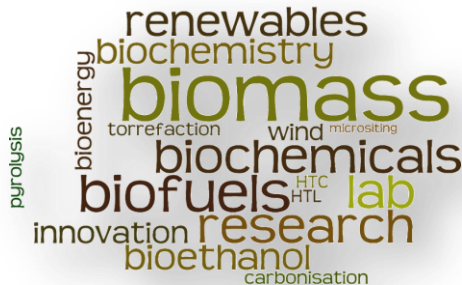


Le prospettive del *Coordinamento nazionale FREE*



David Chiaramonti
RE-CORD

Renewable Energy Consortium for
Research and Development
c/o Dept. of Industrial Engineering
Florence, Italy

Il Coordinamento FREE

Coordinamento Fonti Rinnovabili ed Efficienza Energetica



Raccoglie attualmente, in qualità di Soci, **24 Associazioni** in toto o in parte attive in tali settori, oltre ad un ampio ventaglio di **Enti** e Associazioni che hanno chiesto di aderire come Aderenti' (senza ruoli decisionali) ed è pertanto **la più grande Associazione del settore presente in Italia.**

FREE rappresenta infatti il **92%** delle entità attive nel settore e, attraverso i propri Soci, circa **4.000 aziende** che occupano **150.000 persone.**

- ✓ **Public-private no-profit research Institution**
- ✓ **Members:** Univ.of Florence (CREAR, Az.Agr.Montepaldi) Spike, Eta-Florence, Bioentech

- **R&D on Biomass, Bioenergy, Biofuels & Bioproducts**
- **Valorization of EU-IT know-how and young trained scientists**
- **Transfer of know-how and Innovation to Stakeholders**
- **Policy Development:** support to EU and National Institutions, Industry & Stakeholders
- **Dissemination and Communication**
- **Training & Education**



- **Milling & Briquetting unit** (100 kg/h)
- **Torrefaction/Carbonisation unit** (50 kg/h)
- **Methanation reactor**
- **Hydrothermal Liquefaction HTL** (12-15 l/h) **reactor** (with Spike)
- **Microreactor system** for hydrothermal carbonization & liquefaction
- **1.5 kg/h Intermediate Catalytic Pyrolysis**
- **Open-top twin-fire gasifier** (100 kg/h, 70-100 kW_e)
- **Downdraft Imbert-type gasifier** (10 kW_e)
- **Capstone Microturbine** converted to biofuels (30 kW_e)
- **Garret Microturbine** converted to biofuels (40 HP, 20 kW_e)
- **External Combustion Microgasturbine** (50-100 kW_e)
- **Pure Veg.Oil MicroCHP** (5 kW_e/10 kW_{th})
- **Pure Veg.Oil generators** (7 e 50 kW_e)
- **Anaerobic digestors** (2l-dynamic, BMP-static)
- **Algae pilot plants** (with DISPAA/F&M)
- **Solar simulator for algae** (SOSIA)

Coordinamento FREE
Lungotevere dei Mellini 44
Roma - Tel. 06 - 42014701
www.free-energia.it
mail: info@free-energia.it



Laboratory fully dedicated to
Biomass, Bioenergy, Bioproducts



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INSTRUMENTS AND ANALYTICAL LABORATORY RE-CORD

RE-CORD system provides the skills and resources (laboratories and equipments) of its members, creating a critical mass capable to develop research and activities of primary-level science and technology.

Main analytical chemistry laboratory equipment

Strumentazione

- Atomic Absorption
- HPLC and GC-MS
- Ion chromatography
- Portable Micro GC
- CHNS
- TGA
- Viscometer
- Hydrometer
- Karl Fischer and Electrochemical analysis Instrumentation
- Chemical fume hood
- Biohazard Hood
- Calorimeter
- Ash melting furnace
- Ultrapure Water System
- Vacuum Filtration System
- Hydrogen Generator
- Centrifuge
- Muffle furnace
- Moisture Analyzer

