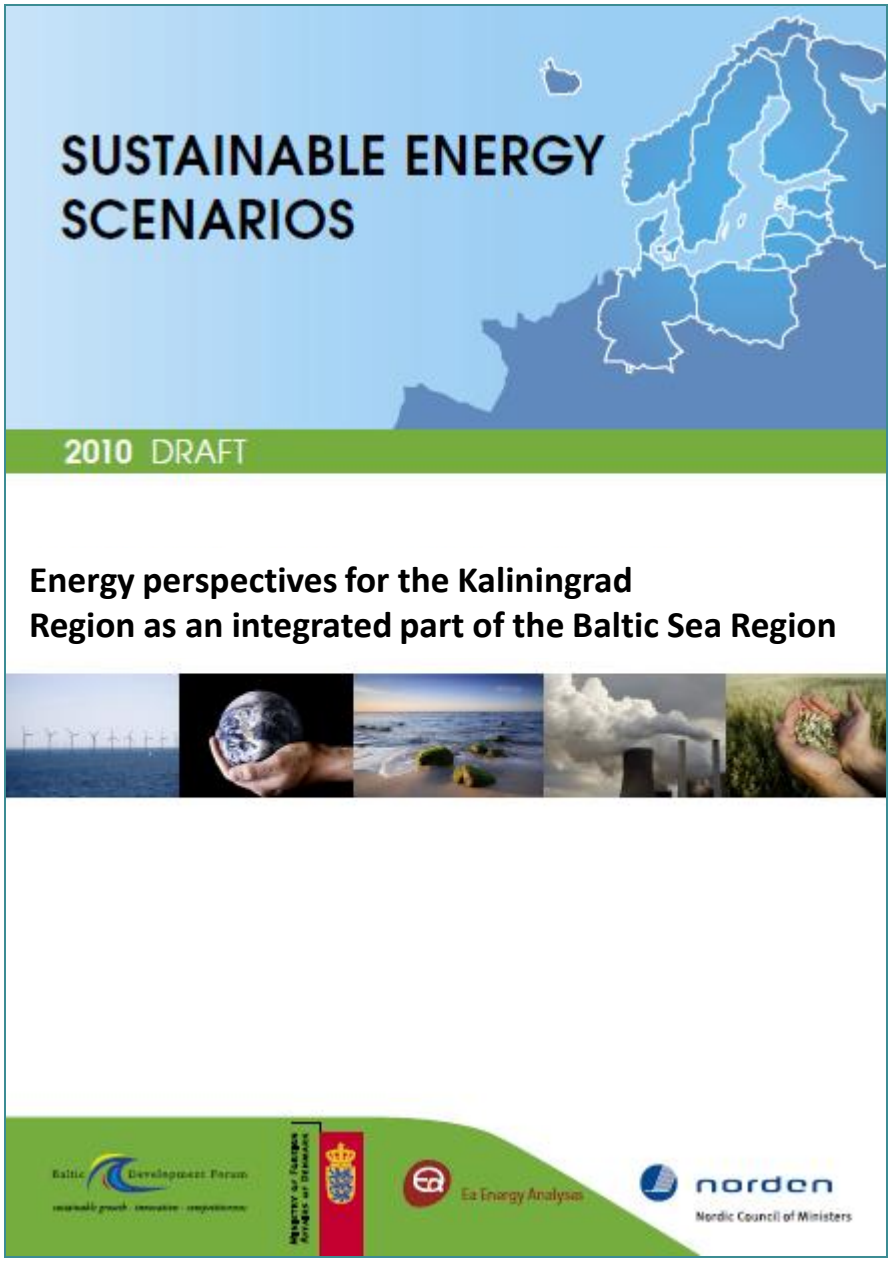


Preliminary results and findings

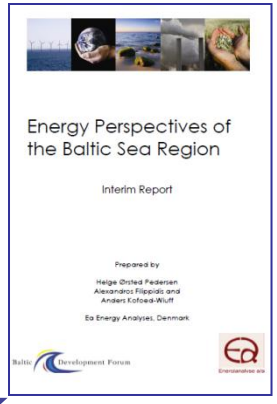
BDF Summit
Vilnius, 2 June 2010

Anders Kofoed-Wiuff,
Ea Energy Analyses

Stakeholder process

PHASE I

- Review of current energy situation

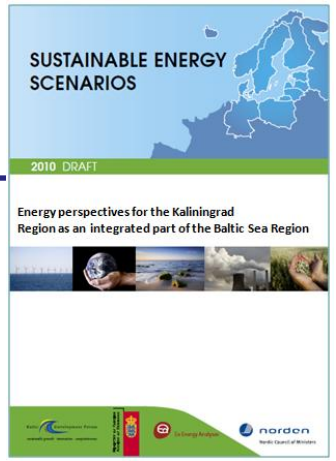


PHASE II

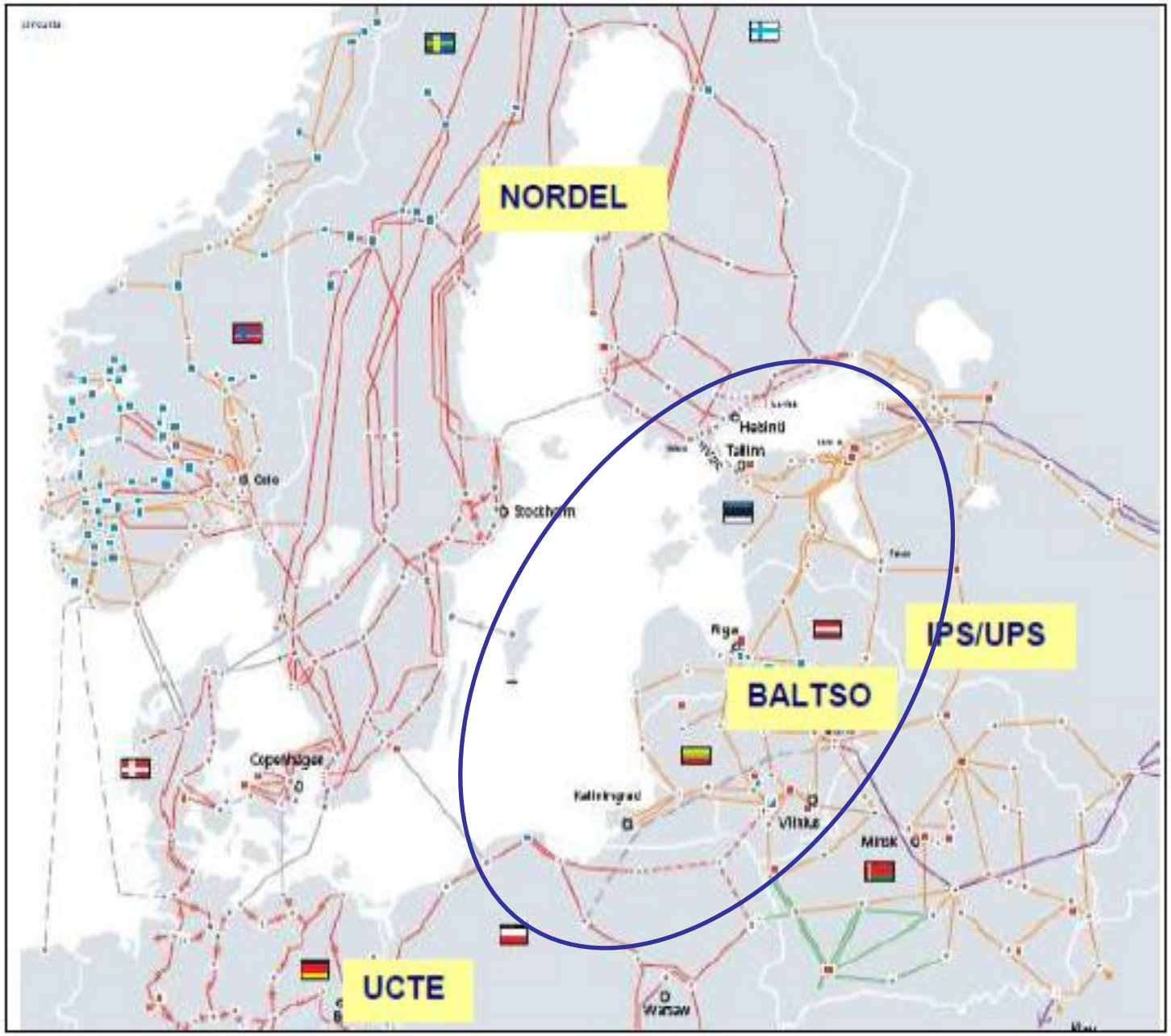
- Detailed scenarios of the electricity markets in the region 2010-2030

