RES in SEERMAP
- key inputs

Energy Economics Group

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RES in SEERMAP
… financing aspects

Green-
Deriving **optimal promotion strategies**
for increasing the share of RES-E
in a dynamic European electricity market

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… developed initially in the period 2002 to 2004
within the research project
Green-X (5th framework programme of
the European Commission, DG RESEARCH)

www.green-x.at

(2) RES in SEERMAP:
Key inputs to the modelling exercise

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► *Key assumptions*

To ensure maximum consistency with existing EU scenarios
and projections the key input parameters of the Green-X
scenarios are (as default) based on **PRIMES modelling**
and the (updates of the) **Green-X database**.

Based on PRIMES*	*Defined for this study*
Energy demand by sector	RES policy framework
Primary energy prices	Reference electricity prices
Conventional supply portfolio and conversion efficiencies	RES cost & learning rates (Green-X database, incl. biomass)
CO_2 intensity of sectors	RES potential (Green-X database)
	Biomass trade specification
	Technology diffusion
	Financing conditions

Main input sources for
scenario parameters

**Primes scenario used
subsequently:
Reference case
(as of 2015/2016)*

WACC – risk elements

WACC assumptions and the impact of risk (policy, technology, country)

$$WACC_{c,t,p} = WACC_{default} * f_c * f_t * f_p$$

Default assumptions concerning energy technologies in Austria

WACC (in Austria)	default (real)	ideal
posttax (nominal)	6.5%	4.9%
pretax (nominal)	8.7%	6.5%
pretax (real)	**7.4%**	**5.3%**

Note: Through complementary measures the investor risk can be reduced, from „real" to „ideal" (according to an assessment conducted in the DIA-CORE project)

Source: Dia-Core project (www.diacore.eu)

Technology-specific risk factor (i.e. multiplier of default WACC)	
RES-electricity	
Biogas	1.00-1.05
Solid biomass	1.05
Biowaste	1.05
Geothermal electricity	1.1
Hydro large-scale	0.95
Hydro small-scale	0.95
Photovoltaics	0.85-0.90
Solar thermal electricity	1.1 (1.0)
Tide & wave	1.4 (1.2)
Wind onshore	0.95
Wind offshore	1.4 (1.15)

Note: Numbers in brackets refer to the period post 2020.

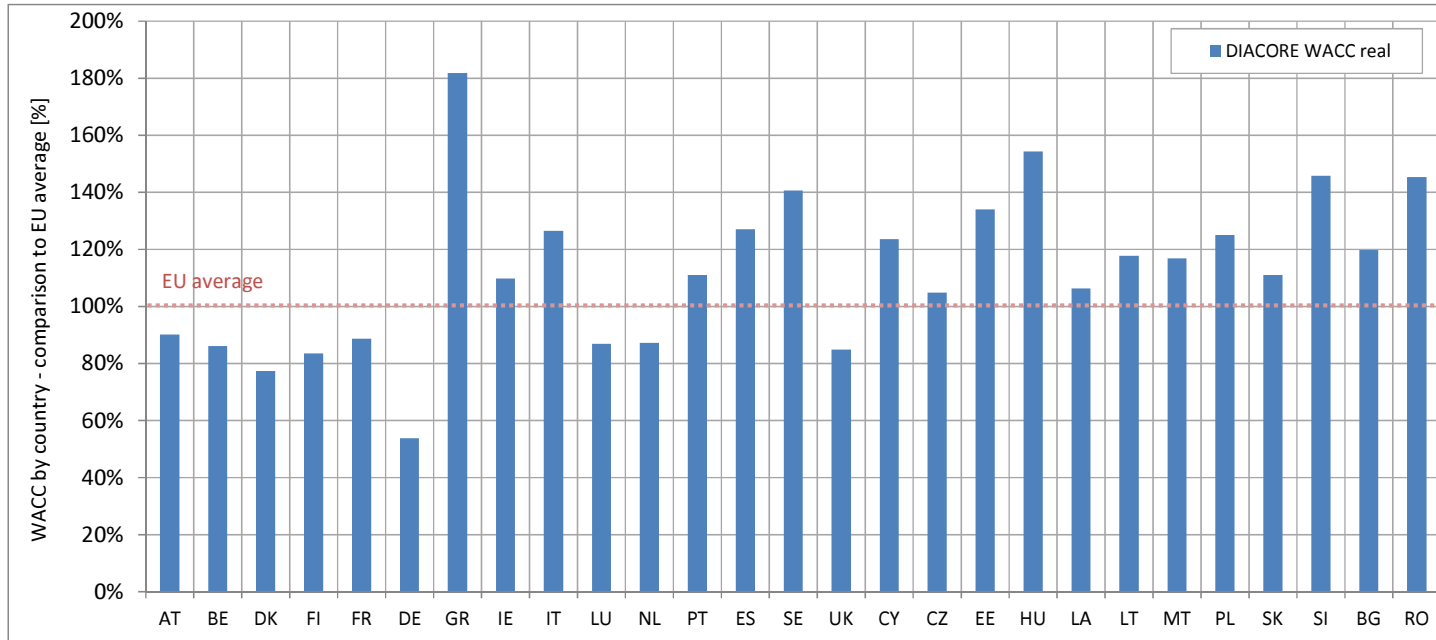| **Policy** risk: Instrument-specific risk factor (i.e. multiplier of default WACC)	
FIT (feed-in tariff)	1.00
FIP (feed-in premium)	1.10
QUO (quota system with uniform tradable green certificates (TGC))	1.20
ETS only (Emission Trading Scheme only - no dedicated RES support)	1.30
TEN (tenders for selected RES-E technologies)	1.15