Possible applications

- Determination of metals contamination on food, beverages, land. Quality control of industrial products, paints, ceramics, glass. Environmental Analysis (Particulate matter, sewage sludge), clinic analysis...
- Analysis of liquid fuels, biological molecules, quality control on chemical products and pharmaceutical organic pollution analysis
- Analysis of water, separation of amino acid mixtures
- Analysis of soils, solid chemical or biological materials
- Recognition of substances, thermal decomposition of organic molecules, polymers and inorganic species study

Main instruments solar and wind laboratory

- Pyrheliometer for direct solar radiation
- Verification and testing photovoltaic systems and three-phase multipurpose tool
- Anemometry tower (30 m)

Other instruments

- Gaseous emissions analysis tool
- Analysis of flows in pipes
- Doppler effect 2D-3D speed measuring tool

Pilot and demo plants

- Several bio-fueled microturbines
- Cogeneration / liquid fuel engines
- Gasifier
- Pyrolyzer / torrefaction roaster

BET Analyzer, NDIR/Electrochem.Producer Gas Analyzer, Portable MicroGC Gas Analyzer, Portable Tar sampling collection system

1962-2017..
Molto è
cambiato da
allora..



1962 Life Magazine

EACH DAY HUMBLE SUPPLIES ENOUGH ENERGY TO MELT 7 MILLION TONS OF GLACIER!

This giant glacier has remained unmelted for centuries. Yet, the petroleum energy Humble supplies—it converted into heat—could melt it at the rate of 80 tons each second! To meet the nation's growing needs for energy, Humble has applied science to nature's resources to become America's Leading Energy Company. Working wonders with oil through research, Humble provides energy in many forms—to help heat our homes, power our transportation, and to furnish industry with a great variety of versatile chemicals. Stop at a Humble station for new Enco Extra gasoline, and see why the "Happy Motoring" Sign is the World's First Choice!

HUMBLE
OIL & REFINING COMPANY
America's Leading Energy company

ENCO
Happy Motoring

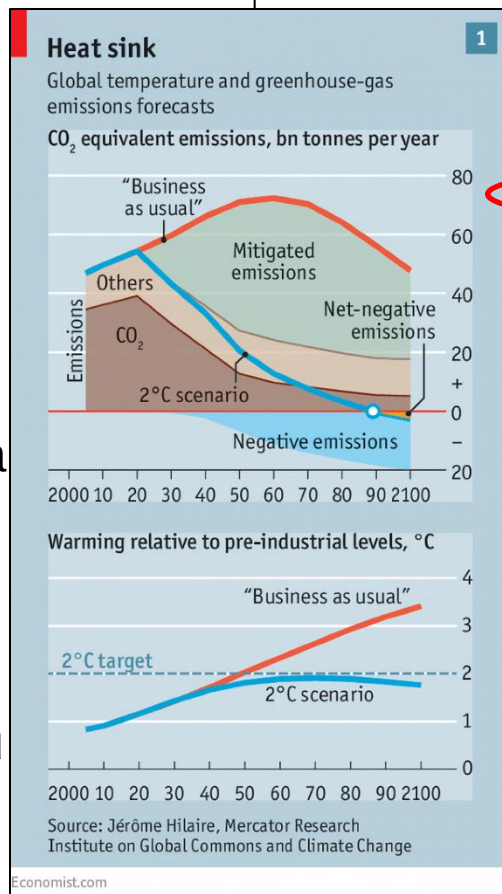
WEO-2015 550 G\$ annual fossil subsidy
is 4 x the support of renewables

Carbon NEGATIVE

La sfida

Da Parigi-COP21 il mondo della scienza ha chiesto di sviluppare azioni **C-negative**.

Ad oggi si è preferito la strada **C-neutral** essendo semplicemente una strada a costi più ridotti ... **ma non più sufficiente!**



Sucking up carbon

Greenhouse gases must be scrubbed from the air

Cutting emissions will not be enough to keep global warming in check



Print edition | Briefing >

Nov 16th 2017 | BONN

[...] No scenarios are at all likely to keep warming under 1.5°C without greenhouse-gas removal. "It is built into the assumptions of the Paris agreement," says Gideon Henderson of Oxford University. [...]

