Concept of Converting Oil Refinery to Biorefinery

IEA Bioenergy Task 43 Workshop

University J.J. Strossmayer, Osijek,
March 27th, 2018

PROJECT
BIOrefinery

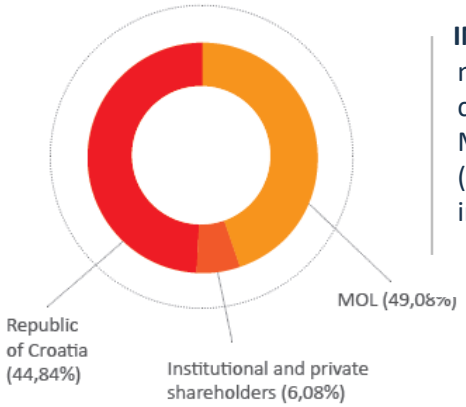
Introduction

General about the Project

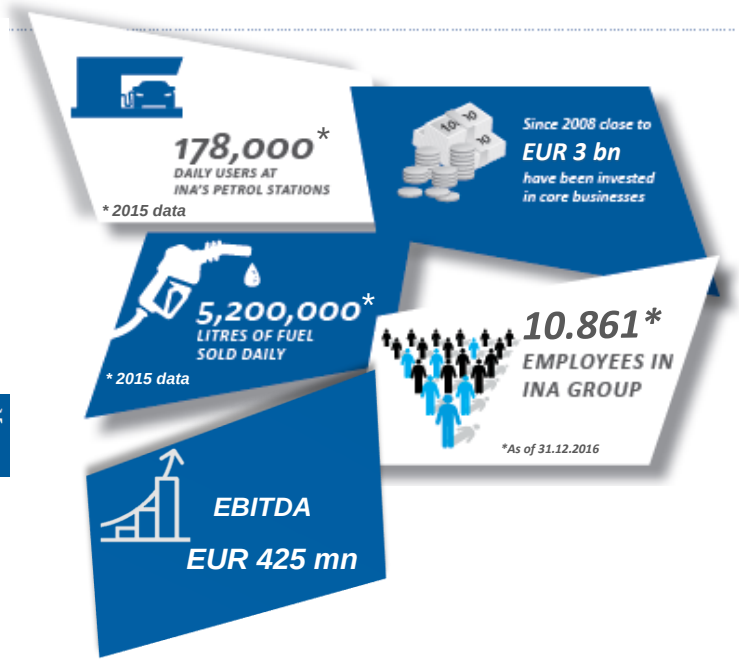
Technology

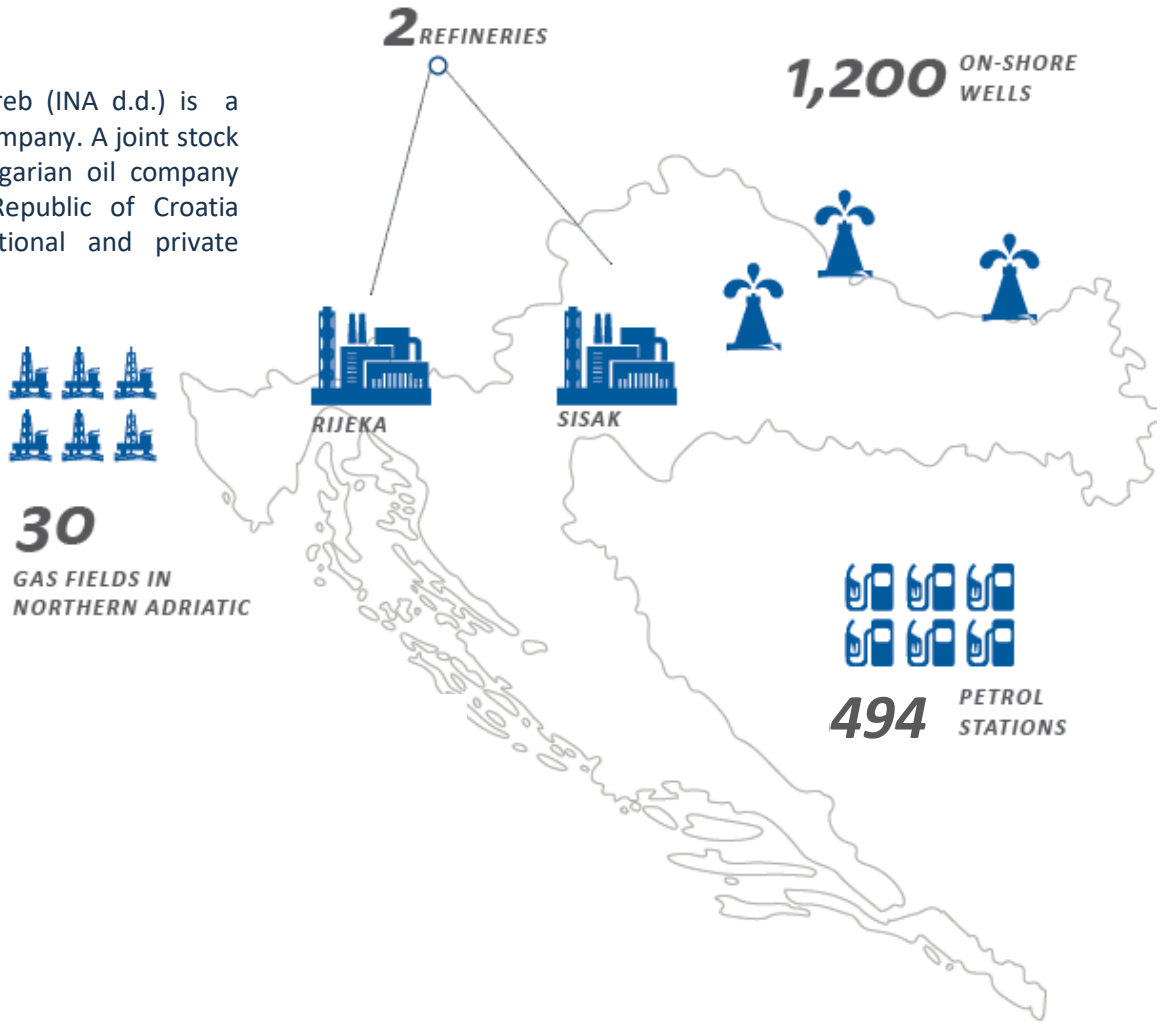
Biomass Supply Chain

OWNERSHIP STRUCTURE



INA-Industrija nafte d.d. Zagreb (INA d.d.) is a medium-sized European oil