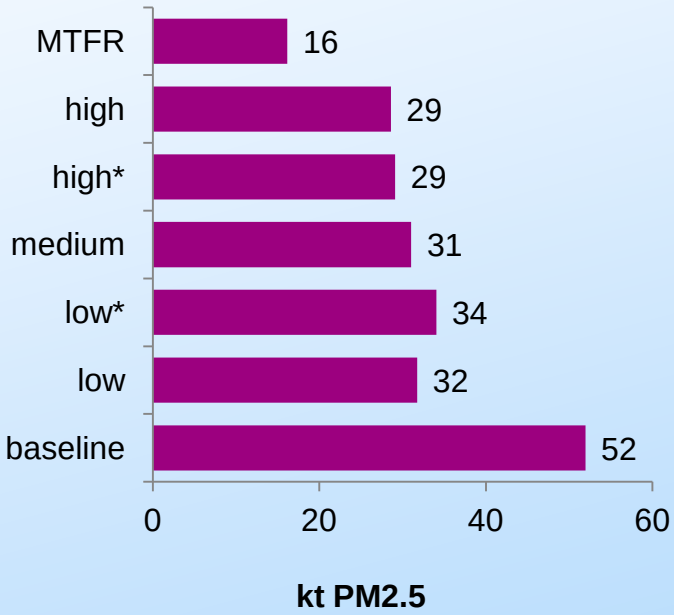
- emissions trends analysis;
- statistic data on costs;
- data and reports from enterprises.

PM2.5 emission

16–52 kt reduction potential

Emission reduction potential (Medium scenario), kt	
Waste: Agricultural waste burning	9,97
Ind. Process: Fertilizer production	7,93
Ind. Process: Electric arc furnace	1,61
Ind. Process: Crude oil & other products - input to Petroleum refineries	0,71
Waste: Open burning of residential waste	0,66
Ind. Process: Glass production (flat, blown, container glass)	0,03
Total	**20,91**

Emission reduction potential (Low* scenario), kt	
Waste: Agricultural waste burning	10,0
Ind. Process: Fertilizer production	7,9
Total	**17,9**



The greatest costs (according to scenario) demand to emission reduction from heating stoves and small industrial and business facilities, significant – from fertilizer production, boiler combustion, also from fertilizers and agricultural production handling and storage.
Realization of scenarios with such parameters is not a trivial task.

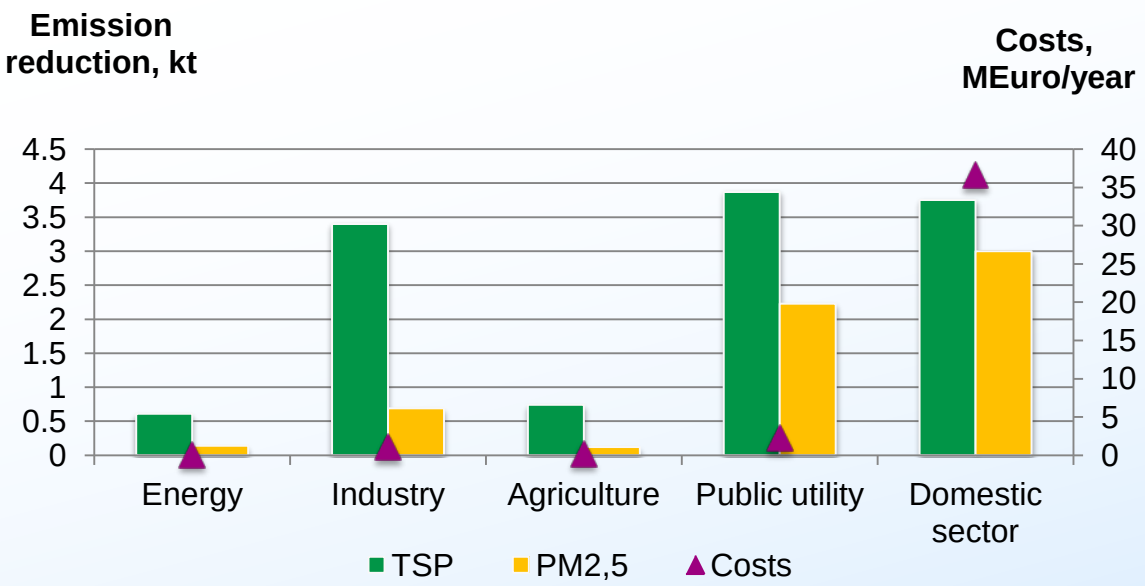
in 2011 two scientific articles on MTFR and key measures scenarios for PM emission sources in Belarus were published.

