



Market Studies

Regional Project Assessment

V1 and V4 scenarios and provisional results

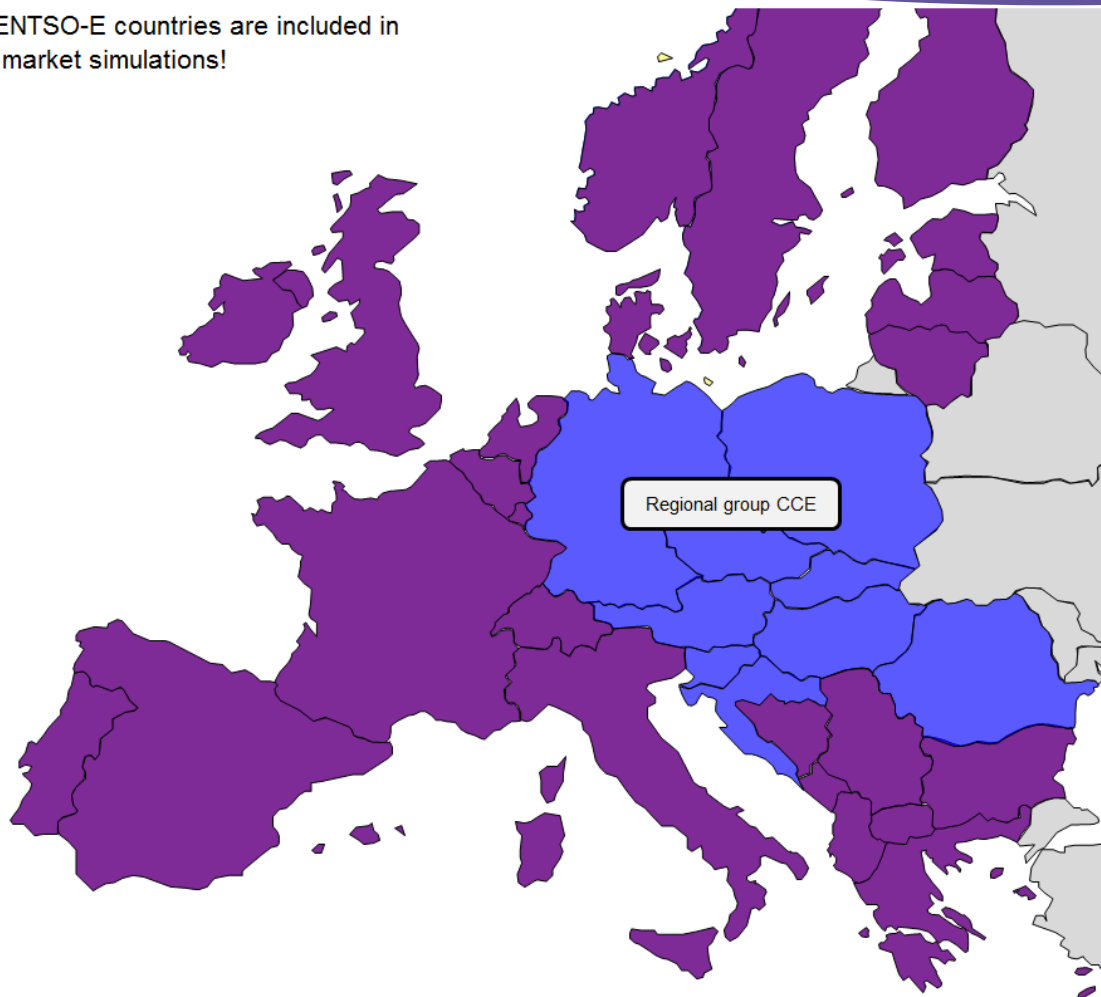
Norbert LECHNER
RG CCE Subgroup Market Study

ENTSO-E RG CCE stakeholder external workshop
26 March 2014, Bratislava, Slovakia

Model

Defining market nodes

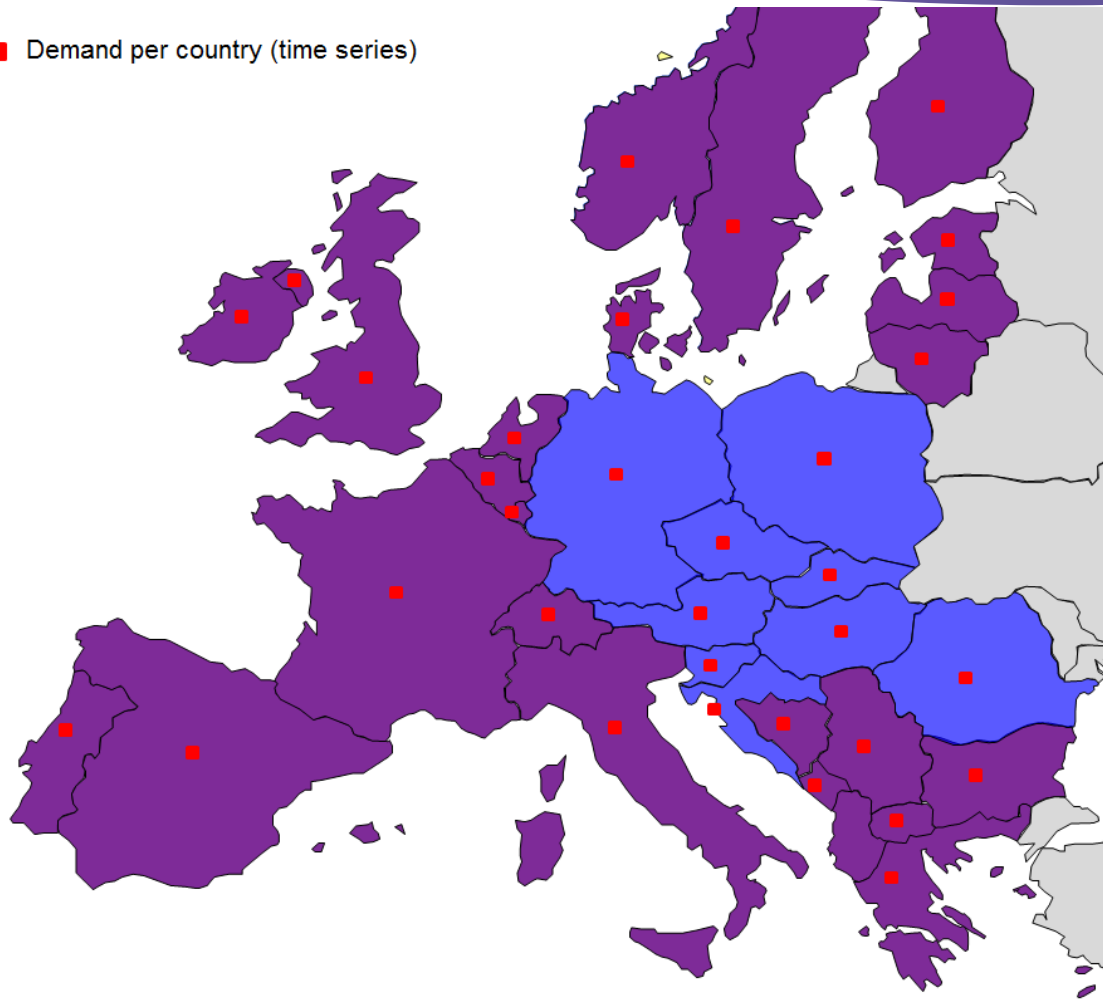
All ENTSO-E countries are included in the market simulations!



