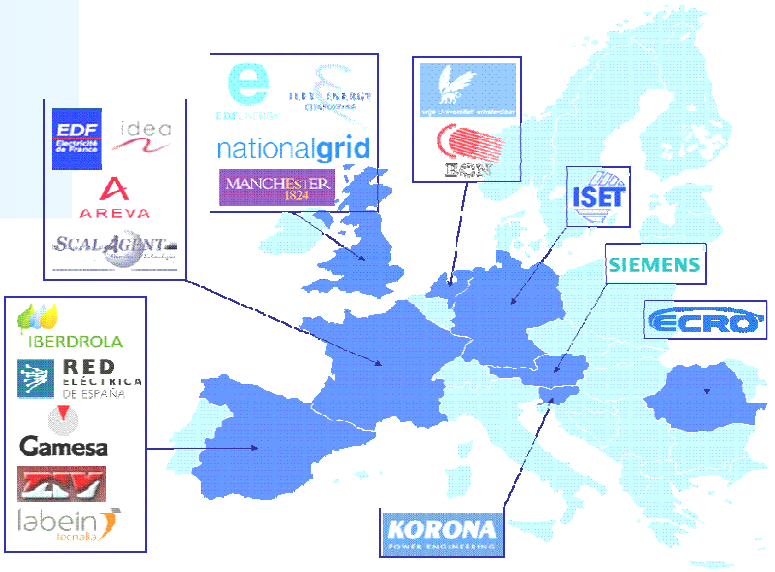
European Commission
Community Research



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'… a step towards the future of electricity networks'

***F**lexible **E**lectricity **N**etworks to **I**ntegrate the e**X**pected 'energy evolution'*

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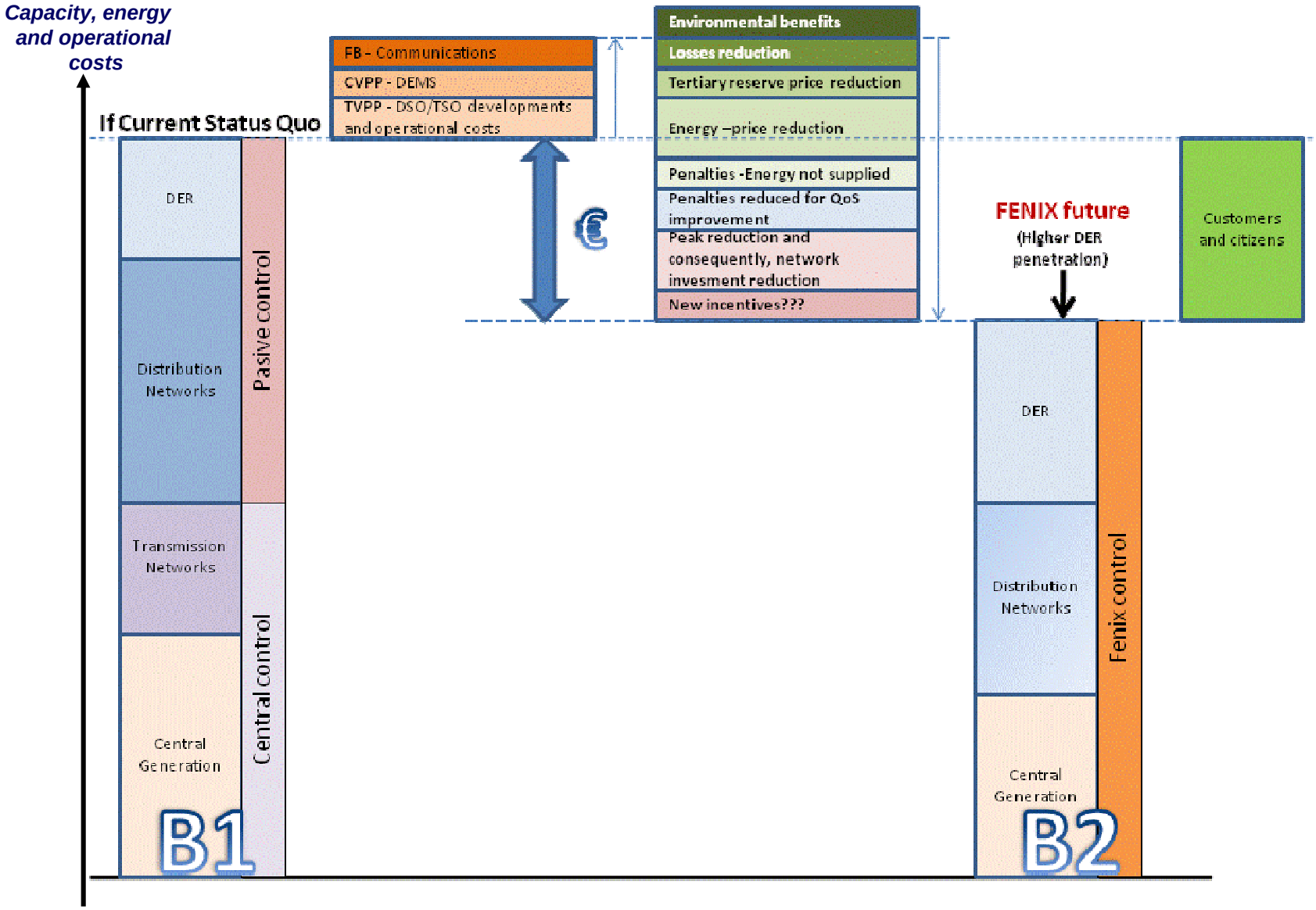
Southern Scenario Simulations