Total emission reduction potential in key sectors (industry incl. stationary fuel combustion) was assessed as 14.5 kt TSP and 6.0 kt PM2.5 (about 17% of total TSP and 23% of PM2.5 emissions).

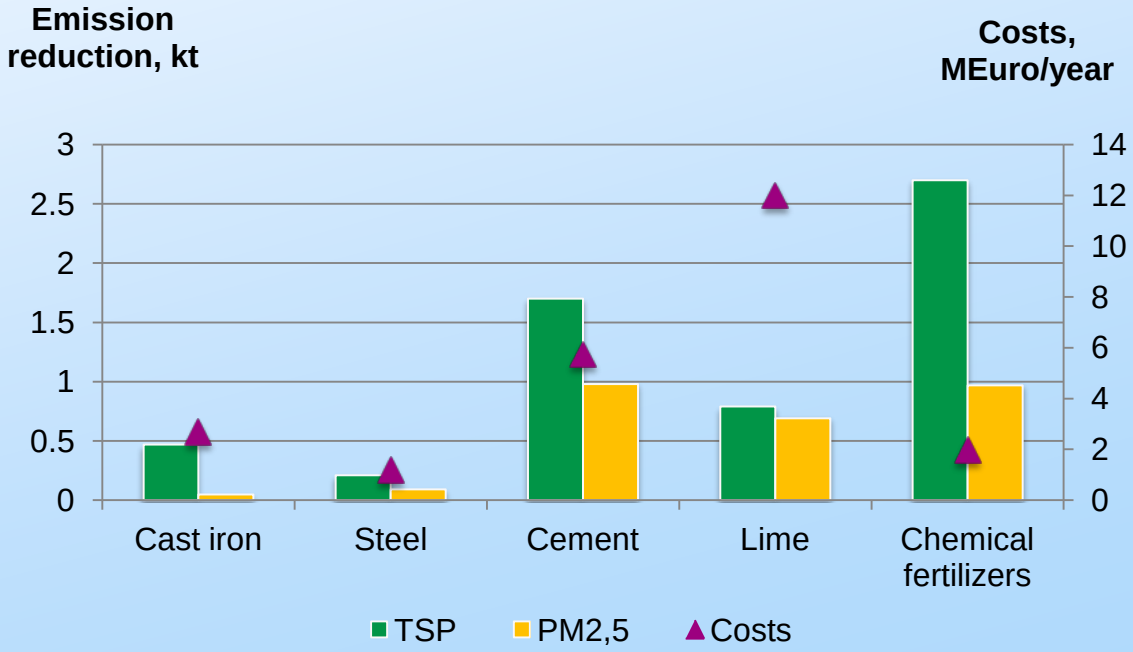
PM emission reduction potential of key measures in industry and transport was assessed as 18.4 kt TSP and 7.9 kt PM2.5 (about 21% of total TSP and 30% of PM2.5 emission).

If residential sector to be added total emission potential will comprise 22.2 kt TSP and 10.9 kt PM2.5 (26% of total TSP and 41% of total PM2.5).

Abatement costs were assessed in 27 mln. Euro for realization of key measures in industry, 45.9 mln. Euro for key measures in industry and transport, 82.5 mln. Euro for key measures in industry, transport and residential sector.



Emission reduction potential for stationary fuel combustion

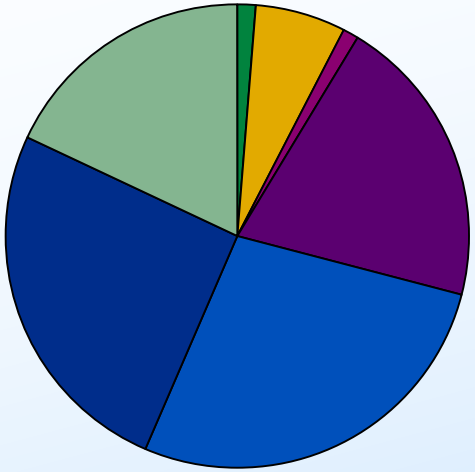


Emission reduction potential for industry

Comparison of emission reduction potential (PM2.5)