PHASE III

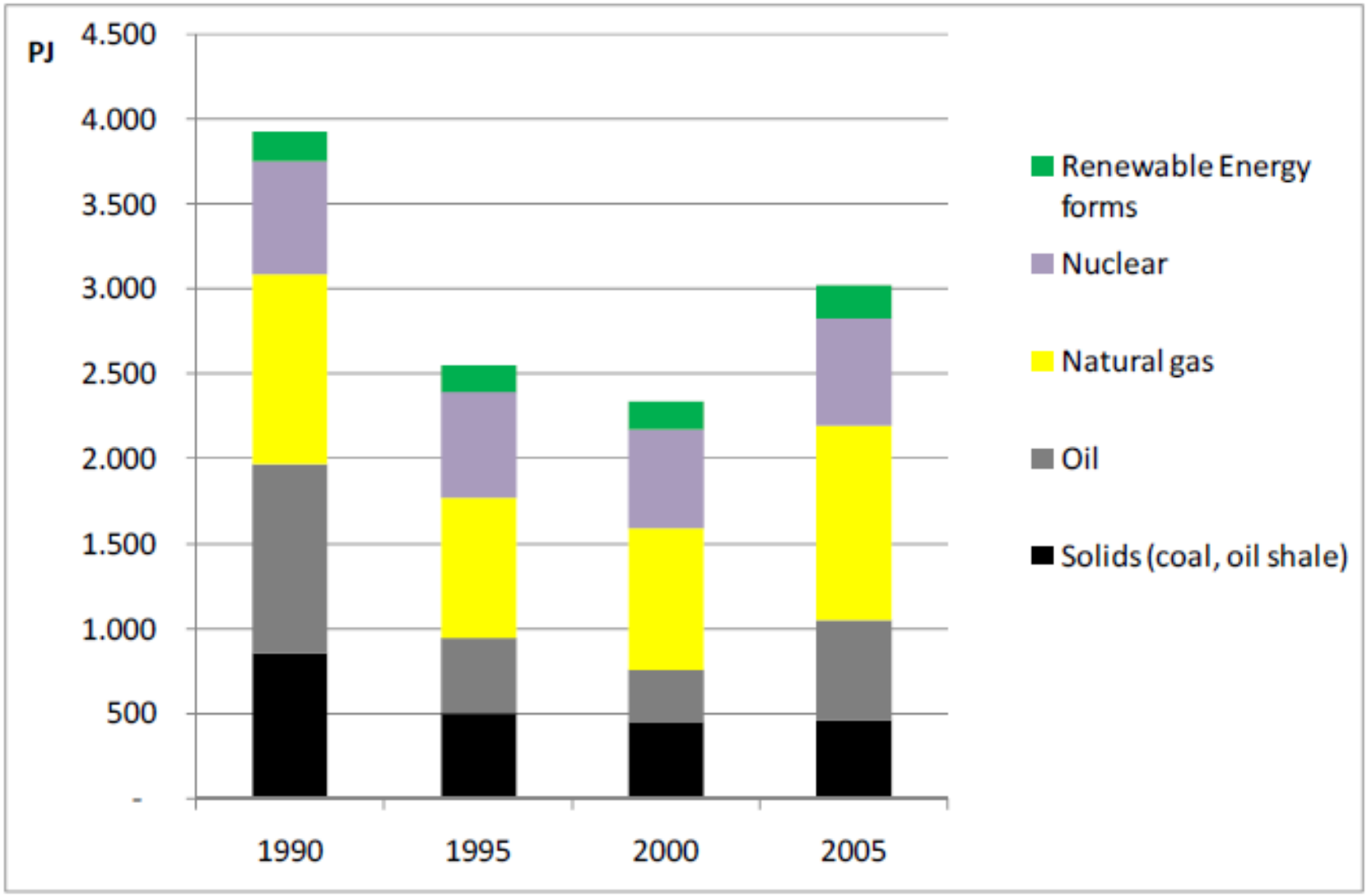
- Kaliningrad region as integrated part of the Baltic Sea Region