SIXTH FRAMEWORK PROGRAMME
Sustainable Energy Systems

FENIX Target



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Loss Reduction

Distribution Losses

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-Non –Technical Losses:

-metering errors, measurement errors, theft

-Technical Losses:

-Fixed Losses:

-Iron losses in transformers,

they account between a ¼ and ⅓ of the technical losses

-Variable Losses.

-Current dependent losses, Copper losses in lines and transformer windings.

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Distribution Losses in the Basque Country

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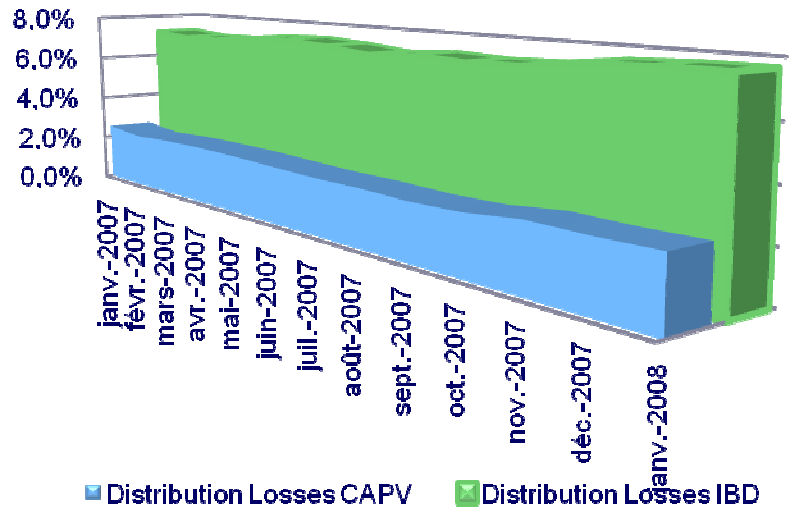
-The Alava province is located in the Basque Country autonomous region (CAPV)

-The measured Losses in this region vary between 2 and 2,6% which is very low comparing to the IBD average of 7%



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Variable Distribution Losses in Alava (I)

