

Towards a new Russia TIMES Model

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ENVIRONMENTAL DEFENSE
finding the ways that work

TIMES-RUSSIA: current versions

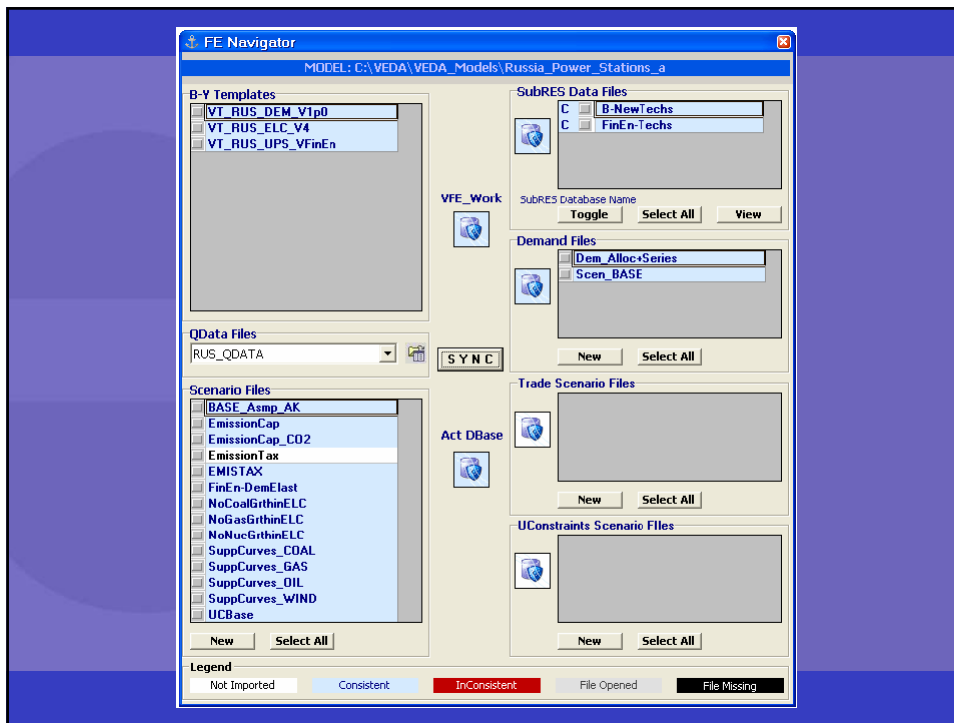
- Aggregated: by technologies and fuels:
 - ELC, HET, CHP
 - COA, GAS, DIS, HYD, NUC, OTH
- Disaggregated:
 - 1200 Power and Heat plants,
 - Base year: 2005

TIMES-RUSSIA: data by PP

- Capacity & Capacity use (kW, hours)
- Fuel mix consumption in 2005, by fuels (tce)
- Electricity and heat production and sales in 2005 (mWh, GCal)

TIMES-RUSSIA: data from RAO UEC development plan

- Growth of efficiency
- New electricity plants builds
- Scenarios for demand and expected production by fuels in 2020