Materie prime residuali per energia e bioprodotti, agricoltura inclusa

- Un grande quantitativo di residui è disponibile in EU
- Attenzione sempre maggiore a queste materie prime
- Cascade approach: una opportunità ma anche una sfida
- Competizione tra materie prime e complementarietà tra bioenergie e bioprodotti (identificare i benefici mutui)
- Sviluppo di politiche integrate: necessario, assieme a prioritizzare le scelte nel BP.... Green Economy/Bio-based products? Bioelettricità? Decarbonizzazione trasporti? Calore/CHP?
- I sistemi si configurano in modo diverso in funzione del mercato principali
- Attori e Stakeholders devono essere commisurati al mercato
- Importante: portare valore al settore primario

Residui ampiamente disponibili in EU



Altre fonti (2015) stimano **105 Mt/y** di biowaste prodotti annualmente in EU, 1/3 dei quali valorizzato in AD (**35 Mt/y**), 2/3 non ancora utilizzati (**70 Mt/y**)

Meyer-Kohlstock D, Schmitz T, Kraft E. Organic Waste for Compost and Biochar in the EU: Mobilizing the Potential. Resources 2015, 4, 457-475; doi:10.3390/resources4030457

....In ogni caso vi sono residui e particolari classi di rifiuti disponibili nell'ordine di centinaia di migliaia di t/y in EU....

- In totale son stati stimati **900 Mt/y** di waste&residues in EU, un quarto dei quali disponibili per energia, cioè circa **220 Mt/y**.
- Potenziale tecnico se convertiti in **biocombustibili per trasporti: 16% dei combustibili stimati al 2030**



FORSU & Compost

Il caso ITALIANO (source: Consorzio Italiano Compostatori, www.compost.it)

✓ **6.71 Mt/y rifiuti organici** recuperate (2015) su **~9 Mt/y** (su 14 Mt/y RD)

➤ **4 Mt/y FORSU** + **2.71 Mt/y rifiuti Verdi** ($66+34=100$ kg/pers/y)

✓ **1.761.000 t/y** compost prodotto ed utilizzato in agricoltura.

➤ **71%** da compostaggio di FORSU, **29%** da AD + composting

✓ **Digestione Anaerobica: ~1700 plants** realizzati (agricoltura + sewage + waste + industrial) (source: L.Maggioni/CIB, 2017)





Complessità e Market uptake:

La scala è importante....

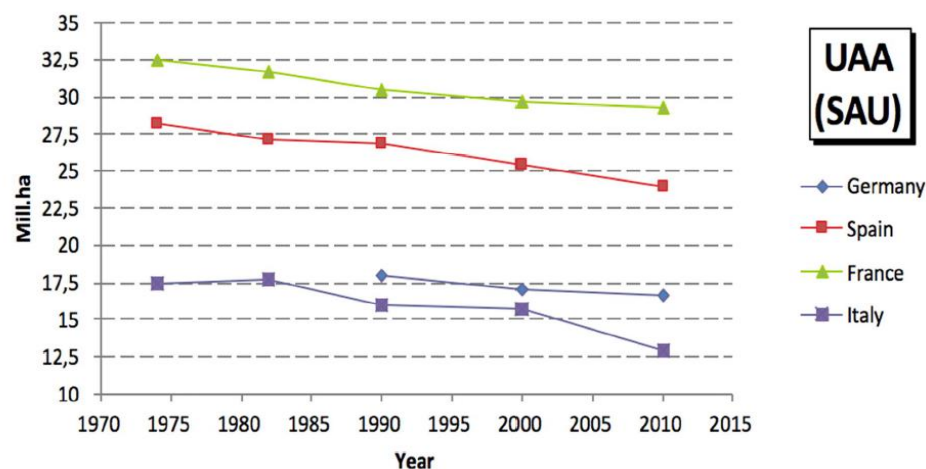


- Industrial Biorefining può essere *Fuel*- o Product-oriented
- Scala & Volumi, Complessità Tecnologica, CAPEX/OPEX & Mercati variano di conseguenza
- Gli operatori devono confrontarsi con Tecnologia e Mercati per avere un business di successo
- Gli aspetti finanziari variano considerevolmente nei diversi casi
- Maggiore complessità attraverso la integrazione Bio- and Thermo-processing (nuove rotte di process)
- La scala conta

