



3rd South East Europe Energy Dialogue

The CHP Portuguese Story

Thessaloniki
18/19
June 2009

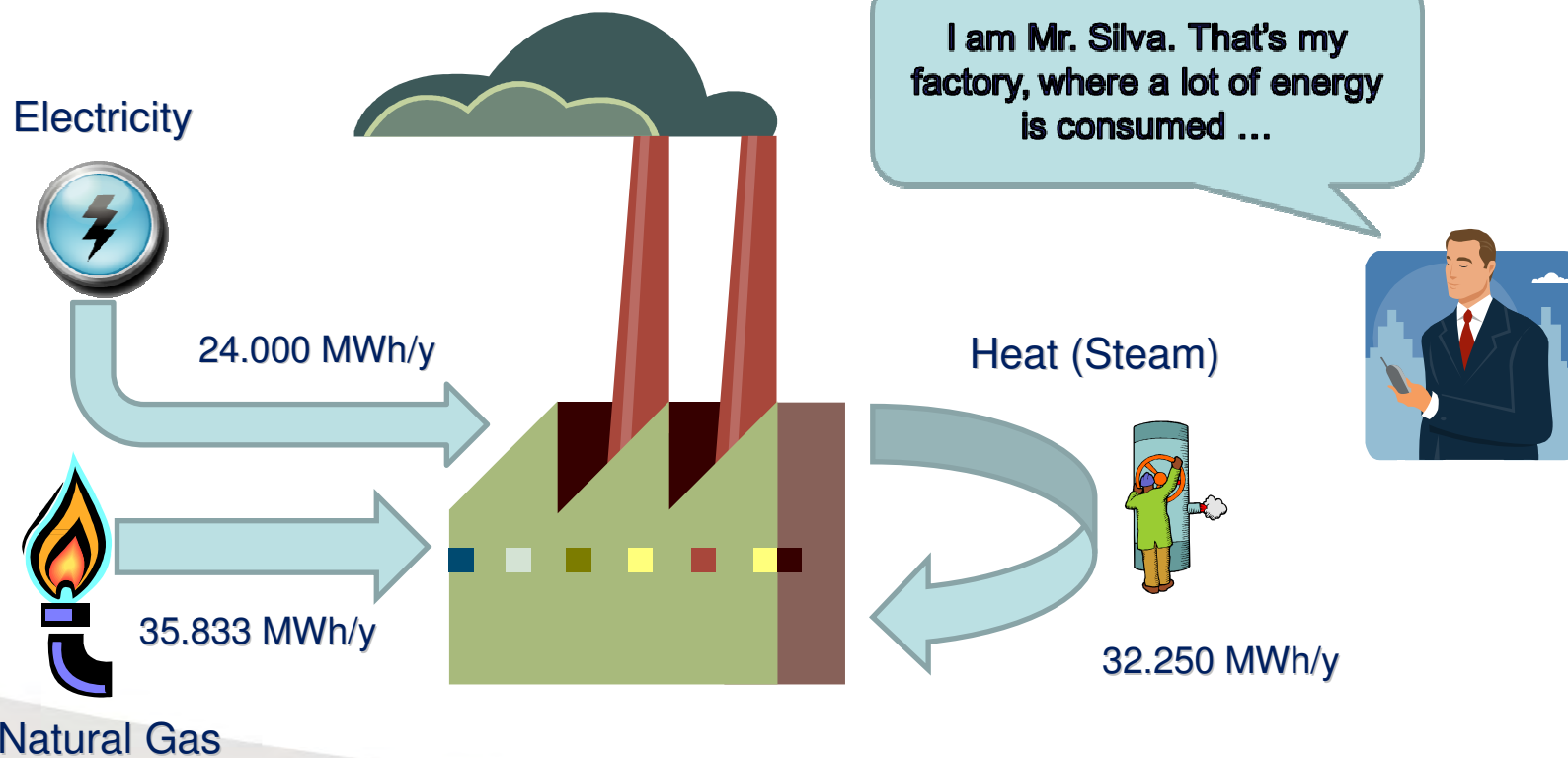
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Managing Director of
COGEN PORTUGAL

- The reasons for a Portuguese story about CHP
- The story
- Main conclusions

- To understand the energy rational to make a CHP project (in every part of the world)
- To identify the main concerns of an investor in CHP (also all over the world)
- To see how the Portuguese CHP remuneration system overcame some of the barriers to the development of these solutions in Portugal
- To show the persistence of some important constraints to the CHP development (in Portugal and in EU)
- To clarify the type of CHP that is normally developed in Portugal

Like all the other stories, also this one starts as following...

... **Once upon a time** there was an industrial unit, owned by Mr. Silva, whose energy consumptions justified the existence of a CHP Plant...

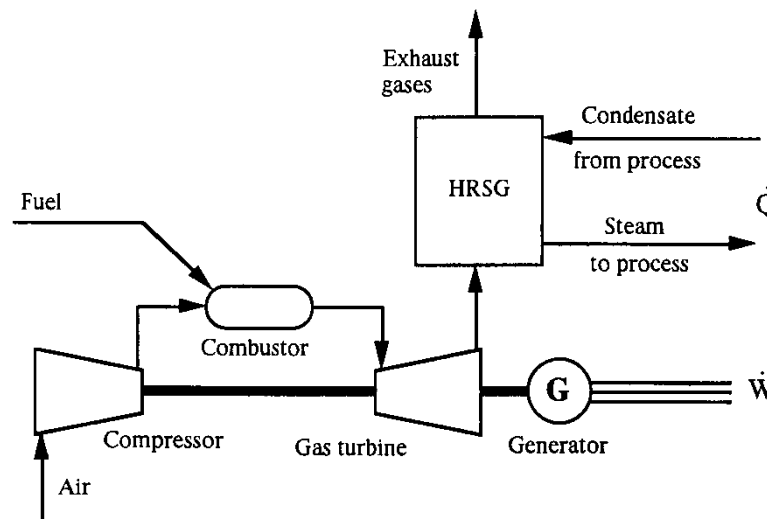


... One day, a Portuguese COGEN man approached Mr. Silva trying to convince him about the advantages of installing a CHP Plant in his factory ...