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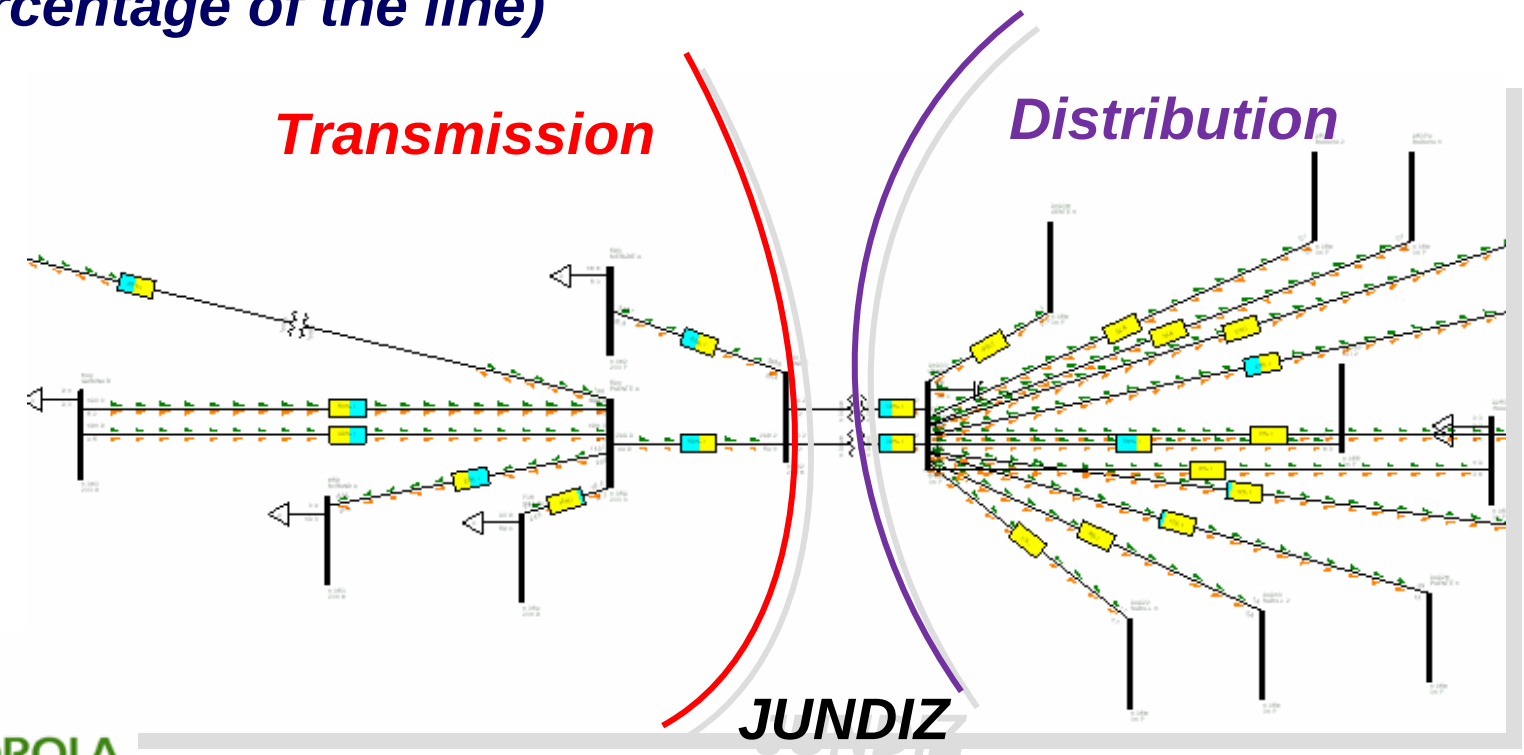
-The Alava region losses are low due to:

-Short line distances

-Adequate network topology

-Low line loading

(In the picture below, the blue stripe indicates the loading percentage of the line)



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Variable Distribution Losses in Alava (II)

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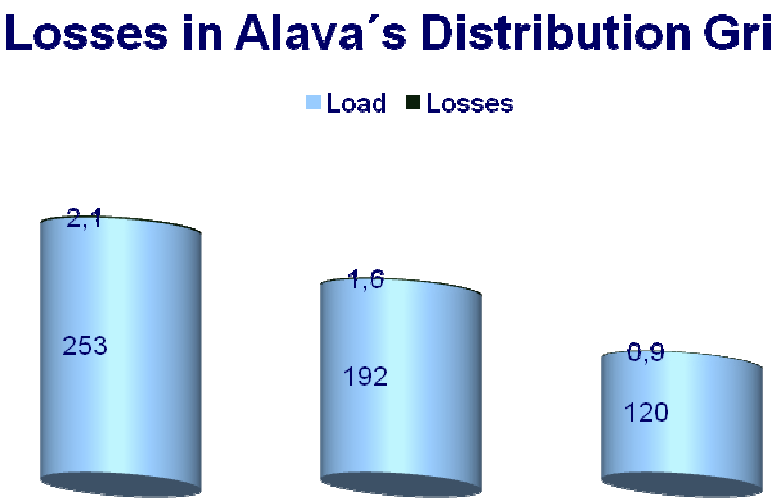
-Thus, the variable losses of the Alava network are very low, because the registrated losess gather technical and non-technical losses, and furthermore the technical gather the fixed and the variable. So they should be at least less than the ⅓ of 2%.