Model

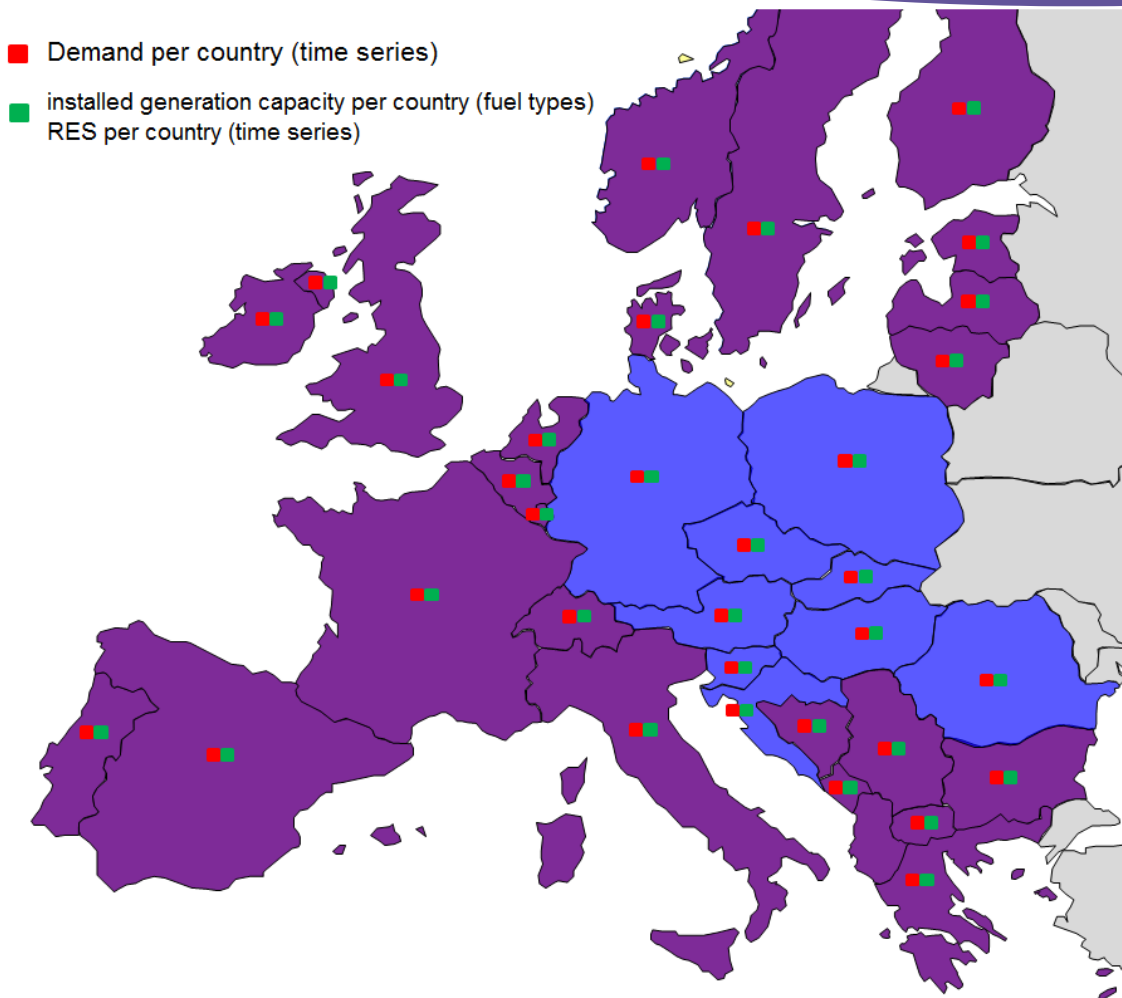
Allocate corresponding demand to each country

■ Demand per country (time series)