WACC – country-specific risk

The impact of country specific risk – our initial figures… based on www.diacore.eu

- Represents the (outdated?) status quo according to an assessment done in the DIACORE project (done in 2014-2015)

- For future trends: link to GDP per capita trends?

- **Problem: mixing country- and policy-related risks → take out policy risk!**

- **Problem II: how to include non-EU Western Balkan countries?**

MS	WACC pretax (real) Interview Real case	WACC pretax (real) Triple A policies Ideal situation
Austria	7.4%	5.3%
Belgium	7.1%	5.8%
Bulgaria	9.9%	6.7%
Croatia	13.8%	7.7%
Cyprus	10.2%	6.0%
Czech Republic	8.6%	6.4%
Denmark	6.4%	5.2%
Estonia	11.0%	4.8%
Finland	6.9%	4.4%
France	7.3%	6.1%
Germany	4.4%	3.7%
Greece	15.0%	9.1%
Hungary	12.7%	7.8%
Ireland	9.0%	6.2%
Italy	10.4%	8.3%
Latvia	8.8%	5.6%
Lithuania	9.7%	5.6%
Luxembourg	7.2%	6.0%
Malta	9.6%	7.4%
Netherlands	7.2%	5.6%
Poland	10.3%	6.5%
Portugal	9.1%	5.9%
Romania	12.0%	7.4%
Slovakia	9.1%	6.3%
Slovenia	12.0%	7.8%
Spain	10.5%	8.6%
Sweden	11.6%	5.3%
UK	7.0%	5.3%
	9.4%	6.3%

WACC – country-specific risk

The impact of country-specific risk – our alternative approach
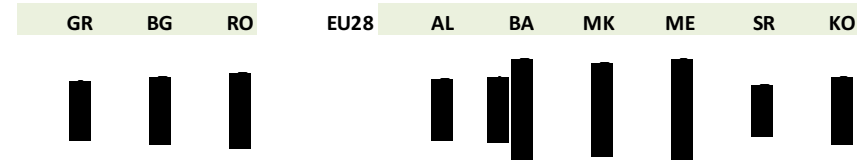
	weighting factor	GR	BG	RO	EU28	AL	BA	MK	ME	SR	KO
Alternative country risk setting											
DIA-CORE figures		182%	120%	145%							
2016 data											
Eurostat - long term government bond yields	10%	8.64	2.42	3.30	1.17						
RES deployment times risk ranking		279.6	46.9	196.9	1978.5						
Default risk multiplication factor		738%	207%	282%	100%						
National Credit Rating	90%	0.44	0.56	0.67	0.84	0.44	0.44	0.56	0.44	0.56	0.56
RES deployment times risk ranking		14.4	10.7	39.8	1418.8	0.0	0.0	0.0	0.0	0.0	0.0
Default risk multiplication factor		189%	151%	126%	100%	189%	189%	151%	189%	151%	151%
Ease of getting credit	0%	0.50	0.70	0.85	0.62						
RES deployment times risk ranking		16.2	13.5	50.8	1054.9						
Default risk multiplication factor		125%	89%	73%	100%						
Average risk rating		244%	157%	142%	100%	189%	189%	151%	189%	151%	151%
Smootheining factor - low	75%	208%	143%	131%	100%	167%	167%	138%	167%	138%	138%
Smootheining factor - medium (default)	50%	172%	128%	121%	100%	144%	144%	126%	144%	126%	126%
Smootheining factor - high	25%	127%	111%	108%	100%	117%	117%	110%	117%	110%	110%
Smootheining factor - very high	13%	118%	107%	105%	100%	111%	111%	106%	111%	106%	106%