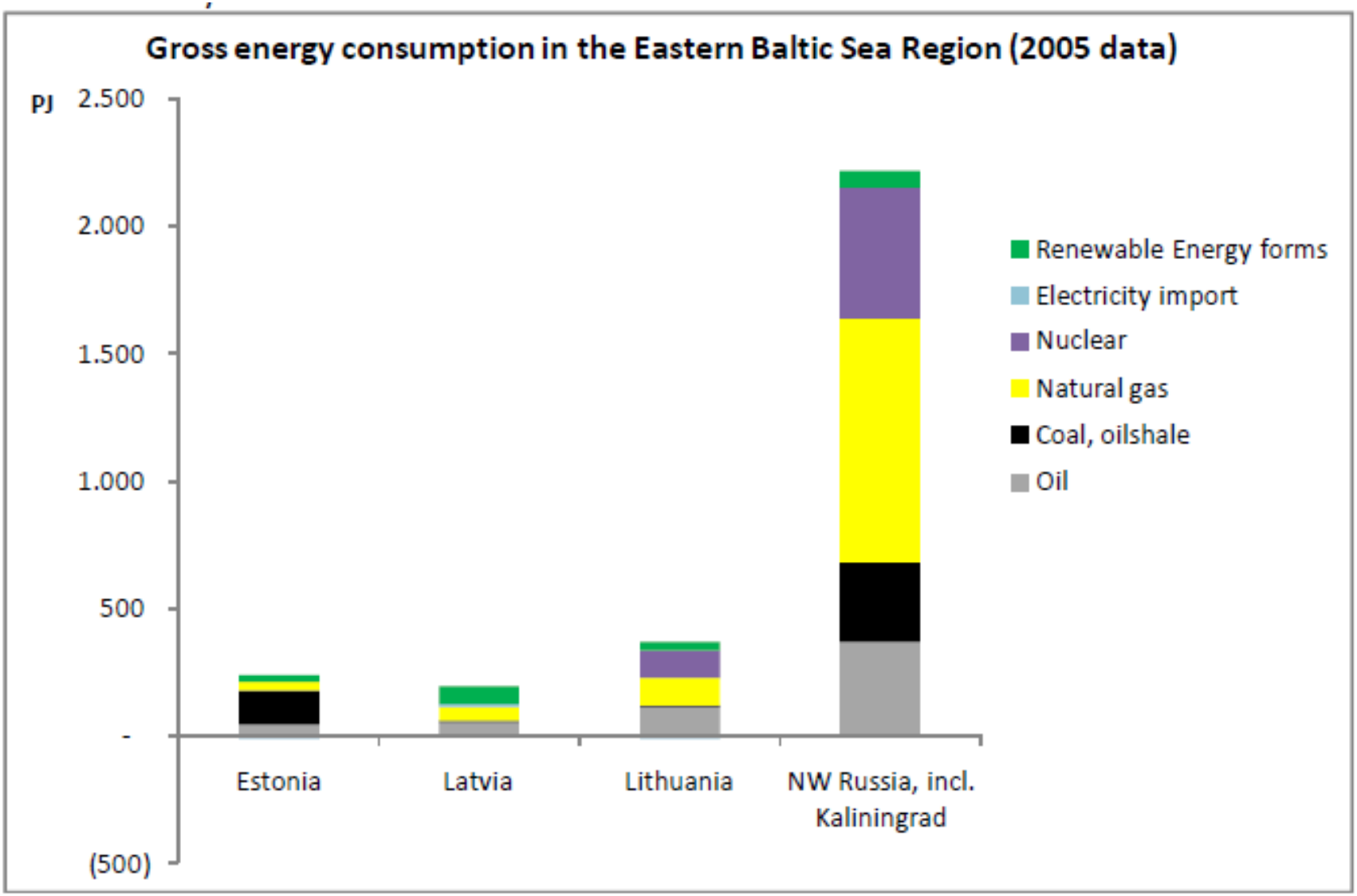
Dec 2008 **Oct 2009** **June 2010**


NORDEL
IPS/UPS
BALTSO
UCTE
Helsinki
Tallinn
Oslo
Stockholm
Riga
Copenhagen
Vilnius
Minsk
Warsaw

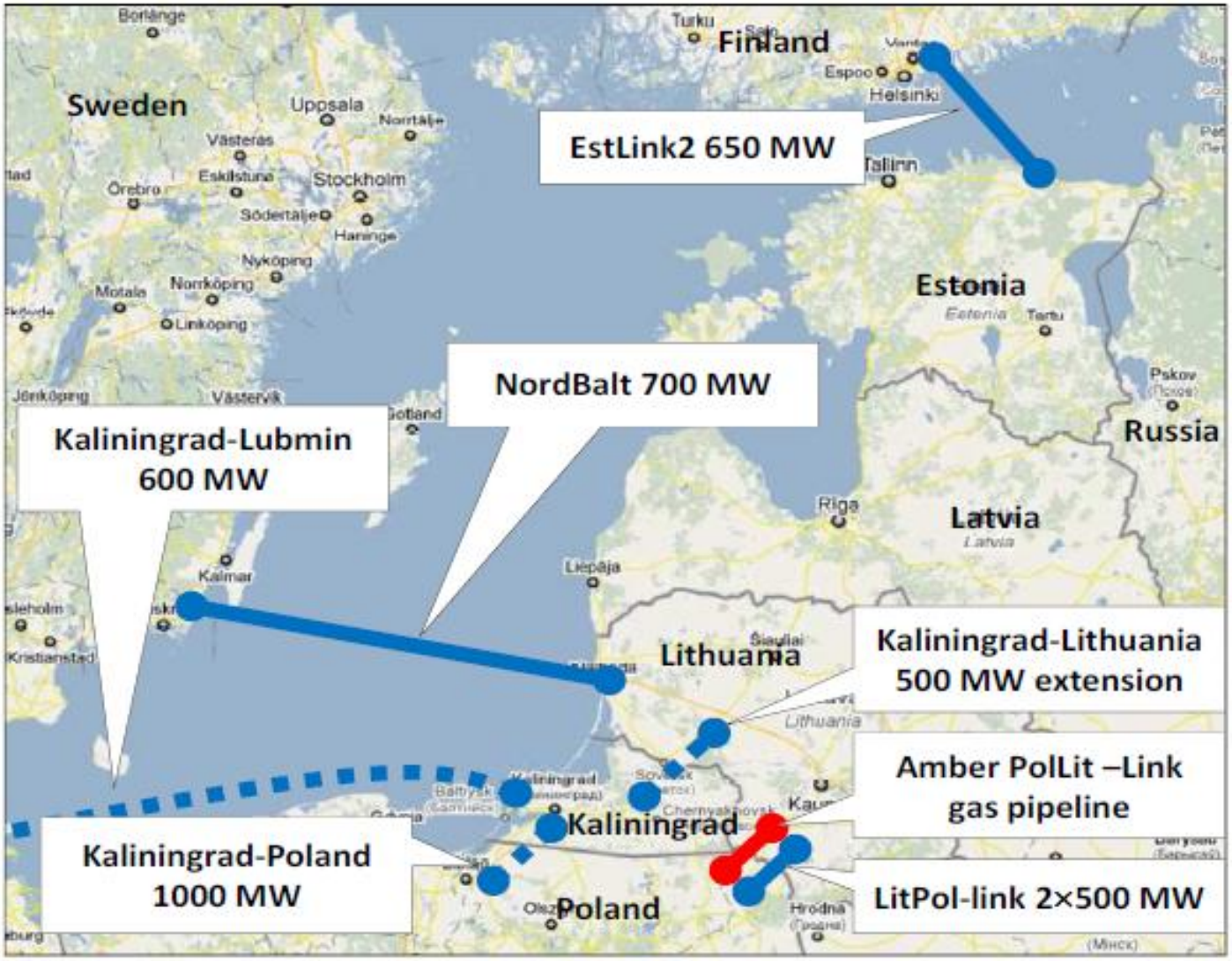
Development gross energy cons.



Gross energy cons. by country



A region with many plans
… how do they interact?



6 scenarios for 2020

- A *Baseline scenario* for a development without new nuclear power plants in the region.
- Three *Nuclear power scenarios*, assessing the impact of a nuclear power plant in Kaliningrad and/or in Lithuania.
- A *Higher Efficiency Scenario* illustrating the effect lower electricity demand than in the Baseline scenario.
- A scenario with *RE-subsidy and CO_2-quotas in Russia*, illustrating the consequences of equal RE-subsidy and CO_2-quota price in all simulated countries.

