ECHI-T

Large bio-ethanol project from Sweet Sorghum in China & Italy

Eng. Norbert Vasen

ETA Renewable Energies
Florence, Italy
Piazza Savonarola 10, I-50132
Tel. +39 055 5002174
Fax +39 055 573425
www.etaflorence.it
eta.fi@etaflorence.it

BIO-ENERGY
ENLARGED PERSPECTIVES

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Outline

- Project partners
- Project objectives
- Considered areas
- The sweet sorghum complex
- Configuration and schemes
- Amount of products
- Conclusions

Project partners

- ETA (Italy)
- COTEI (Italy)
- SIEMENS (Germany)
- WIP (Germany)
- BAFF (Sweden)
- DeltaT (US)
- ISCI (Italy)
- Sorghal (Belgium)
- EUBIA (Belgium)
- Energidalen (Sweden)
- Berwin Leighton Paisner (Belgium)
- C.A.R.E.I. (P.R. China)
- Beijing E&E Biomass Development L.t.d. (P.R. China)

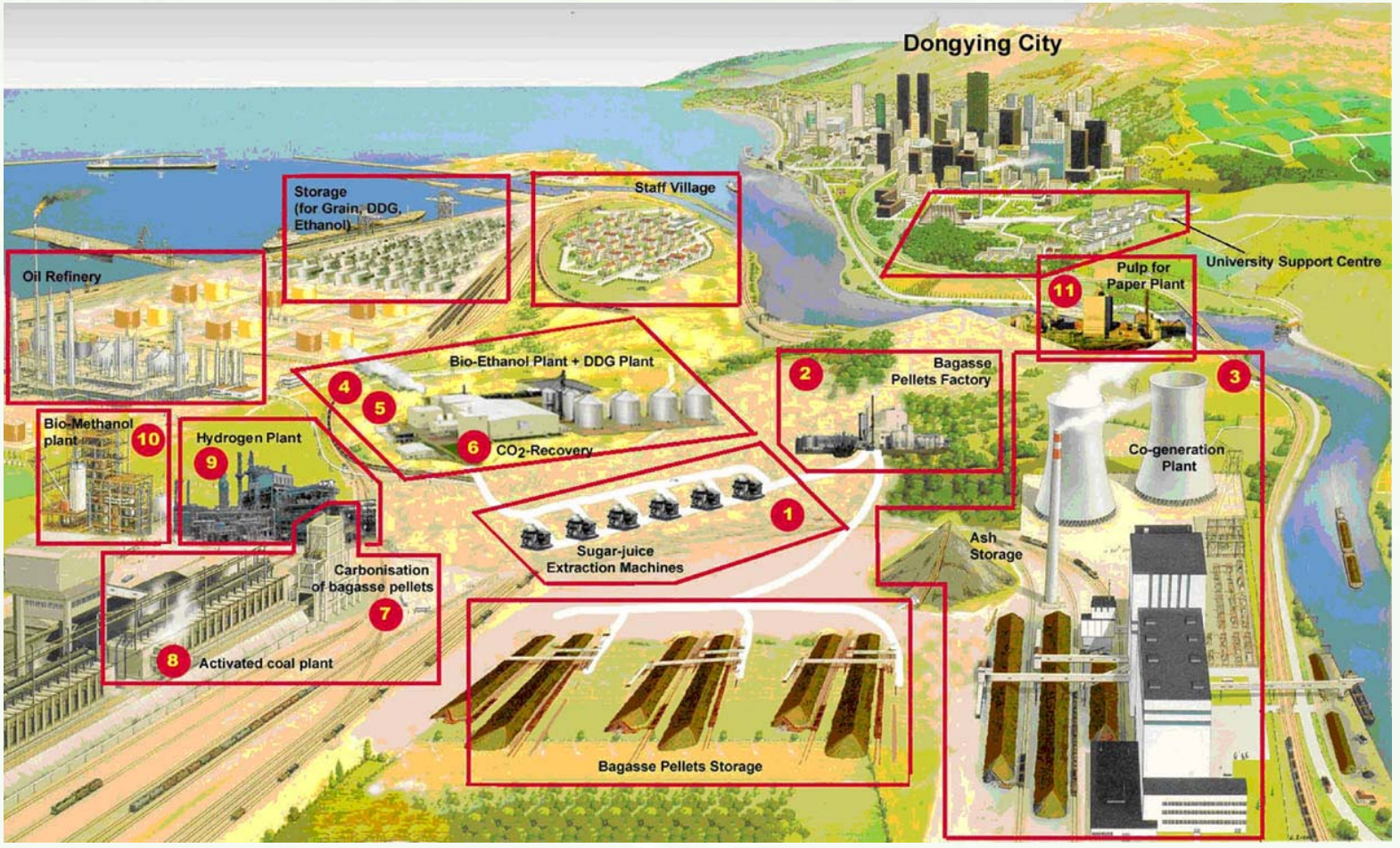
Italy
Germany
Sweden
Belgium
US
China

Main objectives of the project

- Sweet Sorghum variety selections, and evaluation of productivity
- Possible configuration (lay-out) and preliminary characteristics of the three complexes
- Available commercial technologies
- Prelim. main characteristics and dimensions
- Prelim. investment costs
- Logistics needed by the integrated complexes
- Costs associated to the Sweet Sorghum production
- Co-product values
- Techno-economic assessment in China and Italy

Considered areas

The sweet sorghum integrated complex



Dongying: Kenli refinery

Present capacity

- 500,000 t/y crude oil
- Diesel: 37% of prod.
- Gasoline: 17% of prod.

