World Economic Dynamics (WED) Model:
Gas consumption modeling and forecasting

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WED Content

▶ Economic modeling and forecasting

▶ Primary energy modeling and forecasting

▶ Electricity output modeling and forecasting

▶ Oil consumption modeling and forecasting

▶ Gas consumption modeling and forecasting
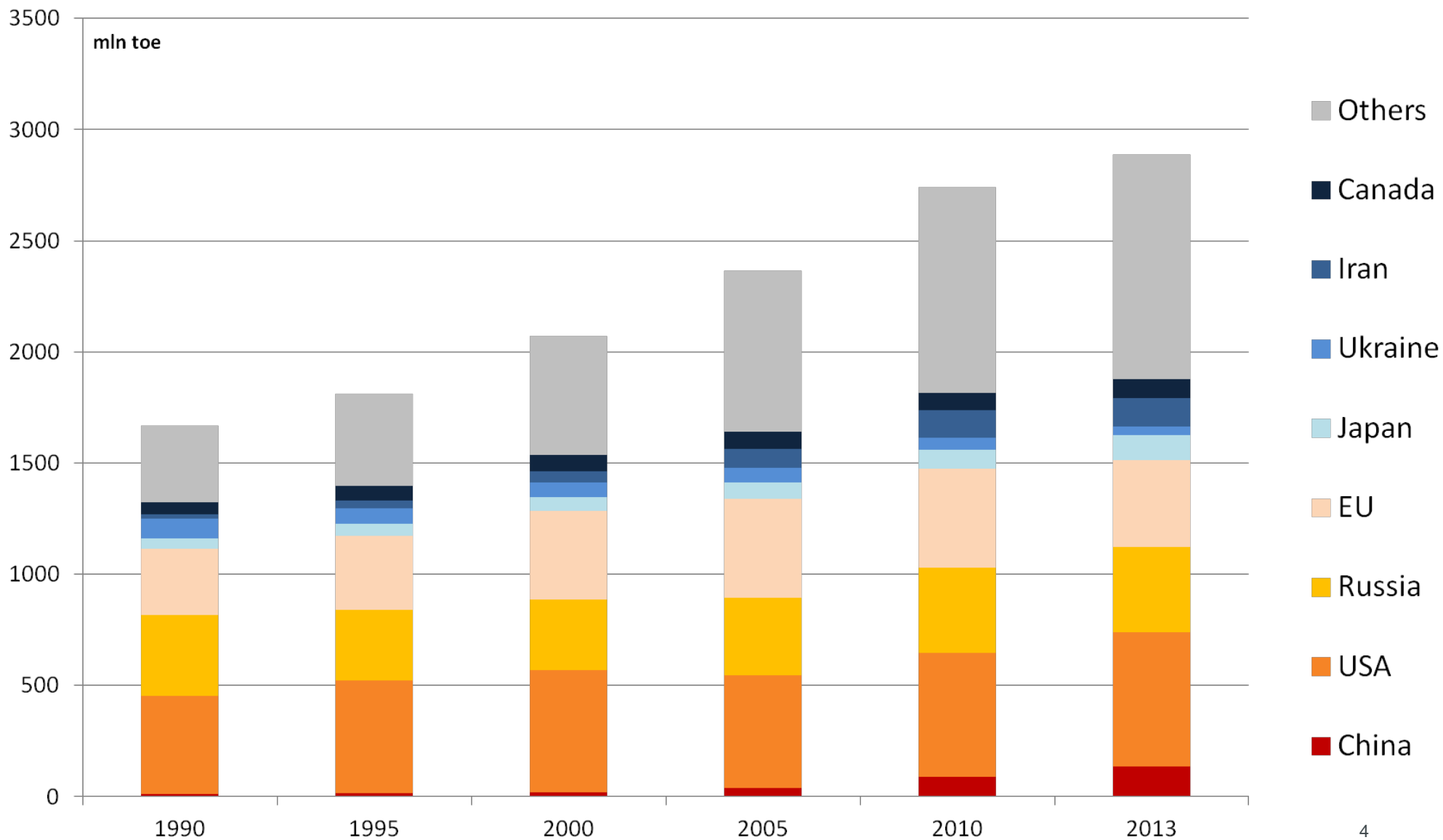
▶ Coal consumption modeling and forecasting

Why <u>consumption</u> modeling and forecasting is important in case of natural gas?
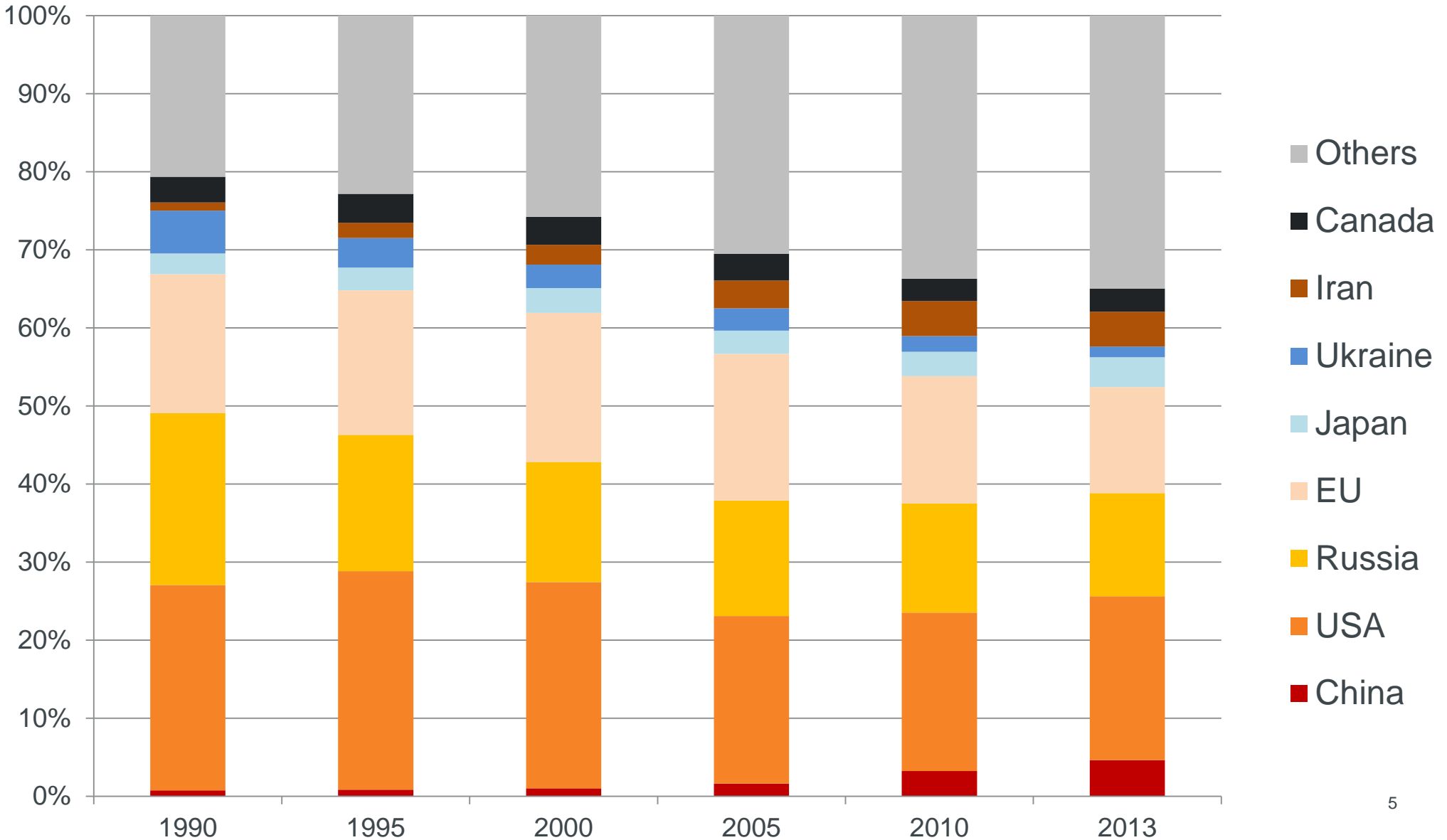
Considering today's gas supply possibility (traditional sources, shale plays, coal bed methane, shelf production etc) and transportation possibility (wide gas pipeline network and LNG shipping), we can assume that the future of gas will be determined by gas demand.