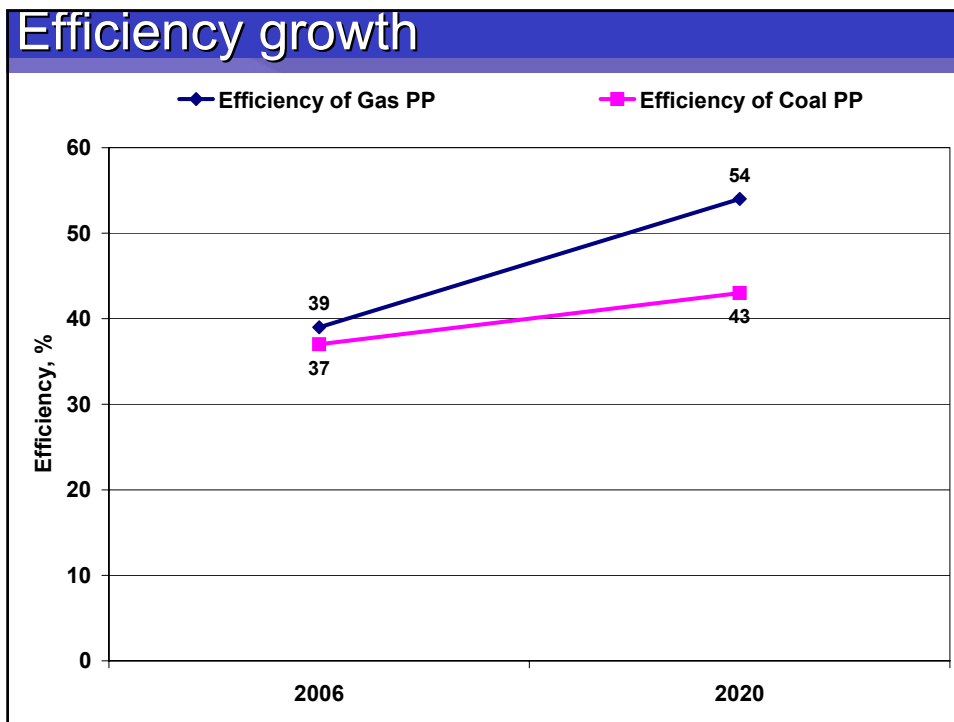
VT_RUS_ELC_V4.xls / "CHP" sheet

					EFF-2005	EFF-2030	CEFF-2005	CEFF-2030	Share-FX	Stock-2005	Stock-2010	Stock-2015	Stock-2020
7	TechName	TechDesc	Comm IN	Comm OUT	Units								
9	CHPG0010GK1GASMASCOA	ELCNGA					0.31263841	0.484478806	70.4%	1.315	1.315	1.315	1.315
10		ELCCOA					0.31263841	0.484478806	29.0%				
11		ELCHFO					0.31263841	0.484478806	0.6%				
12		ELC		ELC									
13		HET		HET									
14	CHPG0020GK1GAS	ELCNGA			0.4003483	0.55026123				2.4	2.4	2.4	2.4
15		ELC		ELC									
16	CHPG0030GK1GASMASCOA	ELCNGA					0.35531201	0.51648401	76.5%	1.58	1.58	1.58	1.58
17		ELCCOA					0.35531201	0.51648401	20.9%				
18		ELCHFO					0.35531201	0.51648401	2.6%				
19		ELC		ELC									
20		HET		HET									
21	CHPG0040GK1GASMAS	ELCNGA					0.37232392	0.529242941	98.9%	2.1	2.1	2.1	2.1
22		ELCHFO					0.37232392	0.529242941	1.1%				
23		ELC		ELC									
24		HET		HET									
25	CHPG0050GK1GAS	ELCNGA			0.4004700	0.5503591				1.6	1.6	1.6	1.6
26		ELC		ELC									
27	CHPG0060GK1GASMAS	ELCNGA					0.2800066	0.480004947	99.9%	0.0224	0.0224	0.0224	0.0224
28		ELCHFO					0.2800066	0.480004947	0.0%				
29		ELC		ELC									
30		HET		HET									
31	CHPG0080GK2GAS	ELCNGA			0.3658931	0.52441981				0.43	0.43	0.43	0.43
32		ELC		ELC									
33	CHPG0090GK2GASMAS	ELCNGA					0.36698594	0.525239458	96.8%	2.4	2.4	2.4	2.4
34		ELCHFO					0.36698594	0.525239458	3.2%				
35		ELC		ELC									
36		HET		HET									
37	CHPG0100GK2MASCOA	ELCHFO					0.31847303	0.488854771	1.4%	1.9204	1.9204	1.9204	1.9204
38		ELCCOA					0.31847303	0.488854771	98.6%				
39		ELC		ELC									
40		HET		HET									
41	CHPG0110GK2GASMASCOA	ELCNGA					0.27213044	0.454097831	62.9%	0.493	0.493	0.493	0.493
42		ELCCOA					0.27213044	0.454097831	47.1%				
43		ELCHFO					0.27213044	0.454097831	0.0%				
44		ELC		ELC									
45		HET		HET									
46	CHPG0120GK2GAS	ELCNGA			0.3775873	0.53319044				3.28	3.28	3.28	3.28
47		ELC		ELC									
		HET		HET									