company. A joint stock company owned by the Hungarian oil company MOL (49.08 percent), the Republic of Croatia (44.84 percent) and institutional and private investors (6.08 percent).





ANNUAL REPORT 2017

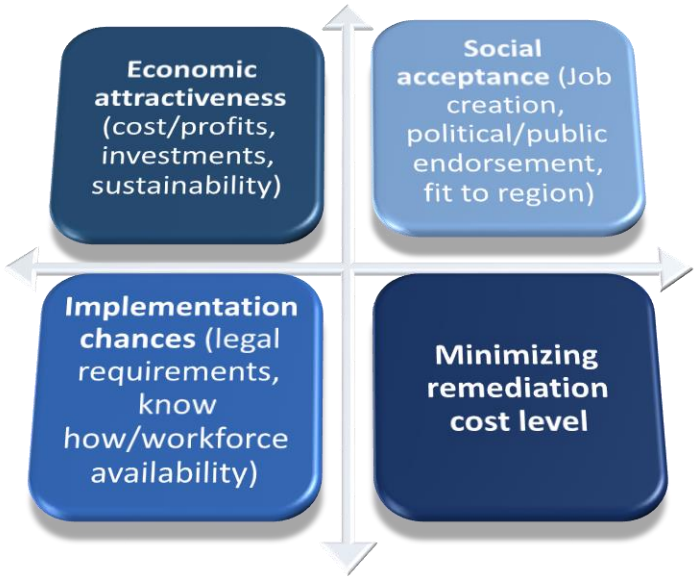
More information: ***www.ina.hr*** *and* ***www. molgroup.info***

General about the Project

1. Objective

Establishment of sustainable industrial activity as alternative option for Sisak oil refinery.