I am the COGEN Man. With your consumption structure you could install a 10 MW CHP unit based on a Gas turbine with a Heat Recovery Steam Generator ...



Natural Gas
74.999 MWh/y



$$\eta_{Global} = 75,0 \%$$

$$\eta_H = 43,0 \%$$

Heat (Steam)
32.250 MWh/y

Electricity
24.000 MWh/y

$$\eta_E = 32,0 \%$$

... Mr. Silva seemed to be interested and started asking some questions ...

First of all because you will save primary energy. According the European Directive, a CHP unit with these characteristics will demonstrate more than 10% of PES...

Why should I build that CHP unit ?



$$\left(1 - \frac{1}{\frac{\eta_E}{\eta_{Eref}} + \frac{\eta_H}{\eta_{Href}}} \right) \times 100 = \left(1 - \frac{1}{\frac{32,0}{49,6} + \frac{43,0}{90,0}} \right) \times 100 = 10,9\%$$

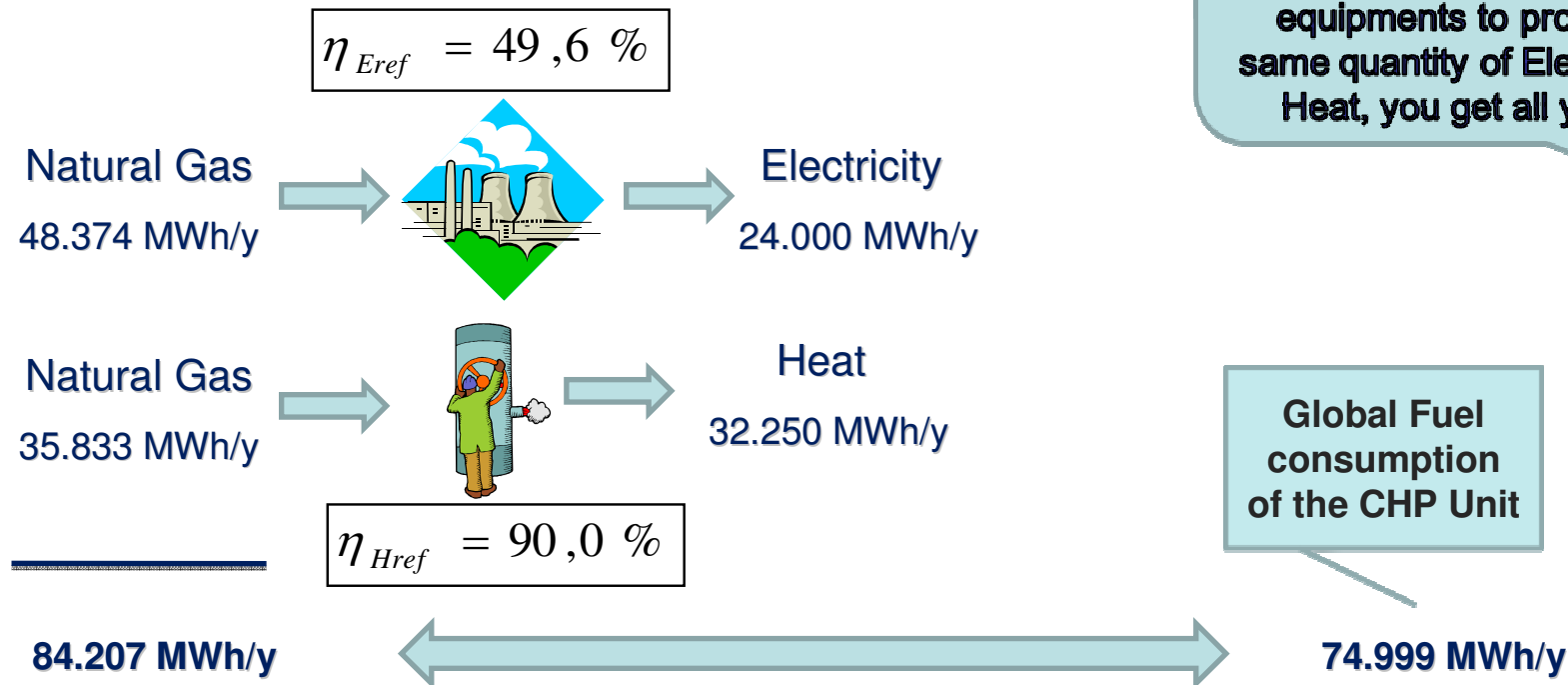


... with this result, this CHP unit will be classified as High Efficiency Cogeneration !

How did you calculate that PES? How much energy is really saved in one year?



Comparing the fuel spent in the CHP unit with the consumptions of separate conventional equipments to produce the same quantity of Electricity and Heat, you get all you need



$$\text{PES [MWh/y]} = 84.207 - 74.999 = 9.208 \text{ or } \text{PES [\%]} = 9.208/84.207 * 100 = 10,9\%$$

According to the calculations made, the fuel necessary to produce the Heat I need in a separate conventional equipment, is exactly the consumption I have in the factory ...



But that means the PES that I can get is only related with the electricity production side. Has nothing to do with the heat production !

If so, the electrical sector and the utility companies should assume the leadership in developing such projects that allow to produce electricity with better efficiency ...

That's correct. That happens because the efficiency of your boiler is equal to the reference value defined by the European commission for those equipments.

That's correct once again.