Gas consumption review

Gas consumption structure review

Natural gas consumption balance

Unit cost coefficient of electricity production

Residential per capita gas consumption

Others sectors unit gas consumption coefficient

Beyond 20/20 Professional Browser - [World Energy Balances (Read-only)]

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COUNTRY

UNIT: ktoe   COUNTRY : Memo: European Union-27   PRODUCT: Natural gas

FLOW \ TIME	1997	1998	1999	2000	2001	2002	2003	2004	2005
Production	201 512	199 865	202 971	207 783	208 437	204 181	199 755	203 013	188 733
Imports		20							322 723
Exports	-39 107	-36 891	-41 408	-48 915	-55	-59 455	-63 679	-65 687	-69 296
International marine bunkers	0	0	0	0	0	0	0	0	0
International aviation bunkers	0	0	0	0	0	0	0	0	0
Stock changes	-4 412	2 009	-3 604	-6 672	4 712	-5 974	2 104	-3 094	495
Total primary energy supply	359 538	371 083	382 479	393 588	403 798	405 261	422 090	432 673	442 656
Transfers	0	0	0	0	0	0	0	0	0
Statistical differences	-2 189	-4 838	-2 351	-3 219	-3 633	-3 896	-3 425	-3 310	-4 818
Main activity producer electricity plants	-37 411	-42 930	-51 352	-51 299	-51 722	-55 164	-54 017	-59 049	-62 549
Autoproducer electricity plants	-5 713	-5 658	-5 673	-3 898	-4 050	-4 026	-1 685	-1 827	-1 710
Main activity producer CHP plants	-22 521	-20 288	-20 353	-28 489	-30 502	-32 237	-38 813	-40 520	-42 513
Autoproducer CHP plants	-9 670	-11 404	-13 173	-9 809	-10 001	-11 306	-15 048	-17 718	-18 585
Main activity producer heat plants	-5 851	-5 559	-5 322	-5 221	-5 231	-5 143	-7 190	-6 532	-6 982
Autoproducer heat plants	-938	-1 265	-3 224	-3 203	-3 039	-2 838	-2 534	-2 631	-2 541
Total final consumption	258 816	262 108	264 451	270 798	278 671	273 433	283 450	284 711	286 080
Industry								99 496	97 626
Iron and steel	11 132	11 416	11 213	11 701	10 674	10 471	11 030	11 499	10 615
Chemical and petrochemical	21 495	20 336	21 312	23 002	22 663	22 558	23 190	21 377	21 822
Non-ferrous metals	2 517	2 684	2 682	2 770	2 914	3 039	2 847	2 889	2 662
Non-metallic minerals	15 337	15 533	15 905	17 014	17 773	17 072	18 013	17 535	18 176
Transport equipment	2 580	2 647	2 713	3 463	3 706	3 501	3 832	3 758	3 354
Machinery	8 512	8 328	8 404	7 912	8 207	7 936	7 688	8 265	8 091
Mining and quarrying	668	646	632	600	573	604	595	623	680
Food and tobacco	12 571	12 627	13 236	13 495	13 991	14 586	14 952	14 469	13 238
Paper, pulp and printing	8 679	8 942	9 172	9 700	9 352	9 409	9 684	8 524	9 004
Wood and wood products	344	386	396	452	464	489	560	755	769
Construction	614	715	731	901	938	890	751	802	909
Textile and leather	3 937	3 928	3 881	5 083	5 102	5 177	5 306	4 907	3 635
Non-specified (industry)	5 974	6 474	6 251	5 259	5 561	5 836	4 334	4 092	4 671
Transport	457	614	638	793	1 560	1 337	2 273	2 529	2 647
Residential	99 849	101 957	103 388	107 680	112 489	111 777	116 617	118 596	117 311
Commercial and public services	37 688	39 557	38 672	34 841	37 057	35 477	42 082	43 646	44 858
Agriculture/forestry	4 045	3 983	3 932	4 041	4 037	3 909	3 991	4 125	3 821
Non-specified (other)	6 780	6 656	6 700	6 468	6 502	5 871	1 791	1 865	4 437
Non-energy use	15 640	14 677	14 593	15 622	15 106	13 494	13 913	14 455	15 380