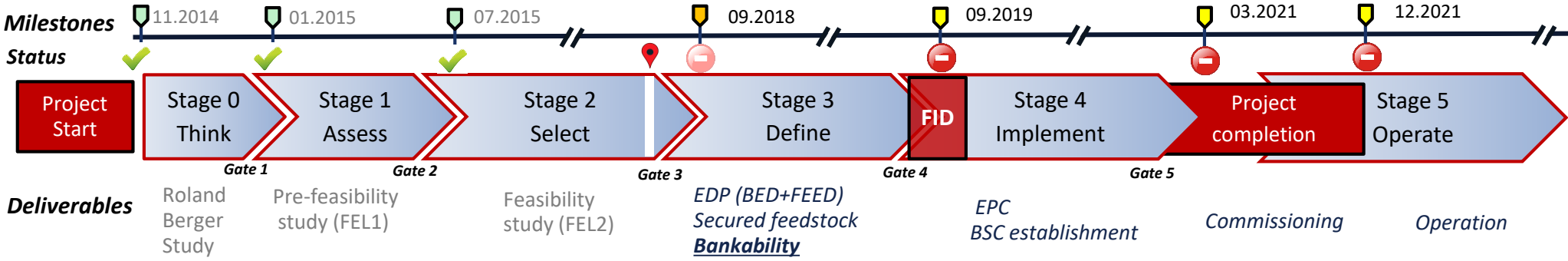
2. Criteria



3. Selected option

Production of second generation ethanol with logistic / distributive hub as a base case.

Project development



General about the Project

Feedstock and main products

~50%
Energy crops
(i.e. Miscanthus)

POTENTIAL FEEDSTOCK
300 kt/y

~50%
Agricultural residues

BIOREFINERY IN SISAK

EOR

~60 kt/y
Biogenic CO_2

~55 kt/
Ethanol
(< -10 g CO_2/MJ)

Shipping through
integrated logistic hub

~1 MW
Electricity out
(or LIGNIN as separate product)