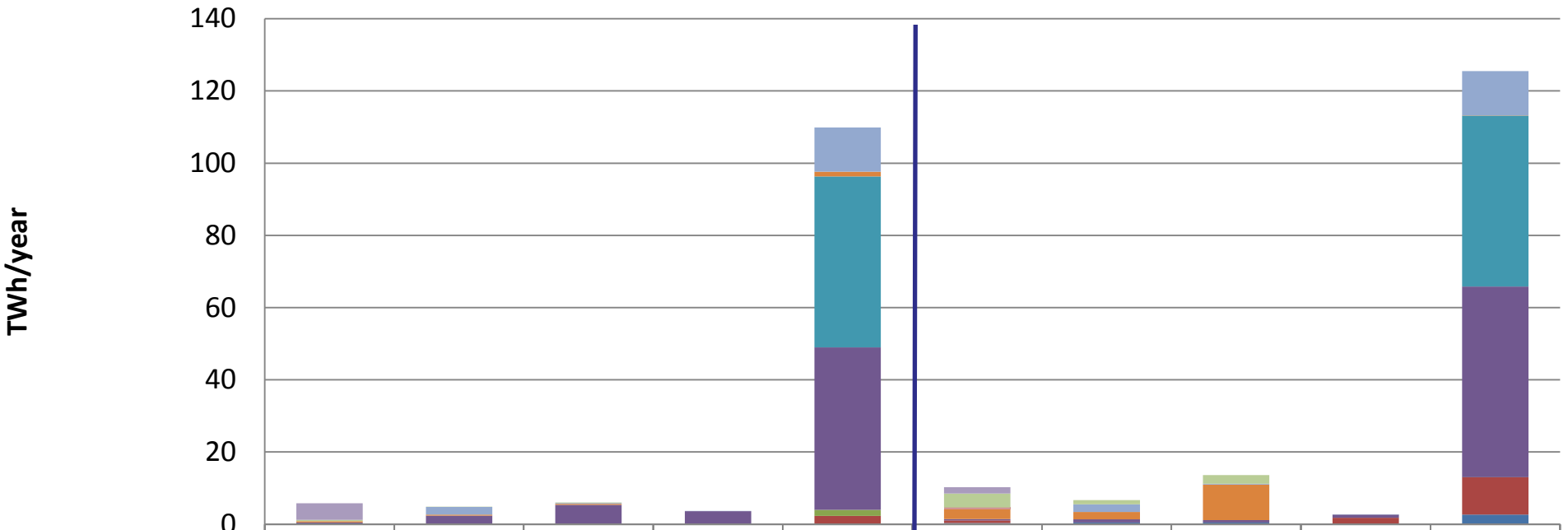
Using the Balmorel model to simulate investments
in power capacity and the dispatch. Nuclear is not an investment option

”Optimal” operation and investments given framework conditions: fuel prices, CO2-cost, technology costs etc.

The baseline 2020

- Baltic Energy Ring established
- No new nuclear power capacity
- Fuel prices from World Energy Outlook (lower gas prices in Russia)
- RE-subsidy and CO2-quotas in 2020

	RE subsidy to electricity generation	CO_2-cost
EU countries	30 €/MWh	25.0 €/ton
Russia	15 €/MWh	12.5 €/ton



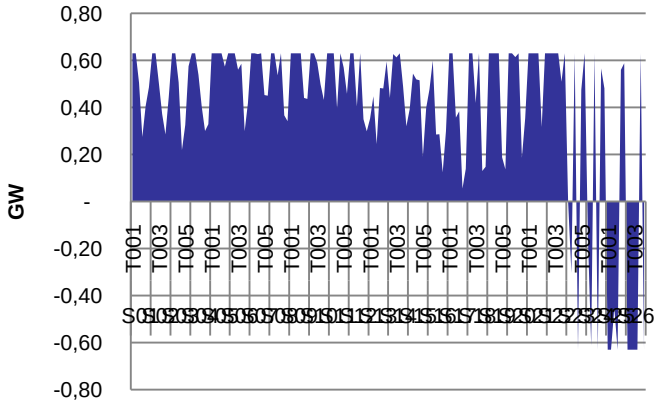
	Baseline 2010					Baseline 2020				
	Estonia	Latvia	Lithuania	Kaliningrad	NW Russia	Estonia	Latvia	Lithuania	Kaliningrad	NW Russia
Shale	4,6					1,8				
Wind	0,4	0,1	0,2			3,8	1,2	2,5		
Biogas						0,5				
Hydro		2,1	0,2	0,0	12,3		2,1	0,2	0,0	12,3
Biomass	0,4	0,3	0,3		1,3	2,7	2,0	9,9		0,0
Nuclear					47,3					47,3
Natural gas	0,5	2,2	5,2	3,6	45,0	0,3	0,9	0,6	0,8	52,8
Oil			0,2		1,7			0,0		0,0
Coal					2,3	0,8			1,8	10,3
Municipal waste		0,1				0,3	0,5	0,5		2,7

Development in the baseline

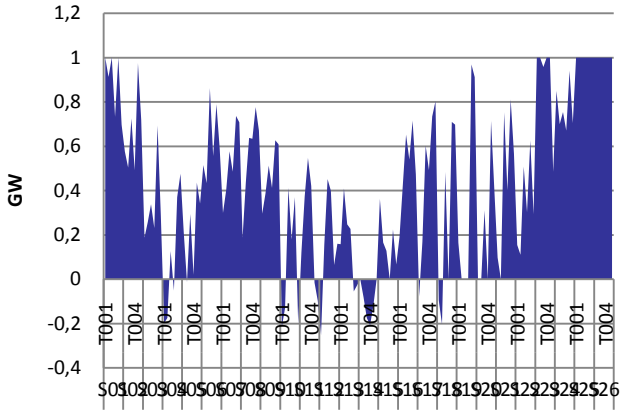
- Estonia: oil shale down 60 %, replaced mainly by biomass and wind (1500 MW)
- Latvia: gas replaced by biomass, waste and wind (500 MW)
- Lithuania: gas replaced by biomass and wind (1050 MW)
- Kaliningrad: gas replaced by coal
- NW Russia: more coal and gas power

Transmission on Baltic Energy Ring

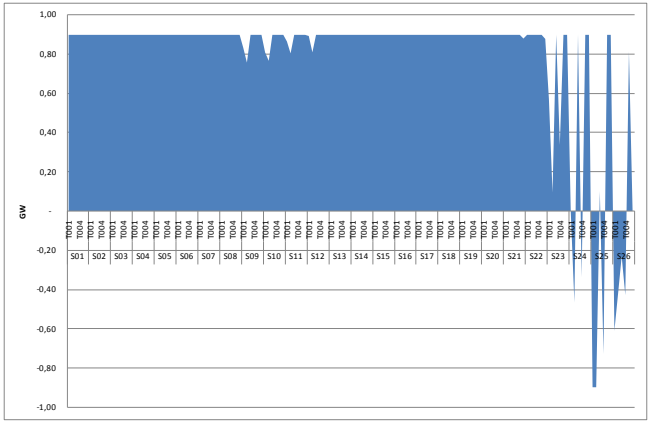
NordBalt (Swedish export)