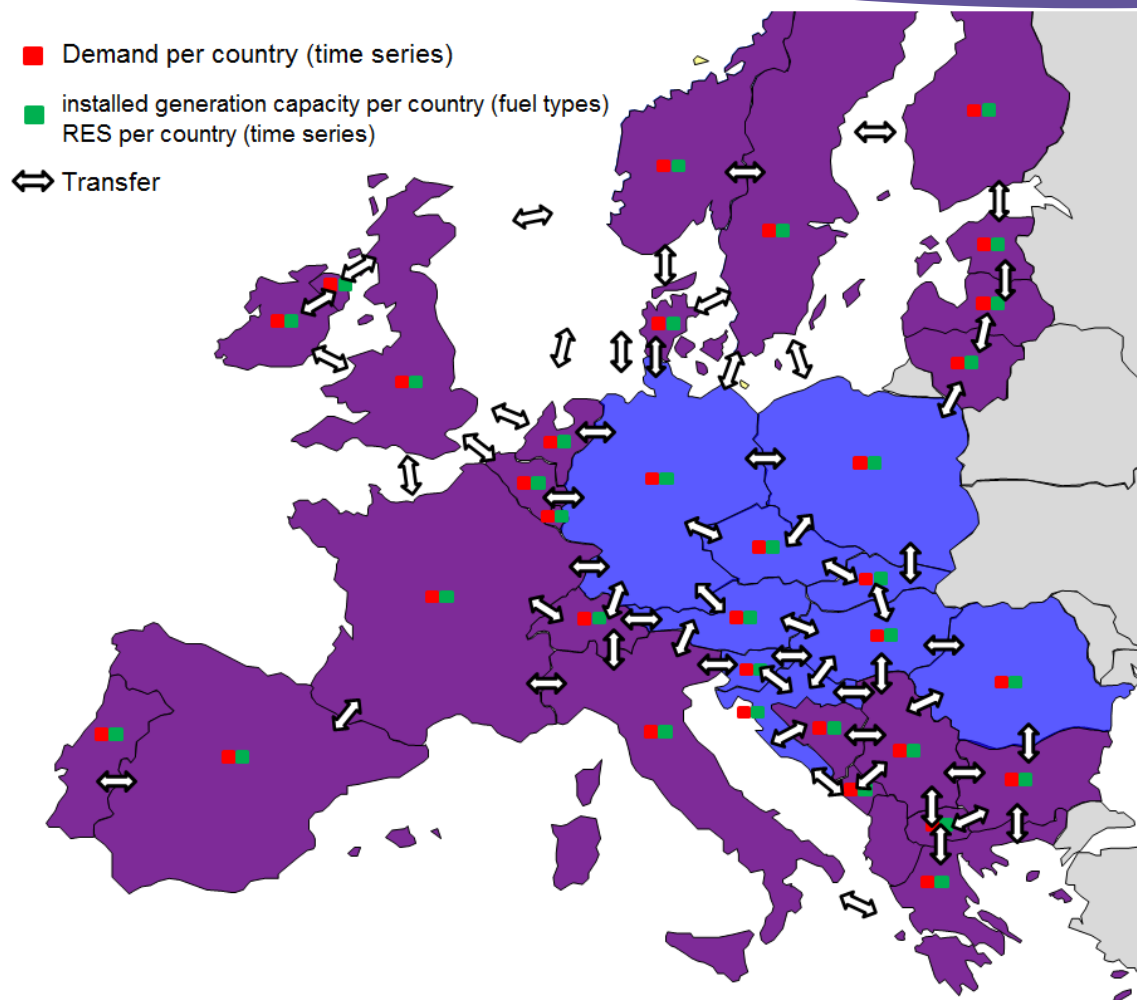
Model

Allocate corresponding generation to each country



Model

Description of the Model



Data taken from Pan European Market Database (consistency to other RG):

- Installed capacity of power plants
- Consistent time series for RES and load (Pan European Climate Database)
- Same fuel prices, CO2 costs, efficiency etc. for whole Europe
- exchange capacities
- RG CCE uses PowrSym OSA, Inc. (USA)
- Minimization of total system costs



Inputs

- Multiple scenarios with hypothesis regarding
 - *Demand profile*
 - *Generator characteristics*
 - *Other generation profile*
 - *Wind and Solar Profiles*
 - *Transfer Capacities*
 - *Exchanges to Rest of World profile*
 - *Fuel and CO₂ prices*

Modelling

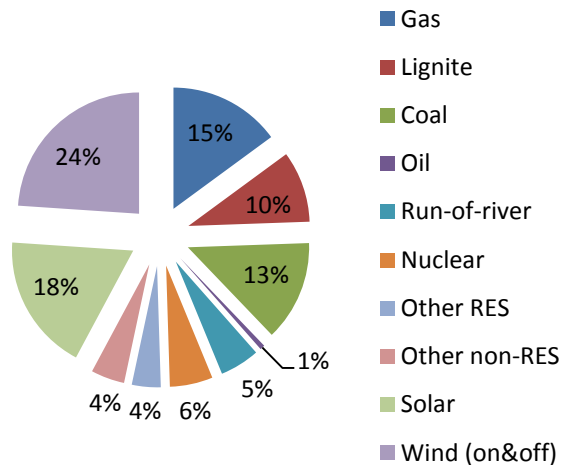
- Chronological Unit Commitment Economic Dispatch model
- Hourly model
- Each bidding area/country is a single market node
- Minimise the system cost (fuel bill/operating costs) subject to constraints such as must-run, generator capabilities.

Outputs

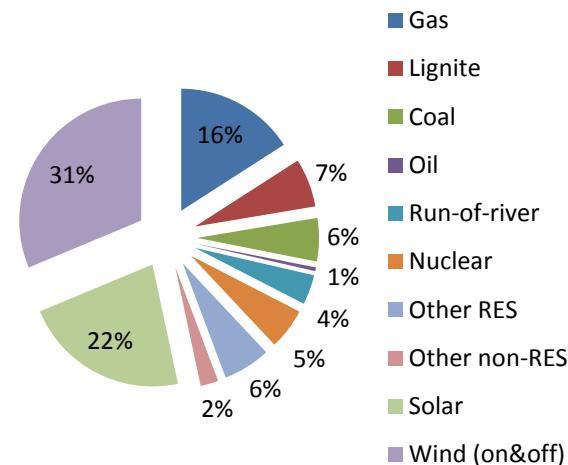
- Country Balances
- Market exchanges btw MSs
- Hourly generation pattern for each generation technology
- System cost
- CO₂ emissions