Key sources scenario

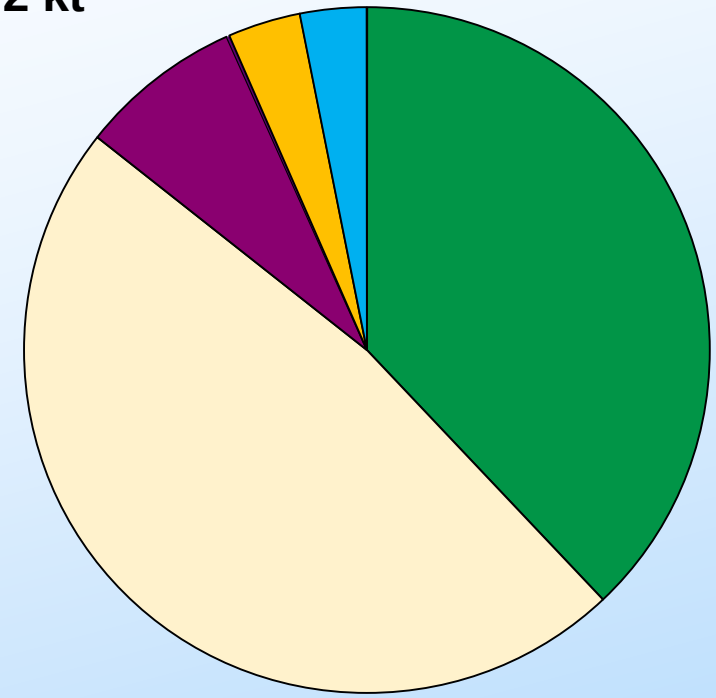
10.9 kt



- Fuel combustion in Enegy
- Fuel combustion in Industry
- Fuel combustion in Agriculture
- Fuel combustion in Public utility
- Fuel combustion in Domestic sector
- Industry processes
- Transport

CIAM 4/2011 medium scenario

22.2 kt



- Ind. Process: Fertilizer production
- Waste: Agricultural waste burning
- Ind. Process: Electric arc furnace
- Ind. Process: Glass production (flat, blown, container glass)
- Ind. Process: Crude oil & other products - input to Petroleum refineries
- Waste: Open burning of residential waste

National and CIAM scenarios are different in absolute values and structure

Emissions abatement options

Comparative PM removal efficiency by sector, %

Abatement technology	Sector			
	Cement production	Lime production	Iron and Steel foundries	Electric Arc Furnace
ESP (2 field)	91.9/97.1			
ESP (3 fields and more)	95.6/99.5	97.5/99.8		
Fabric filters	95.2/99.5	95.5/99.8	83.2/99.1	96.1/94.6
Cyclone	90.7/54.6		74.9/38.5	
Wet scrubber			86.6/80.0	

4. Technical document to EGTEI

Technical paper on emission abatement technologies for PM, applicable in EECCA countries, with special emphasis on Belarus

The structure of Technical paper

- Introduction
- Standards for dust abatement equipment
- Classification of abatement equipment
- Abatement equipment manufacturers
- Abatement equipment features
- Abatement equipment by industry sectors
- References

Task implementation is supported by IVL

PM control equipment standards

USSR

GOST 12.2.043-80. Dust equipment. Classification

GOST 25199-82. (CMEA Standard 2145-80) Dust equipment. Terms and definitions.

Purposes of use
- Air filter for forced ventilation
- Dust collector for emission

Types and subtypes
- Dry
  - Gravitational/inertial/filtration/electrostatic
- Wet
  - Gravitational/filtration/electrostatic

Dust abatement efficiency for particles of different size groups (I-V)

Belarus

Rules of operation for gas treatment facilities

- General types
- Efficiency criteria

Greatest PM emission control equipment manufacturers in EECCA

Russia

- FINGO ENGINEERING, CJSC *(all types)*
- «Folter», SPE *(cyclones, filters)*
- IRIMEX, JSC *(all types)*
- «Giprogazoochistka" OJSC *(all types)*
- «Rankom-Energo», EPC *(filters, electrostatic precipitators)*
- STC «Zenith», Ltd. *(cyclones, scrubbers)*
- «SPA «Talnakh», JSC *(cyclones, scrubbers, filters)*
- «Siberian association of energy engineering», Ltd. *(cyclones)*
- «ALYUMATEK», GC *(all types)*

