Chair of Energy and Prosperity, October 7th

CHALLENGES OF DECARBONIZATION IN THE INDUSTRY

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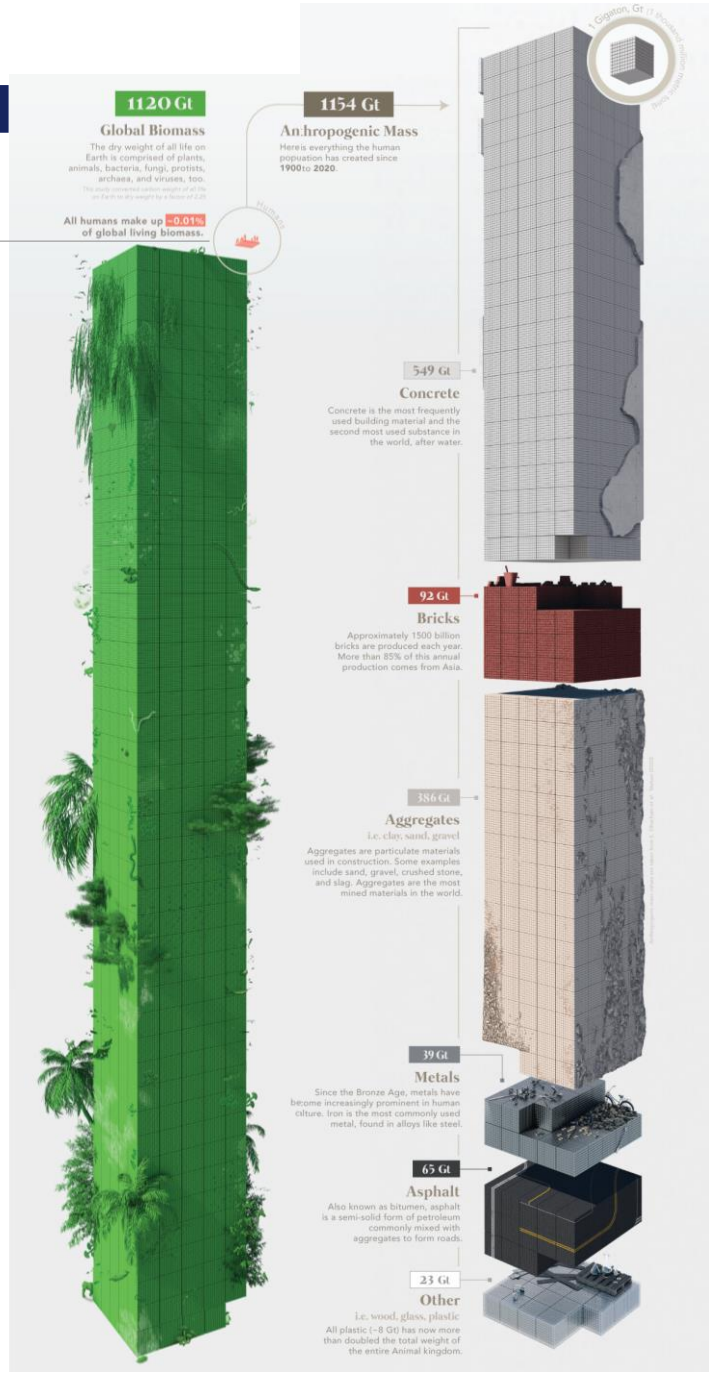
1

Under pressure

Reminder : Industry transforms raw materials into goods & food

Weight of all humans

Weight of living biomass on earth



Concrete

Bricks

Aggregates

Metals, Asphalt, others

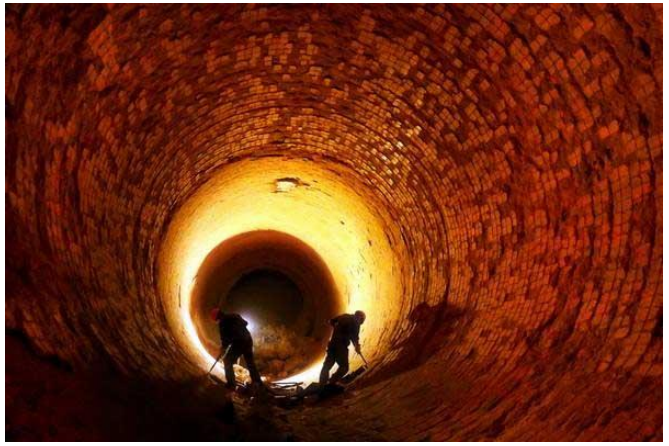
To compare with the anthropogenic mass produced since 1990 !