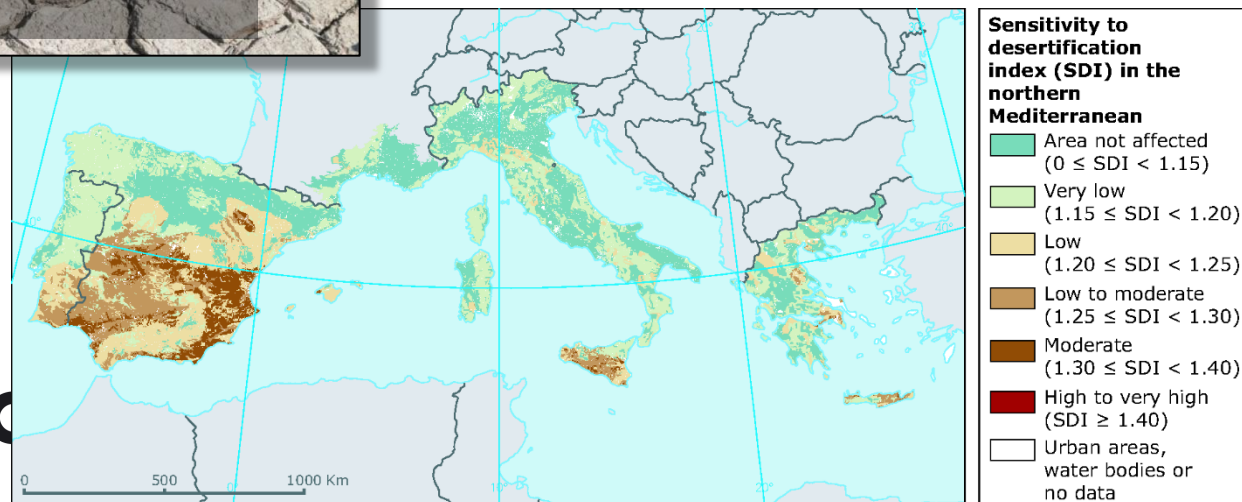
Il caso del biochar in Agricoltura nell'area MED: Potenziale Significativo.

- EU MED è in via di desertificazione
- BIOCHAR: può avere un ruolo importante per aumentare la resilienza dei suoli al Climate Change
- Integrazione con AD e compostaggio: win-win
- Controllo della filiera

EU MED: 8.5 Mha aree marginali, (source: S2Biom)