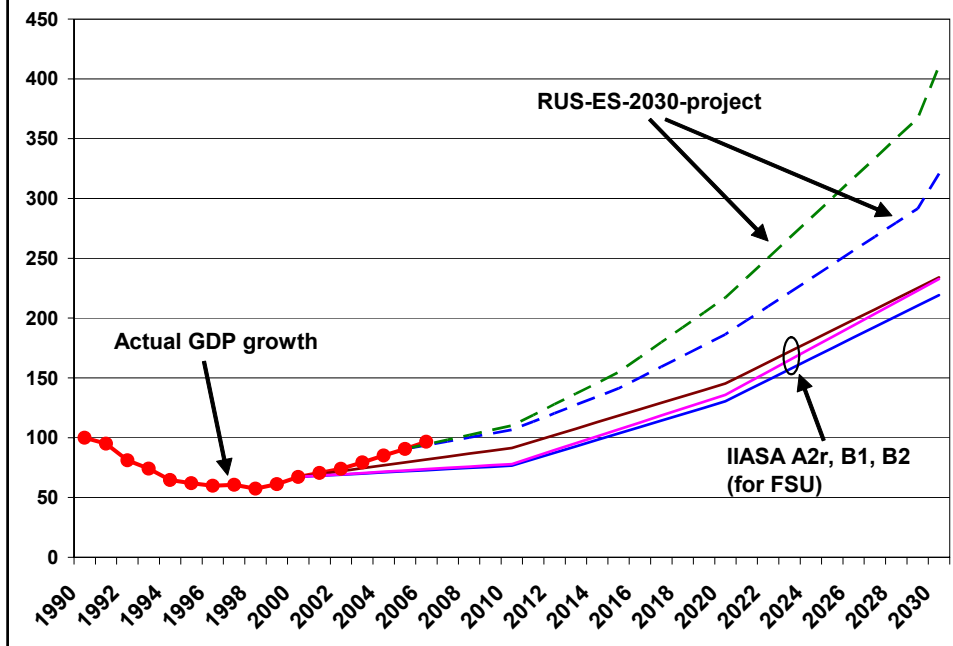
VT_RUS_ELC_V4.xls / "CHP" sheet

Microsoft Excel - VT_RUS_ELC_V4agg.xls

TechName	TechDesc	Comm-IN	Comm-OUT *Units	EFF-2005	EFF-2020	CEFF-2005	CEFF-2020	Share-UP	Stock-2005	Stock-2010
TECHCHPELCCOA	COA	ELCCOA	ELCHFO			0.3	0.4	98%	33.72018	32.32018
TECHCHPNGA	NGA	ELCNGA	ELCHFO			0.39	0.5	98%	86.239879	84.139879
TECHCHPNGANEW	New NGA	ELCNGA	ELCHFO			0.54	0.54	98%	0	24.3
TECHCHPNGACOA	NGACOA	ELCNGA	ELCCOA			0.39	0.5	98%	11.6296	11.6296
TECHCHPHFO	HFO	ELCHFO	ELCHFO	0.2	0.25				1.678126	1.678126
TECHCHPNUC	NUC	ELCNUC	ELCHFO	0.3	0.3				21.9764	23.63
TECHCHPNUCNEW	New Nuc	ELCNUC	ELCHFO	0.3	0.3				0	2.07



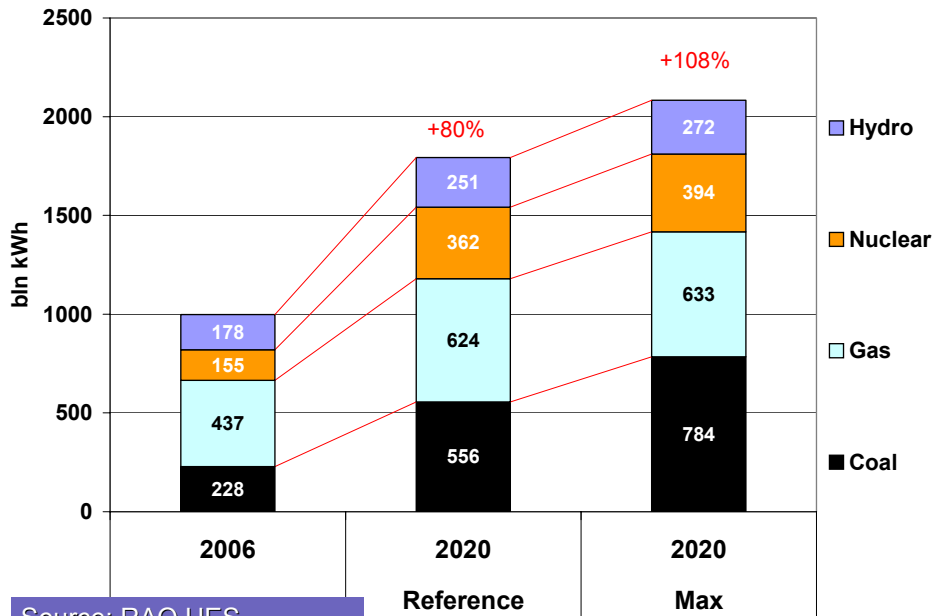
GDP growth projections



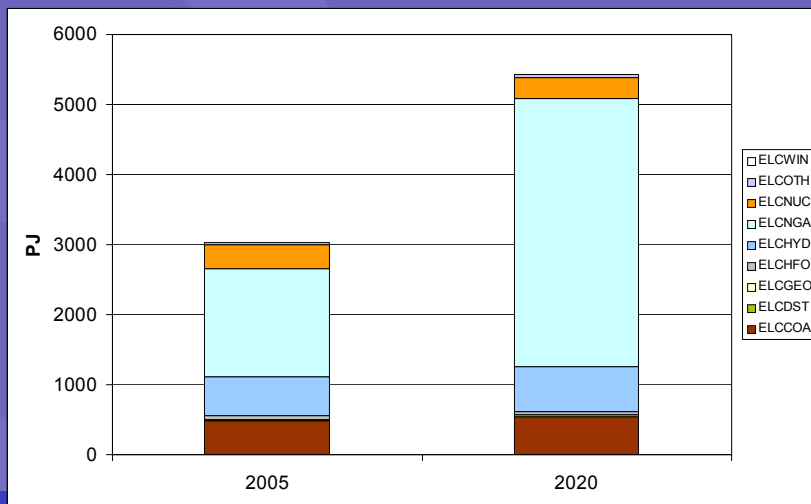
Example scenarios for CO₂

1. Reference (base run – no constraints on fuels), GDP growth 6-7% a year to 2020, Electricity demand growth 70% (2005-2020)
2. No growth in Gas consumption (5000 PJ limit)
3. No growth in Coal consumption
4. CO₂ cap (no growth of ELCCO₂N from 2005)
5. SO₂ tax
6. SO₂ cap
7. ...