Source : visualcapitalist.com

Some examples of major industrial processes that serve the society

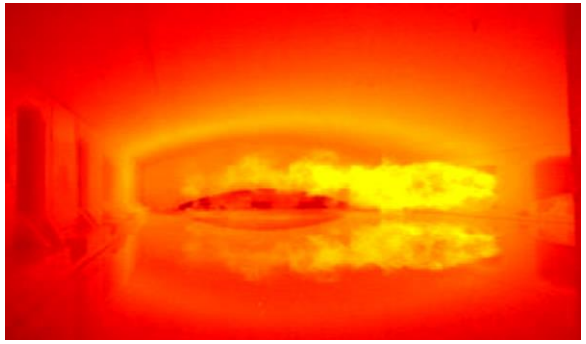
Steelmaking and steel mills

Cement kiln for calcination



Steam cracking units for chemicals

Glass melting



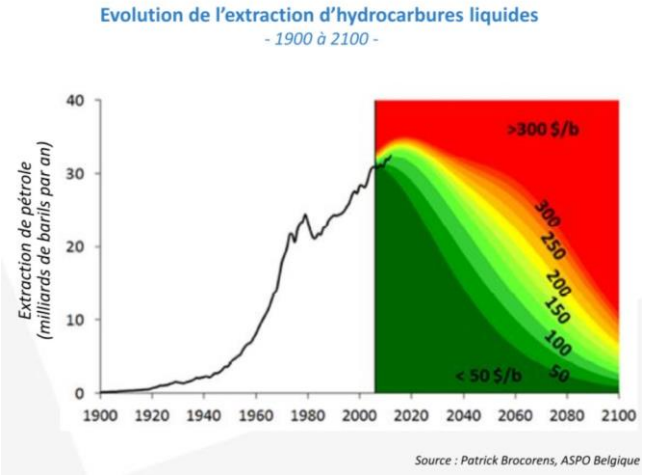
Paper mills

Dairy plants

Sugar refinery

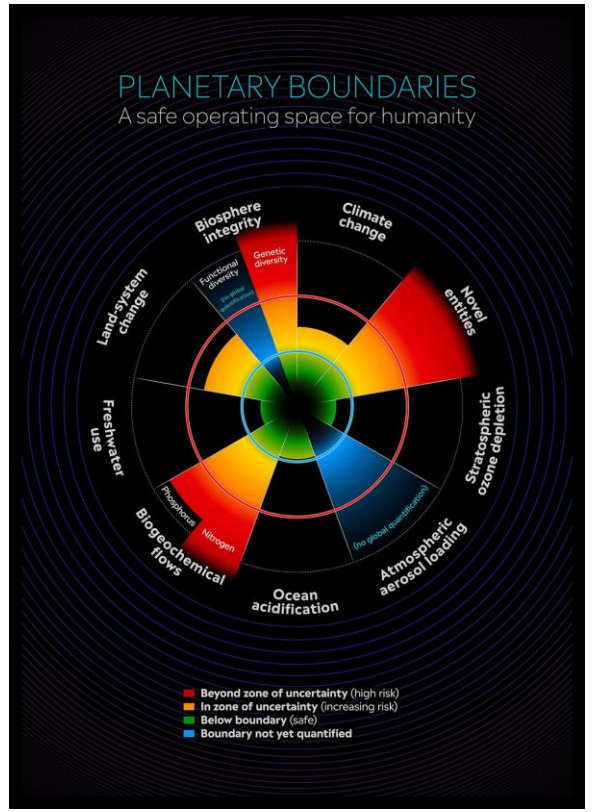
That was fine but…

Transformations process mainly rely on Fossil Fuels, having a limited stock



Fossils phase-out has to be quicker than stock depletion to tackle Climate Change

The Industry impacts not only Climate Change, but several other Planetary Boundaries