Source EUROSTAT

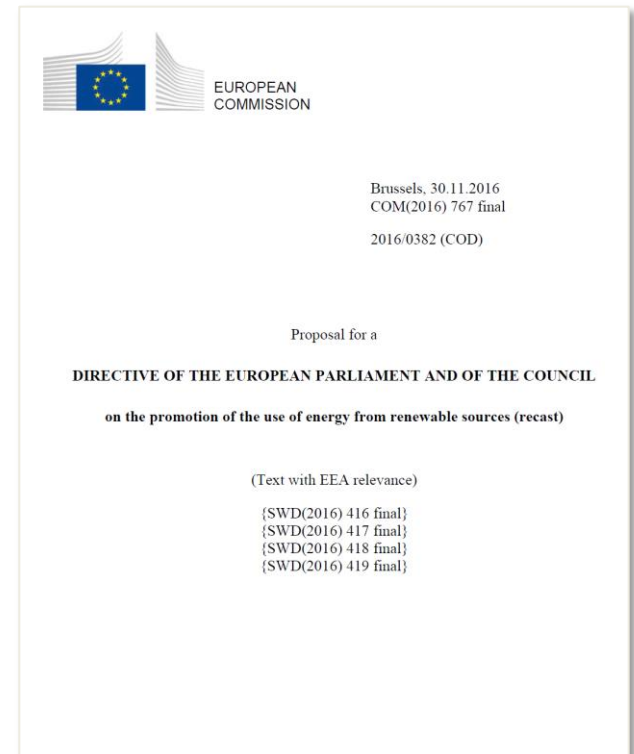




La nuova Direttiva REDII



- E' in discussione al Parlamento EU e poi al Consiglio la proposta di Direttiva REDII
- Regolerà questo tema nel periodo 2020-2030
- I biocombustibili avanzati saranno lì definiti (biomasse residuali)
- Integrazione con Bioeconomia e con Agricoltura



DIRECTIVE (EU) 2015/1513 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 9 September 2015

amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources

(Text with EEA relevance)

15.9.2015

EN

Official Journal of the European Union

I

(Legislative acts)

DIRECTIVES

DIRECTIVE (EU) 2015/1513 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 9 September 2015

amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof in relation to Article 1(3) to (13) and Article 2(5) to (7) of that Treaty,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee,

After consulting the Committee of the Regions,

Acting in accordance with the ordinary legislative procedure⁽¹⁾,

Whereas:

(1) Pursuant to Article 3(4) of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, Member States are to ensure that the share of energy from renewable sources is at least 10 % of the final consumption of energy in transport in that Member State by 2020. The methods available for Member States to meet this target, as set out in Directive 2009/28/EC, also stresses the need for energy efficiency in transport. It is because a mandatory percentage target for energy from renewable sources is difficult to achieve sustainably if overall demand for energy for transport is high that the importance of energy efficiency also for greenhouse gas emissions in transport is stressed. The Commission is encouraged to include more detailed information on energy efficiency in transport in their reports to be submitted in accordance with Annex IV of Directive 2009/28/EC and the Council⁽²⁾ and other Union legislation with a view to improving energy efficiency in the transport sector.

⁽¹⁾ OJ C 198, 10.7.2013, p. 56.

⁽²⁾ Position of the European Parliament of 11 September 2013 (not yet published in the Official Journal) and decision of the Council of 13 July 2015.

⁽³⁾ Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and subsequently repealing Directives 2001/77/EC and 2003/54/EC.

⁽⁴⁾ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on the efficiency of energy use and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

ANNEX IX

Part A. Feedstocks and fuels, the contribution of which towards the target referred to in the first subparagraph of Article 3(4) shall be considered to be twice their energy content:

- (a) Algae if cultivated on land in ponds or photobioreactors.
- (b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under point (a) of Article 11(2) of Directive 2008/98/EC.
- (c) Bio-waste as defined in Article 3(4) of Directive 2008/98/EC from private households subject to separate collection as defined in Article 3(11) of that Directive.
- (d) Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, and excluding feedstocks listed in part B of this Annex.
- (e) Straw.
- (f) Animal manure and sewage sludge.
- (g) Palm oil mill effluent and empty palm fruit bunches.
- (h) Tall oil pitch.
- (i) Crude glycerine.
- (j) Bagasse.
- (k) Grape marcs and wine lees.
- (l) Nut shells.
- (m) Husks.
- (n) Cobs cleaned of kernels of corn.

ANNEX IX - Definizione di Combustibili Avanzati: solo in base alla materia prima

- (o) Biomass fraction of wastes and residues from forestry and forest-based industries, i.e. bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil.
- (p) Other non-food cellulosic material as defined in point (s) of the second paragraph of Article 2.
- (q) Other ligno-cellulosic material as defined in point (r) of the second paragraph of Article 2 except saw logs and veneer logs.
- (r) Renewable liquid and gaseous transport fuels of non-biological origin.
- (s) Carbon capture and utilisation for transport purposes, if the energy source is renewable in accordance with point (a) of the second paragraph of Article 2.
- (t) Bacteria, if the energy source is renewable in accordance with point (a) of the second paragraph of Article 2.