- Remaining problem: how to make it dynamic?
  ... in other words, what would be the country risk by 2030, 2050, …

Sources:

Alternative country risk setting
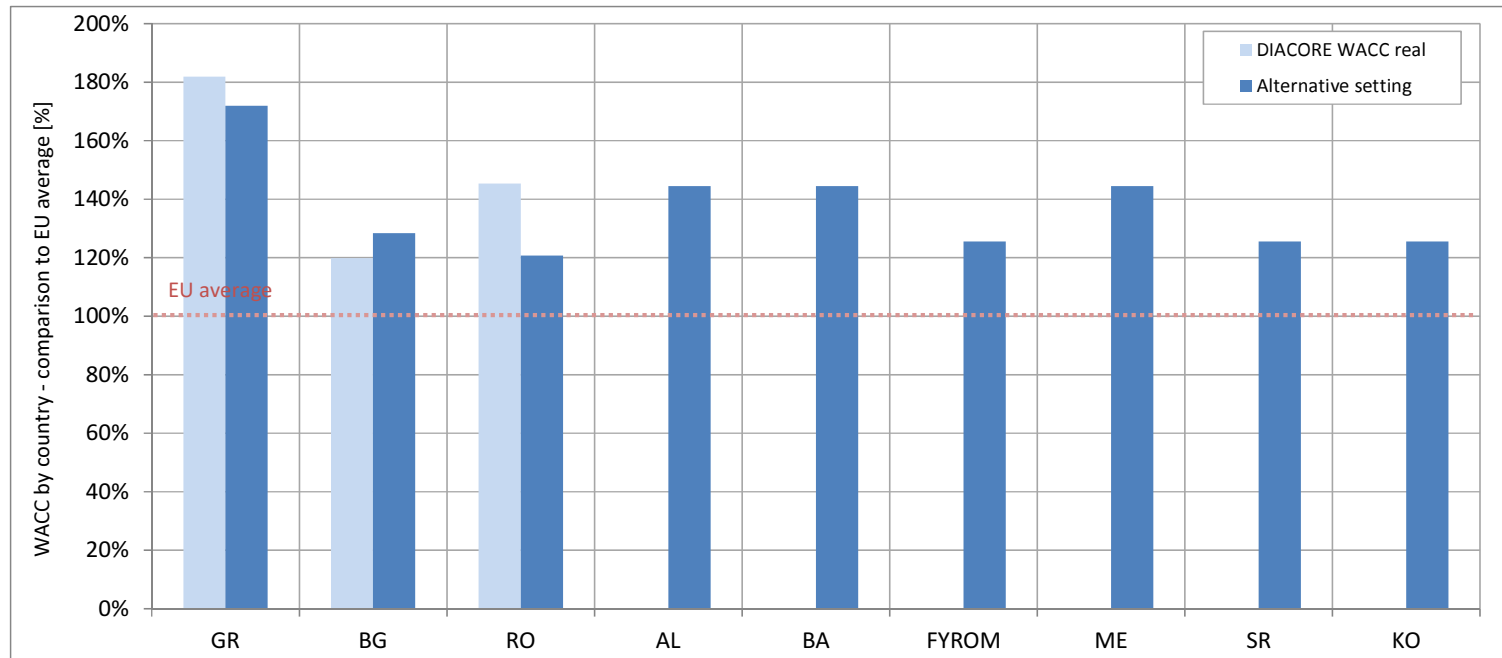**Eurostat - long term government bond yields**
http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin

National Credit Rating
https://www.standardandpoors.com/en_US/web/guest/home

Ease of getting credit
http://www.doingbusiness.org/

WACC – country-specific risk

The impact of country-specific risk – our alternative approach

Remaining "problems":

- **How to make it dynamic?**
  ... in other words, what would be the country risk by 2030, 2050, etc.