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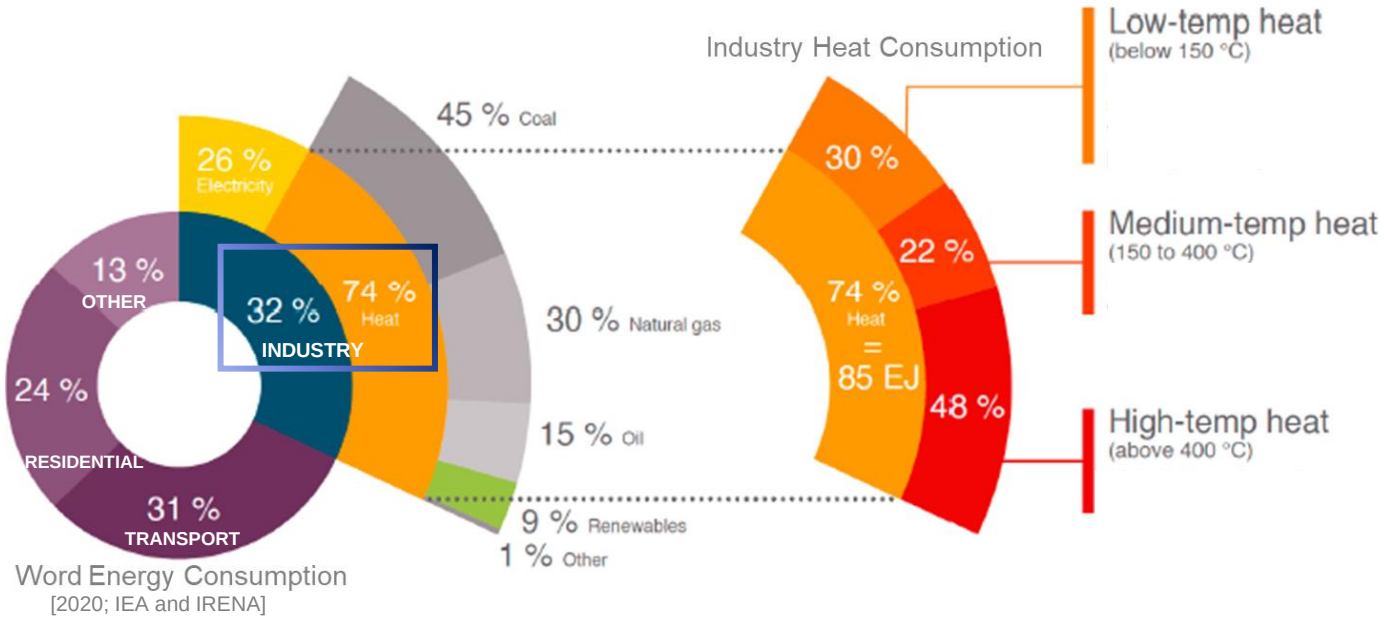
The Licence to Operate

Is this challenge a pure problem of Engineers ?

DIAGNOSTIC

90% of the Energy Consumption still comes from FOSSILS



Word Energy Consumption
[2020; IEA and IRENA]