Social impact – Employment estimation

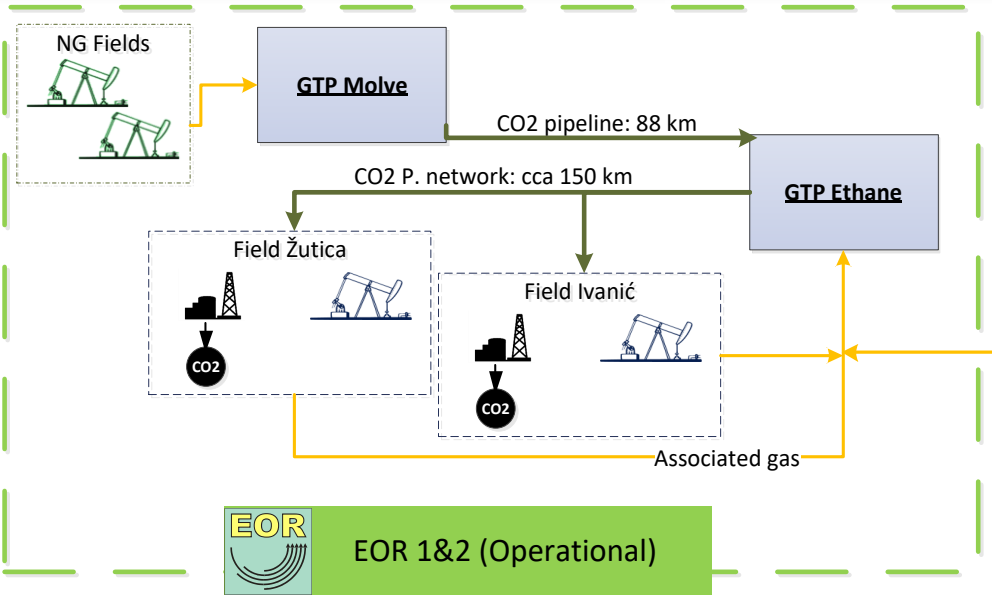
Biorefinery construction
500-700

Biomass planting and collection
600-800

Storage and transportation
80-100

Work In biorefinery
100-120

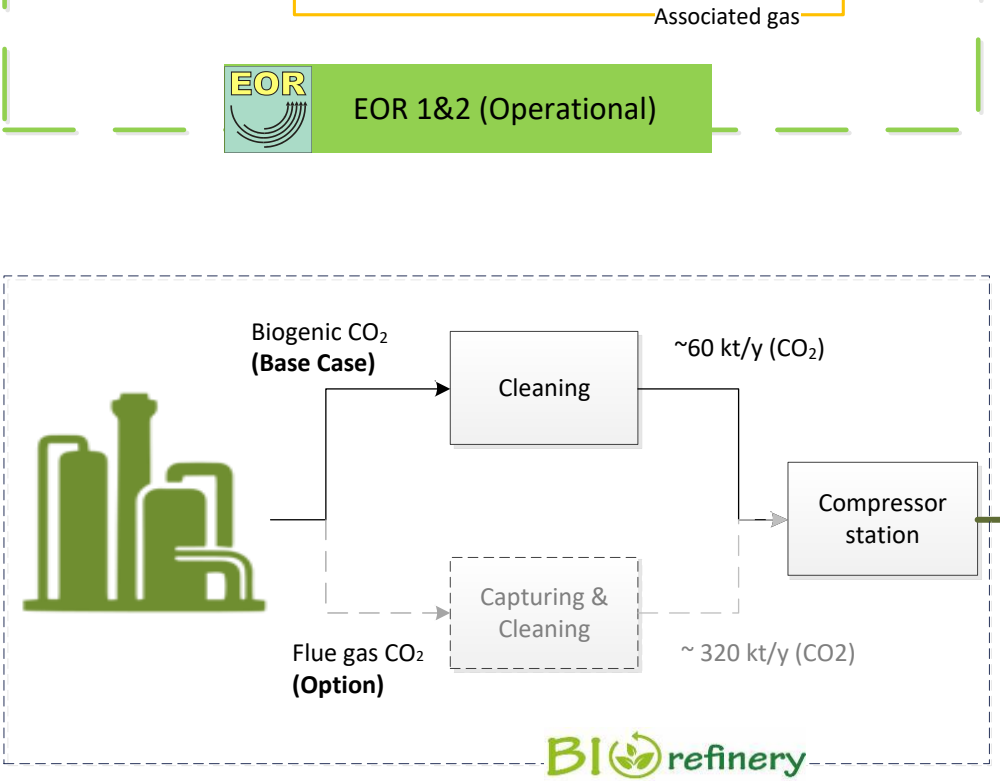
General about the Project: BIO-CCUS



- The minimum CO_2 storage capacity of six larger Croatian oilfields has been estimated at approximately 60 Mt of CO_2.
- EOR Phase 1&2 operates since 2014:
  - Injected 700 kt CO_2 (~15% of annual emissions from transport in Croatia*),
  - ~ 0,2 mn BOE produced.

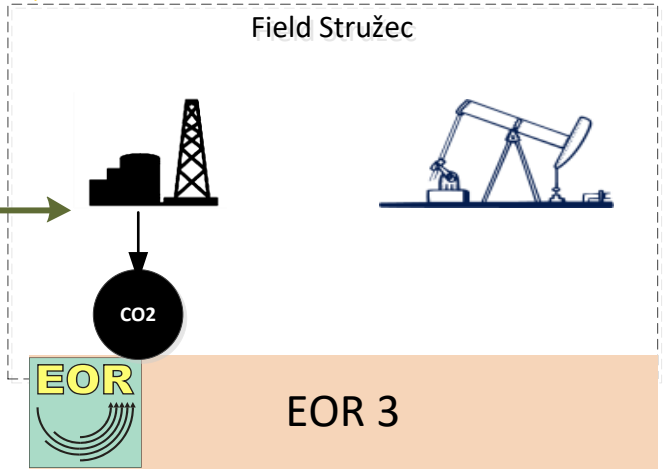
* EU ENERGY IN FIGURES 2016

Associated gas



New pipeline: 16 km

(existing pipeline route)

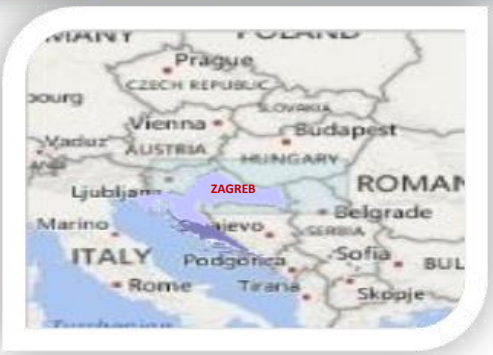


- Project EOR 3rd phase is under development (early stage):
  - Capacity: more than 500 kt of CO_2 per year;
  - Additional production: ~15 mn BOE**.