- The PSS/E simulation in the Alava grid model matches this theory, with losses even lower around the 1%



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Distribution Losses in Alava(II)

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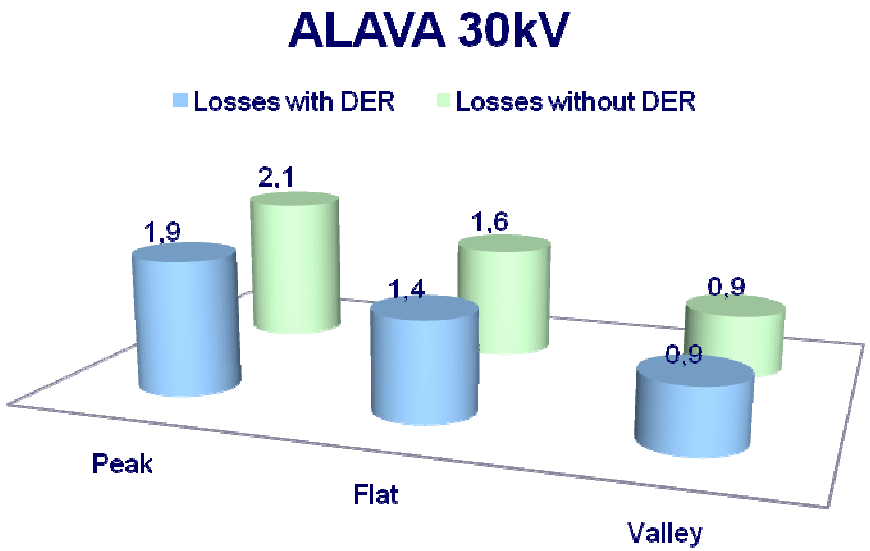
-The DER units of the 30kV grid, contribute to a significant reduction of the loss percentage in peak and flat periods, 9,7% and 13% respectively.

-In Valley periods, the DER influence doesn´t significatively alter the losses in the network

	Load (MW)	Losses without DER (MW)	Losses without DER (%)	Losses with DER (MW)	Losses with DER (%)
Peak	253	2.1	0.83	1.9	0.75
Flat	192	1.6	0.83	1.4	0.72
Valley	120	0.9	0.75	0.9	0.75



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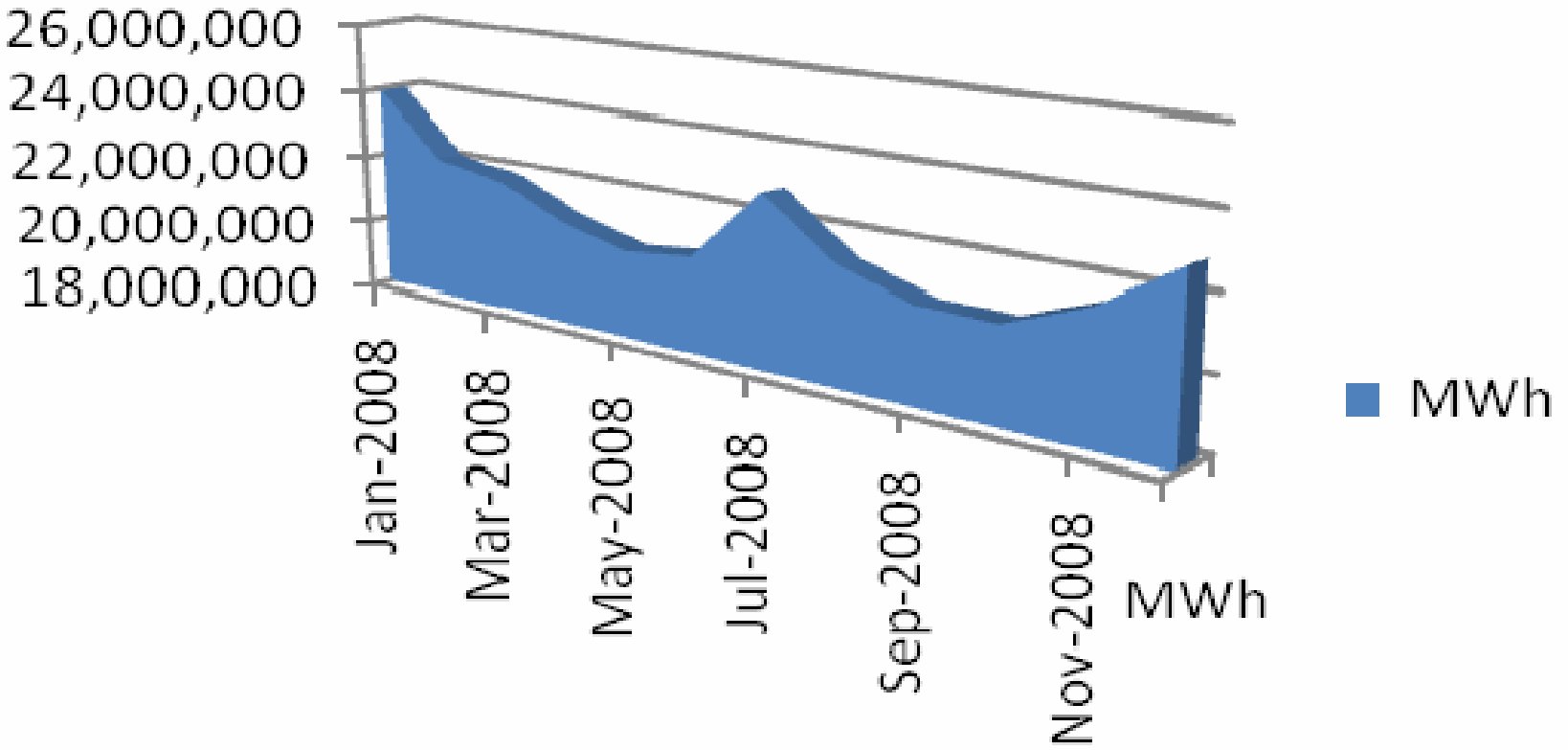
Spanish Distribution Demand