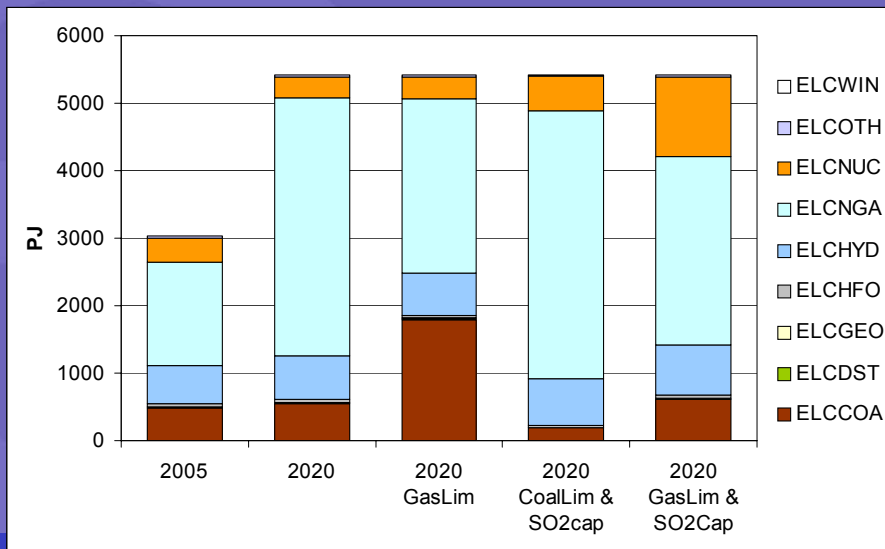
Electricity Production Fuel Mix



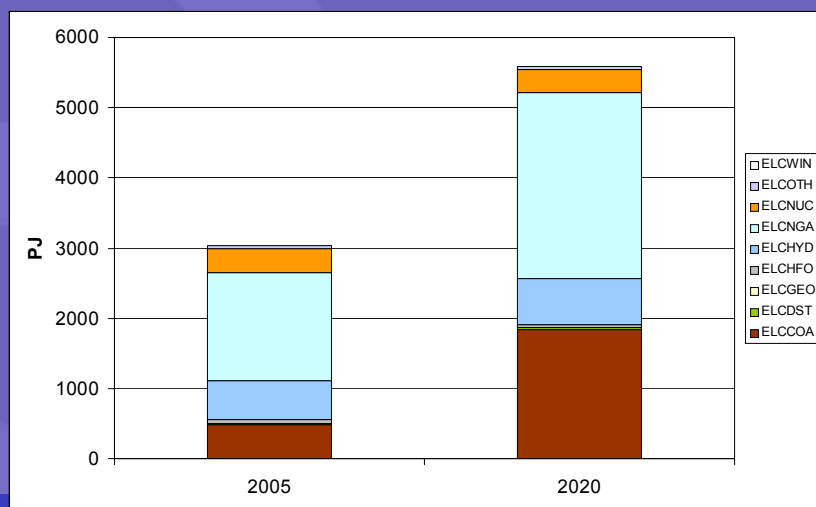
Reference scenario: electricity production fuel mix



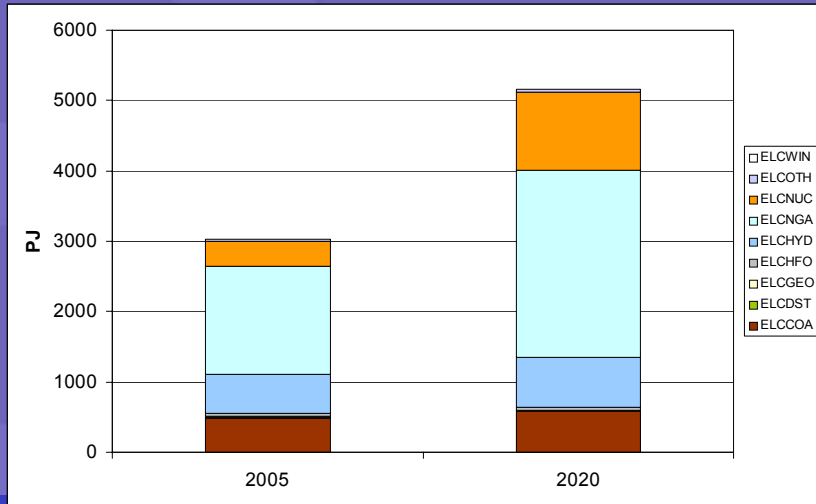
Results of some scenarios



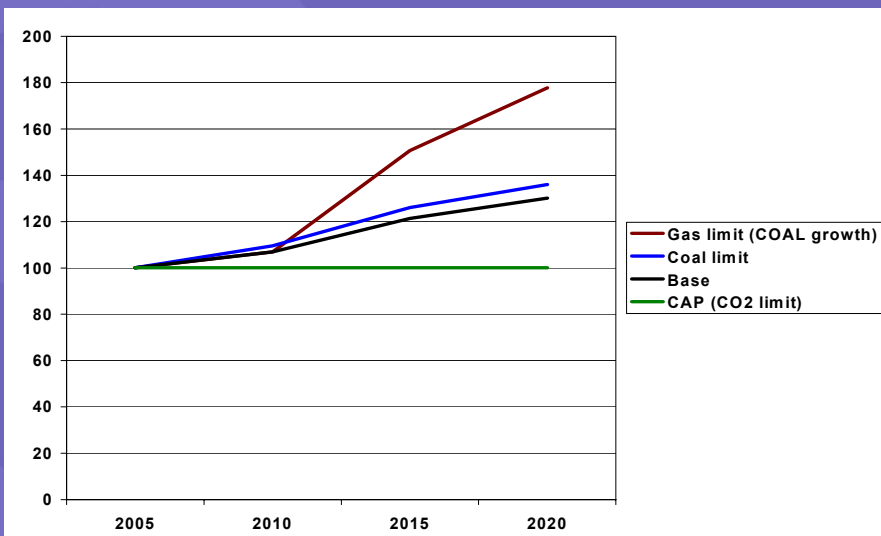
Gas 5000PJ limit: electricity production fuel mix