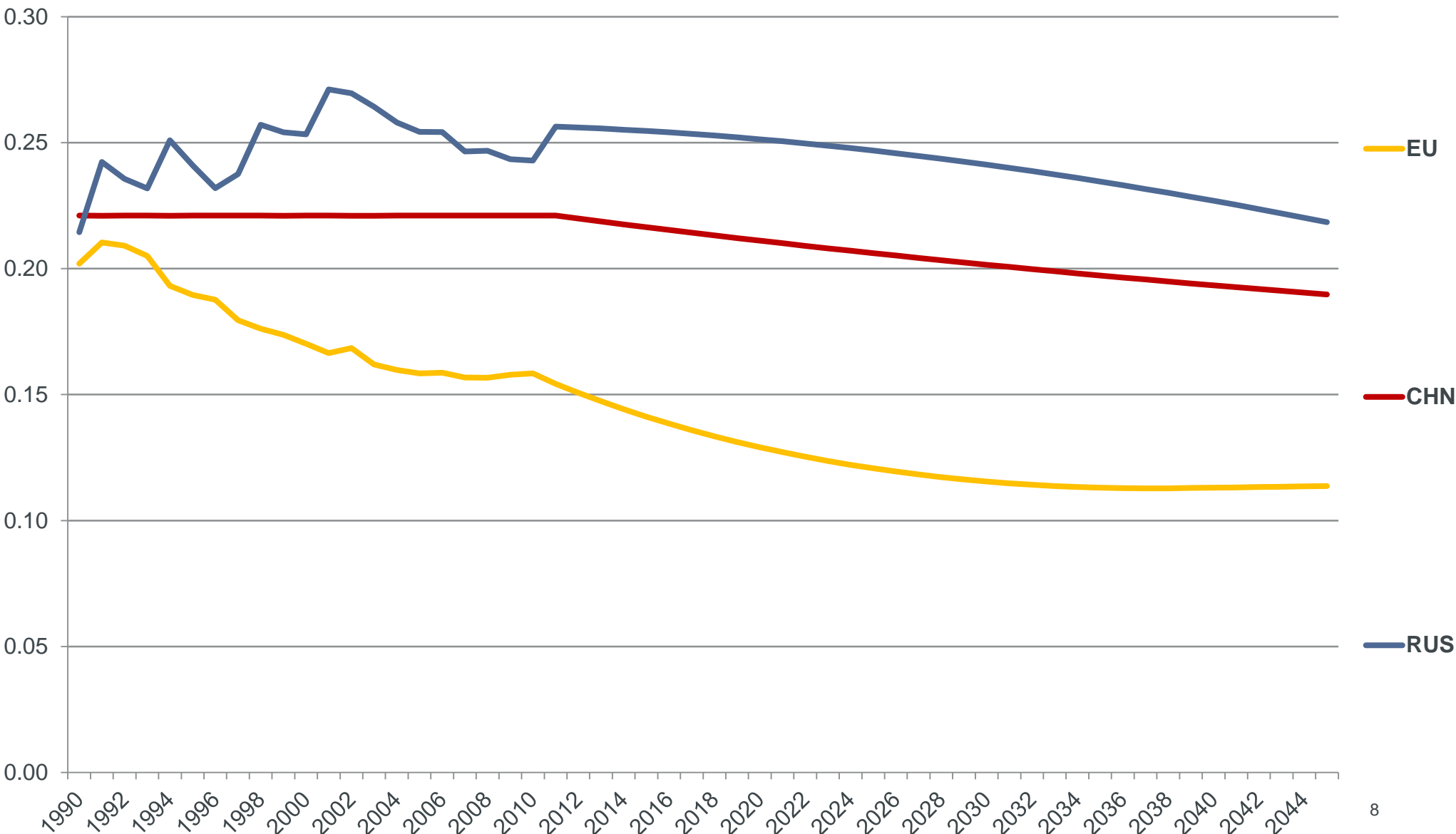## General assumption: Unit cost coefficient on electricity production – should decline everywhere

To forecast the coefficient we use linear regression coefficient for historical data of growth rates. This way we estimate future growth rate until 2024. From 2025 y. we use accumulation function, which will lead us to very slow decline of growth rate at the end of the period (target 0.999).