** With~350-400 kt/y CO_2 injected.

BIOrefinery

General about the Project: Biomass availability and supply



- Sustainable biomass potential (agricultural residues), based on official data and internally conducted survey among farmers (n=600) is 550-700 kt/y.
- Abandoned land activation (low ILUC potential) has big potential.*

* Low ILUC potential of wastes and residues for biofuels, ECOFYS, September 2013

~100 km

ZAGREB

SISAK

~50 km

Straw: 100-200 kt

S. BROD

EC-Energy Crop (i.e. MxG)

Potential EC Fields

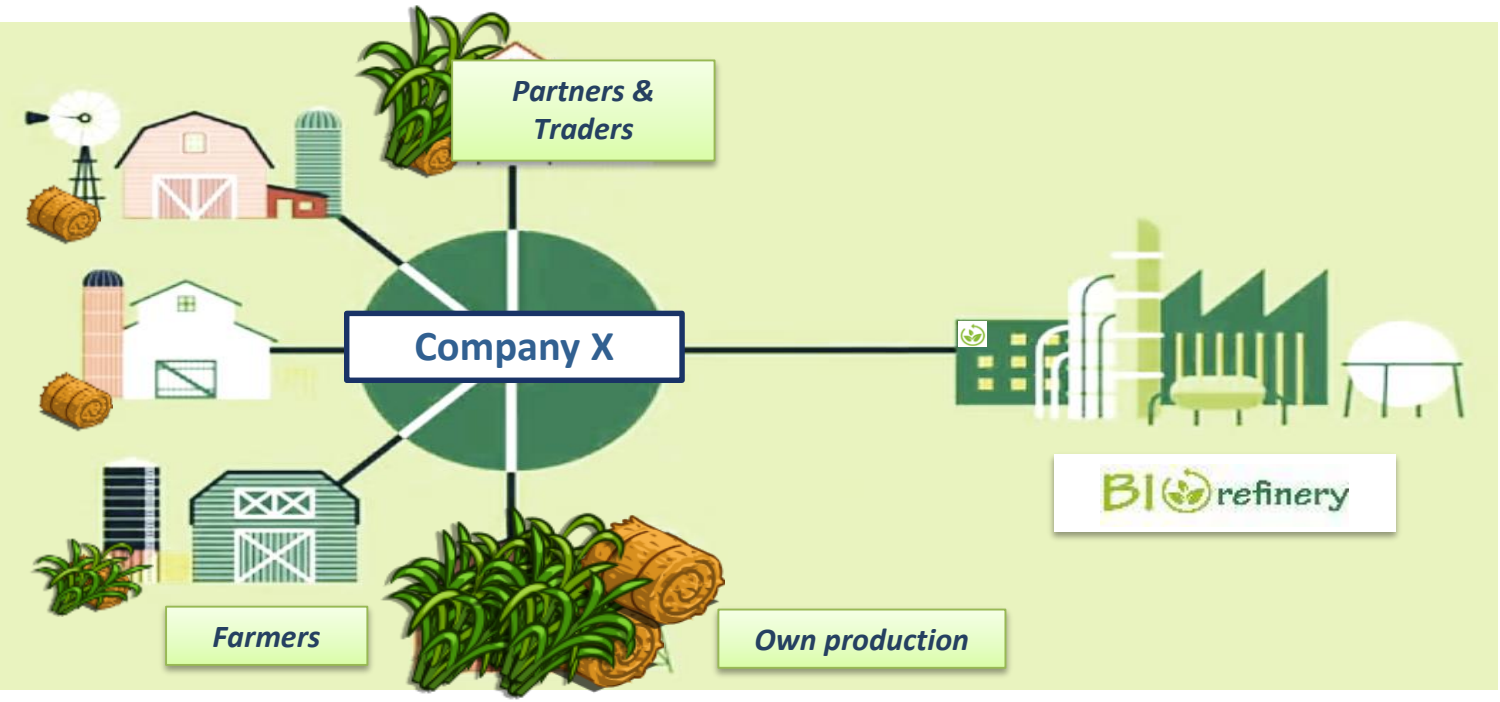
Residues: 400-500 kt

EC: 150-200 kt**

Residues : 150-200 kt

**Abandoned land in Sisak perimeter is ~200.000 ha, which gives theoretical MxG quantity of approx. 4Mt/y.

General about the Project: Set up the business



Local partner in Agriculture: **BcI**

Business Consultant: **Brown&Co.**

Company X
Joint Company
INA + Partner (Optional)

Development of biomass supply chain which includes:

- Sustainability management;
- Establishment of plantations and fields surveillance;
- Biomass trading, collecting, manipulation, storage and logistic;
- Consistent supply and quality insurance;
- Building long term relations with growers and partners;
- Planting material manipulation.

General about the Project: Four pillars of Biorefinery project

Technology

Agriculture and Rural

Holistic approach of Biorefinery project together with innovative technology and low CO_2 footprint can easily become a magnet for various funding options (investment founds, structural, regional, …).