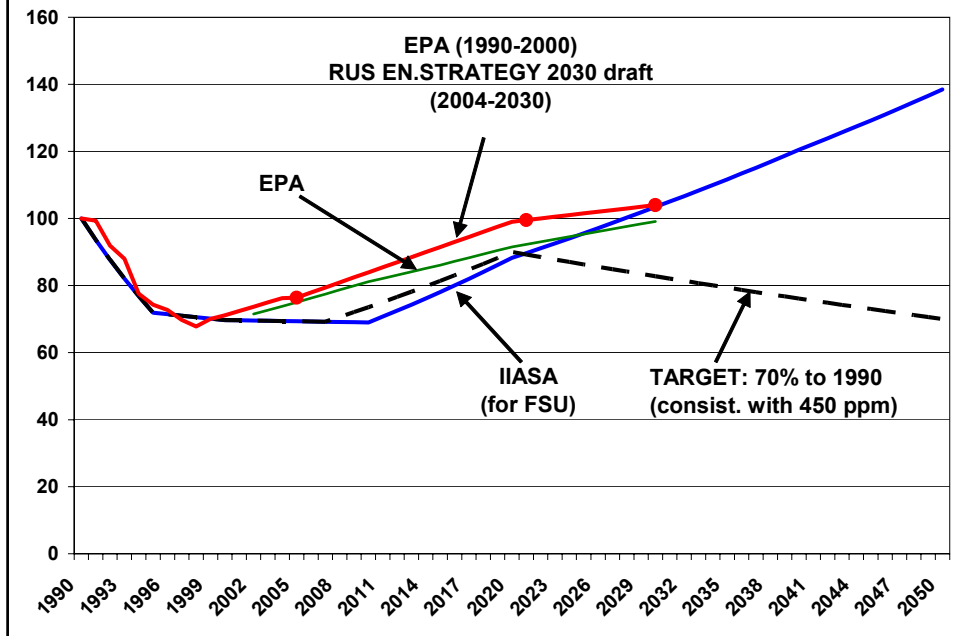
Coal fix with SO2 cap: electricity production fuel mix



CO2 emissions scenarios



Emissions from energy index (Russia)



Next steps

- Detailed sectors:
 - Industrial
 - Commercial
 - Transport
 - Residential

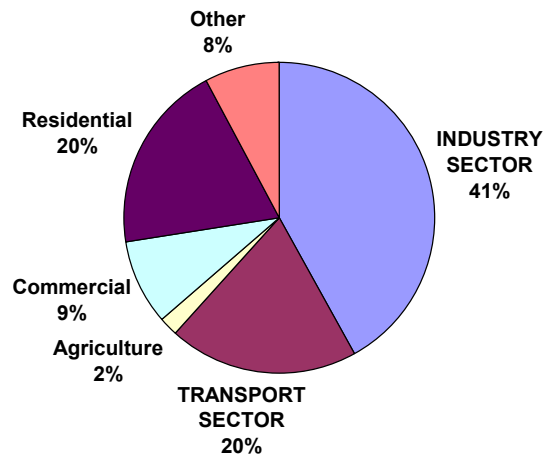
Next steps (cont)

- Data improvement:
 - Costs (fix, var, invest)
 - B-Y technology (efficiency)
 - New technology
 - Demand scenarios
- Better B-Y calibration

Problems

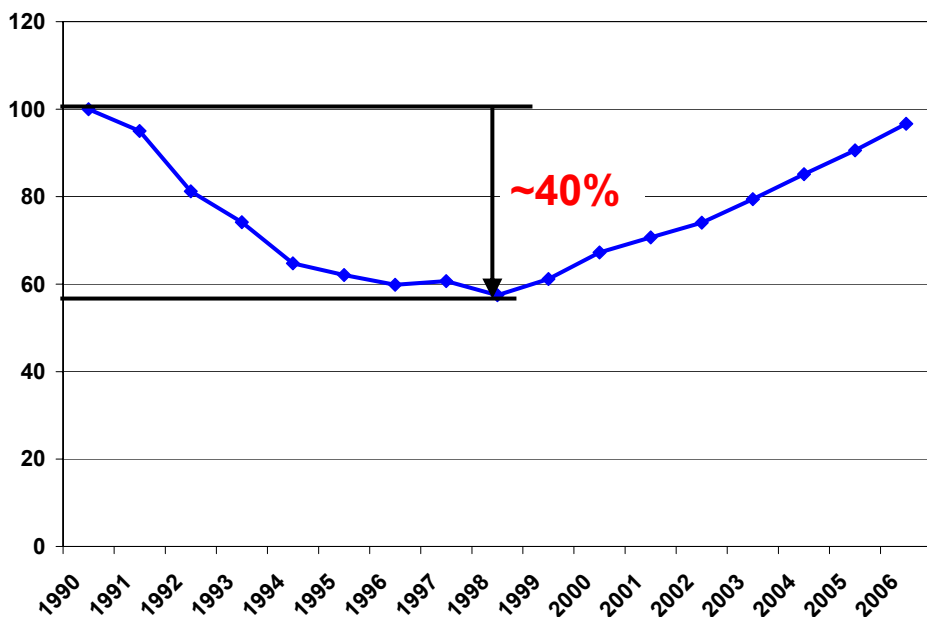
- Working with adratios and user constrains, demands
- Introducing CCS, Scrubber, and others techs
- Compatibility with TIAM-model