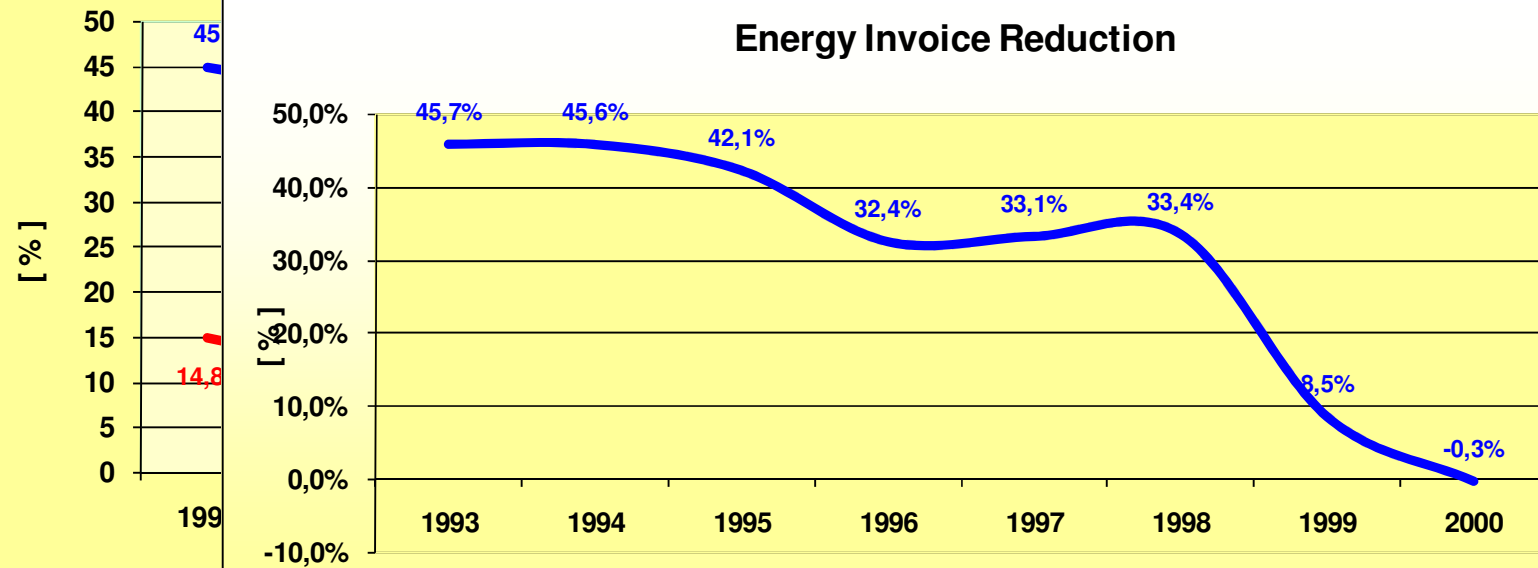
Sometimes is not easy to consolidate that perspective near such entities

Despite of that, I think I could accept the challenge of getting involved in a CHP project. Nevertheless, I need to understand better the economical risks of such a decision.



As far as I know, in the recent past, the Portuguese cogenerators faced severe economical difficulties with their projects ...

IRR vs. Interest Rate

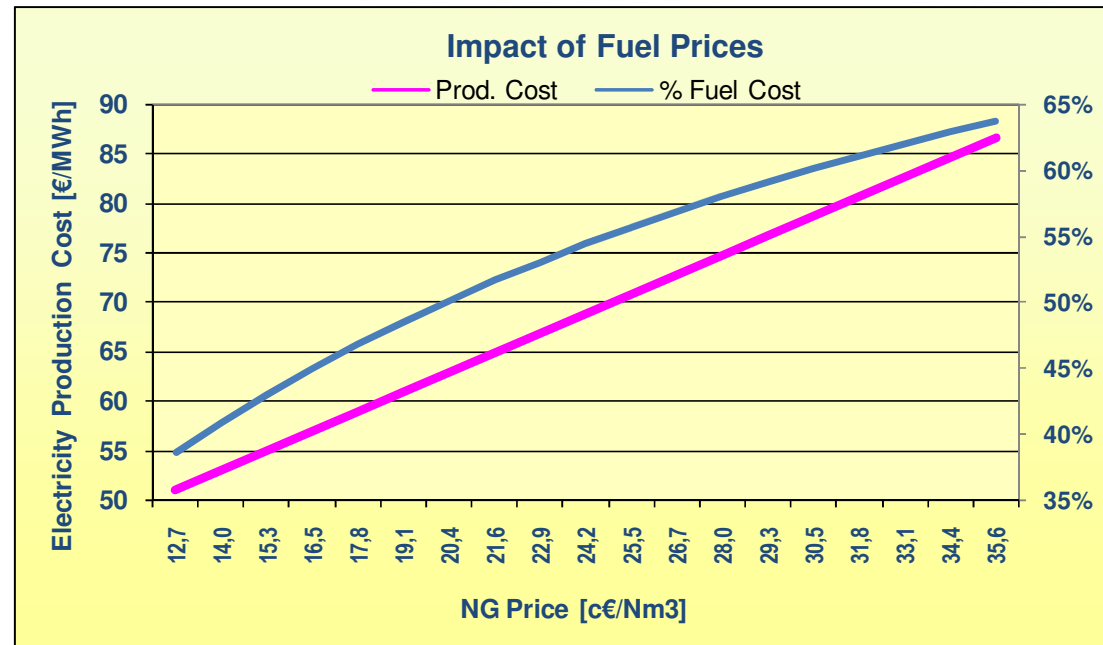


A Portuguese story about CHP...

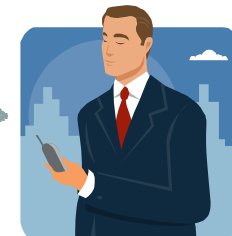


The main economical risk of a CHP project is the great impact of the fuel prices in the CHP electricity production cost ...

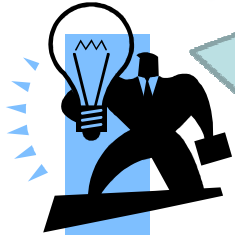
It's not completely true. A CCGT, for example, has a quite similar dependence. Sometimes what they do is to transfer the impacts they got for the years to come. They accumulate a deficit that must be paid in the future ...