Day Ahead Market Prices

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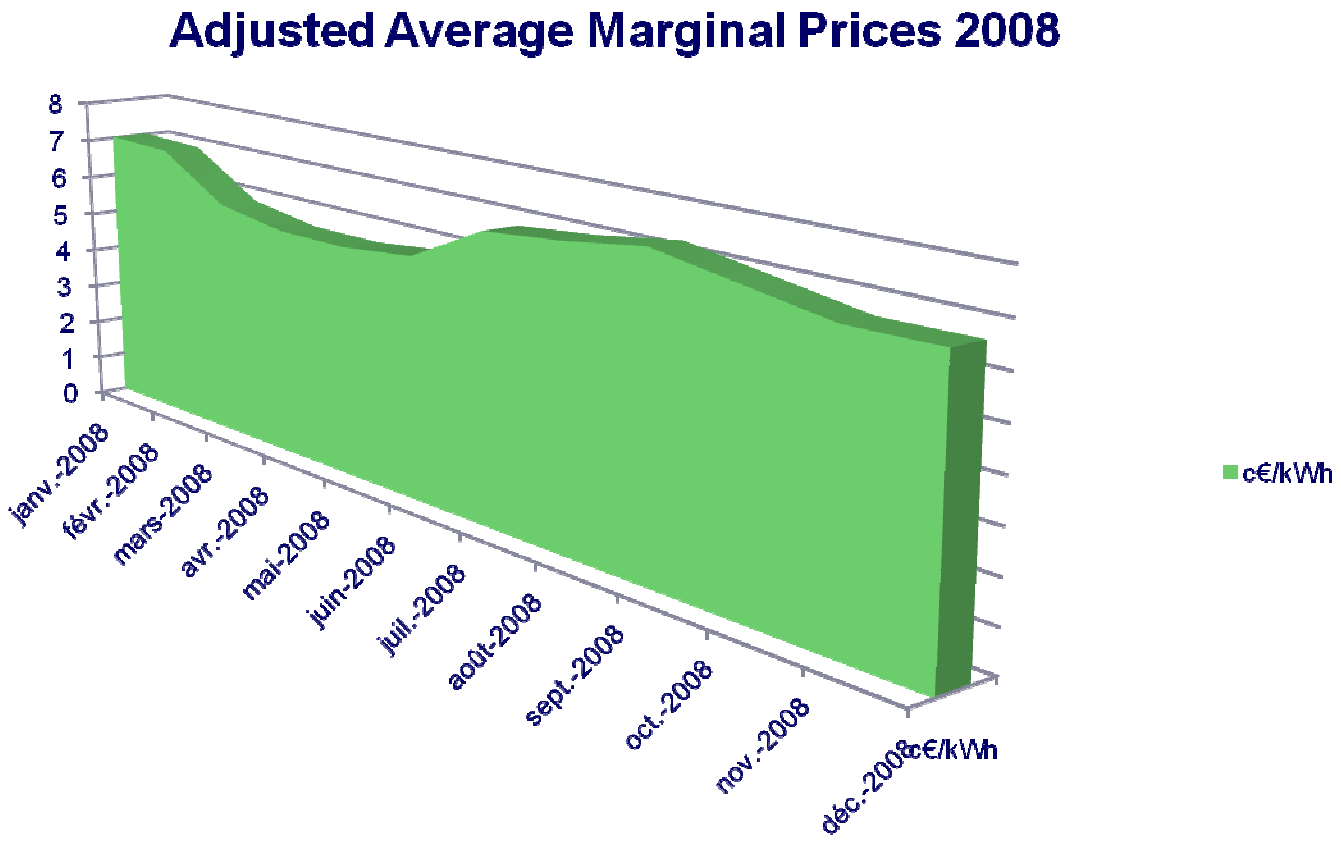

