

World Economic Dynamics (WED) Model: Electricity output modeling and forecasting



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Vasilii Akimov, Rosneft

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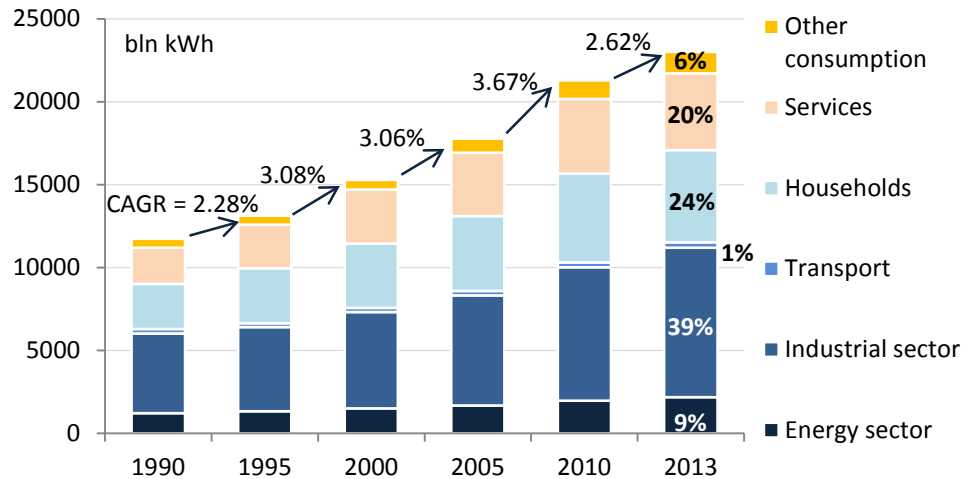


- ▶ Economics modeling and forecasting
- ▶ Primary energy modeling and forecasting
- ▶ Electricity output modeling and forecasting
- ▶ Oil consumption modeling and forecasting
- ▶ Gas consumption modeling and forecasting
- ▶ Coal consumption modeling and forecasting

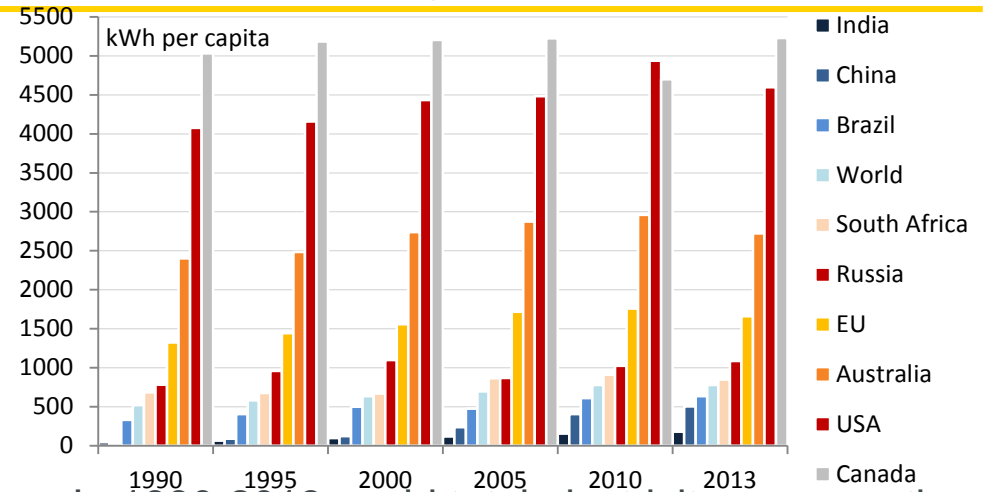
Electricity: Facts and Modeling Assumptions



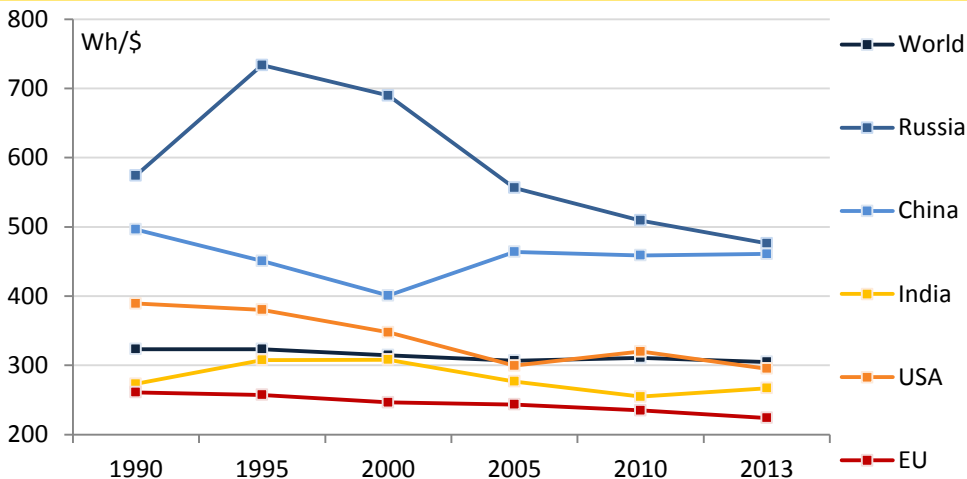
World total electricity consumption structure