I'm already used to live with all the impacts the fuel prices really have in the heat generation. Regarding the electricity, I didn't feel until now any serious impacts in the acquisition price of that energy. Probably, they are not so dependent of the fuel prices as it is the CHP unit...

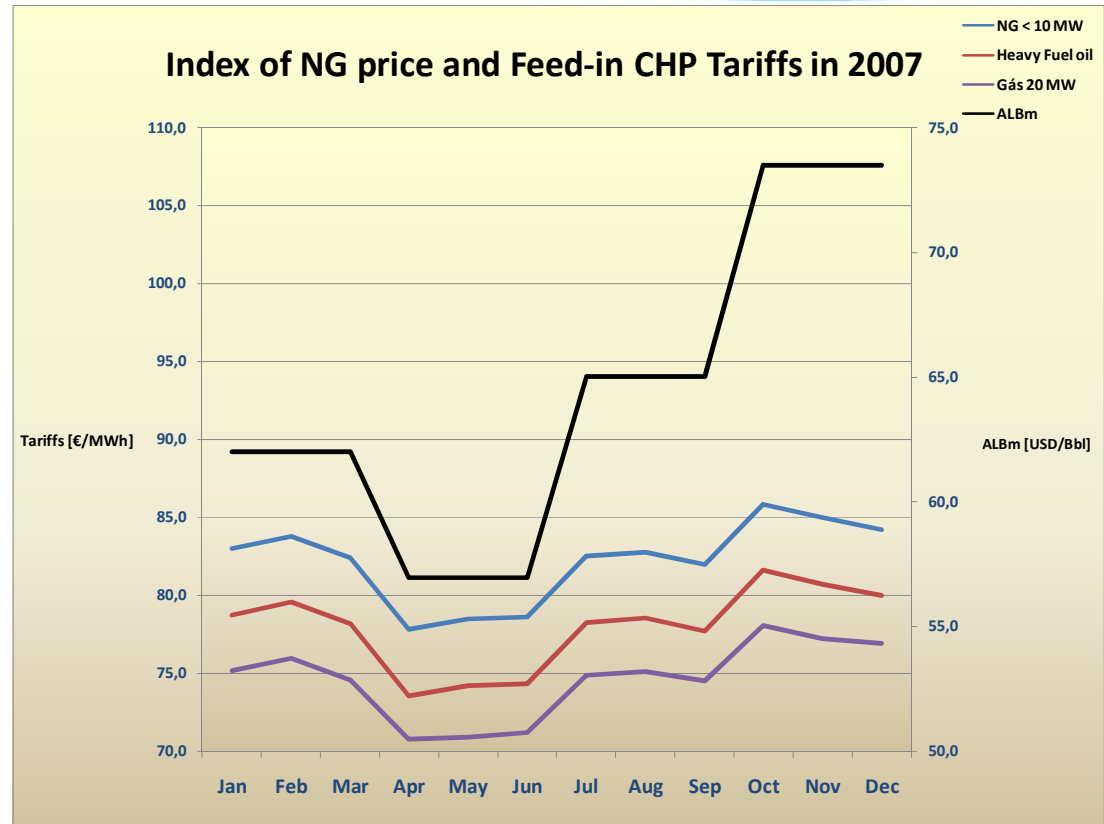


A Portuguese story about CHP...



But don't worry. With the legal framework that we have, you can sell all the electricity produced in the CHP unit, according to a feed-in tariff that incorporates a fair rule of fuel prices indexation ...

It sounds good. The main risk seems to be well mitigated ...

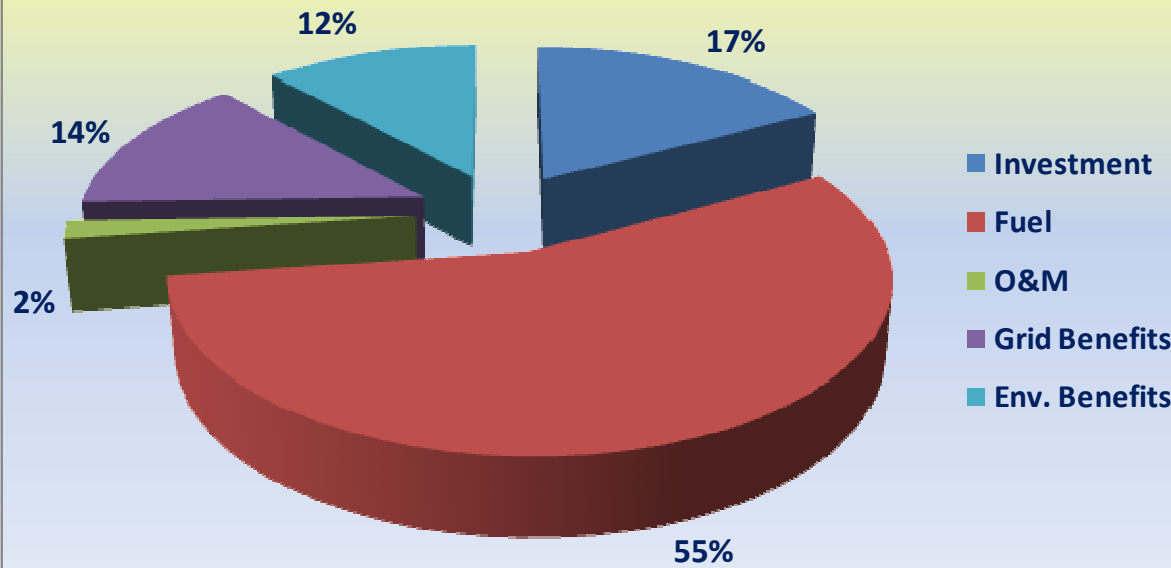


Considering the difficult situation of the financing sector, do you think this project can be easily financed in the market ?



I think so. The project internal rate of return induced by the level of the feed-in tariffs and the economical stability of the business assured by the duration of the remuneration system will help a lot in getting that financing you need ...