Installed generation capacities RG CCE

V1 installed capacity



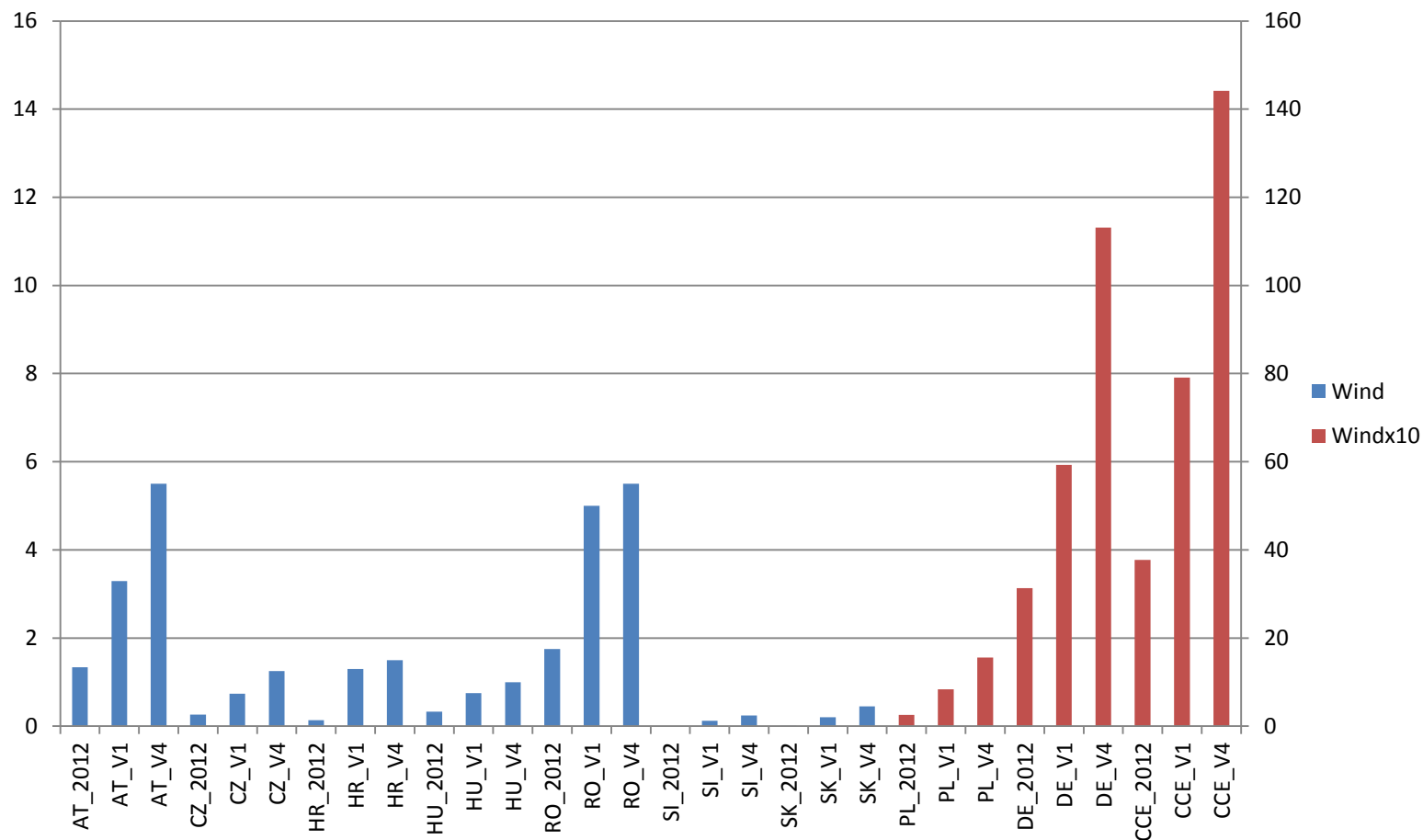
V4 installed capacity



Inst. cap. [GW]	Gas	Lignite	Coal	Oil	Run-of-river	Nuclear	Other (RES)	Other	Solar	Wind
V1	49.3	31.5	44.3	2.1	17.5	18.9	12.7	14.8	60.3	79.1
V4	73.3	29.7	26.4	2.3	18.2	25.1	28.9	10.9	101.7	144.1