  OUR approach → Link to change (compared to today) in GDP per capita

- **How would a common (regional) policy change the picture?**

- *→ A regional (or EU wide harmonised) policy would have an "averaging" effect:*
  OUR approach ... 50% determined by default country risk, 50% by regional (average) risk
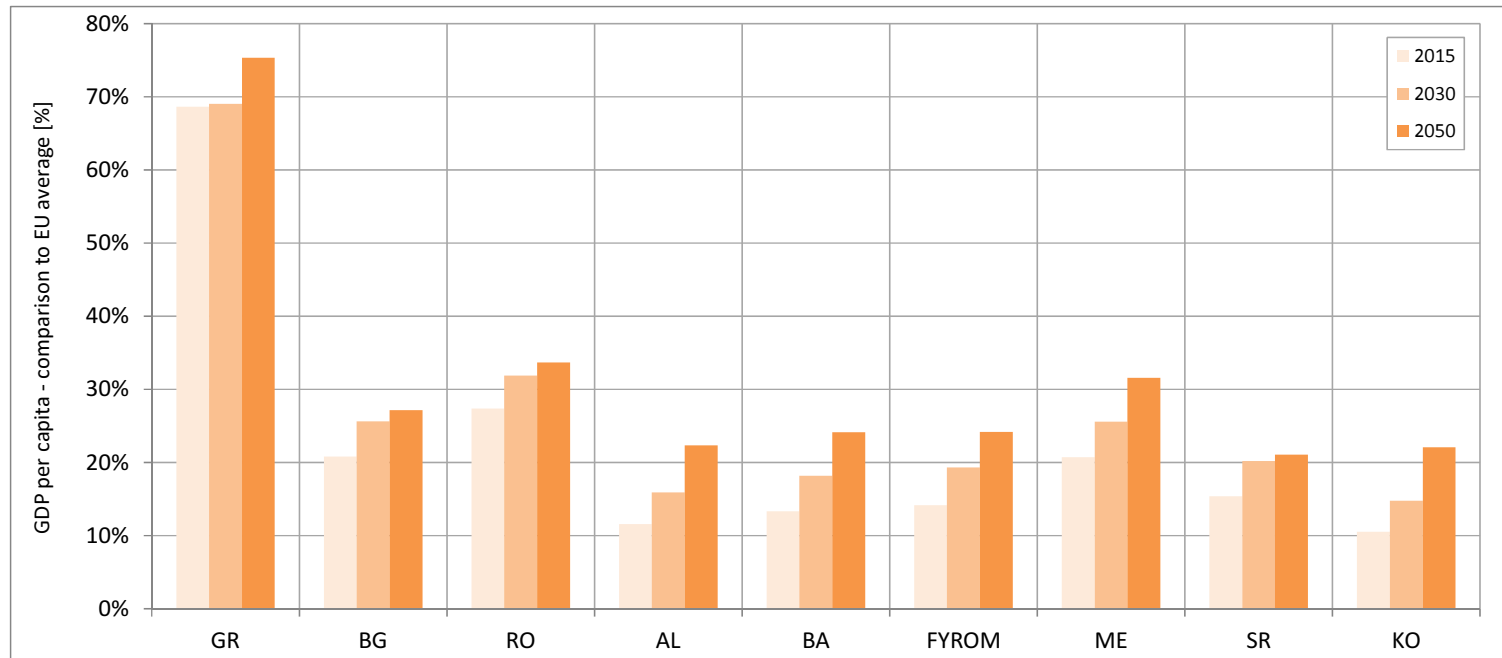
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The impact of country-specific risk – our alternative approach

Remaining "problems":

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  OUR approach → Link to change (compared to today) in GDP per capita

→ **Illustration of GDP per capita trends** (Source: PRIMES, 2012, 2015)