Plan for extension

- Increase to 1,500,000 t/y
- 100,000 t/y ETOH

Dongying: cogen plant

Present capacity

- 6 MWel
- Coal
  - 150 t/d
  - 200 RMB/t

Plan for extension to 12 MWel

Huhhot: Refinery

Present capacity

- 1,500,000 t/y crude oil
- Gasoline, Diesel, LPG, bitumen

Plans

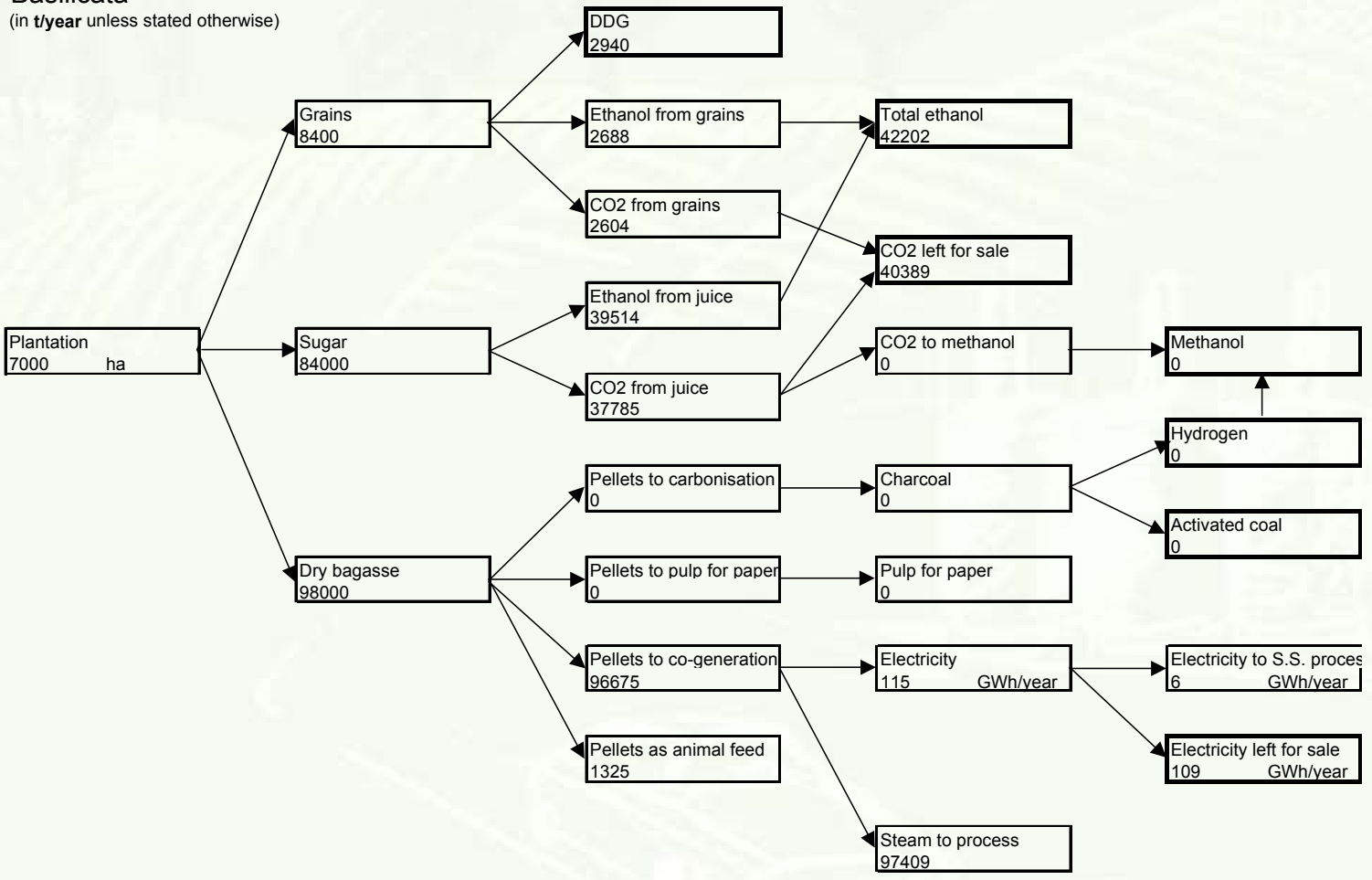
- 100,000 t/y ETOH

Configurations

Product:	*Basilicata*	*Dongying*	*Huhot*
Grains as animal feed			
DDG	*x*	*x*	*x*
Ethanol from sugar juice/grains	*x*	*x*	*x*
CO2 recovery	*x*	*x*	*x*
Bagasse pellets as animal feed	*x*	*x*	*x*
Electricity	*x*	*x*	
Heat	*x*	*x*	*x*
Charcoal			
Activated coal			
Hydrogen			
Methanol			
Pulp for paper			
Animal feed pellets mixture			

