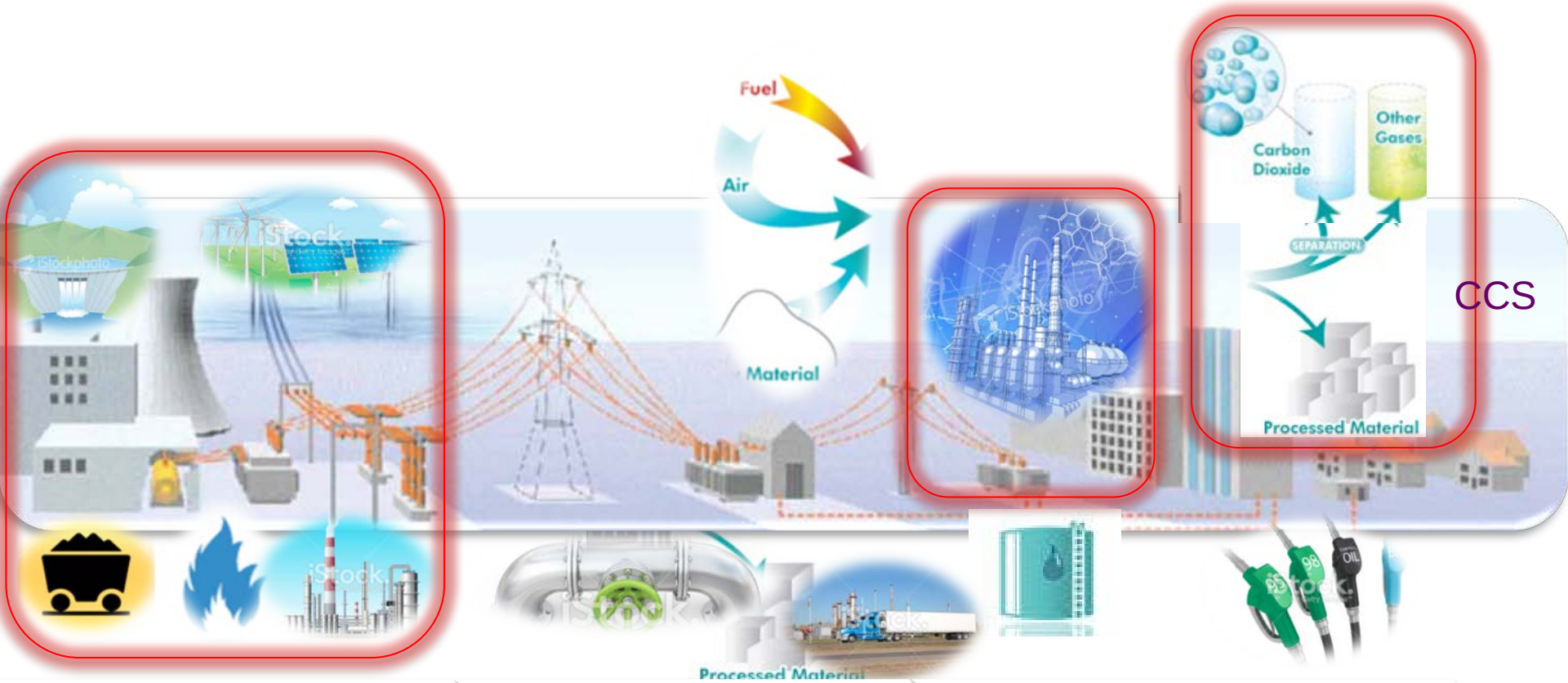
EFCE FORUM on ENERGY:

Challenges and Opportunities in Chemical Engineering for a global vision

EFCE WP & Sections Contributions

EFCE Forum on Energy



Energy Production

Energy delivery and transportation

Use of Energy

Production of Energy or Energy plant devices

Storage

Process for production

Uses: stationnary, mobile ,....