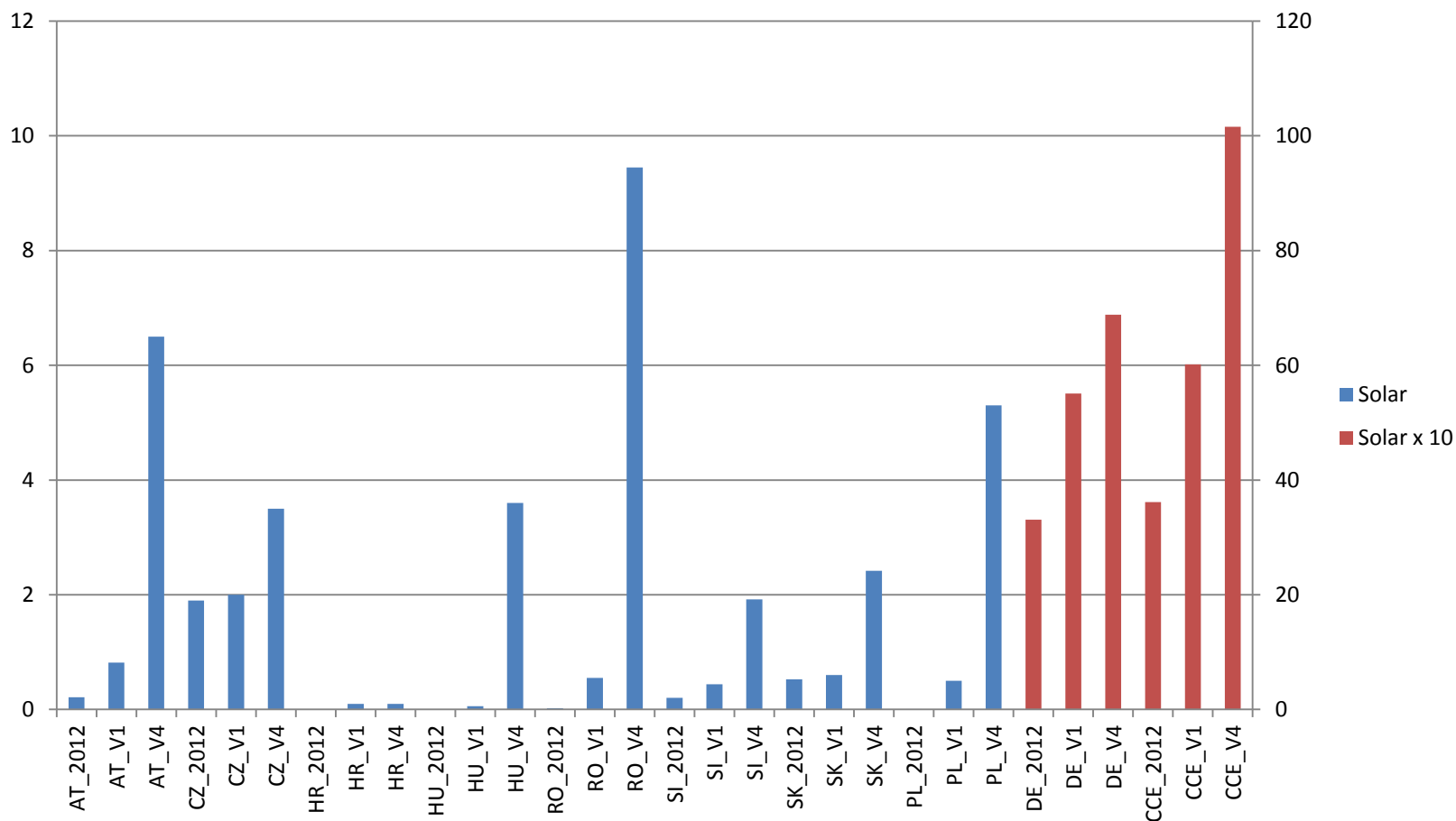
Main changes in CCE

Increase of Wind (in GW)