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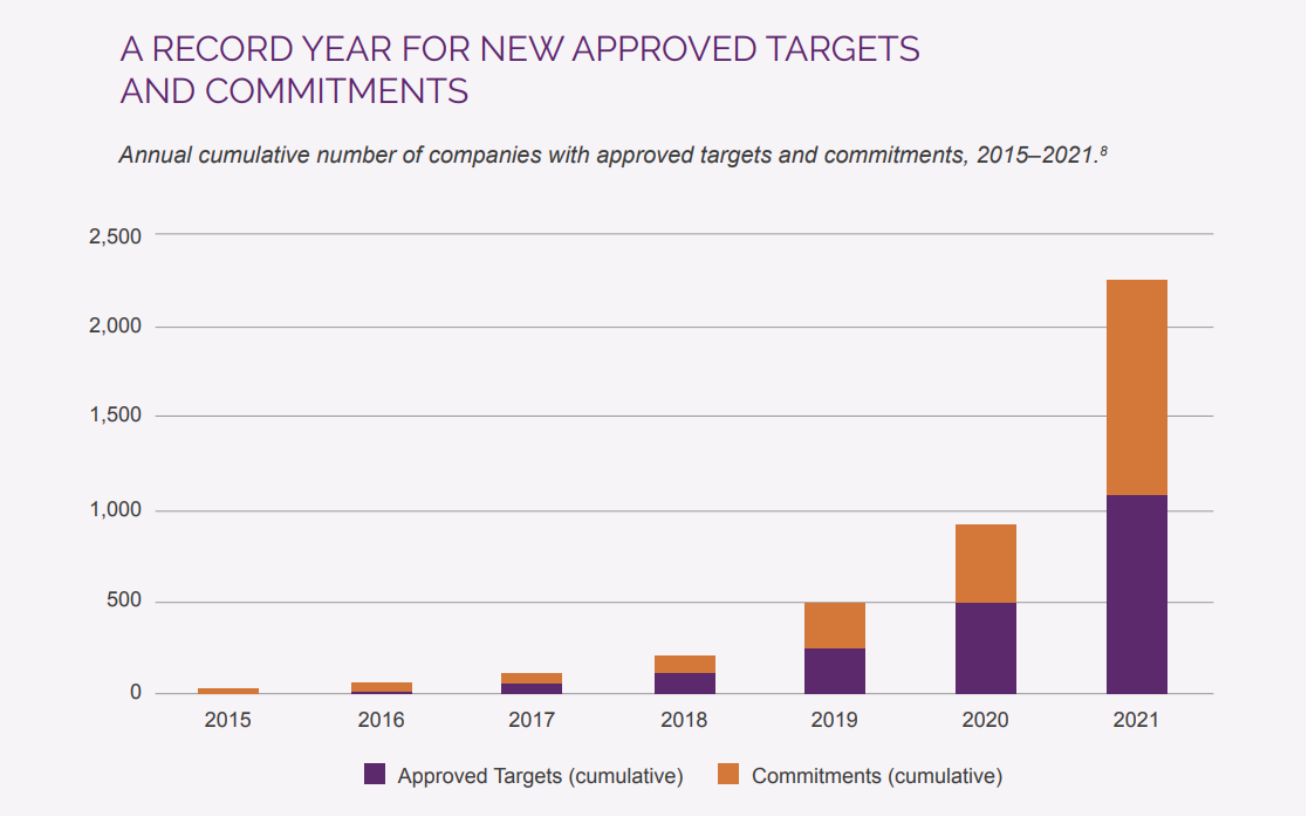
COMMITMENT

Major companies have public commitment, BUT very few exactly know how to deliver in time at scale



Is this challenge a pure problem of Engineers ?

Problem Statement : Phase-out from Fossil Fuels

implementing rupture solutions, not incremental

checking the feasibility at scale : “it must close the loop”

managing the technical and organizational risks

anticipating the need for new competences

ensuring economic performance

ensuring resilience to cumulative shocks

assessing new dependencies brought by low carbon energy

anticipating potential regulation changes

managing controversies on low carbon solutions

And even justifying that the plant serves the society !

…this is a systemic problem, involving much more stakeholders than « business as usual »

Illustration of the Challenges – Steelmaking

Rupture solution :

replace COKE that reduces iron ore by Green Hydrogen, obtained through water electrolysis that is powered by renewable electricity

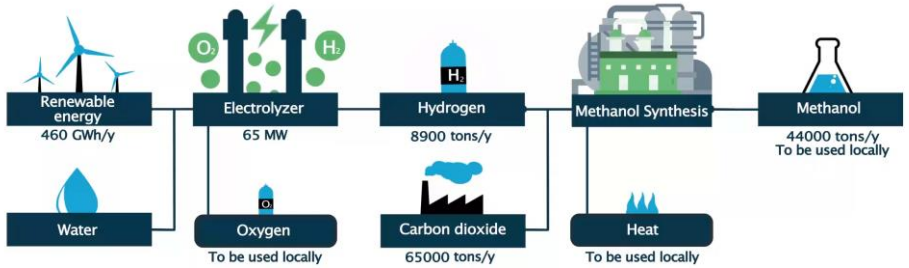
Some motivating Positive Momentums

The Opportunities brougth by systemic changes

Symbiosis with territorial ressources : agriculture, urban wastes, etc.

Opportunities of relocalisations in existing industrial hubs

New CO2 value chain



Less material and energy fluxes, compensated by the redesign of production value chains

“less for the better”

3

Key Challenges for the Mutation

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Competences

Management of complexities : number of stakeholders, rupture vs incremental solutions, resilience issues

Management of controversies : choosing a low carbon energy vector is selecting drawbacks that can be managed

Risks

External risks: legislation evolution, crisis, dependancy regarding an external technical system (national or local),

Organisational : fast innovation and implementation at scale

Technico-economical framework

> How to build prosperity in a context of contraction of fluxes of feedstocks and energy ?

> How to invest in rupture solutions before the end-of-life of existing assets ?

> How to secure projects with increasing uncertainties on many aspects ?

Example of the Glass Industry

engie.com