Proposed Programme:

First Part:

Introduction: Context of this EFCE Forum (5 min)

Rafiqul Gani (EFCE President), Jean-marc Le Lann(EFCE Scientific Vice President)

Management of Energy and Chemical Engineering: Key roles of Chemical Engineers (20 min)

Prof. Jean-Marc Le Lann, University of Toulouse, INP-ENSIACET, LGC, France

CO2, biomass, storage, efficiency : the role of chemical engineering in the energy transition (20 min)

Prof. François Marechal, Ecole Polytechnique Fédérale de Lausanne, EPFL Valais-Walis, Sion , Switzerland

Uncertainty and complexity in the design of biomass-based energy systems: the perfect chemical engineering job? (20 min)

Prof. Fabrizio Bezzo, CAPE-Lab: Computer-Aided Process Engineering Laboratory Department of Industrial Engineering, University of Padova, Italy

Energy futures: oil and gas and the contribution of industrial ecology (20 min)

Prof. Richard Darton, University of Oxford and IChemE Energy Centre, UK

US/dept of Energy efforts in Process Intensification (20 min)

Prof. June Wispelwey, Executive Director, AICHE, USA

Proposed Programme:

Second Part

Round table on EFCE Energy Forum (35min)

Short contributions from Working party & Section chairs or members (3 min, 3 slides)

Discussion (Prof. Jean-Marc Le Lann)

Conclusions and perspectives

Prof. Rafiqul Gani(President of EFCE, DTU Lyngby, Danemark)

Abstracts :

Management of Energy and Chemical Engineering: Key roles of Chemical Engineers

Prof. Jean-Marc Le Lann, University of Toulouse, INP-ENSIACET, LGC, France

This contribution will try to give the context of Energy supply chain management from raw materials up to delivering to consumer, and next...dealing with all form of Energies. Then, it will enhance the key roles of chemical Engineering as an added value contribution in many fields to garantue professional thinking and sustainability. Then , it will more focalized with chemical engineer effective role and will try to show where are involved our WP& sections in this broad area and to what extend...The idea , here is to give a kind of cartography, success stories, innovation and future perspectives for our community in this field in order to solve the challenges at the global level or to contribute for....

Keywords: Energy management, energy and chemical engineering, fossil energies versus renewebals, mix energy....

Abstracts:

CO2, biomass, storage, efficiency : the role of chemical engineering in the Energy transition

Prof. François Marechal, Ecole Polytechnique Fédérale de Lausanne, EPFL Valais-Walis, Sion , Switzerland

The energy transition in Europe aims at increasing the efficiency and the share of renewables in the energy system while mitigating the carbon dioxide emissions and decreasing the share of nuclear power in the electricity mix. The chemical industry and the chemical engineering community have a major role to play in the energy transition. Not only they will develop and supply the chemicals needed for the new energy conversion technologies like PV, batteries or CO2 capture, but they will also contribute by increasing the energy and resource efficiency of the industry. The conversion of biomass into bio-products, fuels and energy services is another important challenge for the energy transition especially for mitigating the CO2 emissions in the transportation and products sectors. With CO2 capture and advanced electrochemical conversions systems like fuel cells , electrolysis and batteries, chemical engineering is today a key discipline for the power sector. In particular, developing new concepts for energy storage to integrate the stochastic, daily and seasonal variations of the renewable energy sources like wind and solar will be a major concern. Combined with CO2 capture, the power to gas or to liquid concepts being thermo-chemical, thermo-physical or biochemical processes, are mandatory for the distribution and the long term storage of renewables and need by essence the contributions from the chemical process industry.

By its holistic approach, from nano to systems, the chemical engineering community has therefore a key role to play for the energy transition.

Abstracts :

Uncertainty and complexity in the design of biomass-based energy systems: the perfect chemical engineering job?

Prof. Fabrizio Bezzo, CAPE-Lab: Computer-Aided Process Engineering Laboratory
Department of Industrial Engineering, University of Padova, Italy

Biomass has long been recognised a very promising raw material to substitute fossil fuels in the energy sector. This is of particular interest in the transport sector, where sustainable alternative options to oil-derived fuels are missing. However, with the exception of few rather specific cases, we need recognise that facts have not met expectations. It is now clear that the exploitation of biomass, especially in the transport sector, has disclosed a variety of complex and multi-faceted technical issues. Furthermore, it has soon become evident that available knowledge is still insufficient: there is uncertainty concerning prices, costs and market responses; there is uncertainty in terms of technology selection and design; there is uncertainty in terms of actual environmental impact and social acceptance. This is quite a formidable problem, but the presentation will aim at demonstrating that chemical engineers can play a central role in tackling the solution, because of their long-term expertise at addressing multiscale and multidisciplinary problems. Case studies concerning bioethanol and microalgae-based fuels will be used to convey the message and to highlight open issues and future research directions.