CHP Feed-in Tariff structure

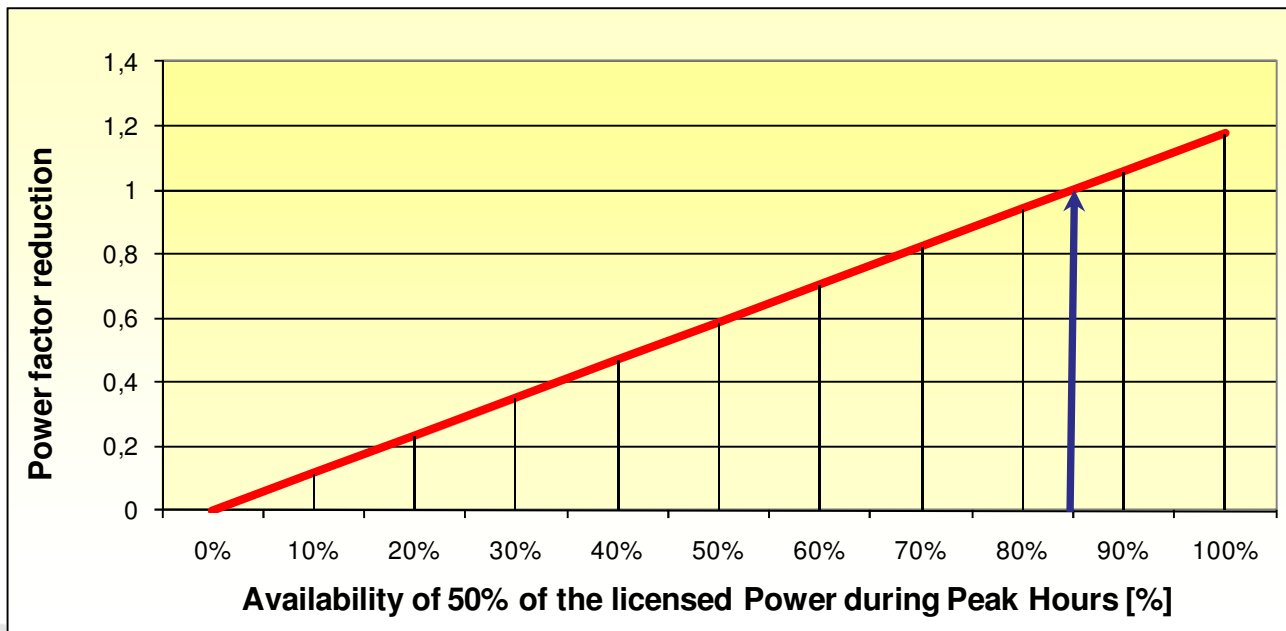


The feed-in tariff structure incorporates a payment of all the costs, including a fair return of the investment during its validity time

Will the remuneration of the investment be guaranteed, independently of the CHP unit availability ?



Of course not. That payment is only due if the CHP unit is giving power to the grid during peak hours ...

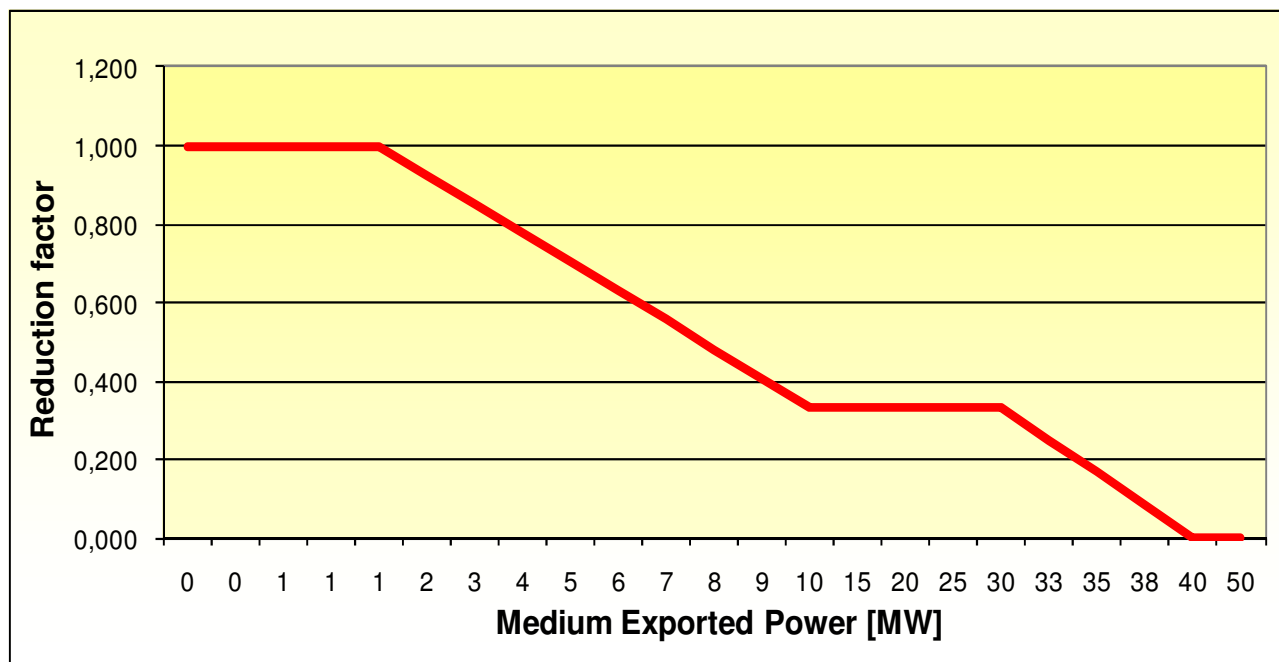


You need to give 50% of the licensed power, during 85% of the peak hours in a month, to receive all the investment remuneration.

As far as I can understand, CHP is a decentralized electricity production system that gives advantages to the grid. Are those benefits duly economically recognized in that feed-in tariff structure?