Household electricity consumption per capita

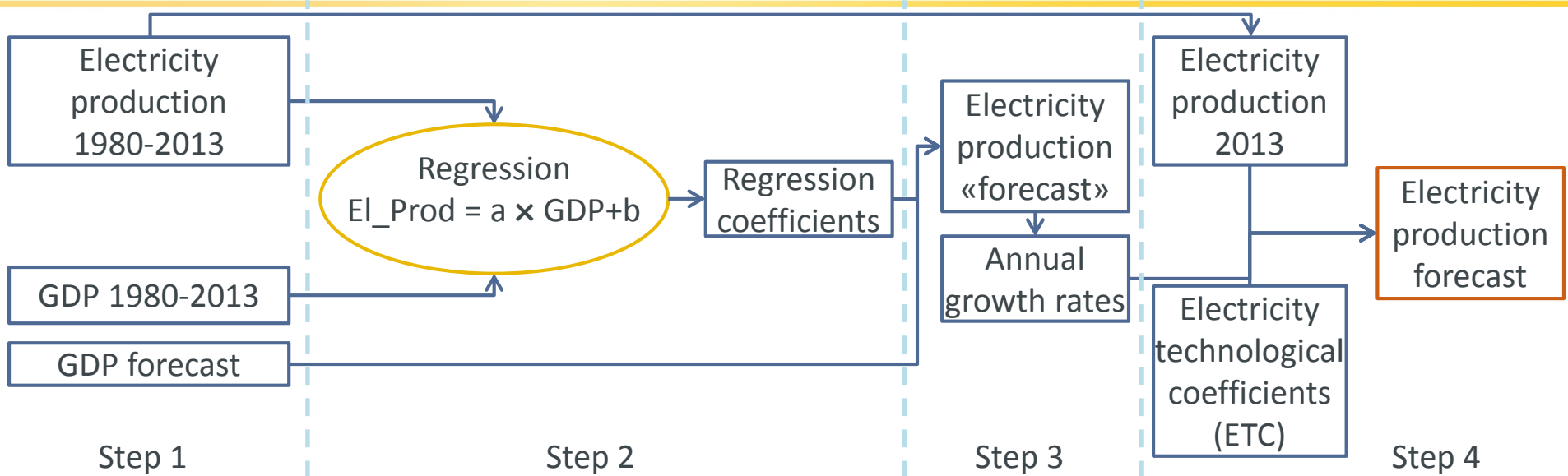


Electricity use per \$1 GDP (constant 2005 PPP)



- In 1990-2013 world total electricity consumption was growing with CAGR 2.97%
- Assumptions:
 - Growth of household electricity consumption per capita (mainly developing countries due to urbanization and de-ruralization processes)
 - The same rates of electricity use per \$1 GDP
- The mentioned assumptions define the link between country's GDP and electricity production