Schedule of quantities produced:
Basilicata

(in **t/year** unless stated otherwise)



= Products available for sale that leave the biomass-complex

Sweet Sorghum yields, cultivation areas

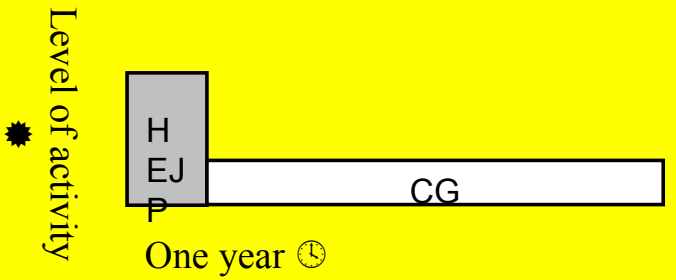
HEJP

Harveting
Extraction
Juice-to-ethanol-
Pelletisation

CG

Cultivation of SS
Grain-to-ethanol

	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Basilicata												
Dongying												
Huhot harvesting												
Huhot other												



Site	*Basilicata*	*Dongying*	*Huhot*
Variety	*Chinese 1, At623xRoma*	*M-81E*	*Tianpin 2*
Grain yield (t/ha)	*5*	*5.25*	*6*
Fresh stem yield (t/ha)	*70*	*75*	*60*
Sugar yield (t/ha)	*7*	*7.65*	*7.2*
Brix (%)	*16*	*17*	*20*
Bagasse yield (t dm/ha)	*17*	*15*	*10.2*
Size (ha)	*7,000*	*19,000*	*20,000*
Harvesting	*Aug., Sep., 2 months*	*Sep., Oct., 2 months*	*Oct., Nov., 2 months*

Products

Cultivated area and Feedstock				
	Basilicata	Dongying	Huhot (1x10)	Huhot (10 units)
Plantation (ha)	7,000	19,000	2,000	20,000
Grains (t/y)	8,400	99,750	12,000	120,000
Sugar (t/y)	84,000	145,350	14,400	144,000
Bagasse (t/y)	98,000	285,000	20,400	204,000
Product:	**Basilicata**	**Dongying**	**Huhot (1x10)**	**Huhot (10 units)**
Grains as animal feed				
DDG	2,940 t/y	34,913 t/y	4,200 t/y	42,000 t/y
Ethanol from sugar juice/grains	42,202 t/y	101,688 t/y	10,614 t/y	106,140 t/y
CO2	40,389 t/y	97,638 t/y	10,197 t/y	101,970 t/y
Bagasse pellets as animal feed	1,325 t/y	101,056 t/y	11,548 t/y	115,480 t/y
Electricity	106 GWh/y *9.5 SS proc* *93 for sale*	176 GWh/y *90 refin* *35 SS proc* *73 for sale* *22 from grid*	- 3.5 GWh/y	- 35 GWh/y
Heat	Process *66-1 t/h*	Process *116-16 t/h*	Process *10-2 t/h*	Process -

Technologies

Technology	Supplier	Capacity per unit	Investment per unit (Euro)
Harvesting	CLAAS Ventor	84 t/h	130,000
Extraction	Brazilian	50 t/h	135,600
Pelletisation	various	7 t/h (in) - 4 t/h (out)	672,000
Ethanol/DDG	Delta-T	Ethanol prod. from juice and grain – t/y Basilicata: 42,202 Dongying: 101,688 Huhot *(1x10)*: 10,614 DDG production – t/y Basilicata: 2,940 Dongying: 34,913 Huhot *(1x10)*: 4,200 CO2 prod. from juice and grain – t/y Basilicata: 40,389 Dongying: 97,638 Huhot *(1x10)*: 10,197	Basilicata: 96,383,800 Dongying: 137,663,000 Huhot *(1x10)*: 30,855,500
Co-generation	Siemens	Basilicata: 16.6 Mwel, Dongying: 28.2 Mwel Huhot *(1x10)*: 10,614 10.26 steam flow t/h	Basilicata: 30,000,000 Dongying: 50,000,000 Huhot *(1x10)*: 3-5,000,000

CONCLUSIONS

- The scheme is technically feasible, based on existing commercial technologies
- Integration with other crops to extend bioethanol production time and reduce investments
- Integrated juice extraction and pelletisation would be an advantage
- Economics are favourable in Basilicata & Dongying
- The integrated complex will have significant benefits form the environmental point of view, both production side and end use, and also in terms of local development and economic growth of the interested areas.

More information

A brochure about ECHI-T is available.

Please contact Gianluca Tondi or Norbert N. Vasen
ETA – Renewable Energies
Piazza Savonarola,10
50132 Florence, ITALY
Tel +39-055-5002174, Fax +39-055-573425
Email: norbert.vasen@etaflorence.it
or eta.fi@etaflorence.it
Web site: www.etaflorence.it