Growth rate=a✕Year+b

Input coefficient on electricity production growth rate
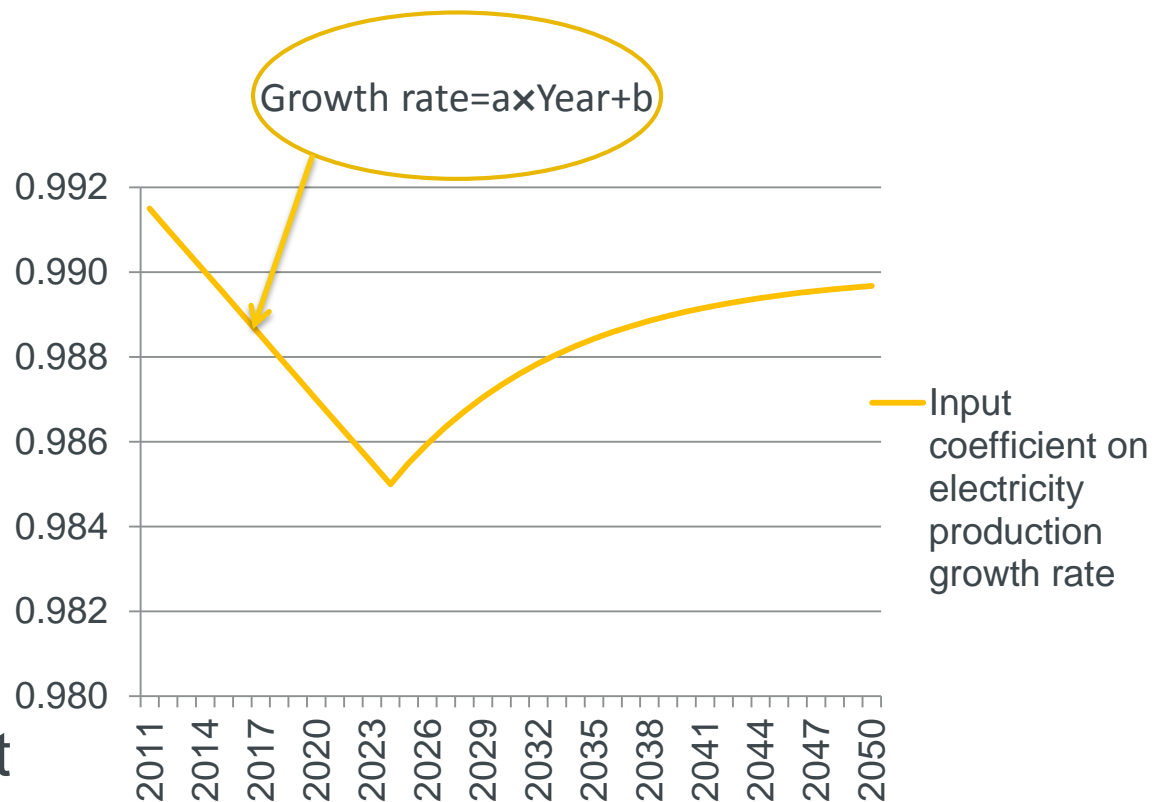
Unit cost coefficient of electricity production: results
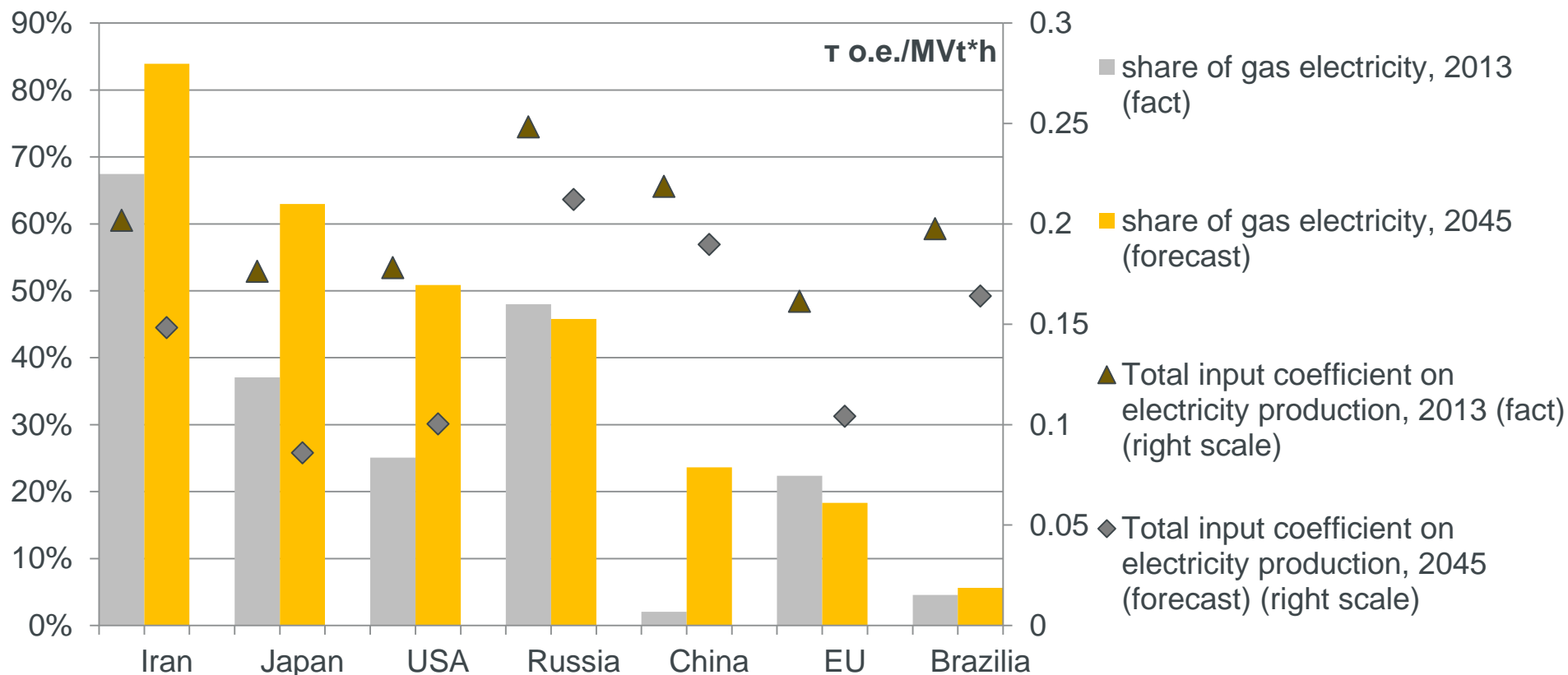
General assumption: Usually – it grows up!

To forecast growth rate of this coefficient, we use linear regression's coefficients until 2019y., than we use accumulation function, which will lead us to very slow growth of growth rate at the end of the period (target 1).
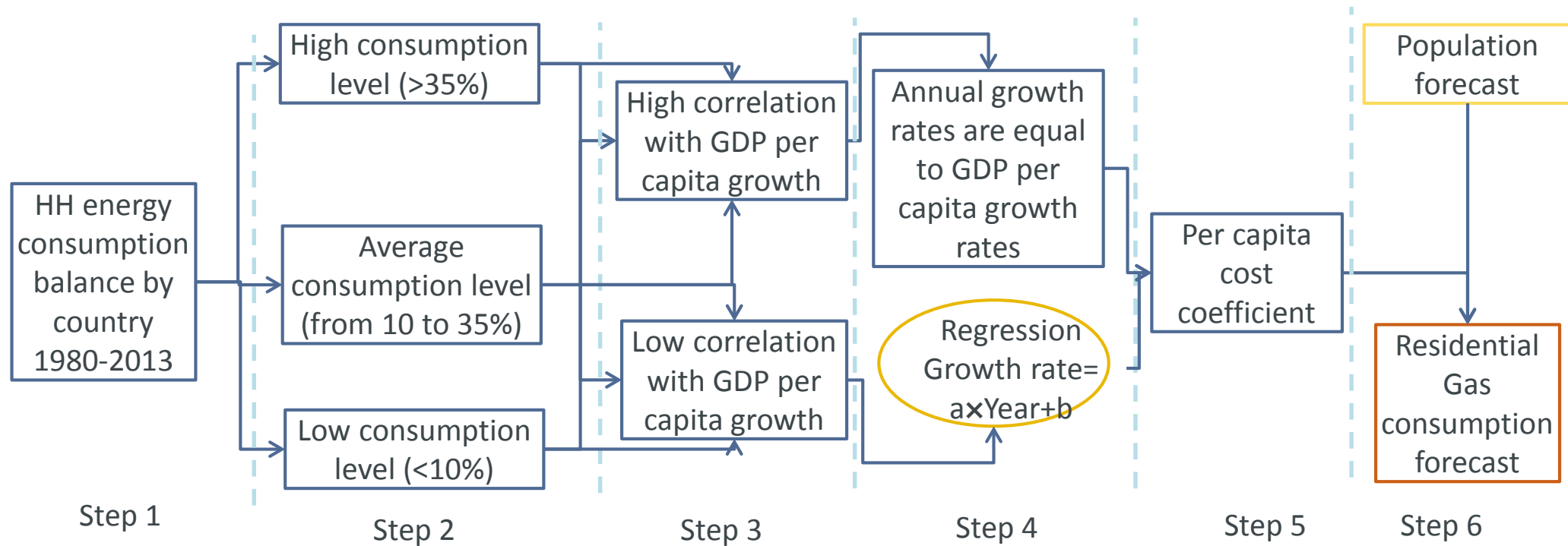
Growth rate=a ×Year+b