Electricity: Methodology



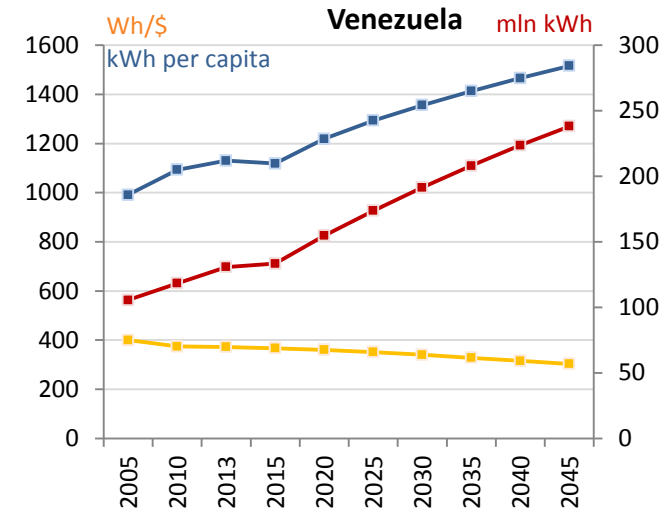
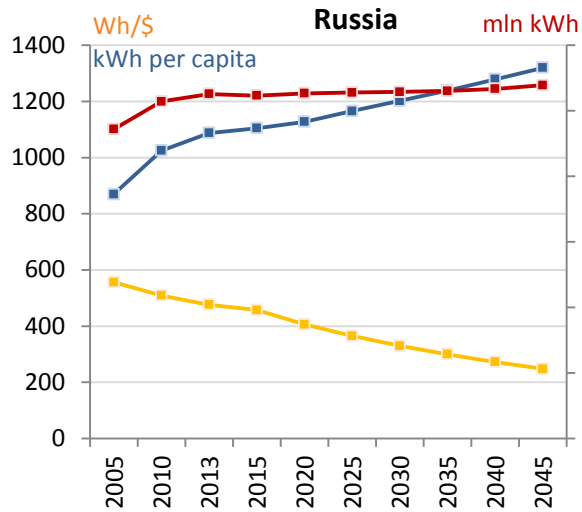
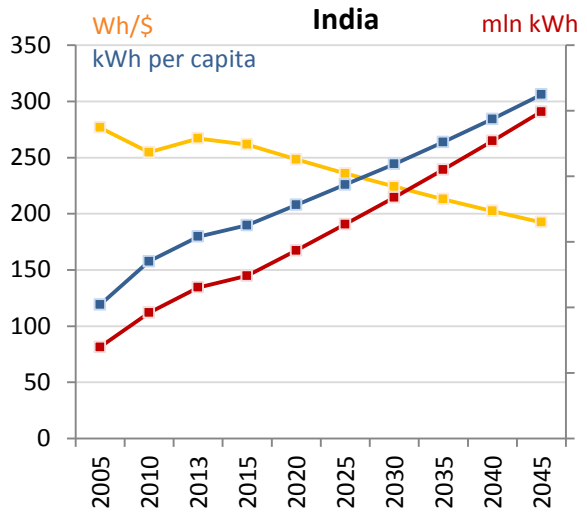
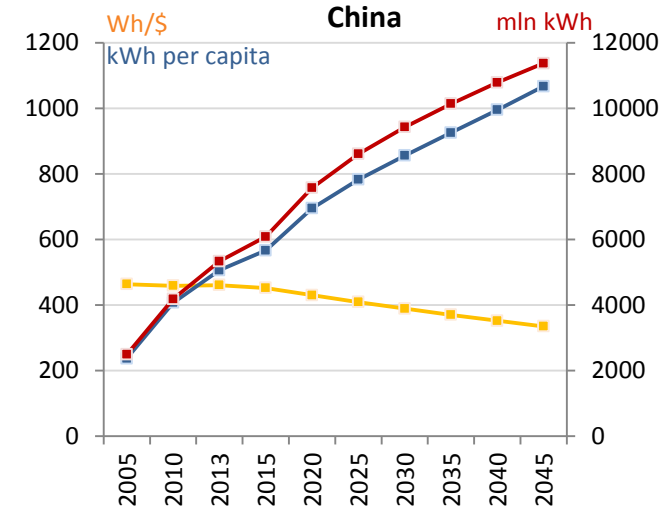
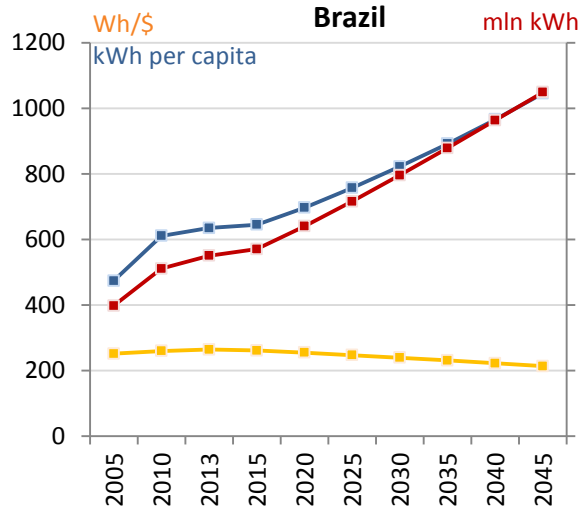
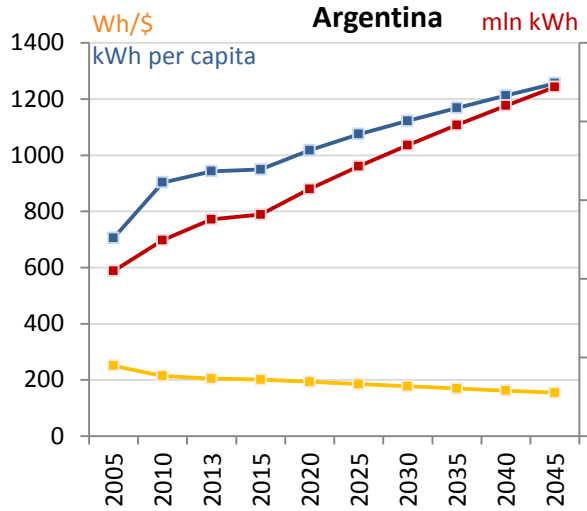
- 4-step methodology: (1) data preparation, (2) regression estimation, (3) calculation of annual growth rates, (4) calculation of electricity consumption forecast
- Possible difficulties: different number of years of historical data for different countries
- Results of the regression (step 2) are presented below

