3rd Bio-Ethanol Conference
Etanolo di seconda generazione: una realtà in Italia
Second generation ethanol: a reality in Italy
BIO ETHERS
AN OPPORTUNITY
FOR 2ND GENERATION
BIO ETHANOL

Dr. Walter R. Mirabella – LyondellBasell Industries
"For legal reasons the names of the farmers, distillers, refiners, politicians, commissioners, fuels and lecturer have been changed."
Fuel-Ethers Manufacturing

- Wood
- Cereals
- Grapes
- Beets
- Canes

- Olefins
- MeOH
- EtOH
- Alcohols

- i-C₄
- MTBE
- ETBE
- Ethers

- i-C₅
- TAME
- TAAE
- Crude
- LPG
- Nat. Gas
- Nat. Gas
EU & Fuels: Relative Positioning

Primary Refining Capacity

Domestic Petrol Consumption

Domestic Diesel Consumption

Biodiesel Production Capacity

Fuel-Ethers Production Capacity
LyondellBasell ETBE Production Capacity (KT/Y)

**USA**
- **TEXAS**
  - CHANNELVIEW
  - 1300
  - 700

**EU**
- **FRANCE**
  - FOS SUR MER
  - 660

**NETHERLANDS**
- **BOTLEK**
  - 650

**TOTAL ETBE PRODUCTION CAPACITY** = 3310 KT/Y
**TOTAL ETHANOL-EQUIVALENT** = 1492 KT/Y
ETBE: Further Enhancing ETOH Performances

- Blending Volatility
- VOCs Emissions
- Octane Barrel Delivery
- CO₂ Emissions Reduction
- Crude-oil Replacement
- No Commingling
- Water Tolerance
- No Azeotrope
- Logistic Complexity
- Blend-stocks Value
- Butane Uptake/Upgrade
- Refining Flexibility
- Material Compatibility
COPERT 2010: VOC Reductions with ETBE

<table>
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<th>Country</th>
<th>EU-5, $\Delta_{VOC}(\text{ETBE-ETOH}) = 26593$ T/Y</th>
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<td>Italy</td>
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<td>EU</td>
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Source: Emissions and Health Unit - Institute of Environment and Sustainability - EC-JRC Ispra

“An assessment of the impact of ethanol-blended petrol on the total NMVOC emissions from road transport in selected countries”
Perché questi dannati gas Serra non se ne vanno attraverso il buco nello strato d'ozono?
ETBE Reduces CO₂ Emissions

**HART July 2007**

“The use of bio-ETBE reduces refining crude-oil need and processing intensity, requires less fuel and, implying relevant petrol composition changes, allows the reduction of carbon factor and lesser CO₂ emissions”

**CE-Delft October 2007**

“This study indicated that, when bio-ETBE is used, the resulting modification of refinery operations determine a significant reduction of greenhouse gases emissions”

**IFEU August 2008**

“Best results by far are obtained when ethanol is converted to bio-ETBE. The use of ETBE can allow the saving of 4 times the primary energy required to produce its fossil alternative. IFEU recommends to exploit the whole potential of bio-ETBE”
RED: Renewable Energy Share
Mandatory National Targets 2020

EU ≥ 20 %
Spain ≥ 20 %
France ≥ 23 %
Germany ≥ 18 %
Italy ≥ 17 %
UK ≥ 15 %
Netherlands ≥ 14 %

Minimum renewable energy share target by 2020 in transport = 10%
Minimum renewable energy share target by 2020 in **transport** = **10%**
Whereas:

9. The European Council of March 2008 repeated that it is essential to develop and fulfill effective sustainability criteria for biofuels and ensure the commercial availability of second-generation biofuels. The European Council of June 2008 referred again to the sustainability criteria and the development of second-generation biofuels;

66. The Community should take appropriate steps in the context of this Directive, including the promotion of sustainability criteria for biofuels and the development of second and third-generation biofuels in the Community;

89. When designing their support systems, Member States may encourage the use of biofuels which give additional benefits, including the benefits of diversification offered by biofuels made from waste, residues, non-food cellulosic material, ligno-cellulosic material;
Art. 21.2
For the purposes of demonstrating compliance with national renewable energy obligations placed on operators and the target for the use of energy from renewable sources in all forms of transport, the contribution made by biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material shall be considered to be twice that made by other biofuels.

Art. 22.1
Each Member State shall submit a report to the Commission on progress in the promotion and use of energy from renewable sources by 31 December 2011, and every two years thereafter. The report shall detail:

c. how, where applicable, the Member State has structured its support schemes to take into account renewable energy applications that give additional benefits in relation to other, comparable applications, but may also have higher costs, including biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material;

i. the development and share of biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material;
Art. 23.5
In its reports, the Commission shall, in particular, analyze:

e. the availability of biofuels made from waste, residues, non-food cellulosic material and ligno-cellulosic material

Art. 23.8
By 31 December 2014, the Commission shall present a report, addressing, in particular:

a. a review of the minimum greenhouse gas emission saving thresholds to apply from the dates ..., on the basis of an impact assessment taking into account, in particular, technological developments, available technologies and the availability of first and second-generation bio-fuels with a high level of greenhouse gas emission saving;

b. a review of

ii. an assessment of the feasibility of reaching the target whilst ensuring the sustainability of biofuels production in the Community and in third countries, and considering economic, environmental and social impacts, including indirect effects and impacts on biodiversity, as well as the commercial availability of second-generation biofuels;
FQD: GHGs Emissions Reduction Targets - Fuels

- Credits Purchasing (Clean Development Mechanism - CDM) 2%
- Carbon Capture & Storage (CCS) 2%
- Electric Vehicles 2%
- Bio-Fuels 6%
- Alternative Fuels
- Reductions Flaring/Venting at Production
Bio-Ethanol (equivalent) for Petrol: Italy 2010

National Law Mandatory Blending (3% e/e in 2010)

Ethanol Equivalent to Current Italian Domestic Ethers Production Capacity

Ethanol Equivalent to Current Ethers Import into Italy
Overcoming Barriers to Bio-Fuels Market Development

- Clear and consistent legislation
- Policies harmonisation
- Open market
- Technology neutrality
- Preserving flexibility
- Product portfolio
Conclusions

2\textsuperscript{nd} generation bio-ethanol greatly reduces CO\textsubscript{2} impact; by conversion into ethers it can synergistically, and significantly, increase, even further, petrol global GHGs emission performance.

Bio-ethanol ethers would, in addition, improve bio-ethanol technical performances and fungibility into engines and...
“Does anyone who actually listened to my speech have a question?”