Options for the future:

- Bio-based chemicals,
- Bio-based polymers,
- Bio-Jet,
- BIO-CCUS (large scale).

Project GRACE:

- INA is a partner on EUR 15 mn project financed through BBI.
- From biomass to high value added products (biofuels, chemicals, polymers, …)
- Partners: Novamont, AVA BioChem, Addiplast, INRA, …

THANK YOU FOR ATTENTION!

BIOrefinery

BACK UP

BIO refinery

Backup slide: Miscanthus facts

Burning process - CO_2 neutral fuel (LCA-standard: savings 75-93% CO_2)

Outstanding adoptability to different climate and pedological conditions

Uninvasive sort (sterile hybrid)

High yield of dry matter on area unit – from third year of planting (average 15 t/ha)

Positive influence on biological diversitiy

Harvest time **from November to April**

Perennial crop for energy production, exploitation lasts over 15 years

Increases soil fertility and decreases erosion

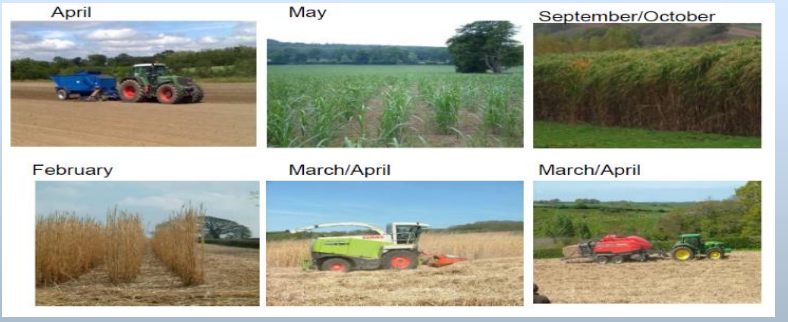
Decreases risk of ground water and soil organisms pollution

Carbon mitigation:

Carbon released during Miscanthus x giganteus combustion is absorbed by plants growing.
GHG emissions from Miscanthus x giganteus cultivation is lower than from other agricultural activities (fertilizer usage and animal related emissions).

Carbon sequestrations:

Carbon inputs are greater than release into atmosphere; carbon is stored in rhizomes and roots.
Additional effects in bioremediation of effluents and sludges.