Total Energy Use in 2004 (mln tce)

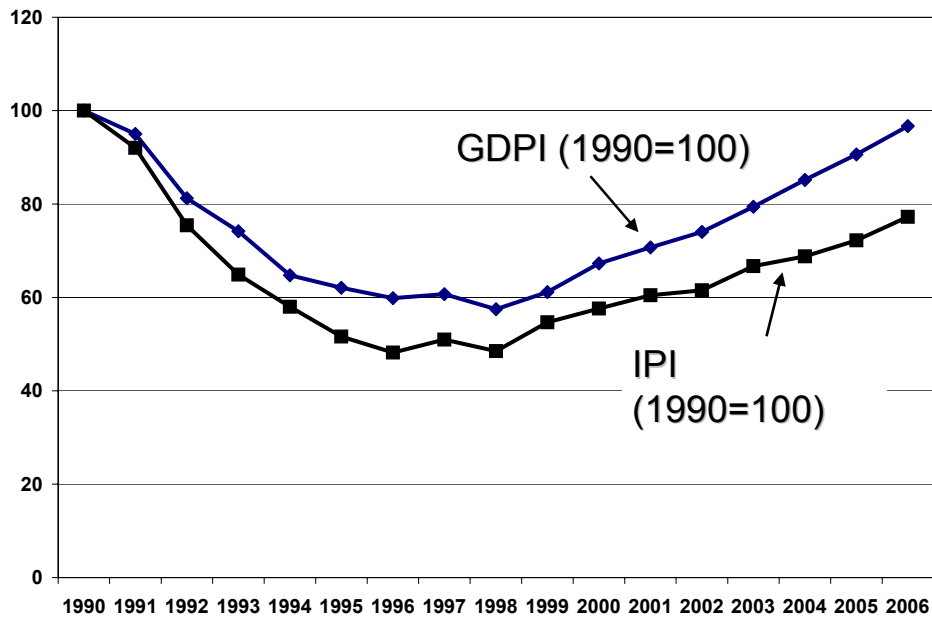


Source: ROSSTAT

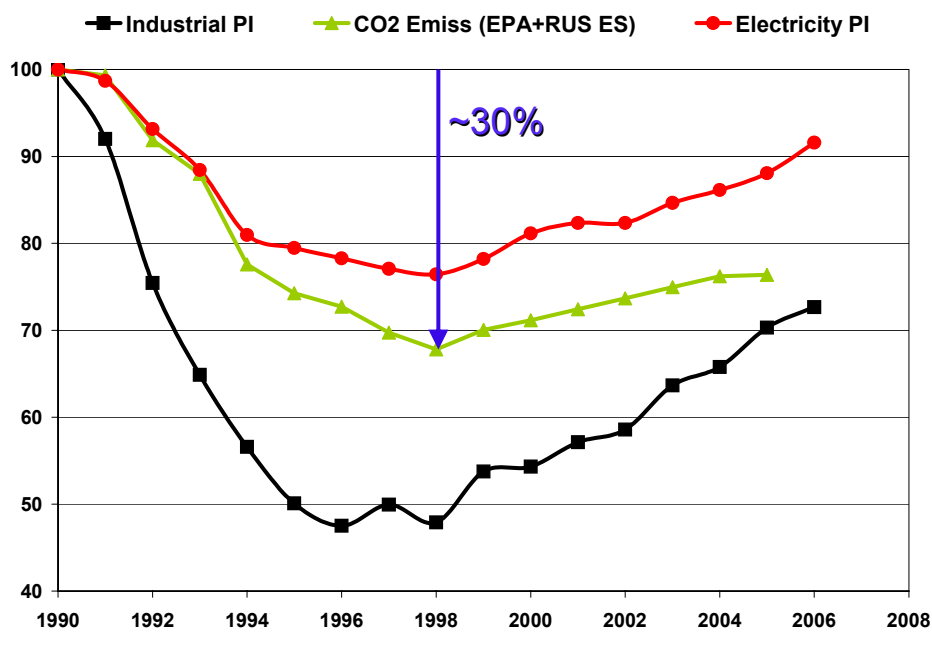
GDP Growth Index 1990-2006



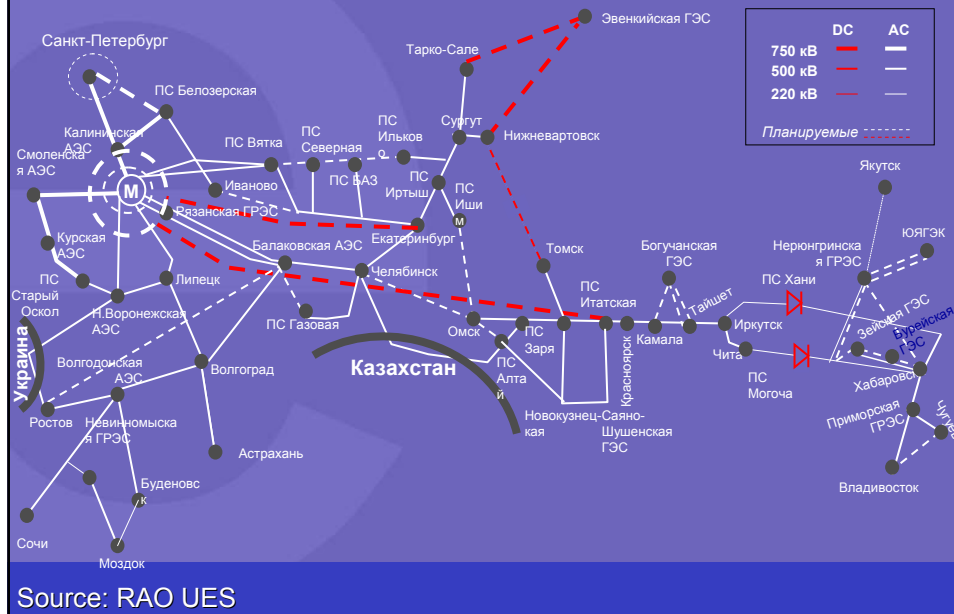
GDP & Industrial Production Indexes



Production and CO2 Emission