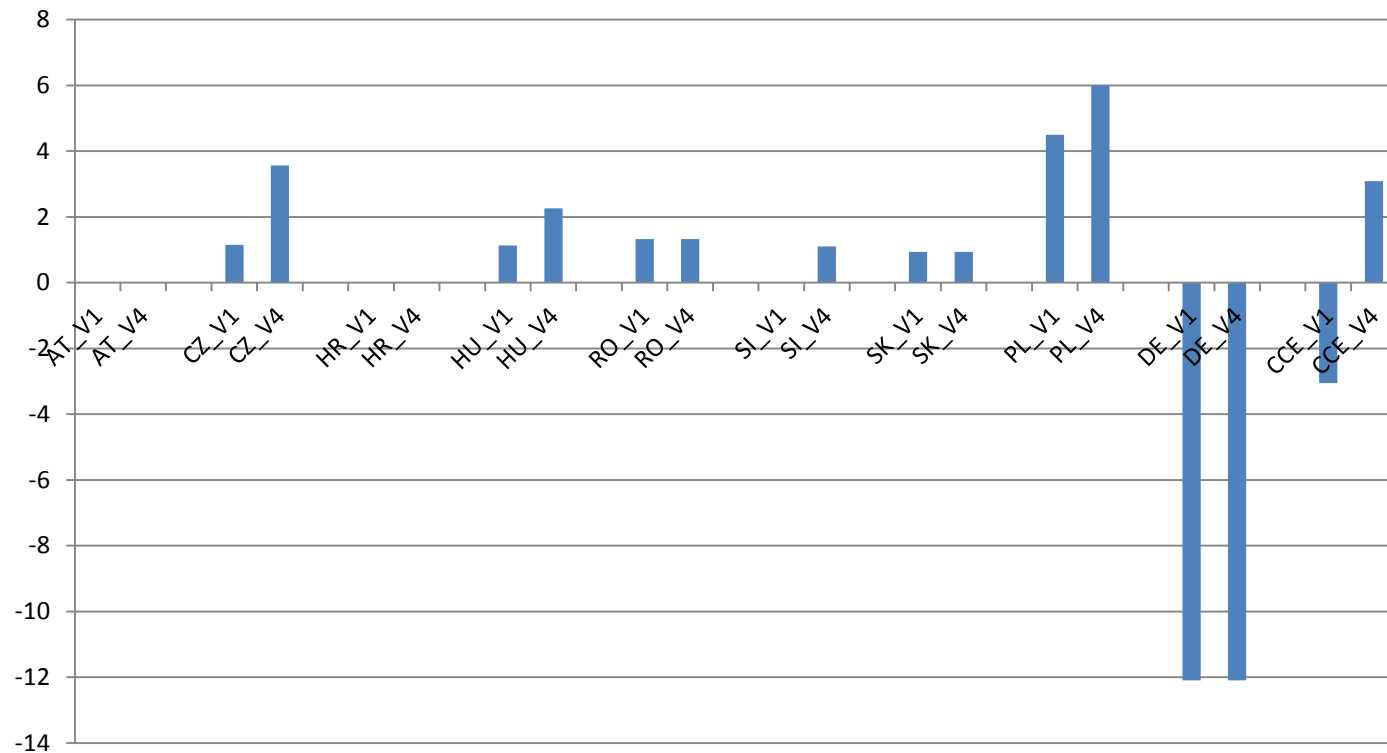


Main changes in CCE

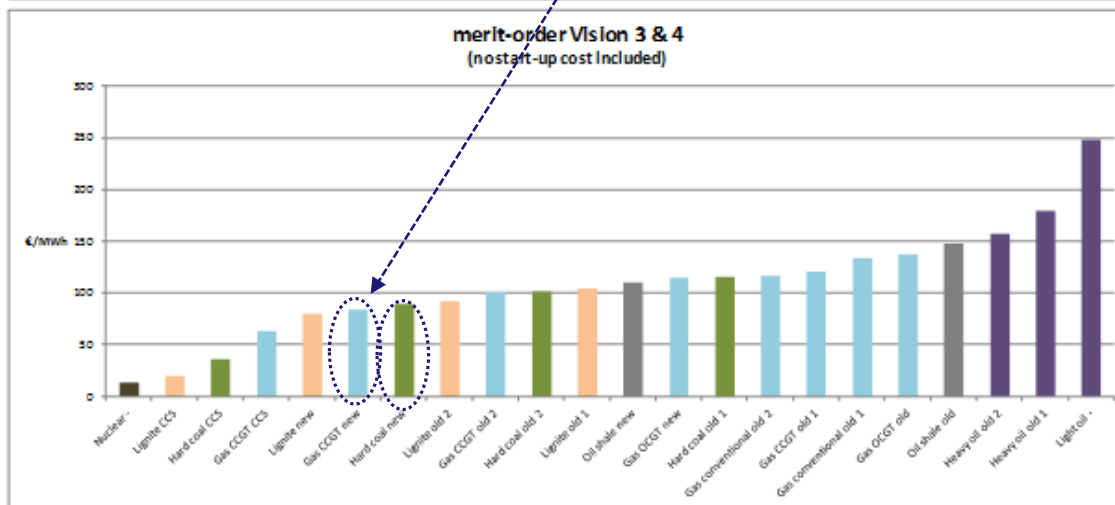
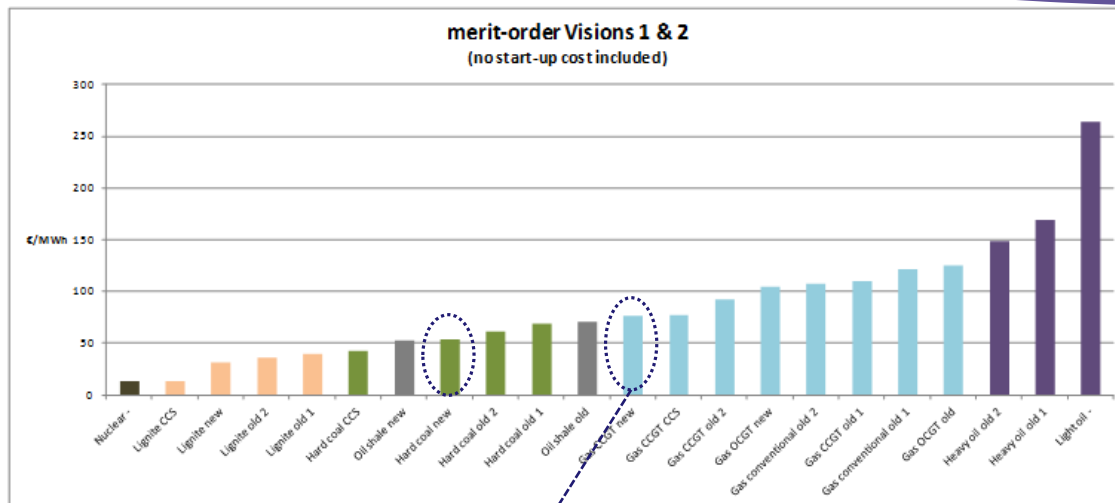
Increase of Solar (in GW)



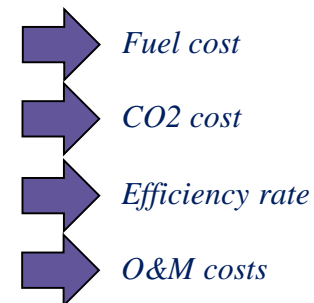
Changes in Nuclear (in GW)



Generation merit order



Variable Generation cost

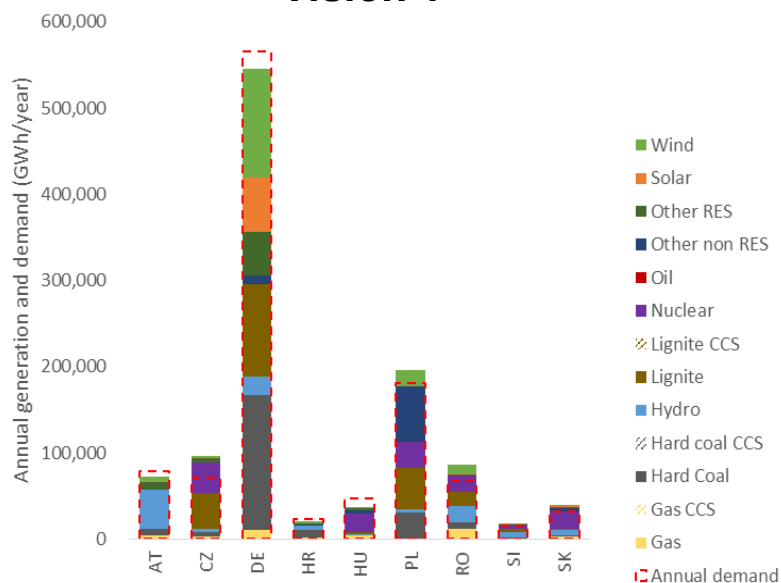


Change of CO2 costs from 31€/t (Vision 1) to 93 €/t (Vision 4) results in shift in the merit order