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Economic Quantification

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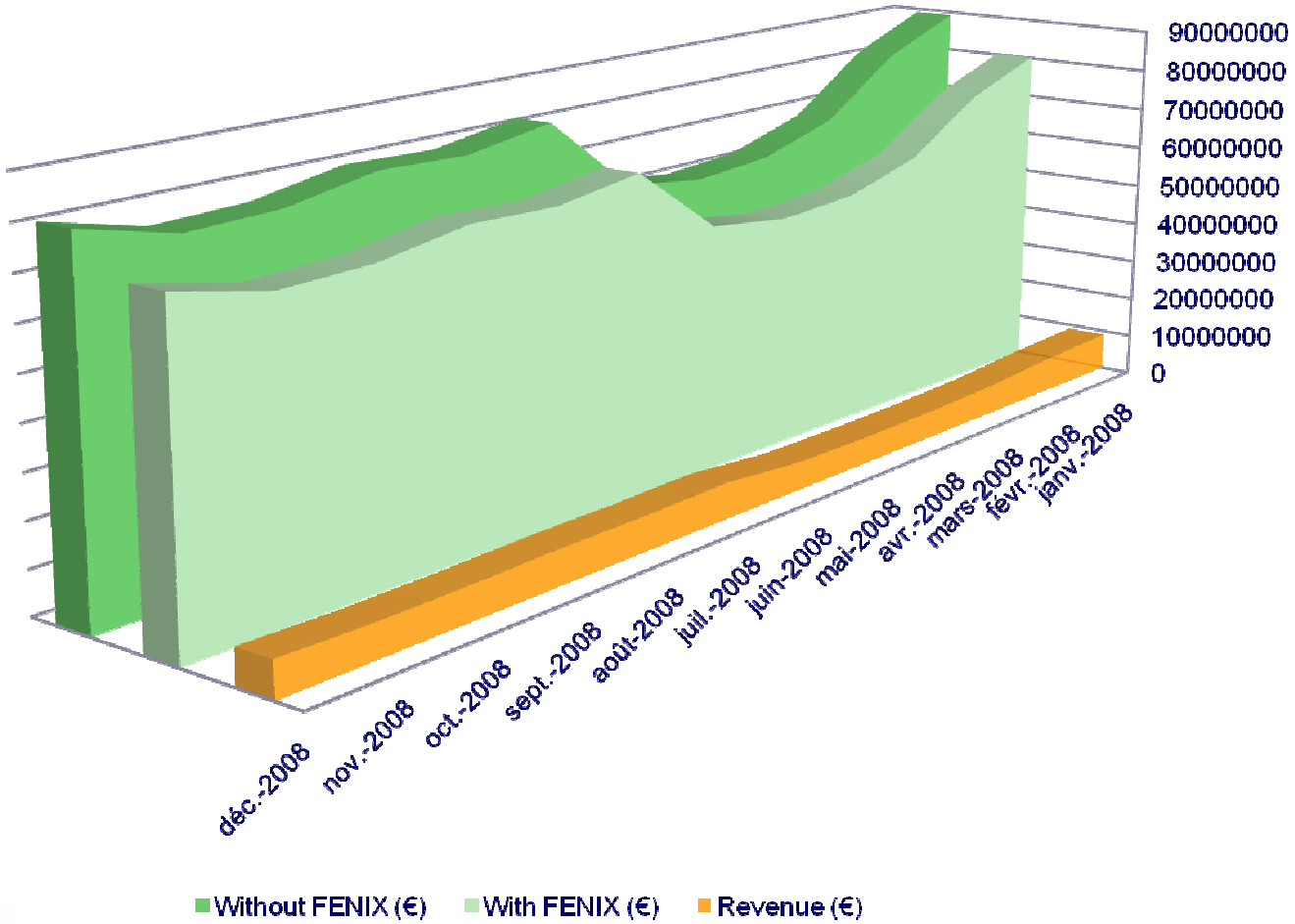

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CO_2 Emission Reduction

CO_2 emission reduction profits(I)