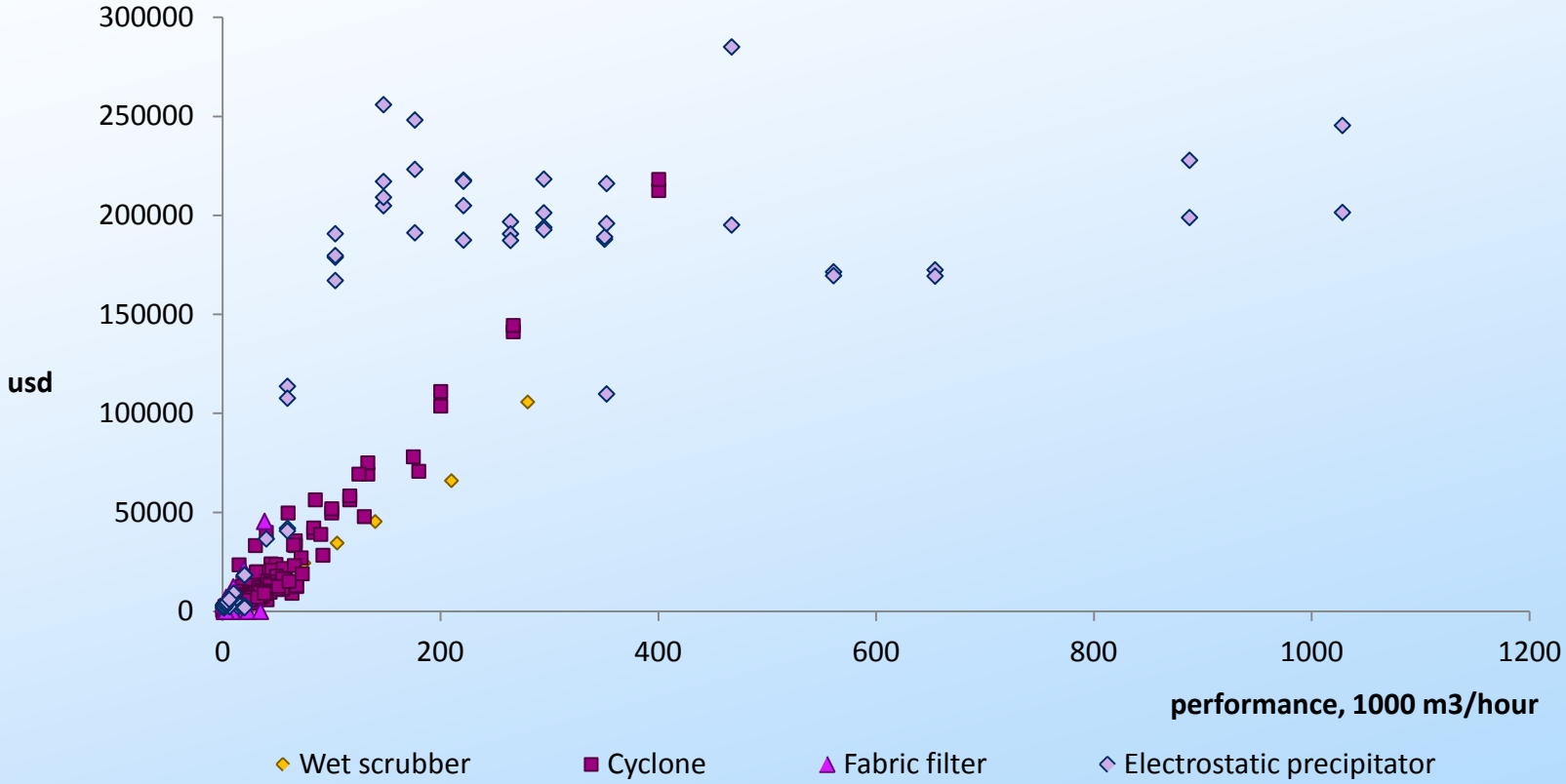
Belarus

- «BELKOTLOMASH», SPE LLC *(cyclones)*
- «Belenergoremnaladka», JSC *(filters, electrostatic precipitators)*

