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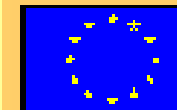
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Workshop "**HYLIGHTS**"
Strategies for successful hydrogen
implementation in the transportation sector



ITALIA

towards zero emission:

***via natural gas-hydrogen mix fuel to the
hydrogen economy***

***Regional Program Agreement for
Transport***

Berlin, May 16th, 2007

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H2-CNG regional project in Italy

- In the context of regional energy programs **Abruzzo, Toscana, Lombardia, Piemonte and Lazio**, together with University, Research Centers and industrial partners, developed a common strategy based on H2-CNG as bridging technology towards pure H2 in transport.
- To obtain national relevance the project will be submitted to the **Italian Minister of Environment and Territory** and the **European Commission for Energy And Transport**

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Triple focus

1. With H2-CNG we start the development of a H2 service station distribution network
2. Sustainable project cost which can be supported by the Regions
3. Through public-private partnership we build the entire H2 chain

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Open issues for H2-CNG

- european standards and guidelines for H2 distribution and storage
- safety standards with building provisions that allow for physical protection instead of distance in urban context
- definition of the fiscal treatment of H2
- self service in Italy also for customers of gaseous fuels to deliver better refueling possibilities while the station network will be limited
- european standards for hydrogen and mix fuel vehicle homologation and street use (actually only experimental vehicles may circulate on public roads in Italy)

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Key success factor for H2-CNG mix fuel

While CNG dampens the tendency of H2 to explode, H2 gives better ignition capabilities to CNG, thus resulting the combination more than its parts:

- Mix ratios of typical 30%-40% in volume (5-7% in mass) do not require physical modifications of the engine
- Horsepower rating remains nearly the same
- The actual CNG vehicle park might switch at least partially to H2-CNG
- CO2 emissions are reduced by 11% with respect to pure CNG (35% with respect to gasoline)
- CO and hydrocarbon emissions are reduced through better combustion and higher H2 fraction
- Vehicle range is reduced by only ca. 20%

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Economics of the H2-CNG project

Cost estimate:

- o For every **Region** the vehicle mini-fleet will initially cost about 300 -500.000 € (for 15- 25 vehicles)
- o For **FIAT**, about 1 mio € to develop a street-ready H2-CNG mix fuel vehicle
- o For **ENI divisione R&M**, the innovative part, that is the H2-CNG fueling equipment of the multifuel station, will cost about 1,2 mio €. These stations are ready for pure gaseous H2 fueling and can be built at added cost for liquid H2.

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Immediate action plan

- ❖ Incentivate the introduction in the Italian market of about **200 / 300 Eco Panda** triple fuel vehicles (gasoline, CNG, CNG-H2 mix) for urban transport in congested city centers
- ❖ Introduce in the Italian service station network **10 / 15 eco-compatible multifuel** service stations **for H2-CNG mix fuel**, open to the public, and ready for pure H2 fueling
- ❖ Build into these eco-compatible stations a distributed energy generation network from renewables, which can, at least partially, supply the energy for local H2 generation.



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- 1) Public transport companies will receive regional financing to realize CNG fueling stations for their vehicle park. Successively the CNG will be substituted by H2-CNG mix fuel.

- 2) The Abruzzo Region approved on 18/12/2006 (delibera regionale 1435):
 - installation of multi fuel service stations which integrated also H2-CNG mix fuels

 - realization local projects to alleviate atmospheric pollution in critical areas through low emission vehicles and plants

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Collesalveti multiEnergy – first italian hydrogen fueling station open to the public

Impianto Multienergy - Grecciano - Collesalveti (LI)