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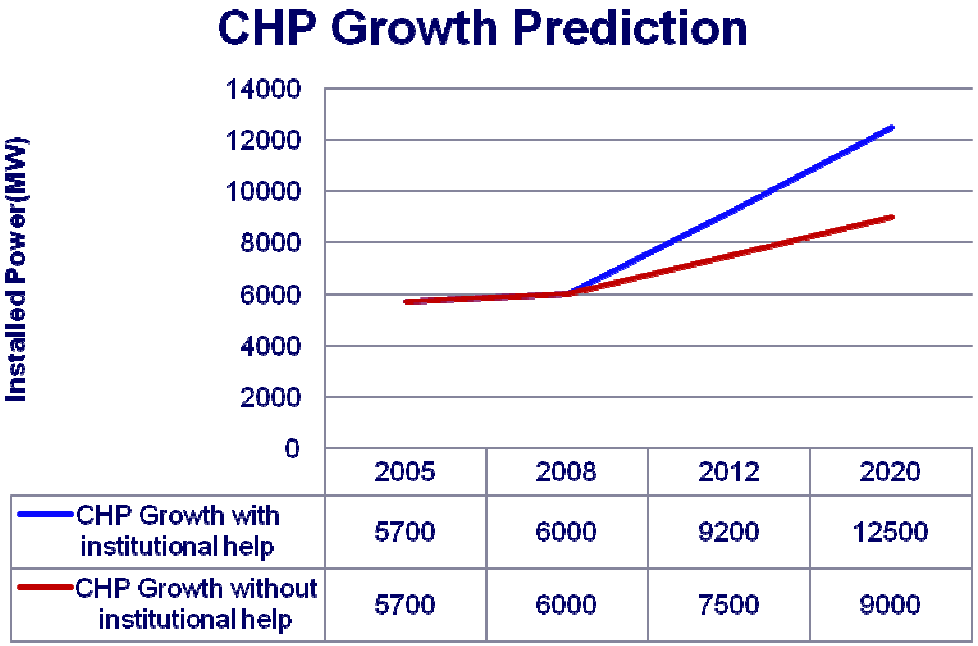

- Cogeneration improves the efficiency of the generation process

- Emission reduction ranges from 46% to 64%, around a 60% for high efficiency cogeneration produced with natural gas

GW	6.5
Working hours per year	8000
Generation per year(GWh)	52000

	Gas	High efficiency CHP
GHG kg/kWh	0.738	
CO2Tn 2020	40,147,200	16,058,880
Value M€	594	237

EUA =14,8€
January 2009

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CO_2 emission reduction profits(II)

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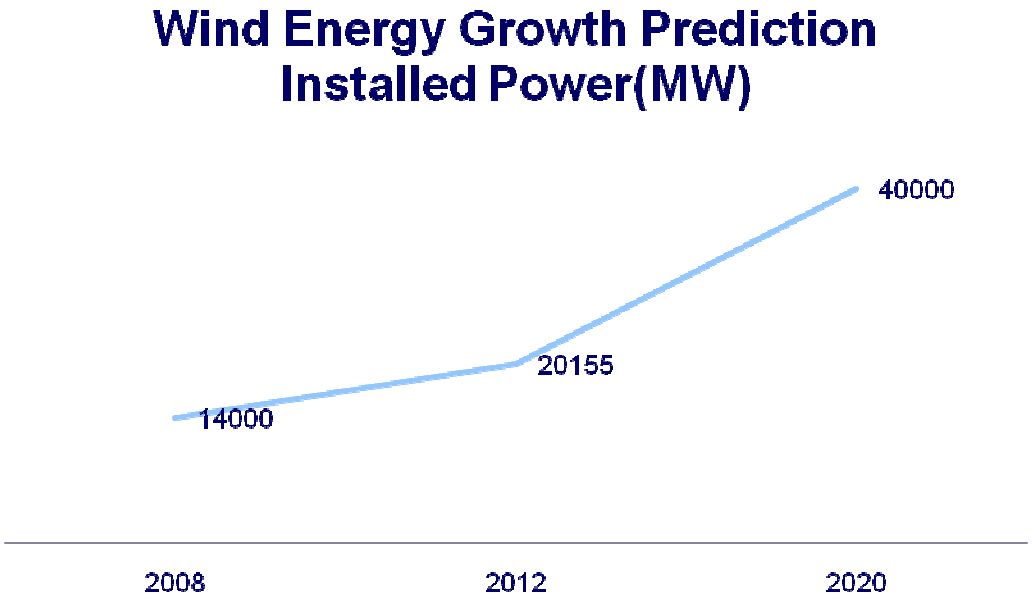