Share pf electricity produced on gas growth rate
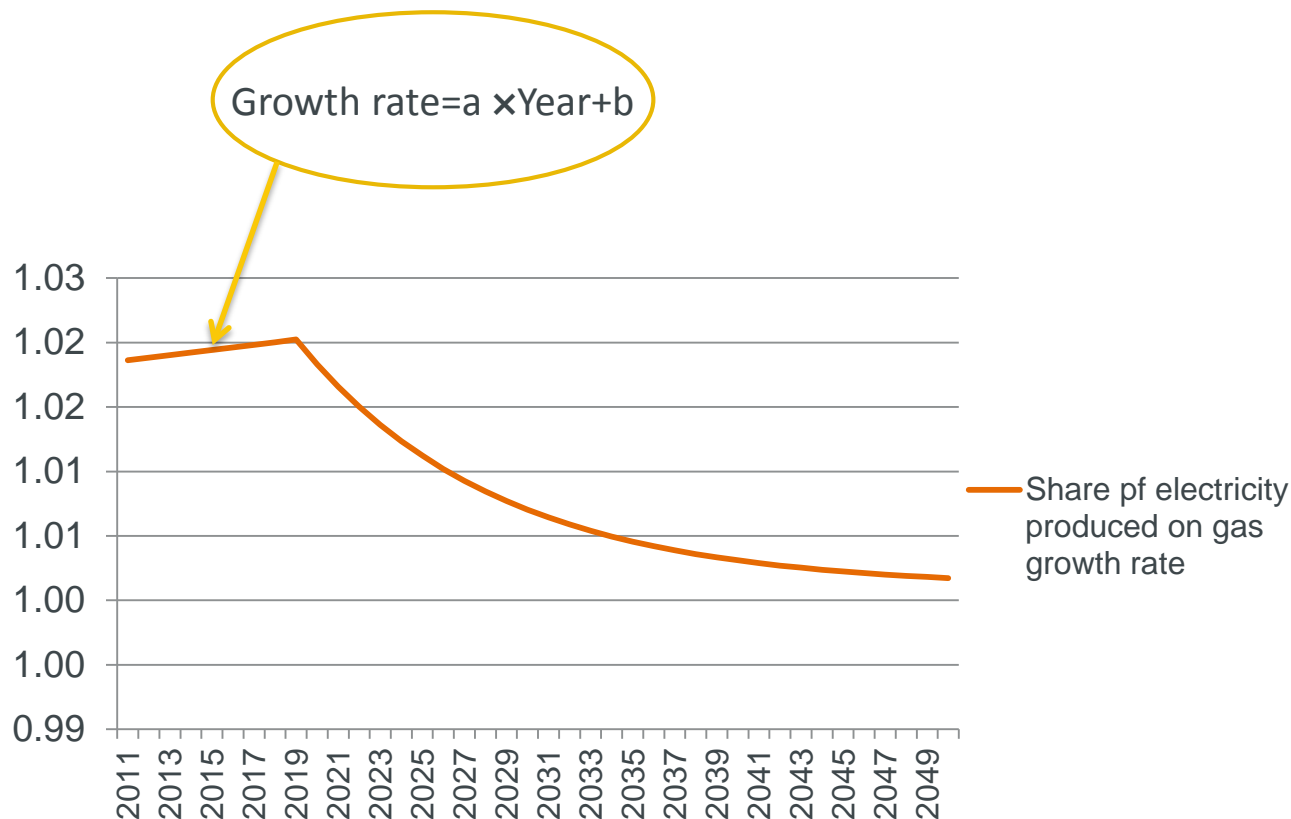
Share of gas power generation: results
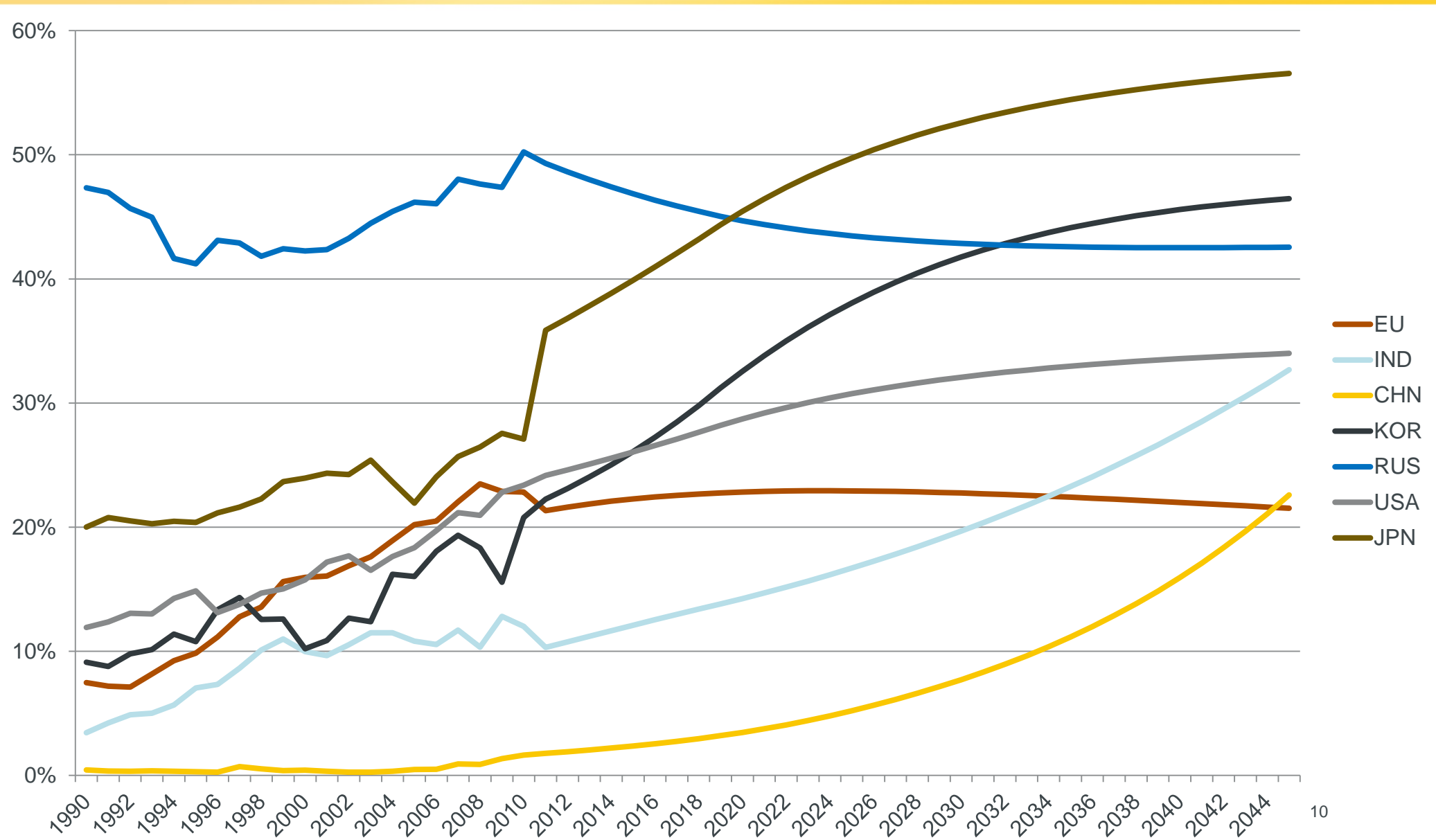
# Unit cost coefficient of electricity production and share of gas power generation in total generation