Annual harvest cycle

EU 2020 TARGETS

Renewable sources	Energy consumption	Greenhouse gases
+20 %	-20 %	-20 %

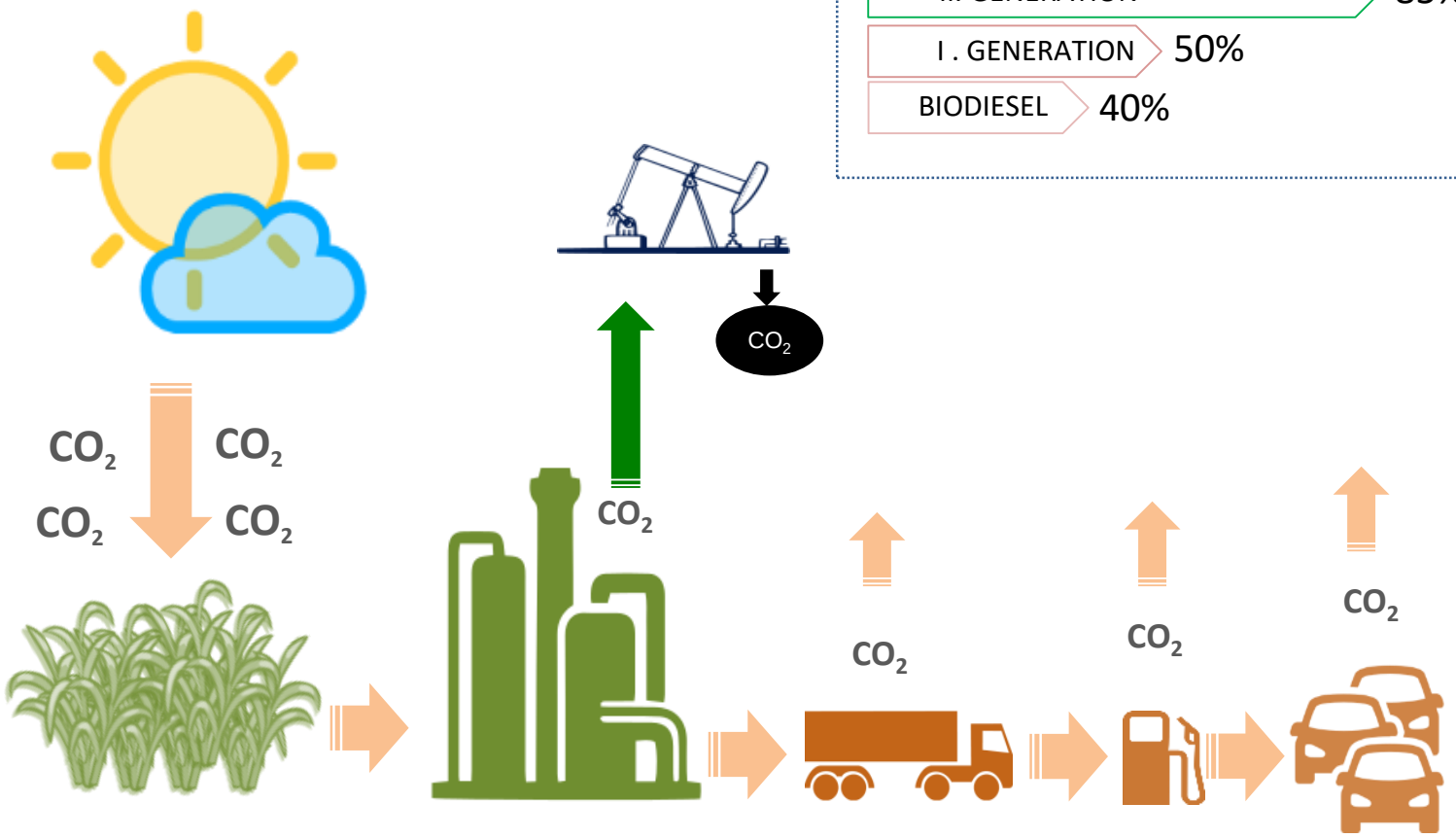
EU 2030 TARGETS ??

Renewable sources	Energy consumption	Greenhouse gases
+27 %	-40 %	-27 %

Greenhouse gas savings

Biofuels Generations

- II. GENERATION — 85%
- I . GENERATION — 50%
- BIODIESEL — 40%



Emissions from different motor fuels:

Gasoline (fosil): ~70 g CO_2/MJ

Ethanol (bio 1G): ~30 g CO_2/MJ

Ethanol (bio 2G): ~10 g CO_2/M

Ethanol (INA 2G): ~ -10 g CO_2/MJ