GW	26
Working hours per year	3800
Generation per year(GWh)	98800

EUA =14,8€
January 2009

	Wind	Coal	Gas
GHG kg/kWh	0.018	1.115	0.738
CO2Tn 2020	1,778,400	110,162,000	72,914,400
Value €	26,320,320	1,630,397,600	1,079,133,120

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THE END

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Supply and Demand

Marginal Price Fluctuation Due to DER Penetration

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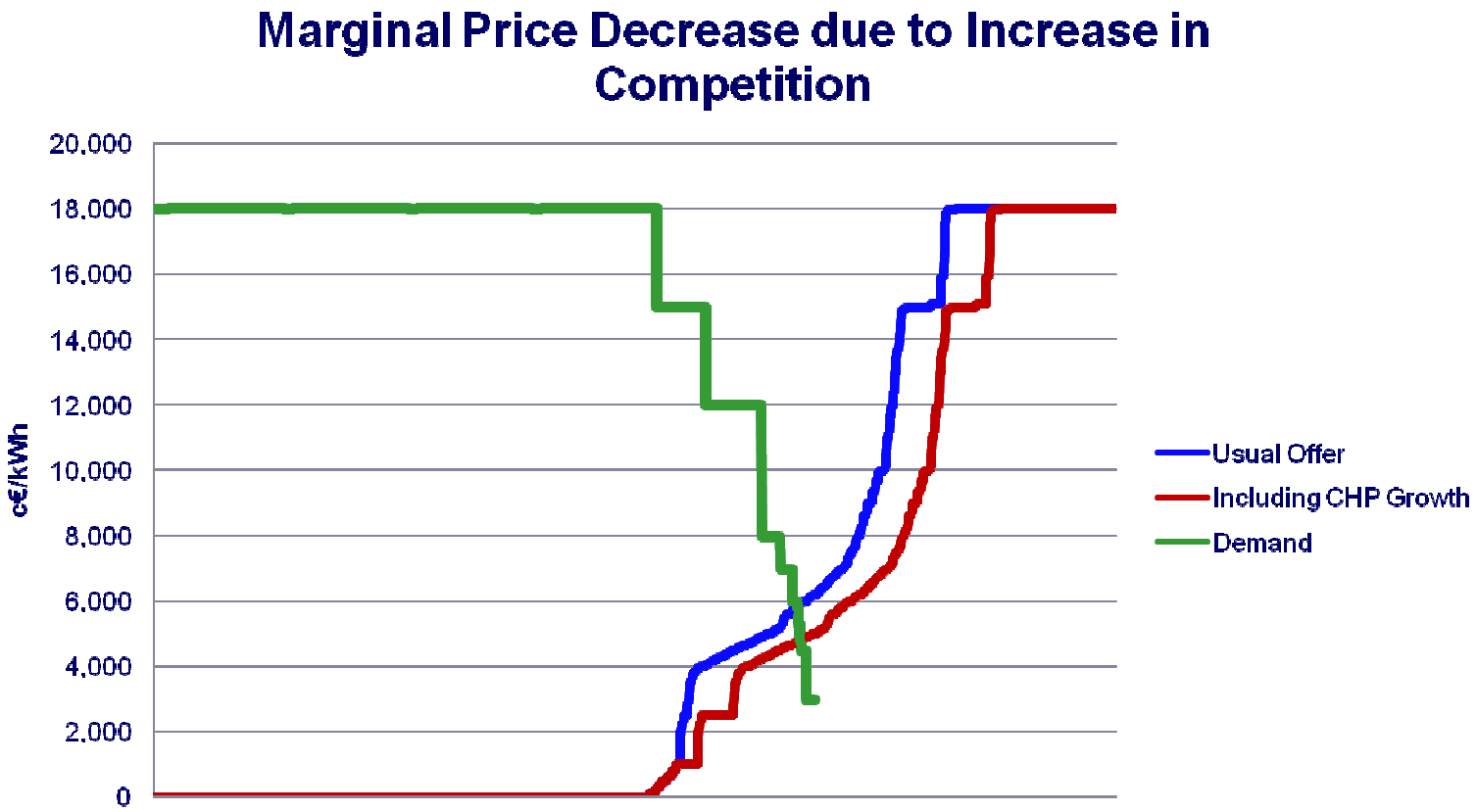

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THE END

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Thank you