Ukraine

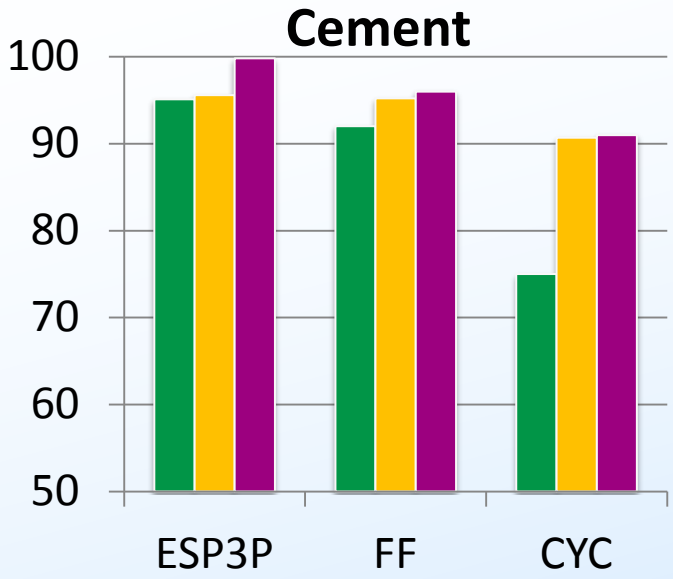
- «Berdichev Machine Building Plant «Progress», TH *(cyclones, filters, electrostatic precipitators)*
- ARTEMOVSKIY MASHINOSTRAITELINYY PLANT«PROMMASH», Ltd. *(cyclones)*
- «Gas Cleaning Equipment Plant» Ltd. *(cyclones, scrubbers, filters)*

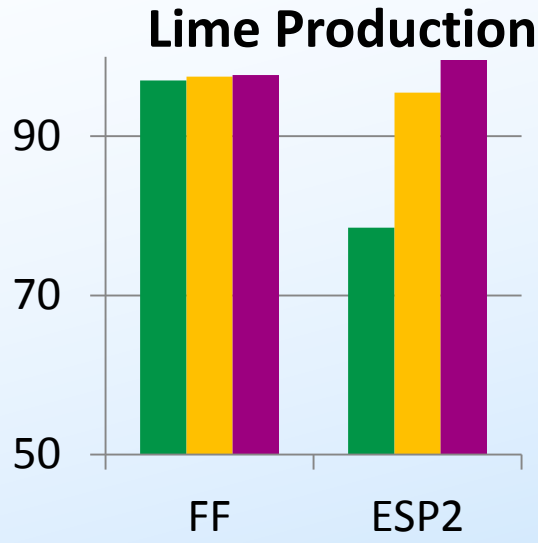
Correlation between capacity and cost of PM abatement equipment by type

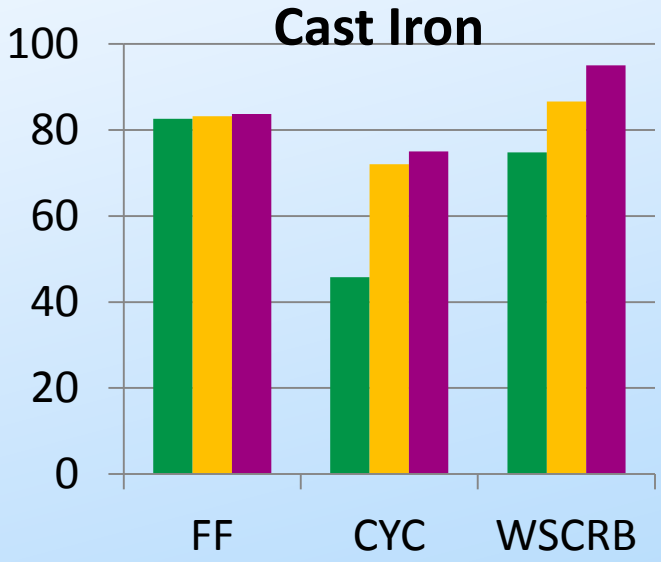


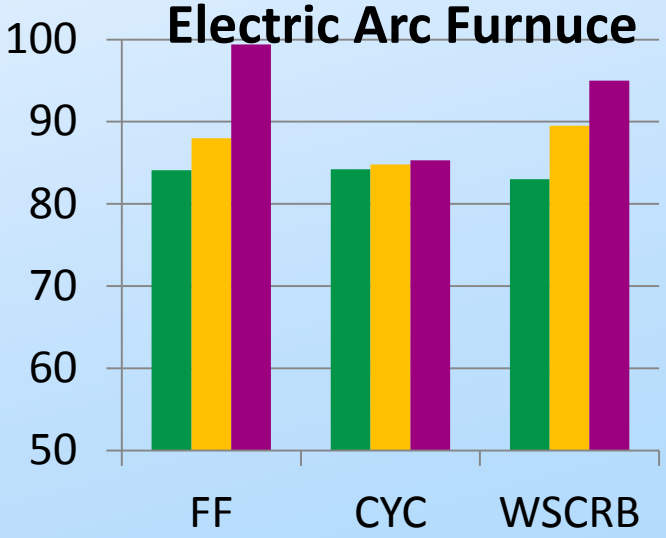
Data on more than 700 models of control equipment from EECCA countries were compiled into database. It includes capacity, weight, efficiency, cost parameters etc.