Part B. Feedstocks, the contribution of which towards the target referred to in the first subparagraph of Article 3(4) shall be considered to be twice their energy content:

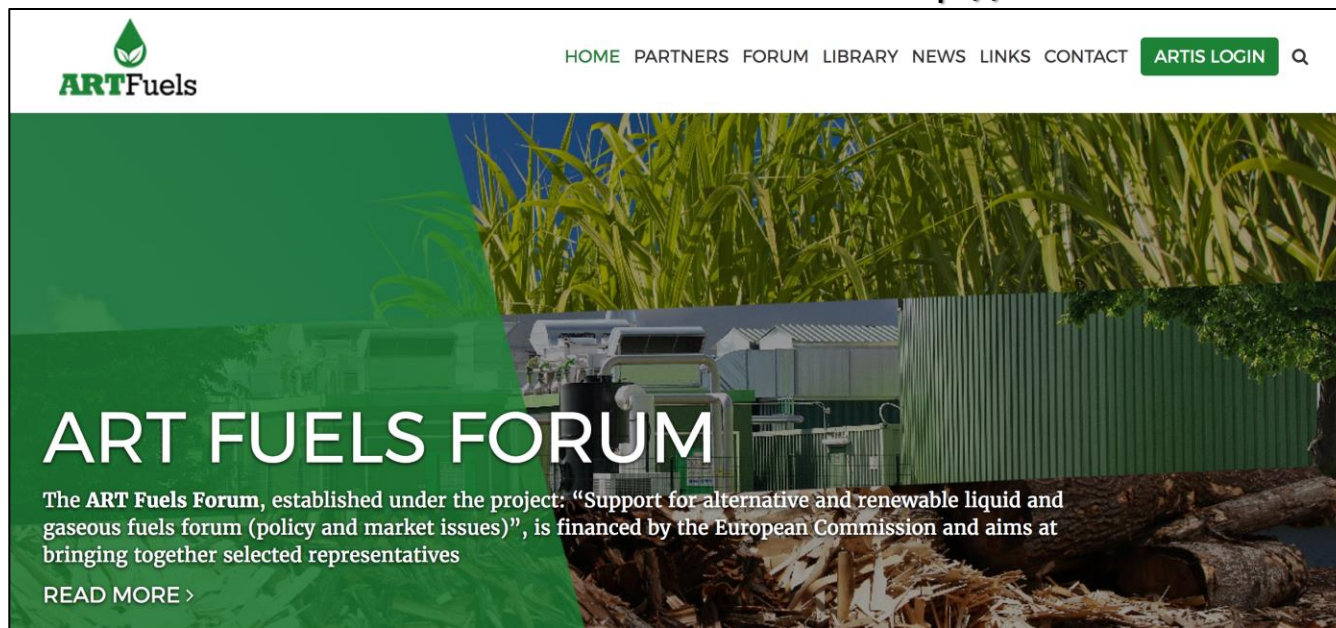
- (a) Used cooking oil.
- (b) Animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009 of the European Parliament and of the Council^(*)

^(*) Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation) (OJ L 300, 14.11.2009, p. 1).