Yes. There is a payment for the grid costs avoided by the existence of decentralized CHP units ...

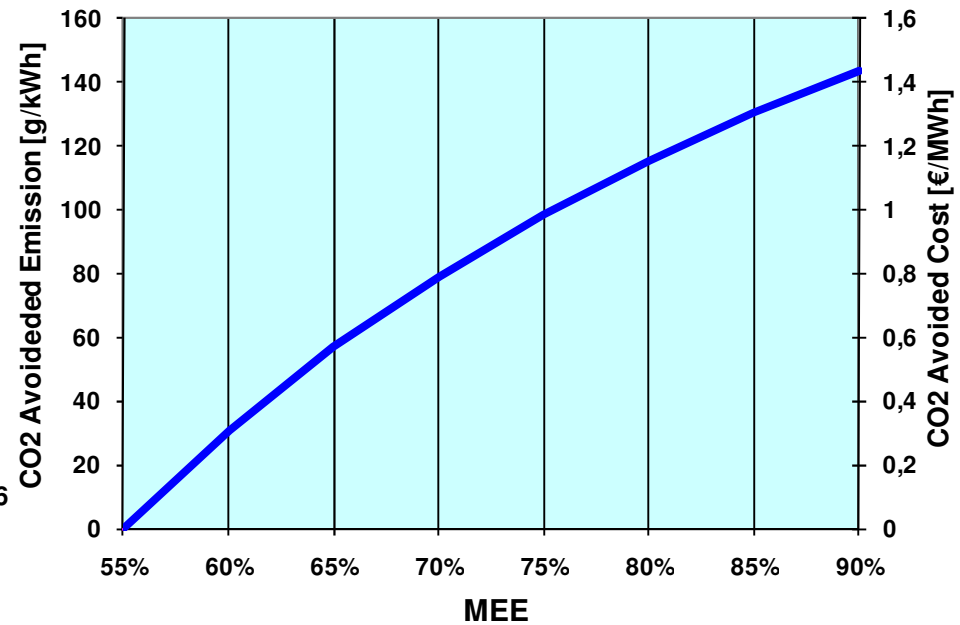
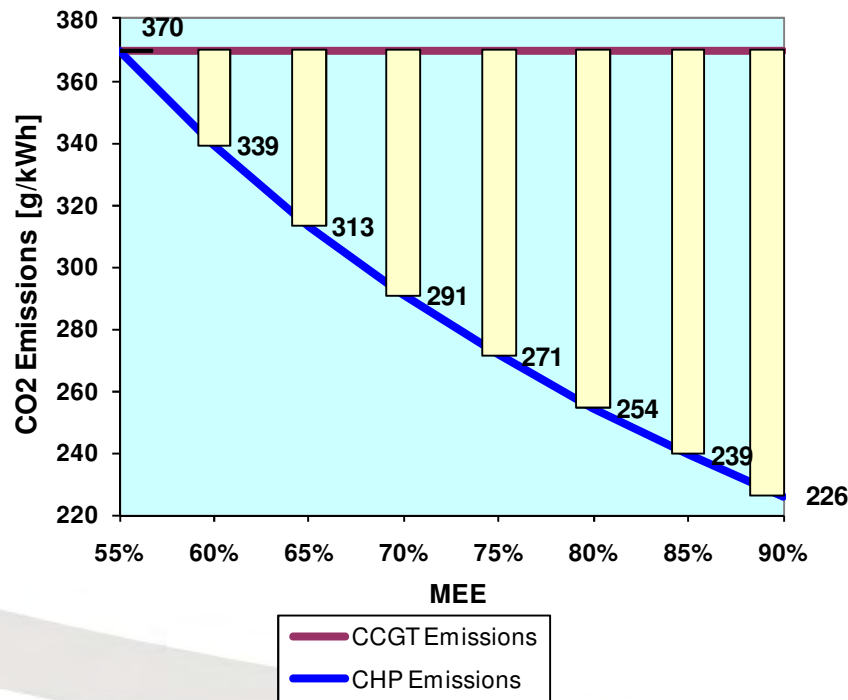


Furthermore, the existent rule is completely fair. As much power is exported by the CHP unit, less grid avoided cost are recognized in the feed-in tariff ...

Is there any connection between the environmental benefits incorporated in the feed-in tariffs and the real CO₂ emission avoided by the CHP unit ?