Keywords: biofuels, bioenergy, multiscale modelling, design under uncertainty, microalgae

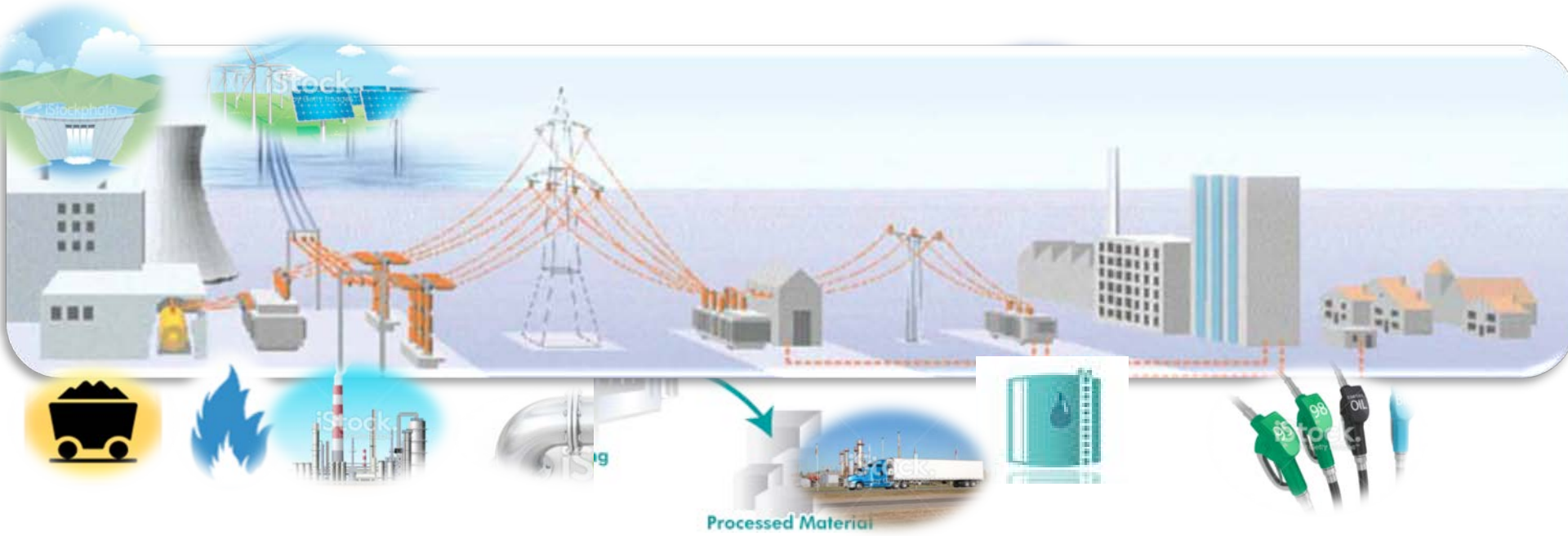
Abstracts :

Energy futures:
oil and gas and the contribution of industrial ecology

Richard Darton
University of Oxford and IChemE Energy Centre

The need to decarbonise the global energy economy is becoming widely recognised as we learn more about climate change. This is an enormous challenge. Renewables currently account for some 13% of total consumption of traded energy, and this is growing as technology improves and measures are taken to mandate or incentivise their use. Nevertheless carbon-based fuels, with an 82% share (rest is nuclear) dominate the energy market. With a large standing investment in infrastructure, and efficient supply chains and functioning markets, fossil fuels will still play a key role for several decades at least. In this period we are likely to see a shift from coal to gas as a less polluting energy source, and perhaps the introduction of CCS. A step-change in the ways we use fossil energy and other non-renewable resources is also needed. New approaches to resource efficiency offer huge potential. Extending service life of manufactured goods and recycling materials and components will become more attractive, leading to new types of product design, market operation and patterns of trade. We will require huge changes both on the supply side, and also in the products and markets where energy is used, if we are to achieve the twin goals of raising living standards and meeting environmental constraints.

Keywords: decarbonisation, oil and gas, renewables, resource efficiency, recycling, industrial ecology



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