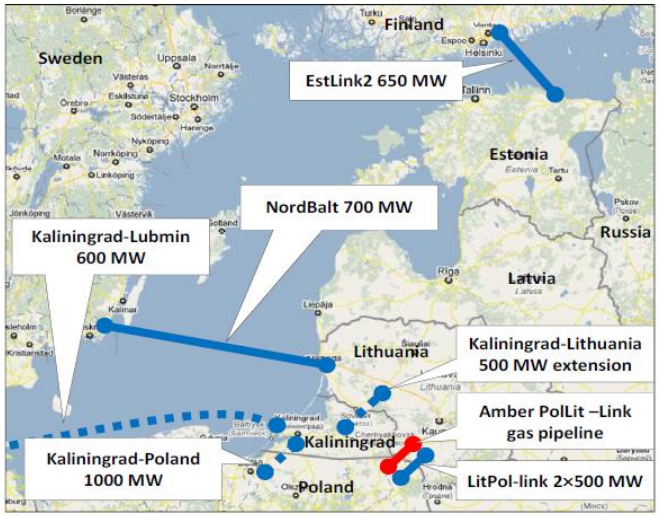


Estlink 1 & 2 (Estonian export)



Lit-Pol (Lithuanian export)

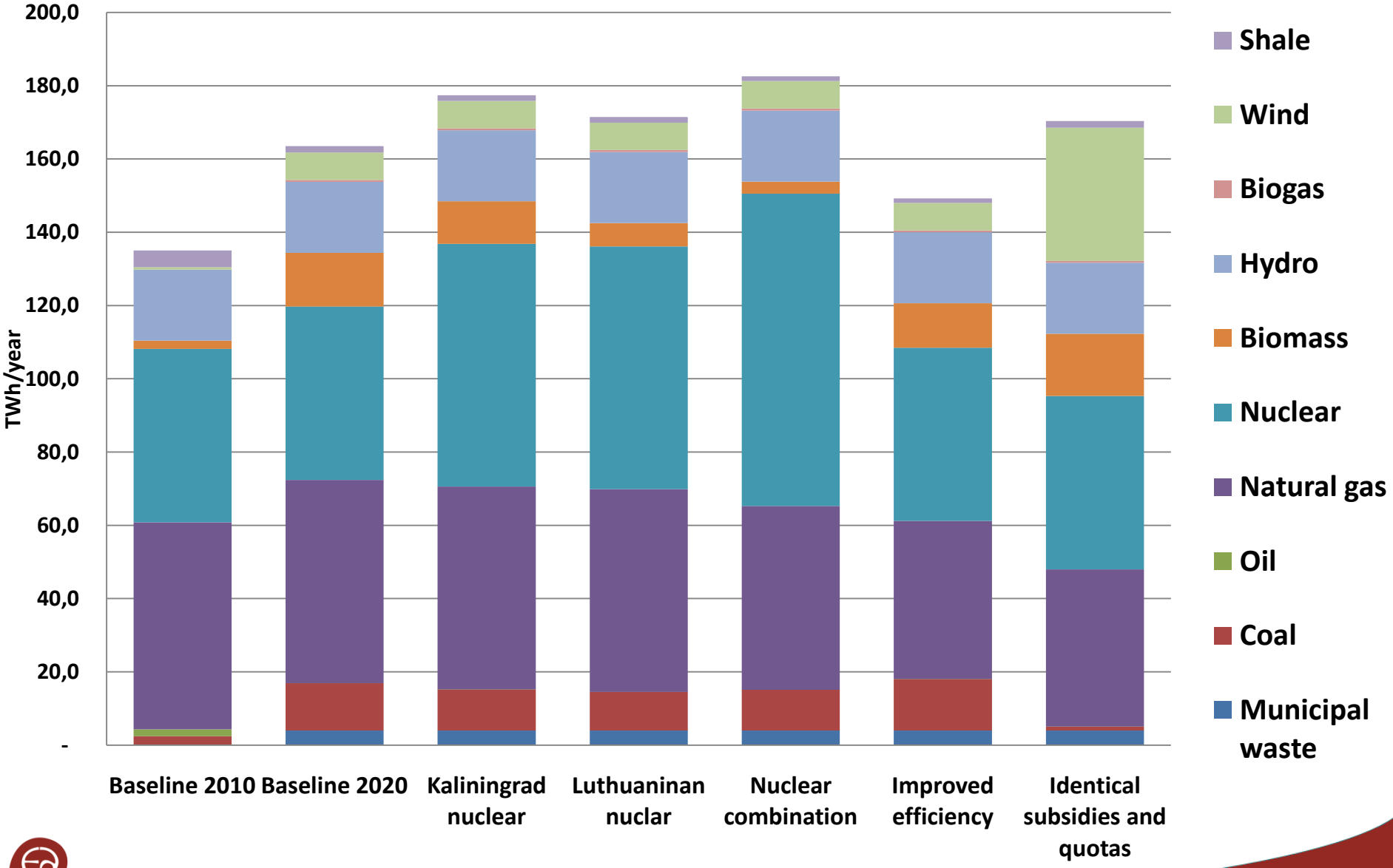




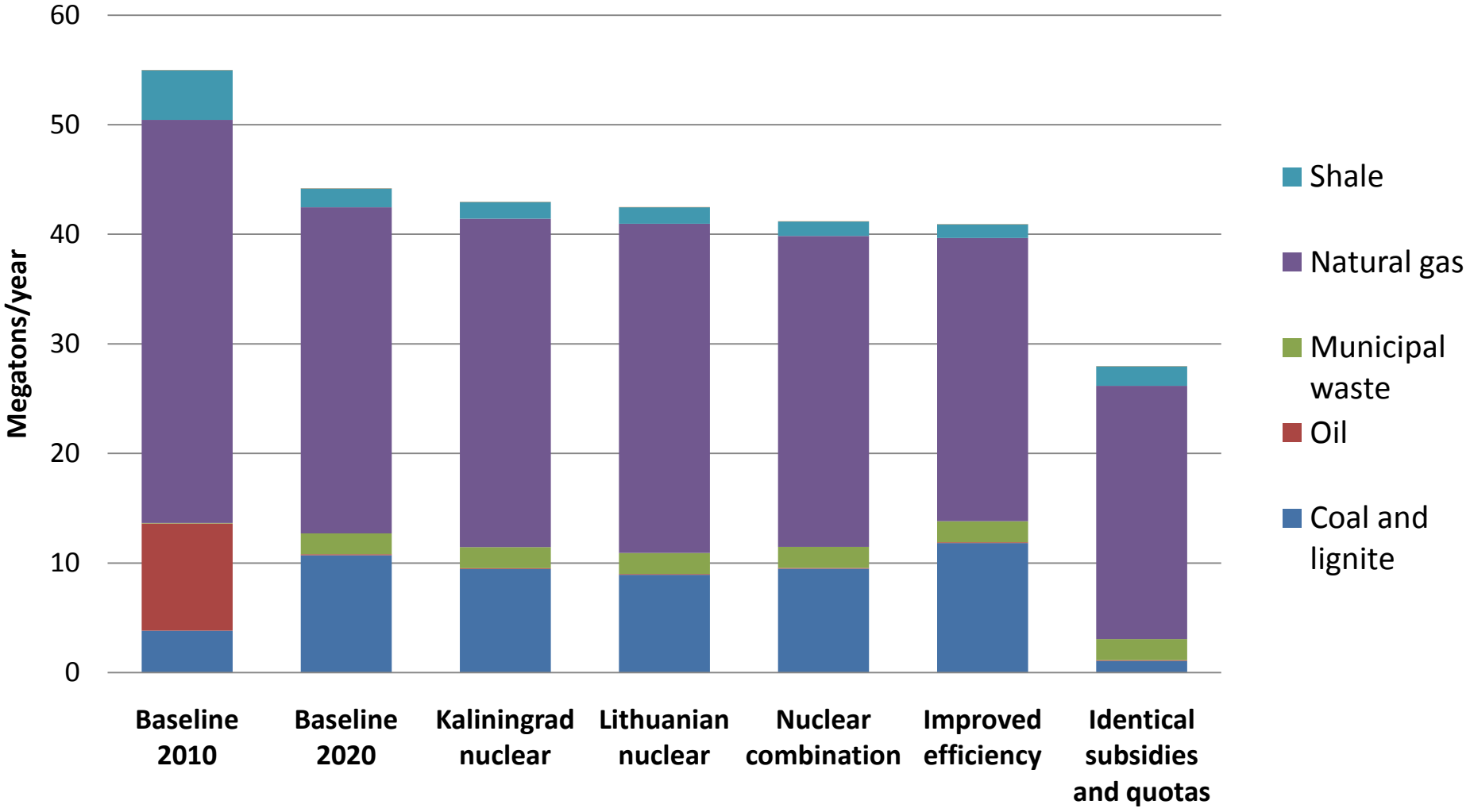
Scenarios variations

- Three nuclear power scenarios*:*
  - *Kaliningrad nuclear:* 2300 MW in Kaliningrad, 1500 MW interconnector from Kal. to Lithuania (upgrade), 1000 MW interconnector Kal. to Poland (new).
  - *Lithaunian nuclear*: 2300 MW at Visaginas. No need for upgrade of transmission grid.
  - *Combination*: 2300 MW at both locations.
- A *Higher Efficiency Scenario.* 10 % lower electricity demand than in the Baseline scenario.
- A scenario with the same *RE-subsidy and CO_2-quotas in Russia* as in the EU

Electricity generation



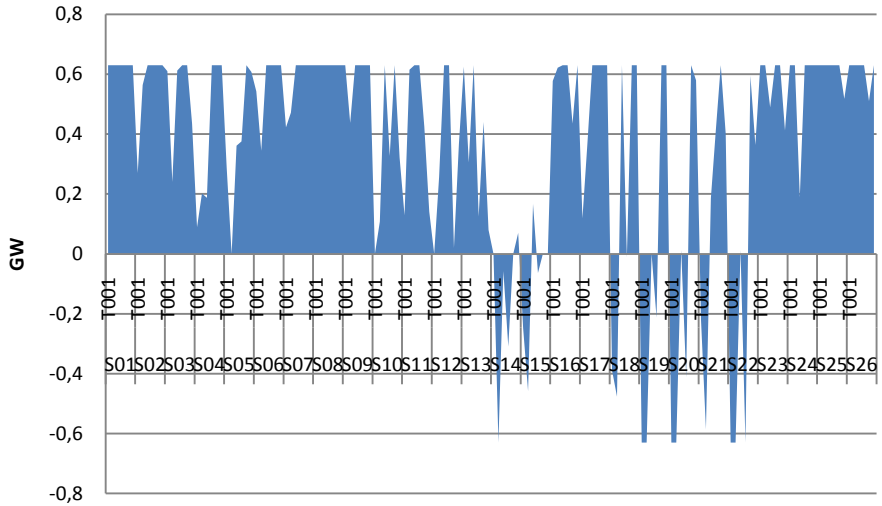
CO_2-emissions