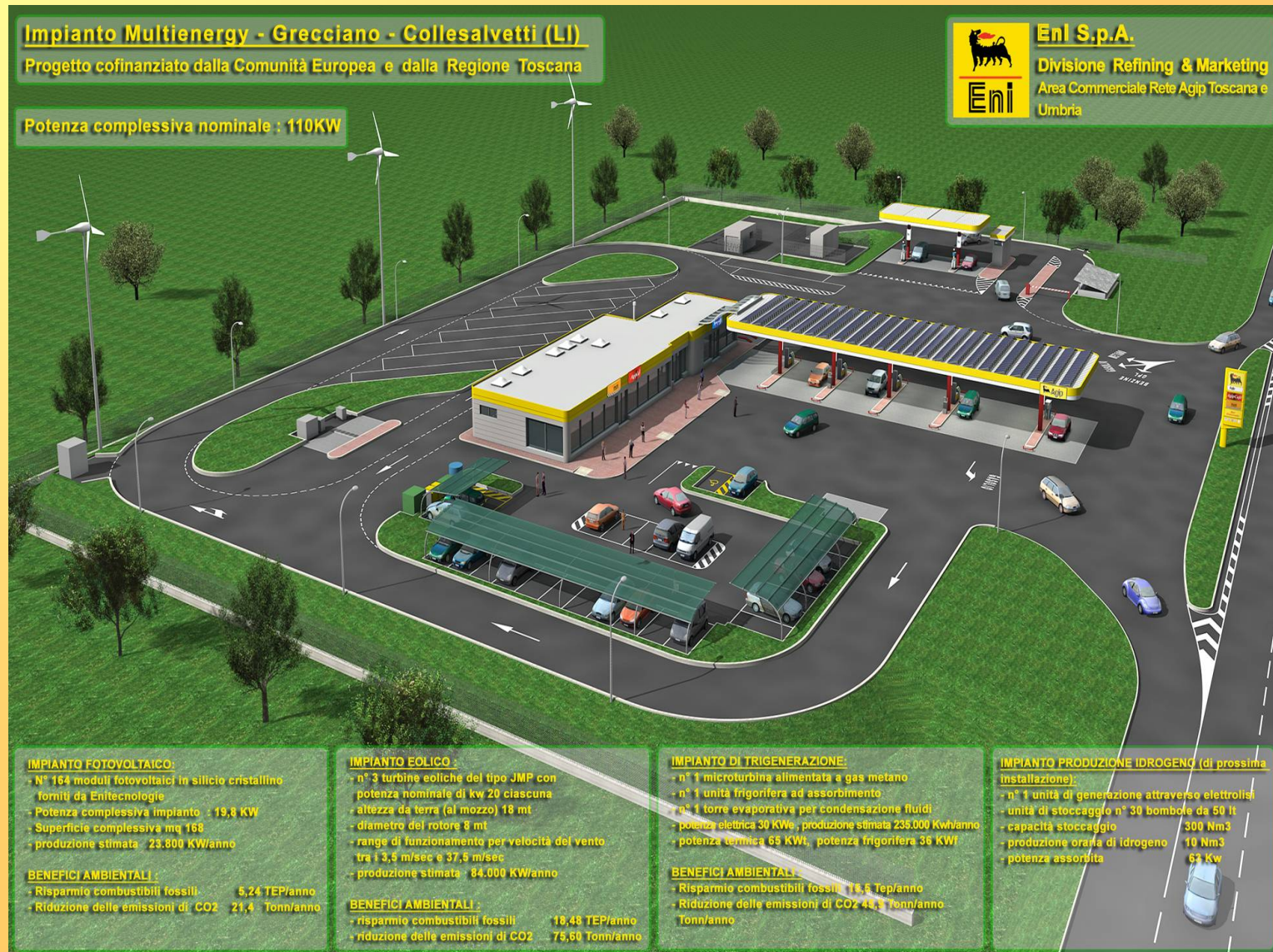
Progetto cofinanziato dalla Comunità Europea e dalla Regione Toscana



Eni S.p.A.

Divisione Refining & Marketing
Area Commerciale Rete Agip Toscana e
Umbria

Potenza complessiva nominale : 110KW



IMPIANTO FOTOVOLTAICO:

- N° 164 moduli fotovoltaici in silicio cristallino forniti da Enitecnologie
- Potenza complessiva impianto : 19,3 KW
- Superficie complessiva mq 168
- produzione stimata : 23.800 KW/anno

BENEFICI AMBIENTALI :

- Risparmio combustibili fossili : 5,24 TEP/anno
- Riduzione delle emissioni di CO2 : 21,4 Tonn/anno

IMPIANTO EOLICO :

- n° 3 turbine eoliche del tipo JMP con potenza nominale di kw 20 ciascuna
- altezza da terra (al mozzo) 18 mt
- diametro del rotore 8 mt
- range di funzionamento per velocità del vento tra i 3,5 m/sec e 37,5 m/sec
- produzione stimata : 84.000 KW/anno

BENEFICI AMBIENTALI :

- risparmio combustibili fossili : 18,48 TEP/anno
- riduzione delle emissioni di CO2 : 75,68 Tonn/anno

IMPIANTO DI TRIGENERAZIONE:

- n° 1 microturbina alimentata a gas metano
- n° 1 unità frigorifera ad assorbimento
- n° 1 torre evaporativa per condensazione fluidi
- potenza elettrica 30 KWe, produzione stimata 235.000 Kw/anno
- potenza termica 65 KWT, potenza frigorifera 38 KW