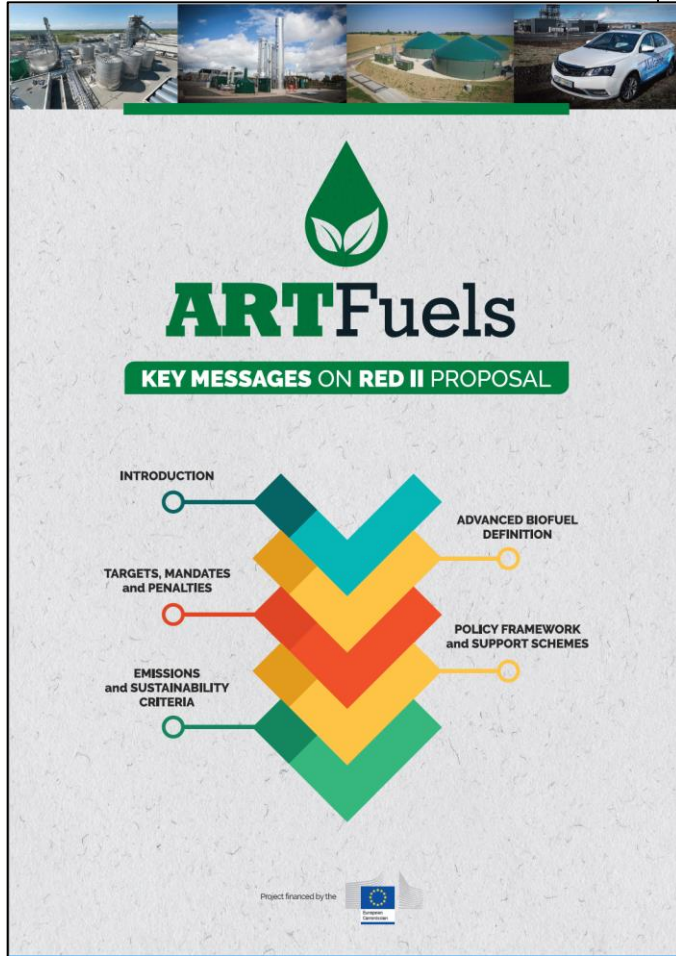
ART Fuels Forum

- Alternative and Renewable Fuels Forum – supportato da EC-DG Energy
- FOCUS: Market & Policies post 2020 (to 2030).
- ~ 100 partecipanti (Members, Affiliate, Observers).

<http://artfuelsforum.eu/>



Key Messages industrie



ART Fuels

KEY MESSAGES ON RED II PROPOSAL

INTRODUCTION

TARGETS, MANDATES and PENALTIES

EMISSIONS and SUSTAINABILITY CRITERIA

ADVANCED BIOFUEL DEFINITION

POLICY FRAMEWORK and SUPPORT SCHEMES

Project financed by the



ART Fuels www.artfuelsforum.eu Financed by the  European Commission

KEY MESSAGES FROM Alternative Renewable Transport Fuel Forum Teams on REDII proposal

ART Fuel Forum (AFF)	Consolidated Key Messages on REDII – SECTOR SPECIFIC
Scientific Coordinator	David Chiaramonti

SECTOR-SPECIFIC KEY MESSAGES
(listed not in order of importance but according to AFF team numbering)

sectorial teams provided comments on REF II on a general basis, but some teams - as listed below - provided additional messages, specific to the main focus of these teams (also named sectorial working groups).

Large Scale Deployment - For large scale production of pyrolysis oil and its applications in the transport sector, the whole ecosystem (technology, sustainability, finance, economics, legislation, logistics, organisation, etc.) should be properly addressed.

CO-PROCESSING - Co-processing of pyrolysis oil in existing and new refineries (including co-hydrotreating) is possible. Interesting and competitive solutions are within reach and RTD and investment programs should be facilitated to investigate, further develop, demonstrate and roll-out integrated pyrolysis oil oil processing and upgrading.

STAND-ALONE PYROLYSIS OIL BASED REFINERIES - Beside the parallel development of co-refining limited amounts of pyrolysis oil in existing or new refineries, a program for stand-alone pyrolysis oil based refineries needs to be developed to overcome the initial investment barrier for oil majors. The not-profitable CAPEX being assessed at some hundreds of million Euro's.

Chemical

ETHERS-RELATED MEASURES - REDII should encompass the deployment potential of the recently developed "100% bio-ethers" chain. REDII should be the proper occasion to revise the portion of the Annex III and Annex V of RED1 relevant to Fuel-Ethers.

Lipid-based biofuels

ADVANCED BIOFUEL DEFINITION - The definition of Advanced Biofuels elaborated by SGAB and endorsed by AFF, as reported at General Section point 2, is welcome, in particular given the relevance of waste and residue material for the lipid-based biofuel sector.