τ o.e./MVt*h

- ■ share of gas electricity, 2013 (fact)
- ■ share of gas electricity, 2045 (forecast)
- ▲ Total input coefficient on electricity production, 2013 (fact) (right scale)
- ◆ Total input coefficient on electricity production, 2045 (forecast) (right scale)

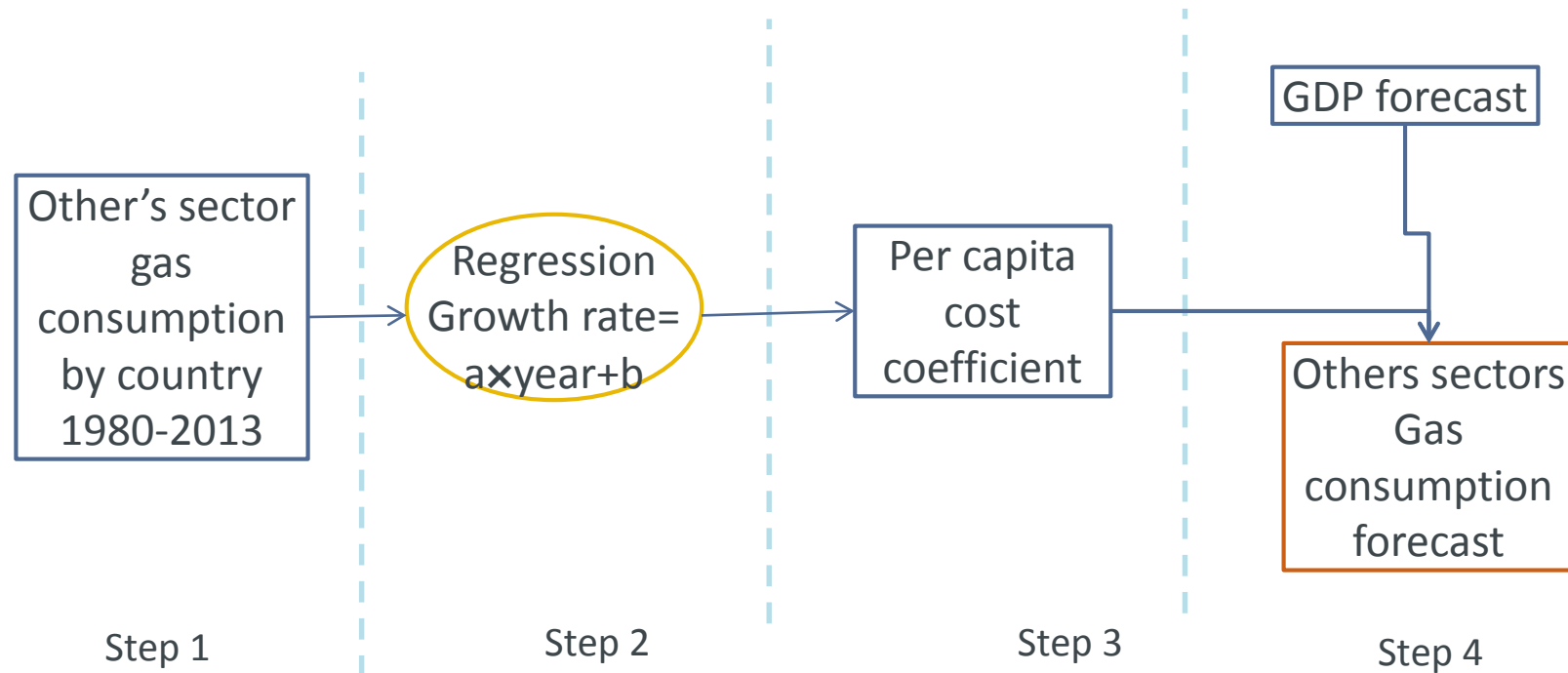# Residential per capita gas consumption: Methodology

6-step methodology: preparing data, analyzing data, checking for correlation between per capita consumption costs growth rates and GDP per capita growth rates, regression and calculation of annual growth rates, calculation of per capita cost coefficient, calculation of residential gas consumption forecast