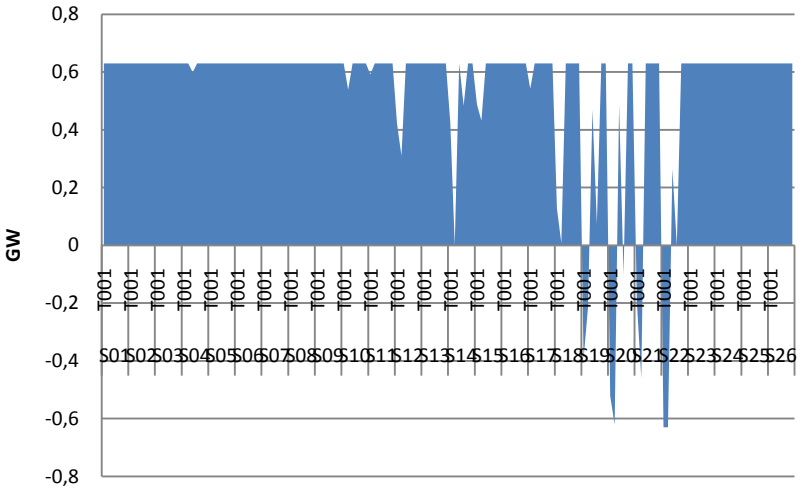
Ea Energianalyse

Transmission on NordBalt

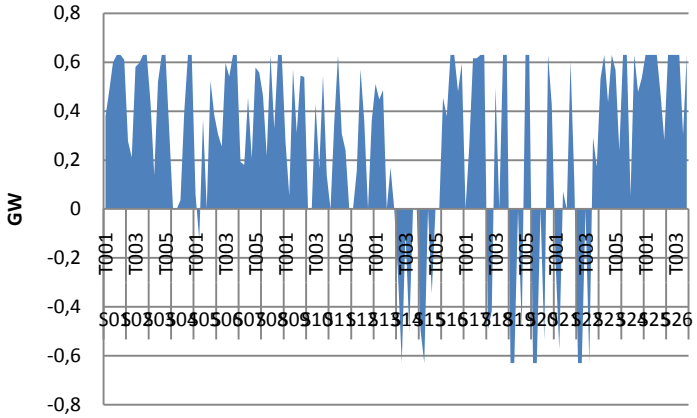
Lithuanian nuclear (Lithuanian export)

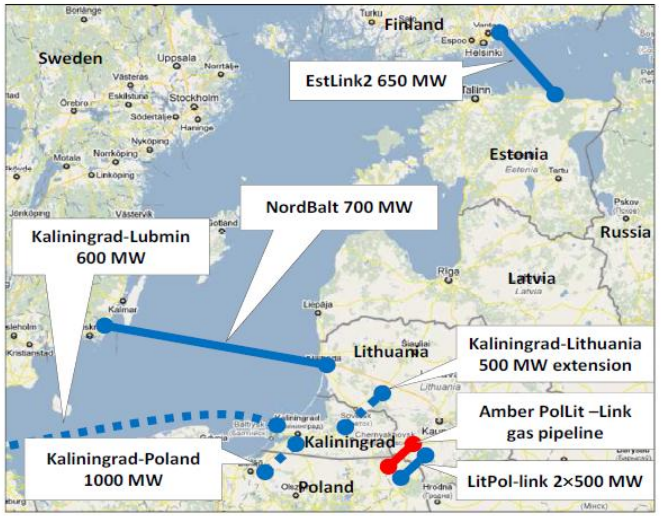


Combi nuclear (Lithuanian export)



Kaliningrad nuclear (Lithuanian export)





PRELIMINARY FINDINGS

- The Baltic Energy Ring (BER) has a high utilization rate – indicating that the investments are of high value to the electricity system
- The ring enables the system to integrate large amounts of both nuclear and wind power
- Kaliningrad nuclear is mainly motivated by the possibilities of export of electricity from Kaliningrad. The plant only influences the generation in the Baltic States in a moderate way.
- Introduction of nuclear power in Lithuania reduces the use of biomass and import from Sweden.