CAP ON ANNEX IX-PART B TO BE REMOVED - The cap on Annex IX part B should be removed as it is a counter-productive proposal that can only restrict the use of development of the waste-based production facilities and act as an inhibitor to investment in new waste streams. The ILUC directive has promoted the use of Annex IX part B biofuels, which has led into industry investments. These biofuels should be included into advanced biofuel definition (as SGAB advanced biofuel definition does).

exergia ENERGY & ENVIRONMENT CONSULTANTS
Oronzo Sirri & Vissarona 1, 10672 Athens (GR)
Tel: +30 210 6966185, e-mail: office@exergia.gr

RE-CORD RE-CORD, c/o Dept. of Industrial Engineering,
University of Florence, Viale Morgagni 40, 50134 Florence (IT)
Tel: +39 055 2756600, e-mail: info@re-cord.org

ART Fuels www.artfuelsforum.eu Financed by the  European Commission

KEY MESSAGES FROM Alternative Renewable Transport Fuel Forum Teams on REDII proposal

ART Fuel Forum (AFF)	Consolidated Key Messages on REDII – INTERNATIONAL
Coordinator	David Chiaramonti

KEY MESSAGES FROM THE INTERNATIONAL PERSPECTIVES

International

Biomass - There should be more emphasis on supplying biomass. It feels that in the REDII biomass is a given and it is assumed that it will be there and available. However, the document focuses on all types of energy going from heat, cold, electricity up to liquid and COLD. A mechanism should be established in order to help the industry that will be left for the production of ART fuels to have access to biomass at a fair price. Considering that these biorefineries will be 3-5 times the OPEX of first generation it would be very detrimental for them to pay disproportionated prices for biomass. There is concern that biomass will be available and at a good price is a huge mistake and without biomass, there is no fuel (unless e-fuels rise dramatically).

E-fuels - The answer may be as simple as carbon tax. If you add a carbon tax you penalize the oil and natural gas industry. Of course, the consumers will end up paying for this but the idea that these funds needs to be invested back into renewables in order to help them make out of the economics of advanced renewable transportation fuels. In Canada, price of oil should reach 50\$/tonne in 2022, this mechanism could be very beneficial, especially to technologies such as e-fuels where CO2 will become a negative value feedstock. The idea to ask for carbon tax the more you can invest back into new technologies. It will be a painful transition which will require a close interaction with the population that will be paying for this. However, carbon tax should be reduced once the objectives are met.

Policy - The point on the policy and in that sense I agree with the SGAB report that there should be gradual transitions between the first and second generation biofuels. First generation biofuels are essential to reach the GHG reduction objectives. Hence it would be a big mistake to remove them aside right away. Overall, the main message is to penalize carbon emission to support production options.

Technology - Funding should be reviewed by teams of external reviewers that will ensure the project make sense prior to fund them. Following biomass supplies I think this may be one of the most problematic aspect assuming that policy is settled.

Timeline

permitting periodic revision of goals and targets on a time horizon of less than 15 years leading to investment. Projects breaking ground in 2020 will not start generating revenues

exergia ENERGY & ENVIRONMENT CONSULTANTS
Oronzo Sirri & Vissarona 1, 10672 Athens (GR)
Tel: +30 210 6966185, e-mail: office@exergia.gr

RE-CORD RE-CORD, c/o Dept. of Industrial Engineering,
University of Florence, Viale Morgagni 40, 50134 Florence (IT)
Tel: +39 055 2756600, e-mail: info@re-cord.org



Conclusioni

- La Bioeconomia, I Bioprodotti, le Bioenergie, le Bioraffinerie, i sistemi rinnovabili integrati sono un elemento centrale di una moderna strategia di riduzione dei gas serra e dello sviluppo sostenibile
- A breve FREE costituirà un gruppo di lavoro sulla bioeconomia, cui la bioagricoltura fornisce in Italia un contributo importante.



Grazie per l'Attenzione



David Chiaramonti
david.chiaramonti@re-cord.org
david.chiaramonti@unifi.it