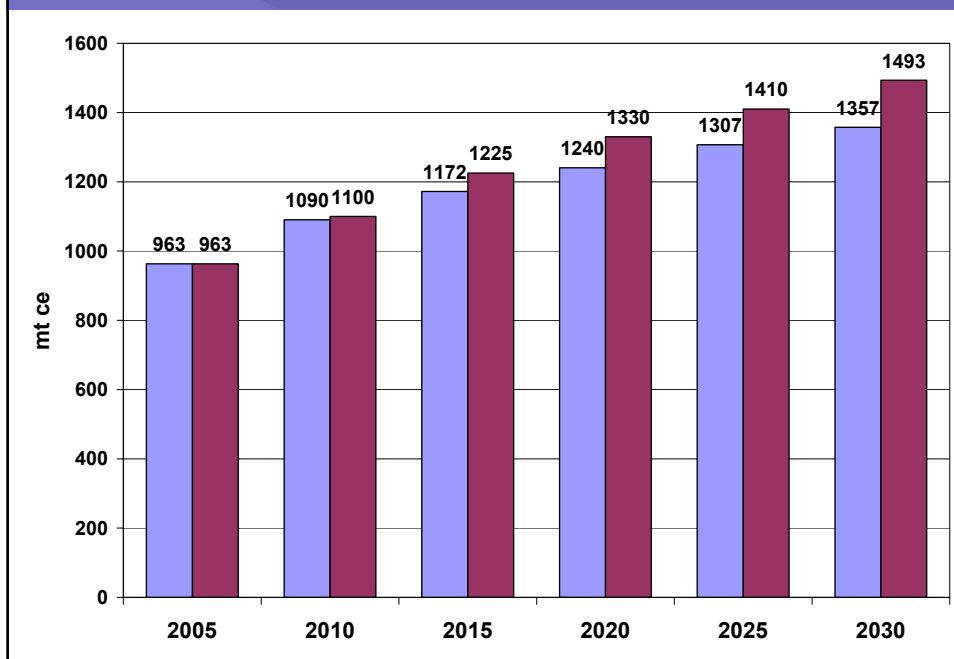
Plan of Development of Electric Network (RAO UES)



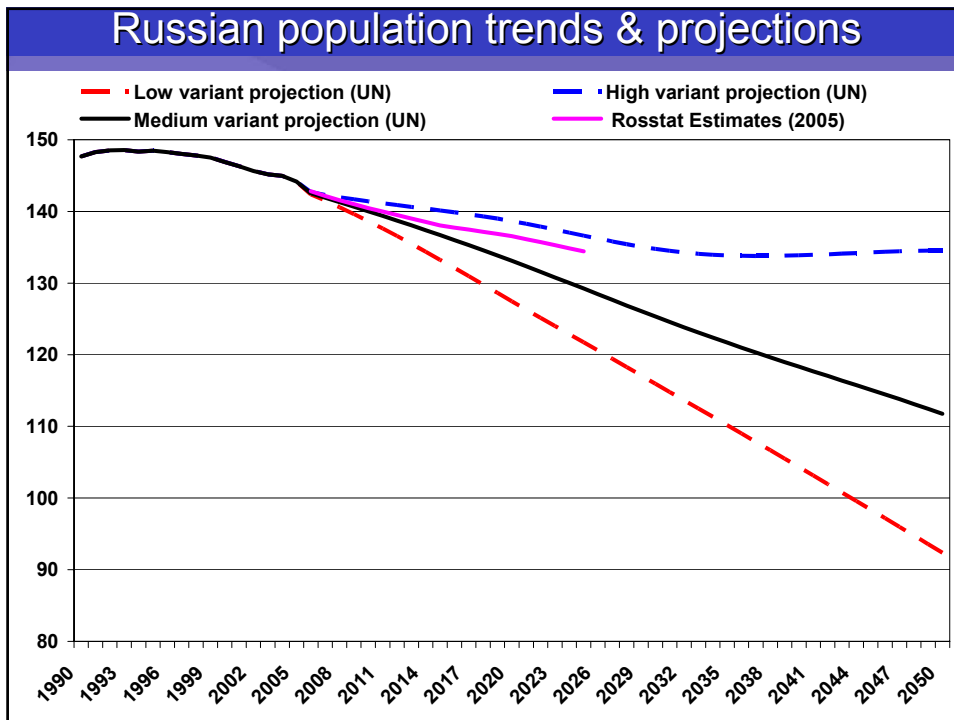
Main documents

- Russian official energy strategy to 2020 (2003)
- RAO UES development plan
- Draft (concept) of Russian energy strategy to 2030 (published in June 2007)