- Wind power is a viable on market terms when subsidies and CO_2 quotas are included. Expansion with wind power in the Baltic countries will take place regardless of the introduction of new nuclear power capacity in region.
- A significant potential for biomass and wind could be utilised if Russia, including Kaliningrad, introduces the same subsidies and CO_2-quota regulation as in the EU. Reduces coal consumption.
- Efficiency measures (10%) will reduce the demand for investments in new thermal capacity by approx. 1900 MW.
- Integrating electricity markets between the Baltic countries and Russia could bring benefits without any additional costs

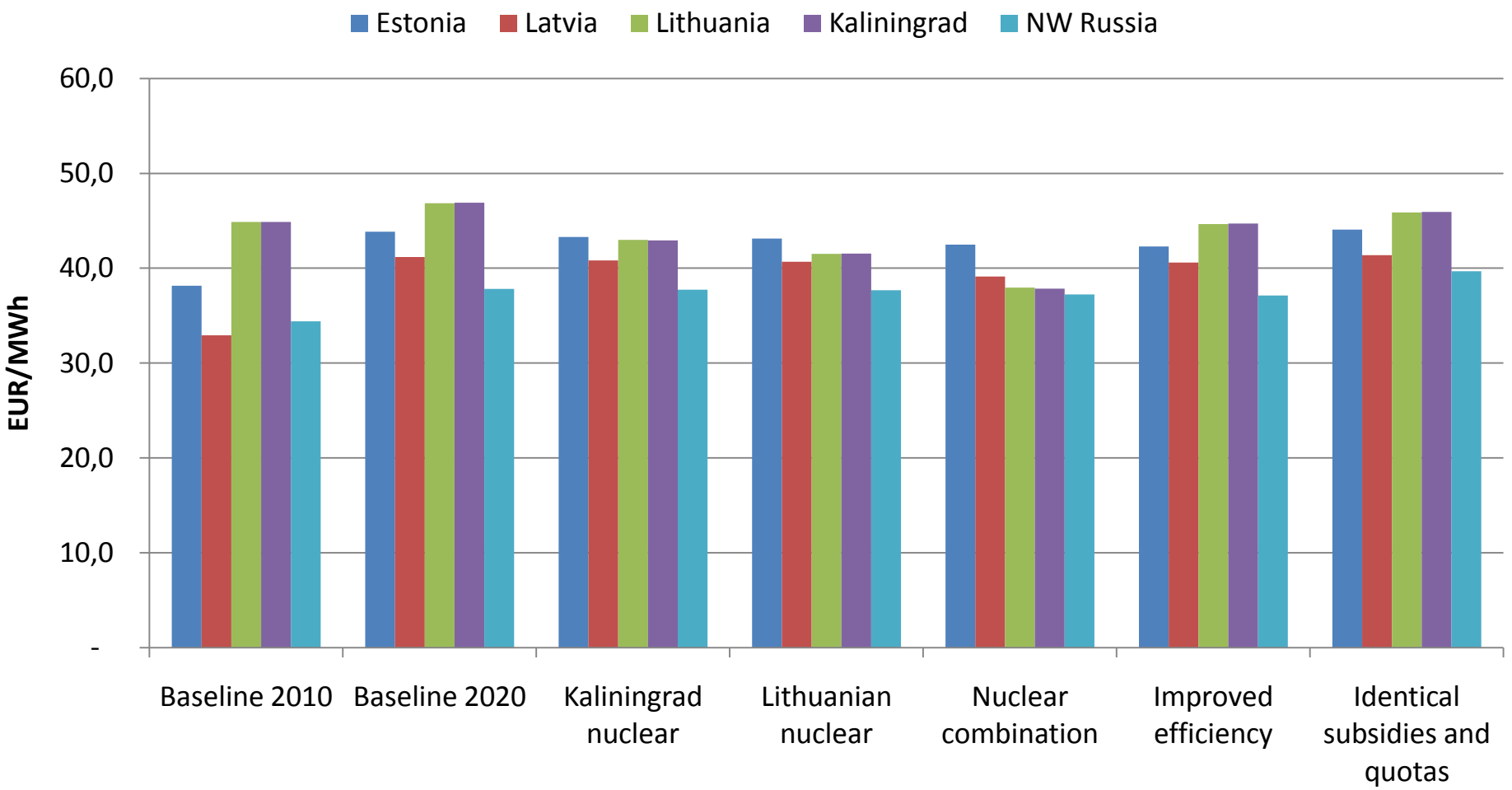
Next steps

- Final report ready by end June
- Data from Kaliningrad will be more detailed
- Comments are much welcomed

- Suggestions for further analyses
  - Is nuclear, wind and energy efficiency measures feasible?
  - Wind power integration on a regional level
  - Economic case analyses of concrete projects
  - Explore benefits (and costs?) from more integrated electricity markets