Residential per capita gas consumption: results
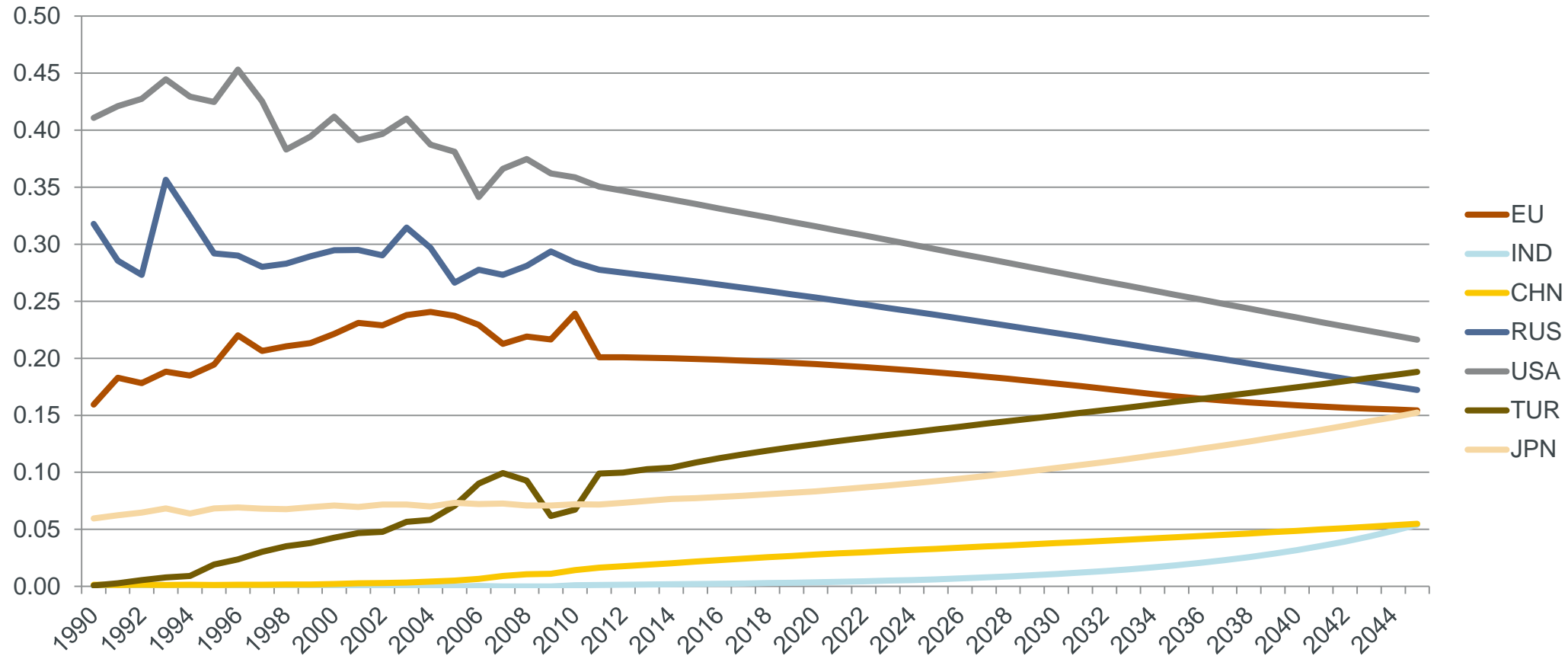
Others sectors unit gas consumption coefficient: Methodology

Step 1 — Other's sector gas consumption by country 1980-2013

Step 2 — Regression Growth rate= a×year+b

Step 3 — Per capita cost coefficient

GDP forecast

Step 4 — Others sectors Gas consumption forecast

4-step methodology: preparing data, analyzing data, checking for correlation between per capita consumption costs growth rates and GDP per capita growth rates, regression and calculation of annual growth rates, calculation of per capita cost coefficient, calculation of residental gas consumption forecast

Last step

Gas consumption forecast in a specific country

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Electricity output*Electricity unit production cost coefficient*share of gas power generation
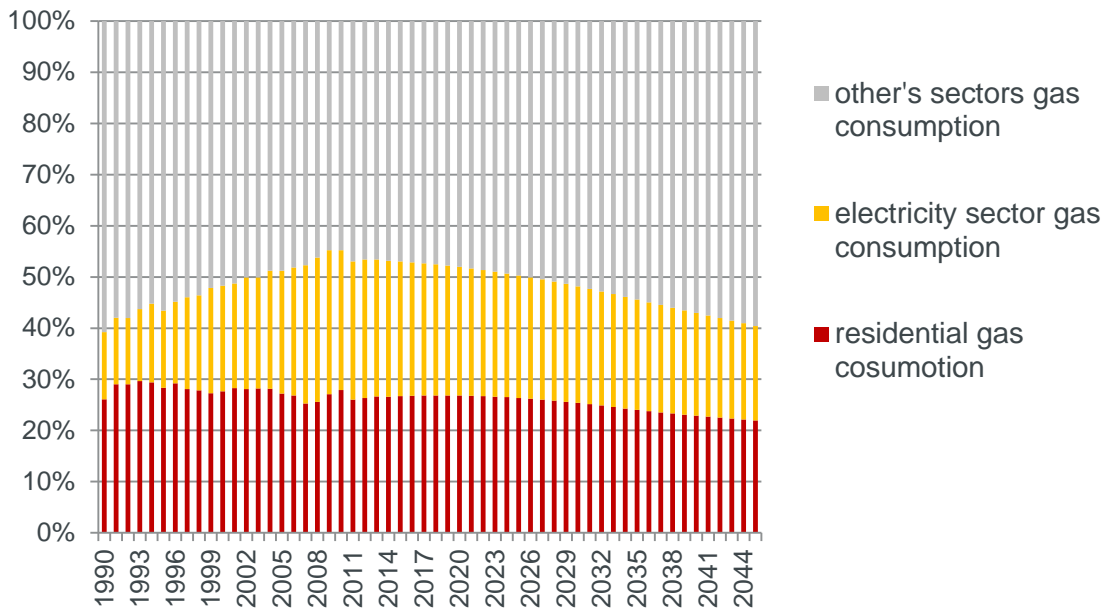
+
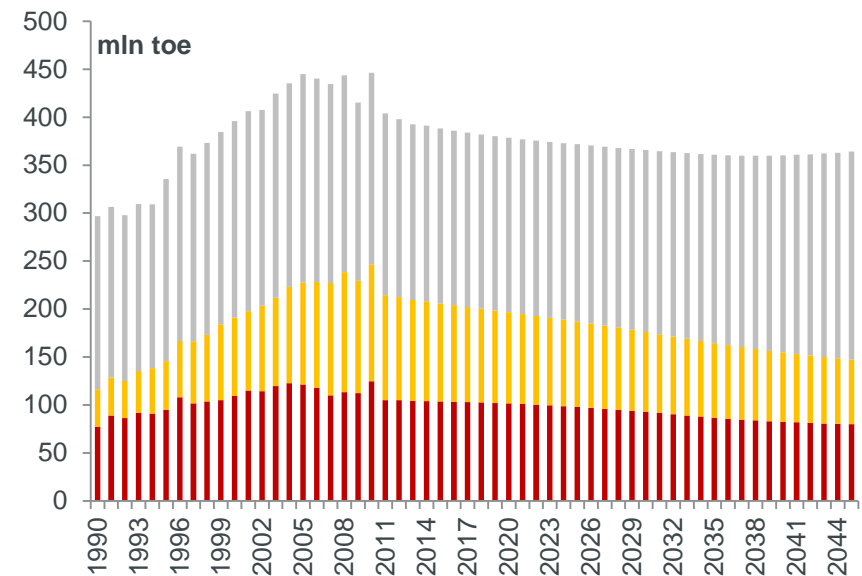
Population*Residential per capita consumption