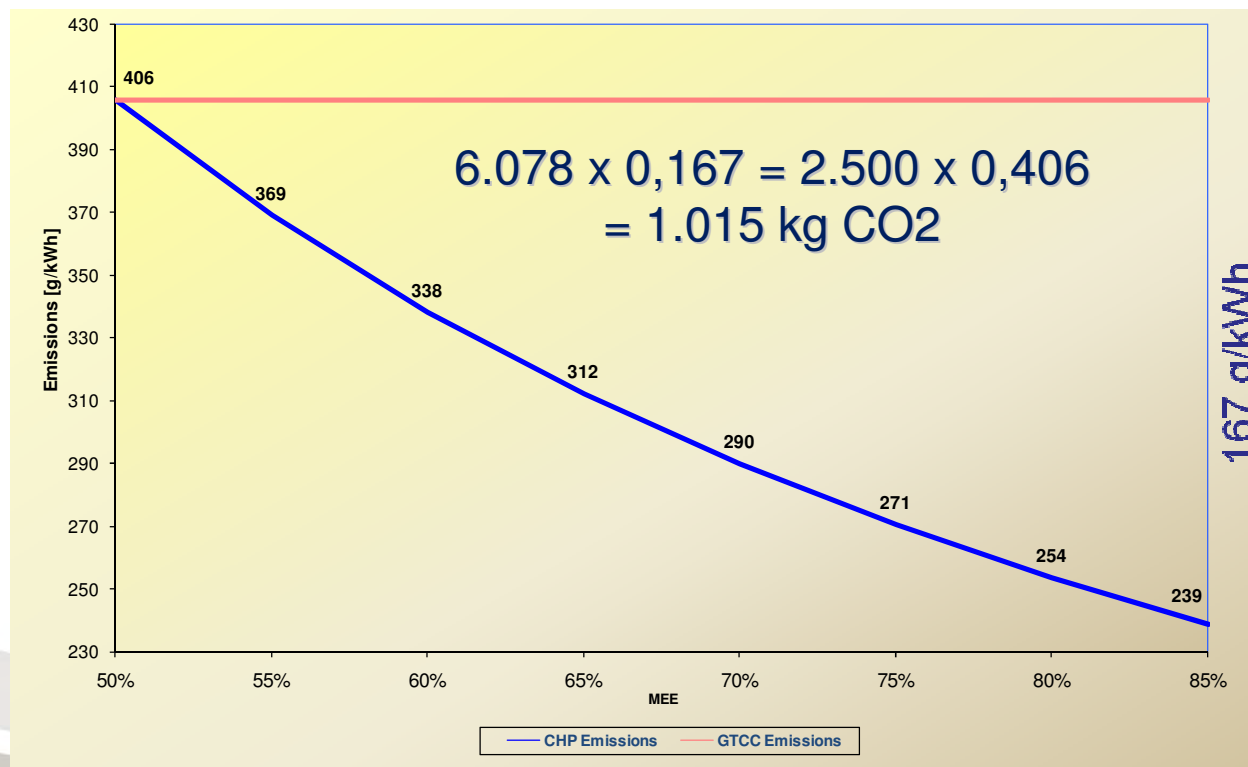
Yes. The avoided emission is obtained from the comparison between the real emission of each CHP unit and a CCGT with an EE of 55%.



Is it possible that the energy policy in favor of renewables will threaten all these positive rules that exist for CHP ?



It can happen but it shouldn't. As CHP saves Primary Energy, the existence of these units will reduce the CO2 emissions, which is always useful when the electrical sector continues to use fossil fuels to produce electricity...



A CHP with a MEE of 85%, working 6.078 h/year, will reduce the same quantity of CO2 emissions as a renewable project working 2.500 h/y

Can the transposition of the Directive affect, in any way, all the fundamentals that are supporting the existing legal framework and the CHP business?



It will affect , most probably, the way the CHP Projects will get their license. Besides that, some new requirements for the cogenerators will appear, mainly related with the obligation of feeding the European Union with homogeneous statistical data.

And what about any mandatory specific change regarding the remuneration system ?

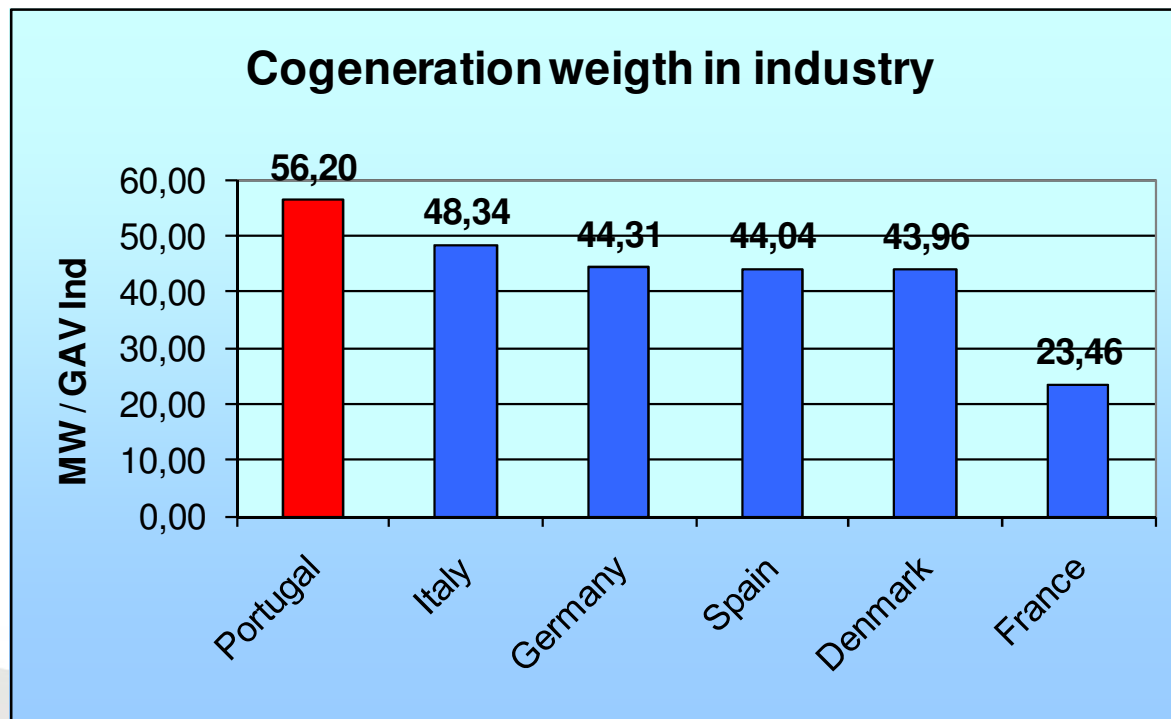
The Member States must guarantee they only apply support schemes to CHP Projects that can demonstrate a certain level of PES. The way they implement such schemes is not limited by the Directive. The Member States have the freedom to freely define the support policies they prefer to implement.



Are the Portuguese industrial companies, capable of installing CHP, normally available to do such investment ?