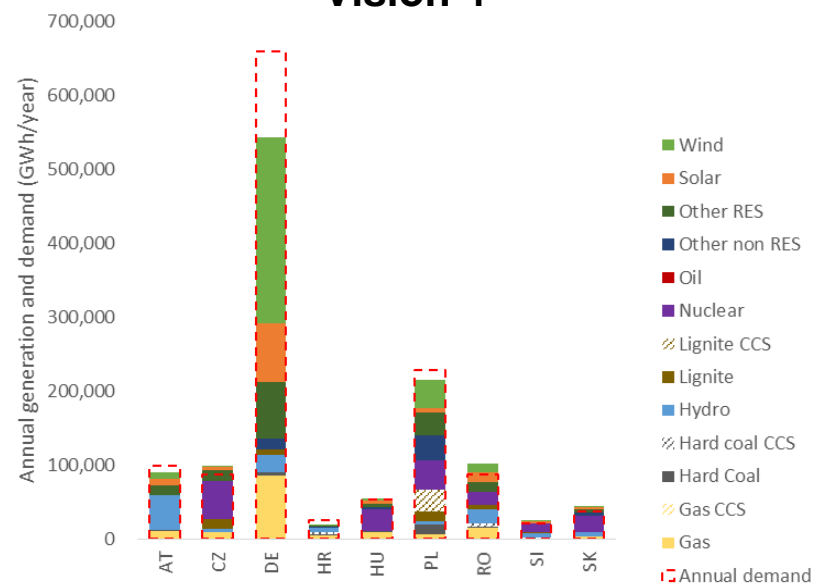
General results for RG CCE



Vision 1



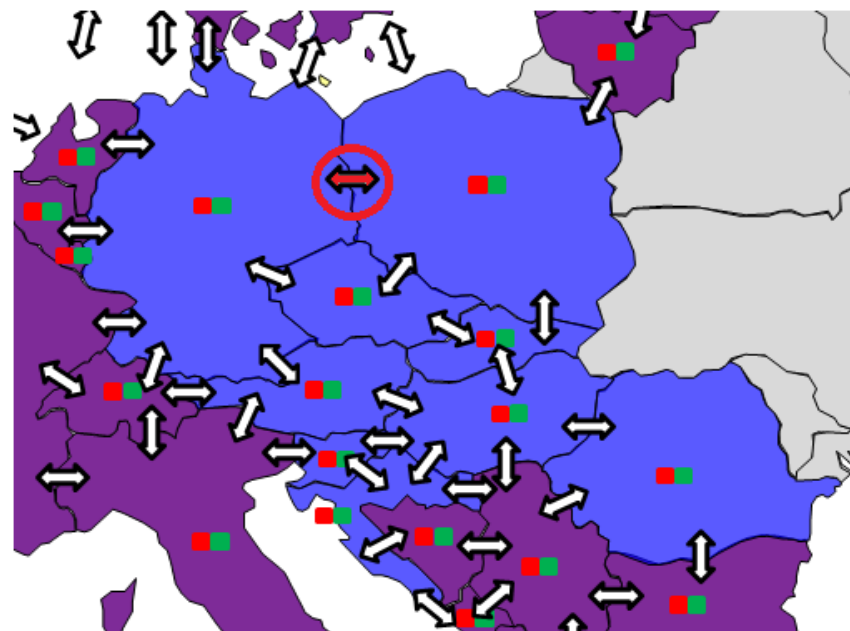
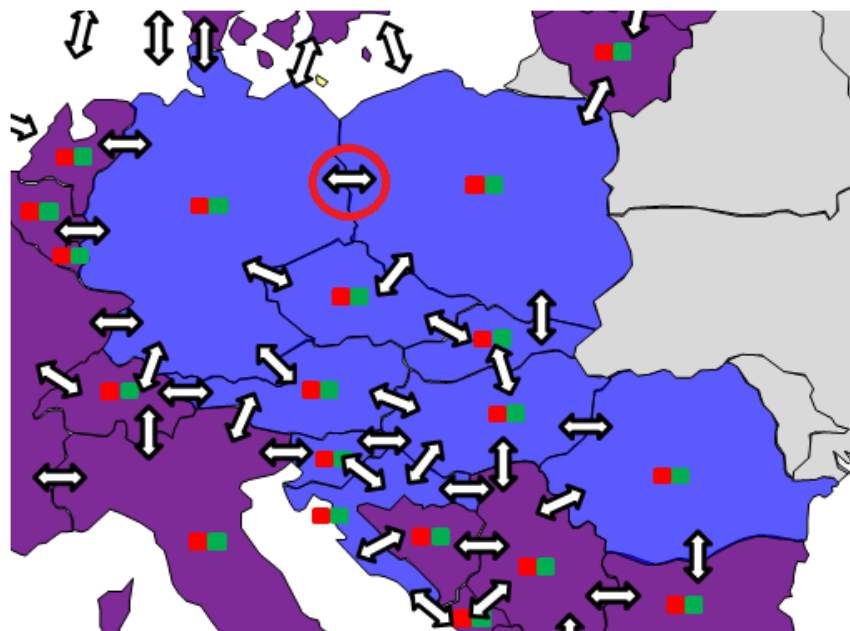
Vision 4



Assessment of projects

Methodology: TOOT (take out one at time)

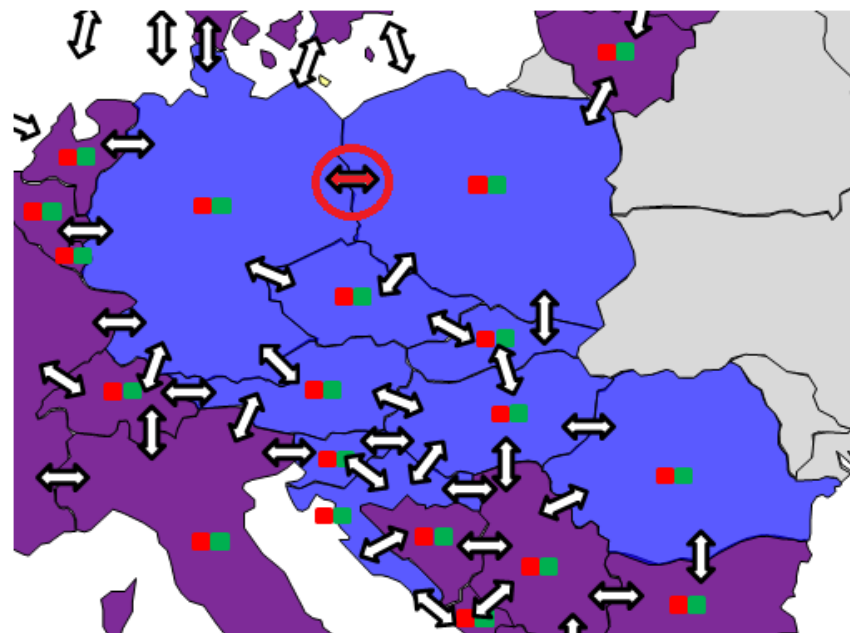
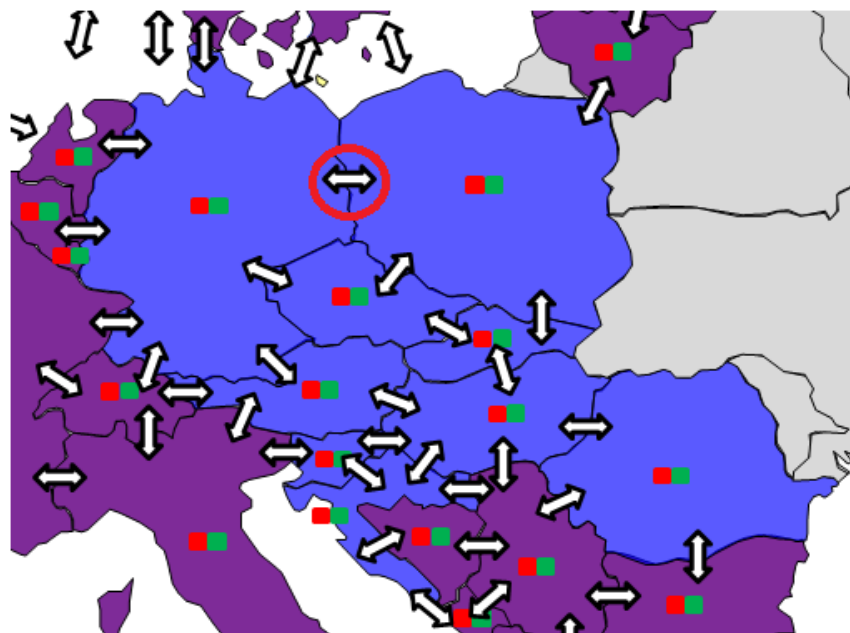
reference case (all projects in)