+

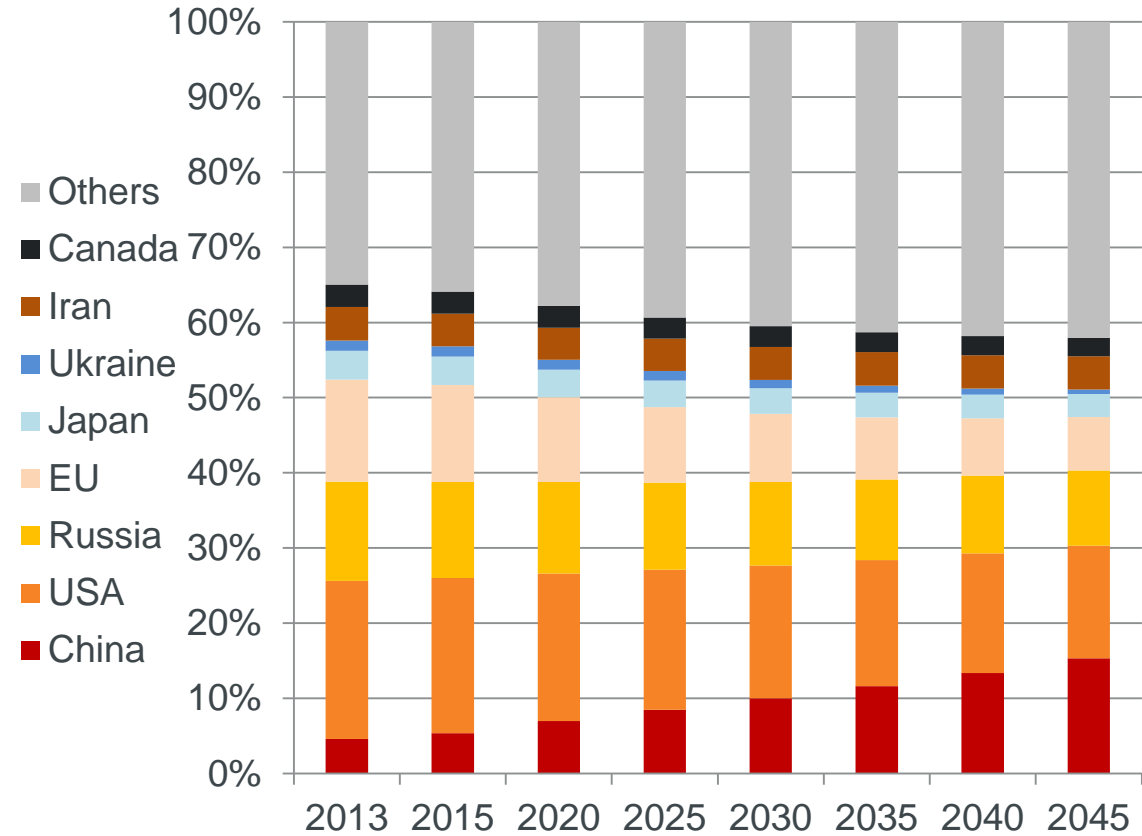GDP* other's sectors unity consumption cost coefficient

EU

- other's sectors gas consumption
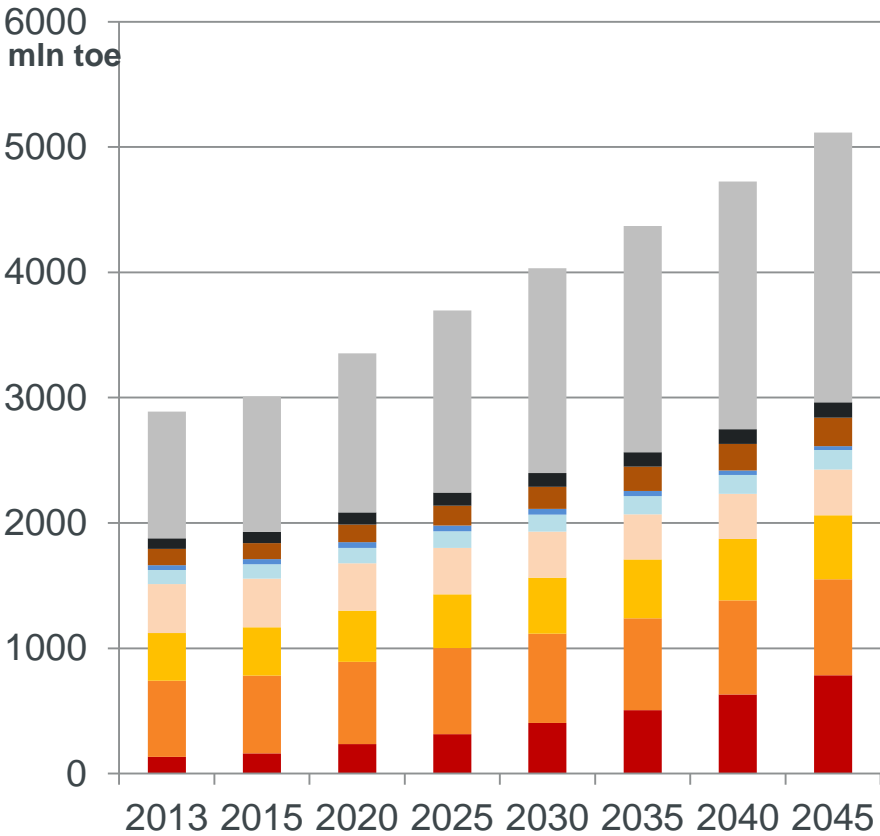- electricity sector gas consumption
- residential gas cosumotion

EU

Gas consumption outlook

Thank you for your attention!

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