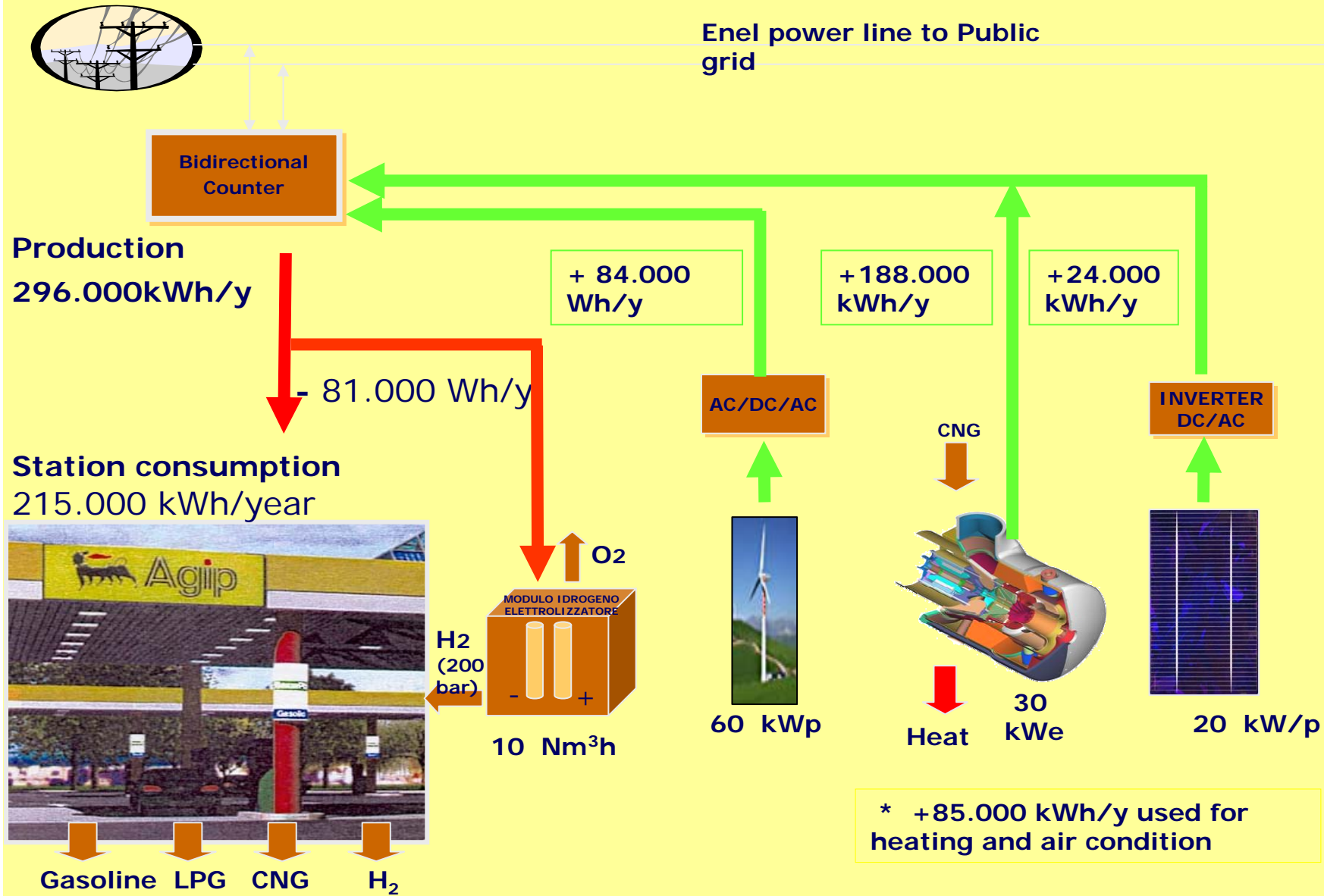
BENEFICI AMBIENTALI :

- Risparmio combustibili fossili : 14,5 TEP/anno
- Riduzione delle emissioni di CO2 48,3 Tonn/anno

IMPIANTO PRODUZIONE IDROGENO (di prossima installazione):

- n° 1 unità di generazione attraverso elettrolisi
- unità di stoccaggio n° 30 bombole da 50 lt
- capacità stoccaggio : 300 Nm3
- produzione oraria di idrogeno : 19 Nm3
- potenza assorbita : 67 Kw

Collesalvetti: energy balance



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Collesalvetti: environmental balance

	Energy Savings (tpe)	CO2 emission reduction (t)
Renewables	24	78
Cogeneration	15	47
Hydrogen		10
Total	39	135

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Contact Point

Marino Artusa

Energy and Environment Councillor
marino.artusa@regione.toscana.it

Regione Toscana
Italy

Franco Caramanico

Energy and Environment Councillor
franco.caramanico@regione.abruzzo.it

Regione Abruzzo
Via Passolanciano 75
Pescara
Italy

Iris Flacco

Manager Energy Region Abruzzo
iris.flacco@regione.abruzzo.it

Regional Energy Agency

araen@regione.abruzzo.it