	Argentina	Brazil	China	India	Russia	Venezuela	Canada	Australia	EU	Japan	Korea	USA	Other countries	World
R²	0.90	0.99	1.00	0.98	0.86	0.91	0.88	0.95	0.95	0.97	0.98	0.93	0.99	1.00
a	235.6	331.7	459.6	268.9	207.8	472.8	331.1	299.7	158.7	285.3	413.4	220.0	215.8	295.5
b	-11.4	-135.5	-14.5	11.0	613.5	-30.6	247.4	27.1	1044.6	-88.0	-87.0	1240.0	288.6	805.7
# of years	34	34	34	34	24	34	34	34	24	34	34	34	24	34
ETC	-0.1%	1.1%	-0.3%	-0.1%	-0.8%	0.7%	-0.9%	-1.1%	-0.7%	0.0%	2.5%	-1.2%	-0.9%	-0.3%

Electricity: Forecasts



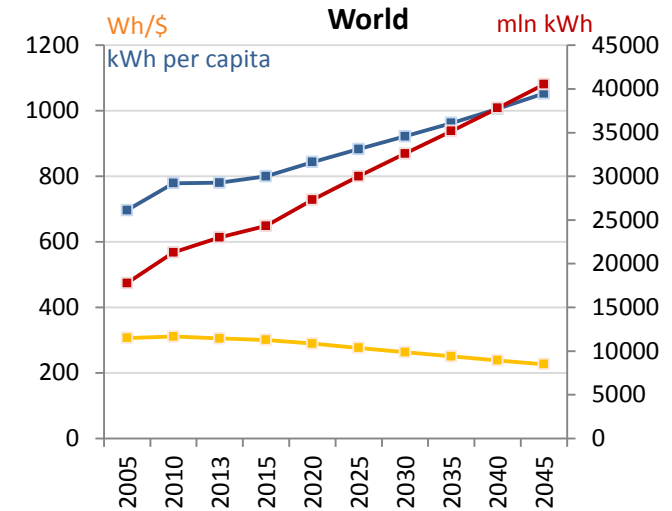
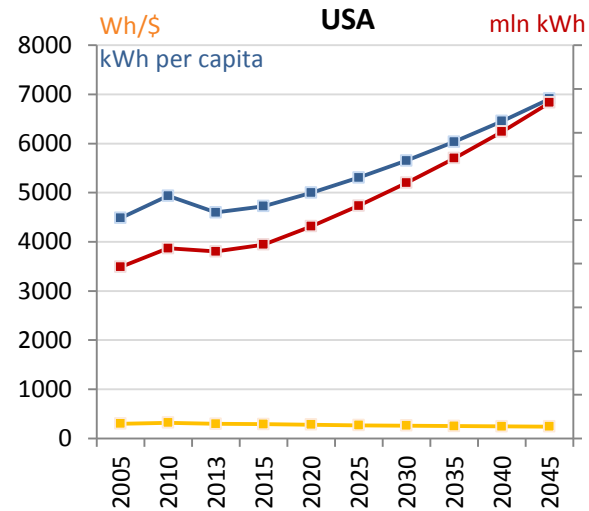
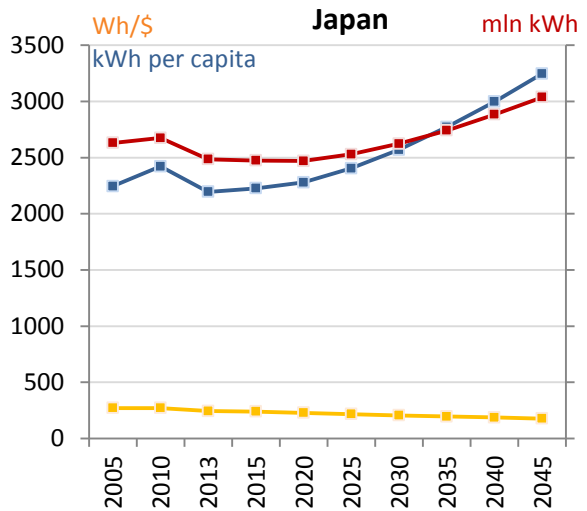
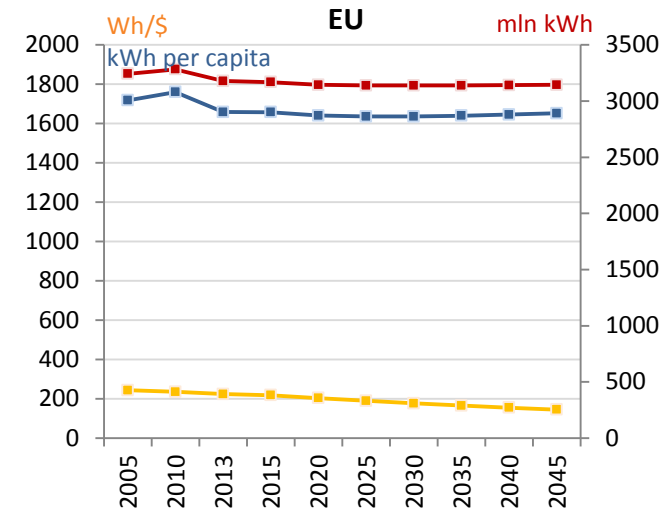
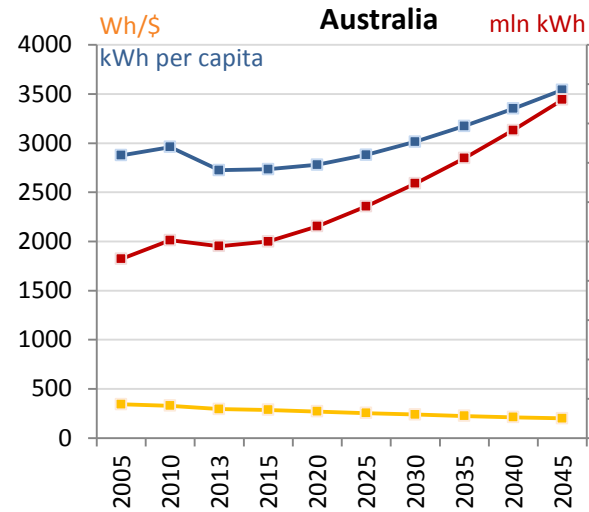
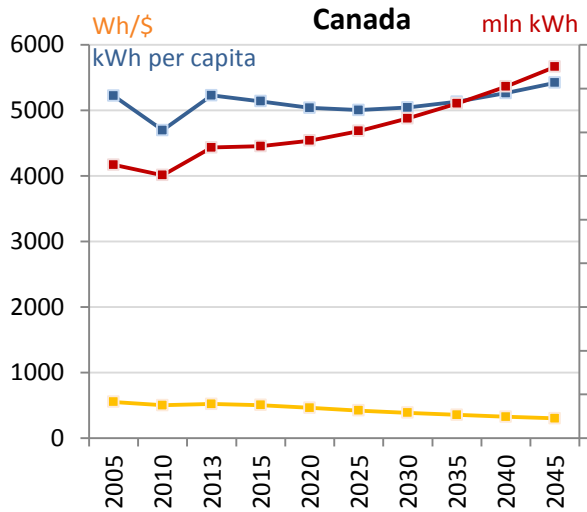
— Total electricity use per \$1 GDP (constant 2005 PPP) — HH electricity consumption per capita — Electricity production (right axis)



Electricity: Forecasts



— Wh/\$ — kWh per capita — HH electricity consumption per capita — Electricity production (right axis)



Electricity: Possible Modifications



- Forecast of the household consumption (its share in total consumption)
 - Currently used moving average approach
- Modeling source consumption in electricity production
 - Via resource consumption elasticity of power generation
 - Another approach
- More research on technological efficiency (electricity consumed per \$1 GDP) is planned



Контактная информация

117997, г. Москва, Софийская наб., 26/1

Телефон: +7 (499) 517-88-99

Факс: +7 (499) 517-72-35

E-mail: postman@rosneft.ru