take **out** project to be assessed
(decrease relevant market capacities)

Assessment of projects

Methodology: calculating benefits



Calculation of benefits:

- SEW: Total system costs (**without project**) minus total system costs (**ref. case**)
- CO₂: Total system emission (**ref. case**) minus total system emission (**without project**)
- RES-Integration: Dump-energy (**without project**) minus dump (**ref. case**)

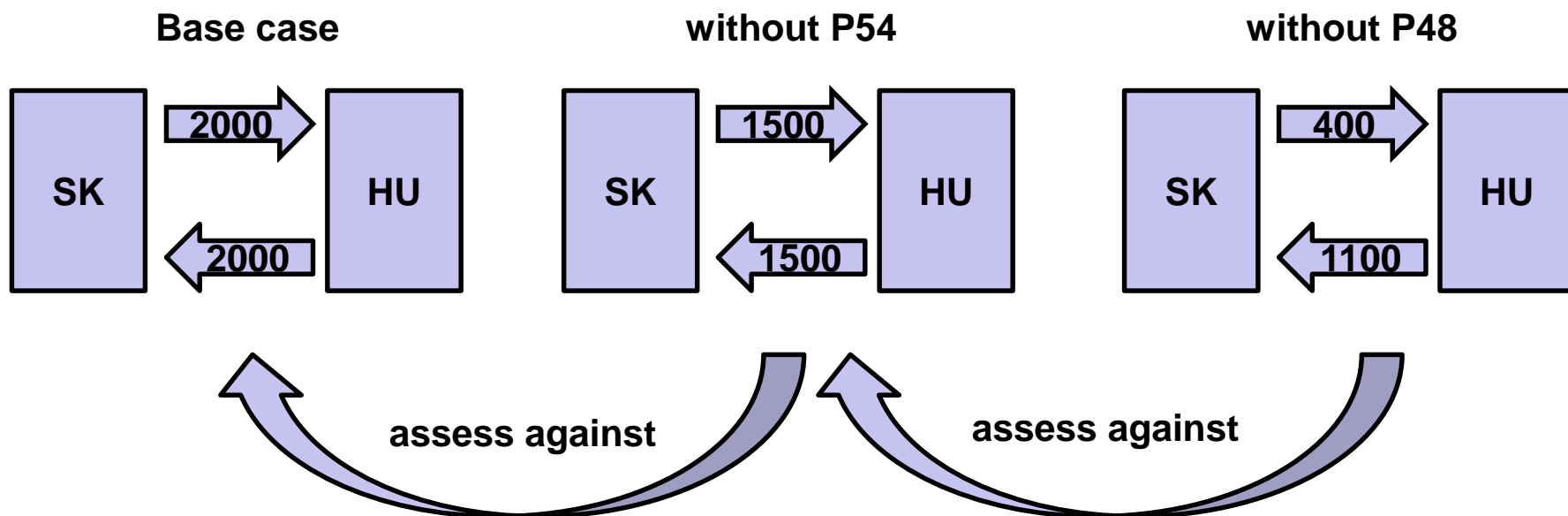
Assessment of projects

Results for Projects P54/P48 (new interconnector SK-HU)

Project with two steps: first P48, later P54

Assessment in two steps:

- calculate benefits of P54 against ref. case
- calculate benefits of P48 against P54



Assessment of projects

Results for Projects P54/P48 (new interconnector SK-HU)

	SEW (Mio. €)		CO2 (kTons)		RES integration (MWh)	
	Vision 1	Vision 4	Vision 1	Vision 4	Vision 1	Vision 4
P48	31	74	453	-239	0	36.000
P54	3	29	-49	-84	0	17.000

Assessment of projects

Results for Projects P35



Project 35 is an internal project in Czech Republic
it reduces restrictions of the infeed of RES and nuclear power plants
it allows to increase the trading capacity between Germany and Czech Republic by 500
MW

Assessment of projects

Results for Projects 35 (CZ)



	SEW (Mio. €)		CO2 (kTons)		RES integration (MWh)	
	Vision 1	Vision 4	Vision 1	Vision 4	Vision 1	Vision 4
Overall Benefits	279	1.392	-2.313	-7.774	227.000	235.000
Benefits of NTC increase	12	5	150	-88	0	208.000

- Through market simulation some CBA indicators have been elaborated.
- Results depend strongly on the assumptions of the visions.

THANK YOU FOR YOUR ATTENTION!

Questions?

norbert.lechner@tennet.eu

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