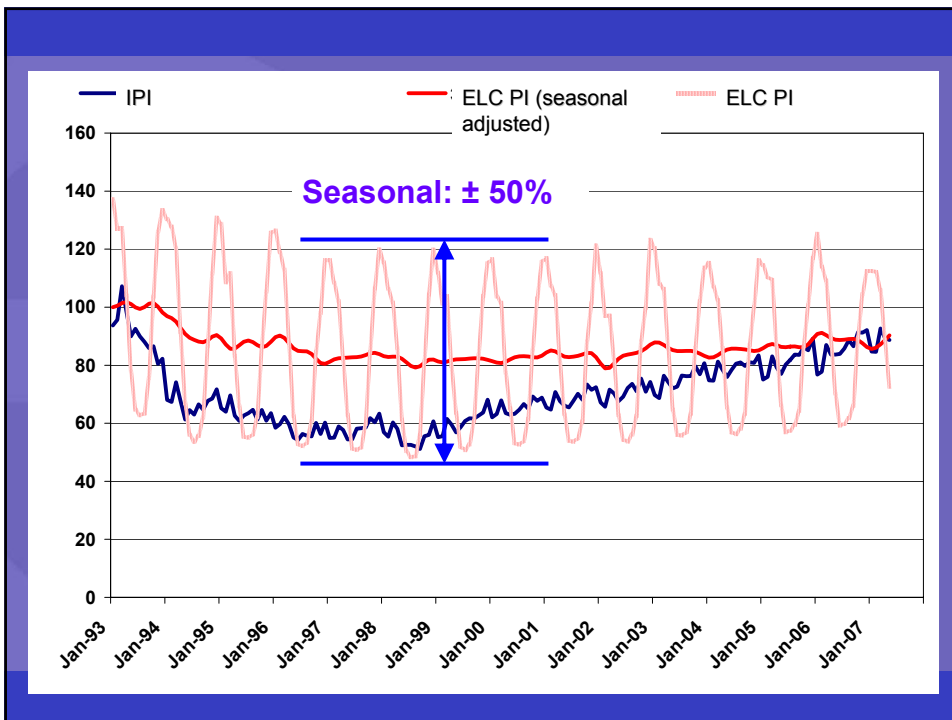
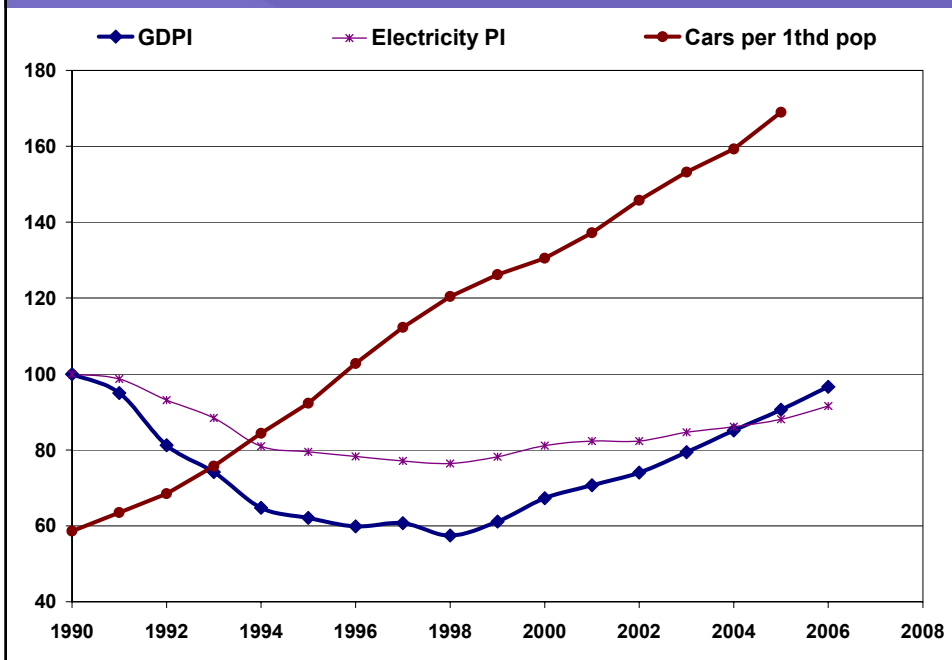
Energy consumption projections (ES-2030)



Russian population trends & projections



Cars per capita growth



Regional Growth Scenario Based on Regional Growth Econometric SE Model



Source: IET, Lugovoy, Fomchenko, Mazayev et al, 2006

Some notes

- Russia will increase coal consumption
- According to the RUS-ES-2030 (draft) Russia will reach 1990 level of emissions in 2020 and will overshoot the level up to 4% in 2030
- The potential of renewables in Russia estimated up to 4.4 bln tce a year, or 5 times current energy consumption but only 25% of current level are economical effective
- Current Russian (to 2030) scenario of CO₂ emissions exceeds scenario for 450ppm to 2050