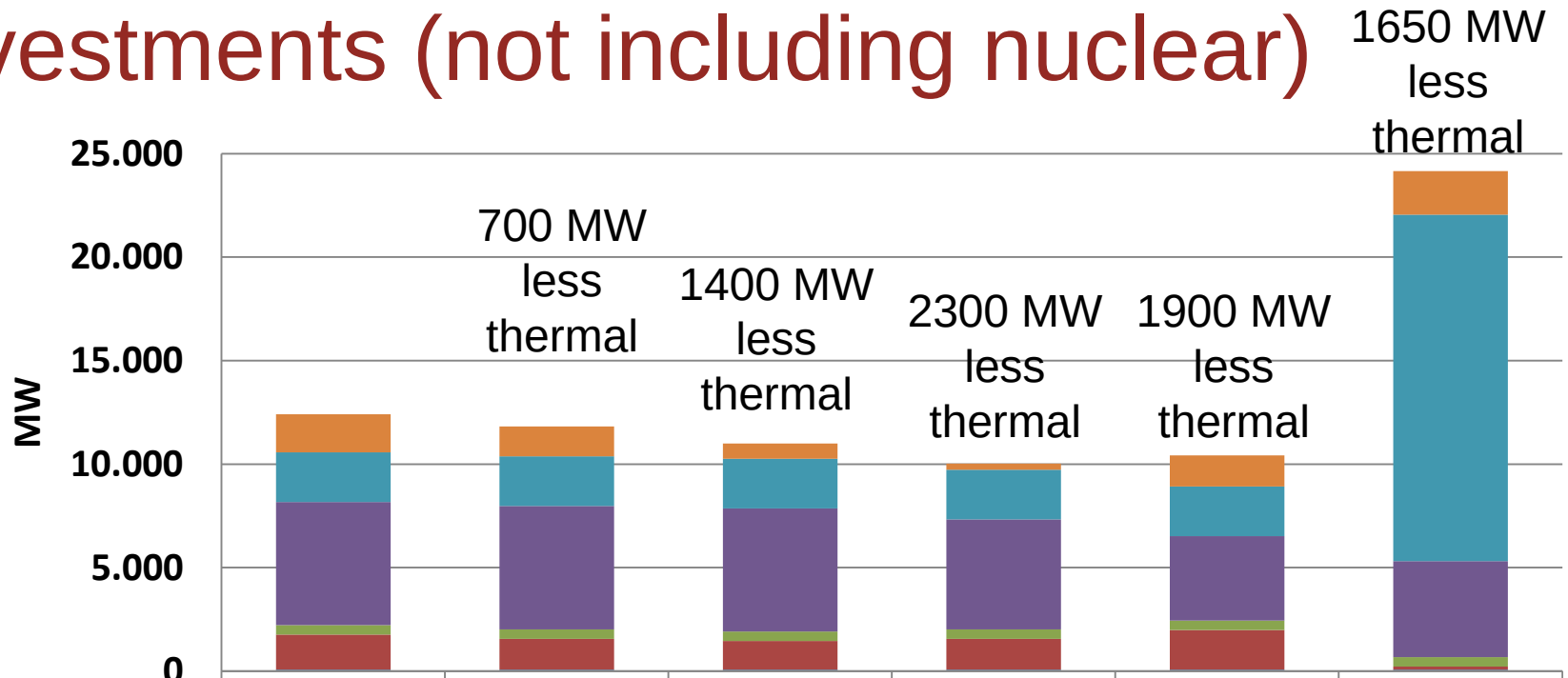
THANK YOU!

Average annual electricity market prices



Capital cost of investments in new generation capacity and interconnectors are not directly reflected in the electricity market prices

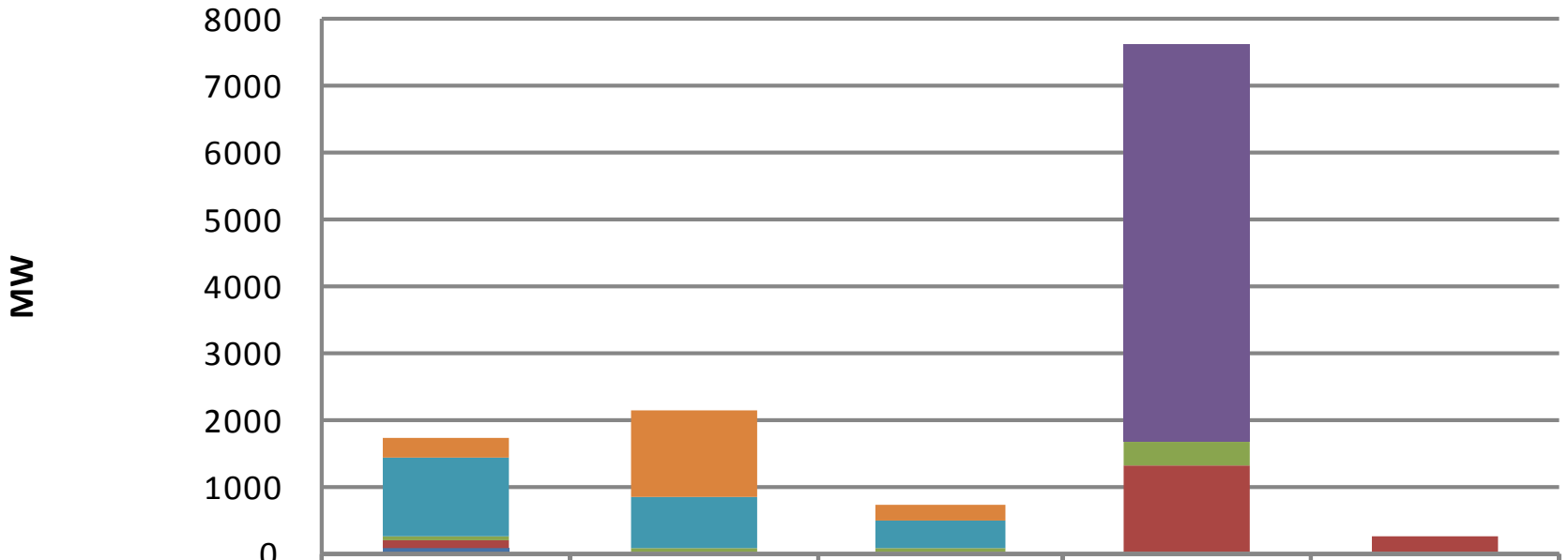
Investments (not including nuclear)



	Baseline 2020	Kaliningrad nuclear	Lithuanian nuclear	Nuclear combination	Improved efficiency	Identical subsidies and quotas
Biomass	1830	1439	745	306	1493	2111
Wind	2400	2400	2400	2400	2400	16727
Natural gas	5948	5975	5941	5308	4083	4641
Municipal waste	453	453	453	453	453	453
Coal	1705	1490	1394	1497	1923	157
Biogas	68	68	68	68	68	68

	Short description	Target timescale
Electricity interconnections		
LitPolLink	400 kV, 2x500 MW	2015/2020
Estlink 2	650 MW	2014
NordBalt	HVDC 700 MW	2015
New generation capacity		
OL 3, Finland	Max 1600 MW, nuclear	2012
OL 4, Finland	1450-1650 MW, nuclear	?
Fennovoima, Finland	1500-2500 MW, nuclear	?
Visaginas, Lithuania	Max 3400 MW, nuclear	2018
Bechatow thermal plant, Poland	Max capacity 858 MW, lignite with CCS	2010
Nuclear, Poland	1-2 nuclear power plants	2020
Lithuanian Power Plant, thermal	444 MW, combined cycle, gas turbine	2012
Kurzeme, thermal power plant, Latvia	400 MW, coal and biomass	2016
Riga 2, thermal plant, Latvia	420 MW, gas	2016
Kalinigradskaya TETs-2, Kaliningrad	450 MW, gas	2010
Baltic Power plant, Kaliningrad	2*1150 MW, nuclear	2016/2018
Trade		
Electricity market	Integration of Baltic markets with Nord Pool Spot Exchange	2013-15

Investments 2010-2020



Baseline 2020	Estonia	Lithuania	Latvia	NW Russia	Kaliningrad
Biomass	306	1266	257		
Wind	1184	783	433		
Natural gas				5948	
Municipal waste	23	60	45	325	
Coal	138			1325	242
Biogas	68				