Abatement efficiency variability by type of control equipment







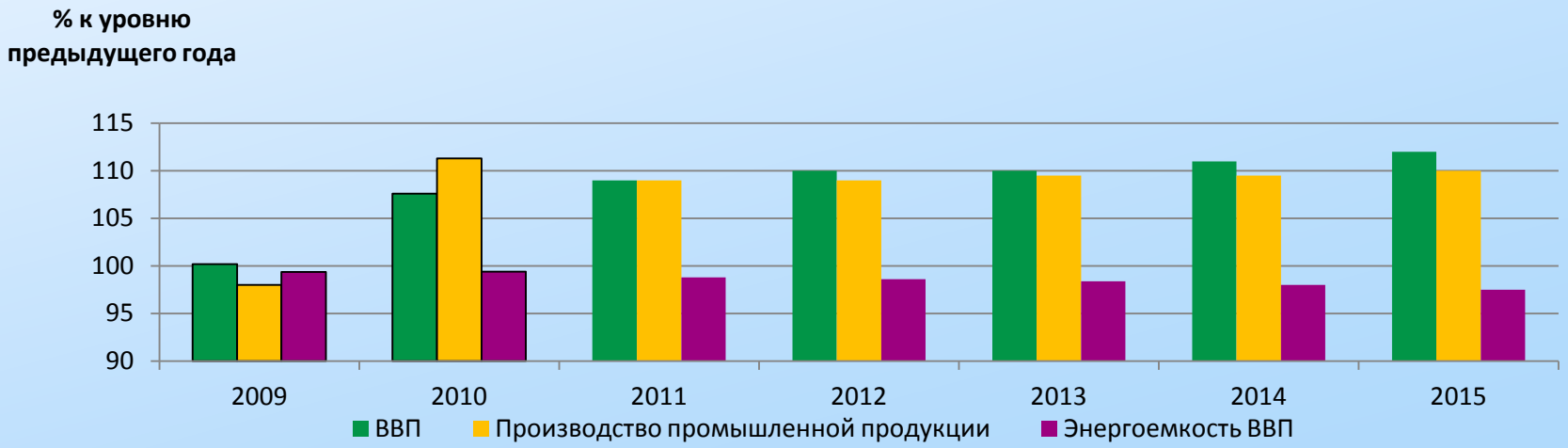


5. Ways forward: new scenarios for 2015-2030

Scenarios are based upon plans and programs approved in 2011-2012

	Main State Plans and Programs used for scenarios development
1	Программа социально-экономического развития Республики Беларусь на 2011-2015 годы. Утверждена Указом Президента Республики Беларусь 11 апреля 2011 г. № 136;
2	Государственная программа инновационного развития Республики Беларусь на 2011-2015 годы. Постановление Совета Министров Республики Беларусь от 26.05.2011 № 669.
3	Закон Республики Беларусь от 27 декабря 2010 года «О возобновляемых источниках энергии» (Национальный реестр правовых актов Республики Беларусь, 2011 г., № 2, 2/1756);
4	Постановление Совета Министров Республики Беларусь от 23 января 2008 г. № 94 «Об утверждении Государственной программы «Торф» на 2008 – 2010 годы и на период до 2020 года» (Национальный реестр правовых актов Республики Беларусь, 2008 г., № 29, 5/26698);
5	Постановление Совета Министров Республики Беларусь от 22 февраля 2010 г. № 248 «О мерах по повышению эффективности использования топливно-энергетических ресурсов на период до 2012 года» (Национальный реестр правовых актов Республики Беларусь, 2010 г., № 53, 5/31328);