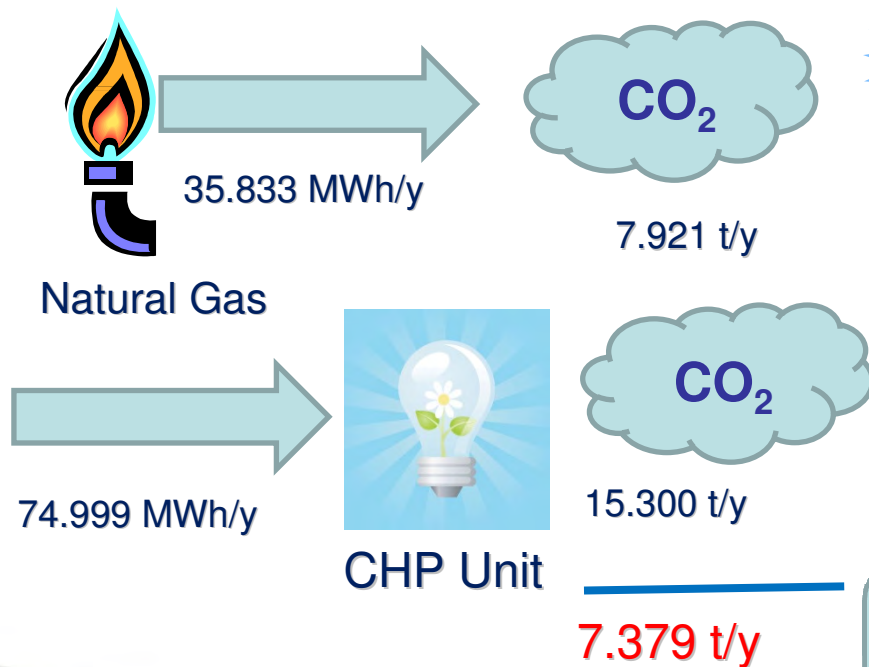
Portugal has one of the highest ratios of CHP installed Power by Gross Added Value in the industrial sector.



How can the European ETS affect the economical fundamentals of these CHP units ?



To understand what can happen in your site, remember the local NG consumption you have in your factory and the one you will achieve if you decide to install a CHP unit ...



You increase local CO₂ emissions because the CHP unit will produce electricity on site, which was previously generated somewhere else. The emissions savings can only be seen once you consolidate the thermal and electricity production activities ...

The problem is that ETS only controls emissions per site. And the new rules do not foresee any free allowances for cogenerated electricity ...

Even with that ETS risk and after all this discussion I'm convinced. Let's make that CHP project ...



For that you need to get a permission to interconnect your new project to the grid. But, for the moment, there is no interconnection capacity available for CHP.

When do you think that limitation be overcome ?

Hard to say.



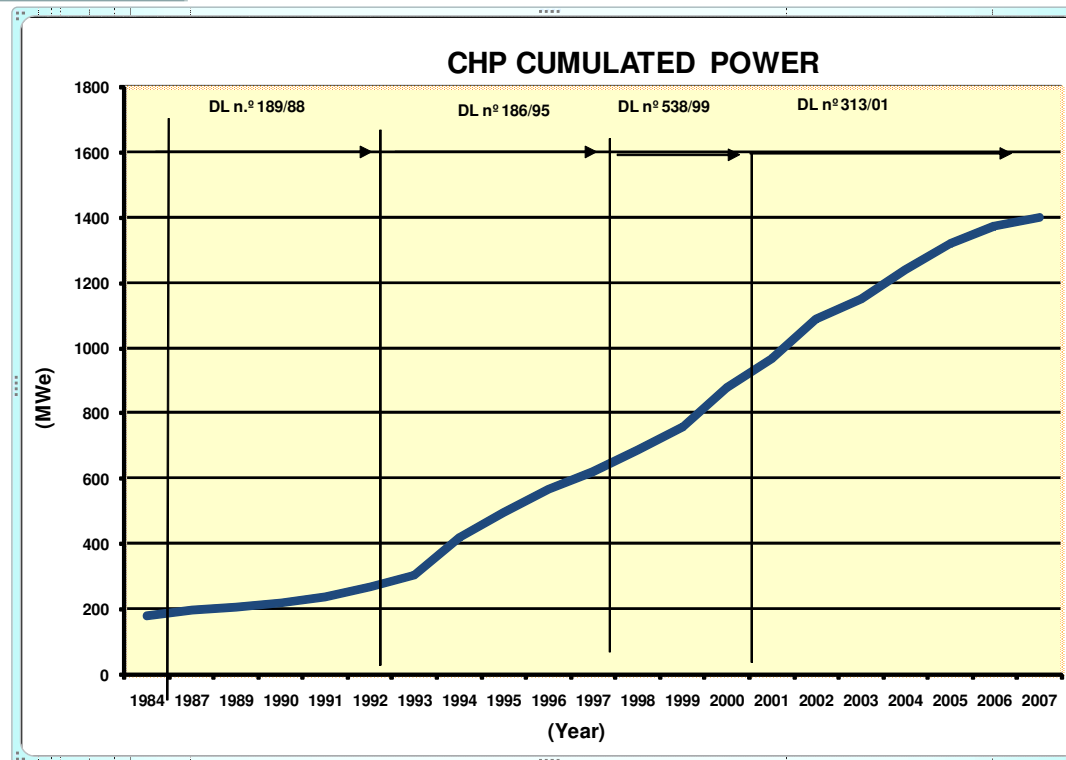
What do they need to solve the problem?

They say they need to make more investments to reinforce the grid reception capacity. But, in my opinion, a correct adjustment of the technical criteria that are being used to define the CHP interconnection maximum capacity would unblock that situation. But until something be done, the only solution is to wait ...

Interesting but a little disappointing in the end, this story. Are we really making progress in this challenge of promoting CHP as a good energy efficiency measure?



Something important was already done. But there is still a lot of work to do.



- The primary energy savings allowed by a CHP project are **almost exclusively related with the electricity production**
- The main driver to invest in a CHP project is the expectation of getting a **global energy invoice reduction** and not to save energy
- The Portuguese CHP remuneration system proved to be efficient enough to **give the economical stability** the investors need
- The ETS rules **can be a threat** to the CHP development in EU
- The grid interconnection capacity for new CHP projects is now the **most important barrier** to the CHP development in Portugal

**Thank you for the
attention you gave
to my presentation**