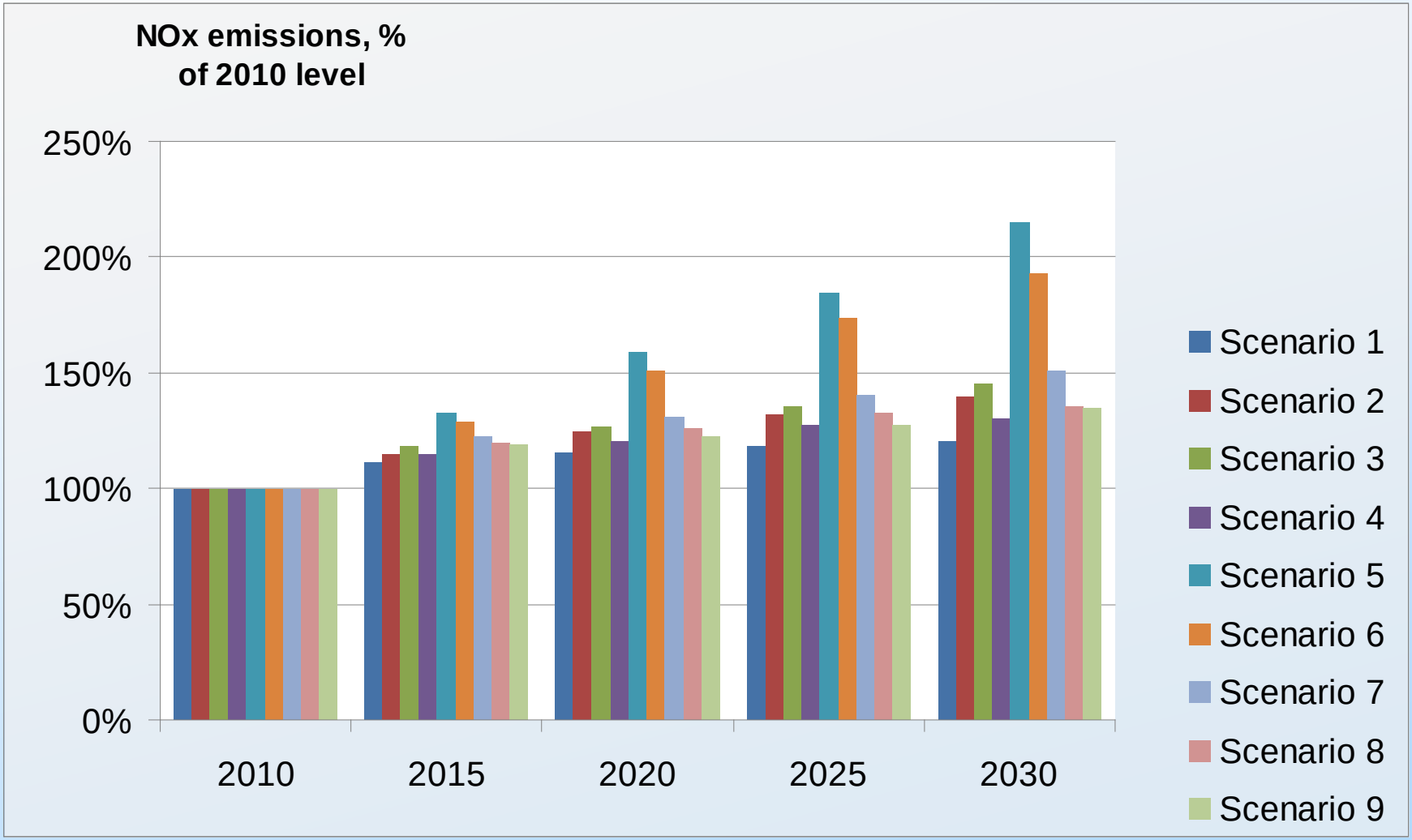
Key macroeconomic parameters by 2015



Scenarios scheme

Rate of economy growth	Energy structure	Control strategy		
		Basic	Current legislation	Optimistic
Pessimistic	Basic	Scenario 1		
Nominal	Basic		Scenario 2	
Optimistic	Basic		Scenario 5	Scenario 6
Planned	Basic		Scenario 3	Scenario 4
	Local and Renewable energy sources		Scenario 7	Scenario 9
	Local and Renewable energy sources+ Atomic energy		Scenario 8	

NOx emission projection by 2030 vs. 2010 level



Further plans:

- More attention to impact assessment
- GAINS + other IAM models
- Application of IAM for certain state plans and programs analysis
- Urban environment air abatement impact analysis
- VOCs and NH3

Thank you for your attention!