

Mobility and biofuels



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Levi Cases Retreat Day

Monday, January 18th, 2016

Aula Magna – Pentagono – Agripolis, Legnaro (PD)

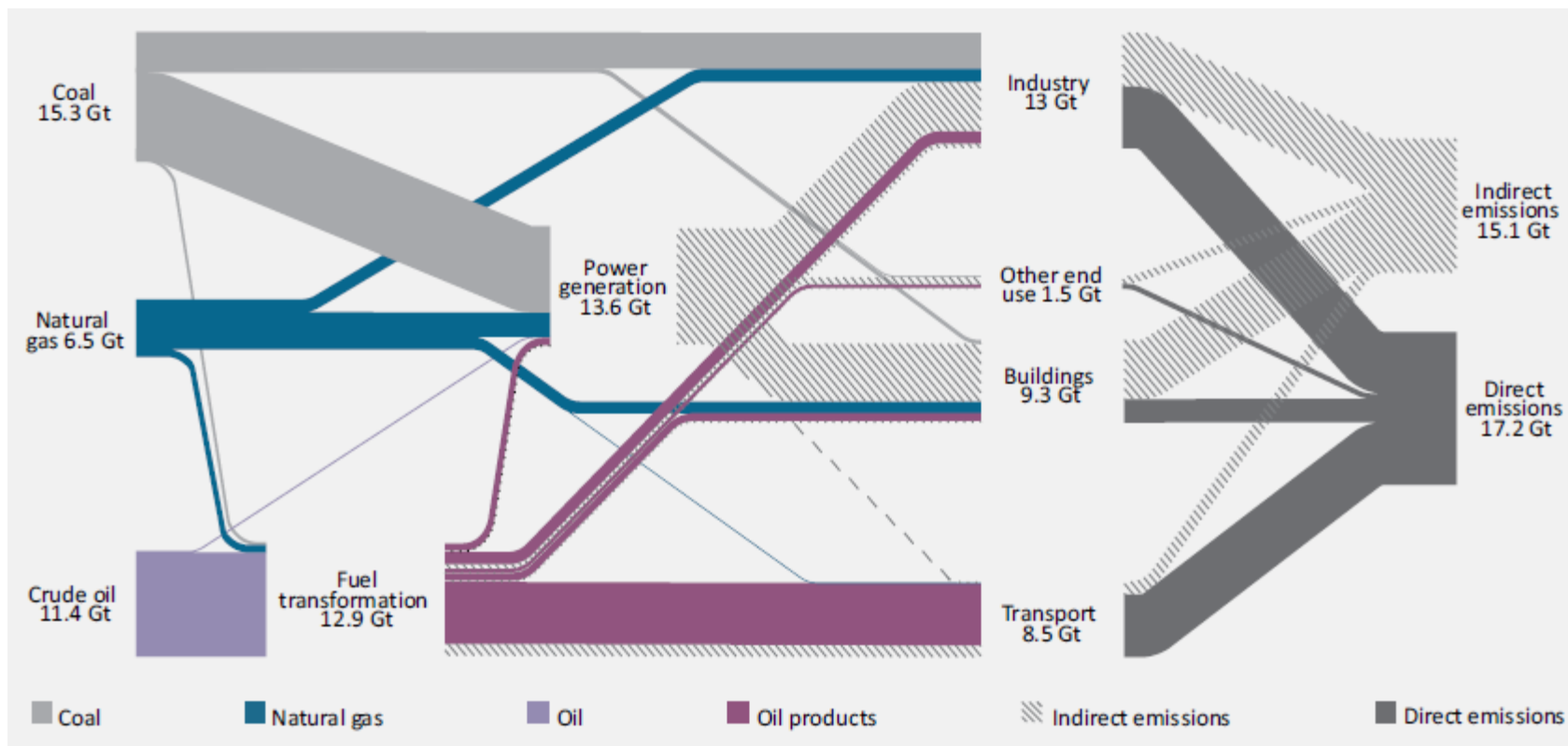


Outline

- State of the art and open issues
 - IEA publications (*Energy Technology Perspectives 2015; Renewable Energy Medium-Term Market Report 2015; World Energy Outlook 2015*)
- Levi-Cases Projects
 - N.1 (coordinator: Chiara D'Alpaos): Investing in biomethane: incentive design, optimal diet and energy efficiency. Market comparison Italy vs EU member states
 - N.2 (coordinator: Manuele Bertoluzzo): Towards a new scenario for electric mobility: dynamic wireless charging systems



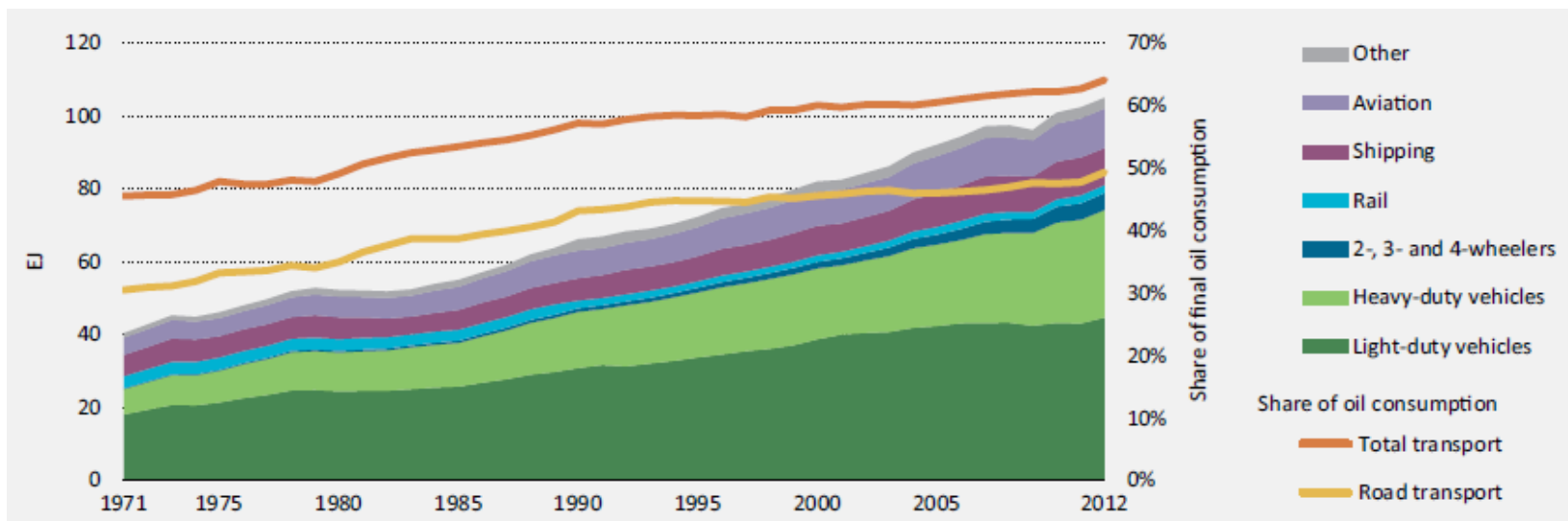
The big picture



The transport sector accounted for **27% of total global final energy consumption** in 2012 and **20% of global energy- and process-related CO2 emissions**

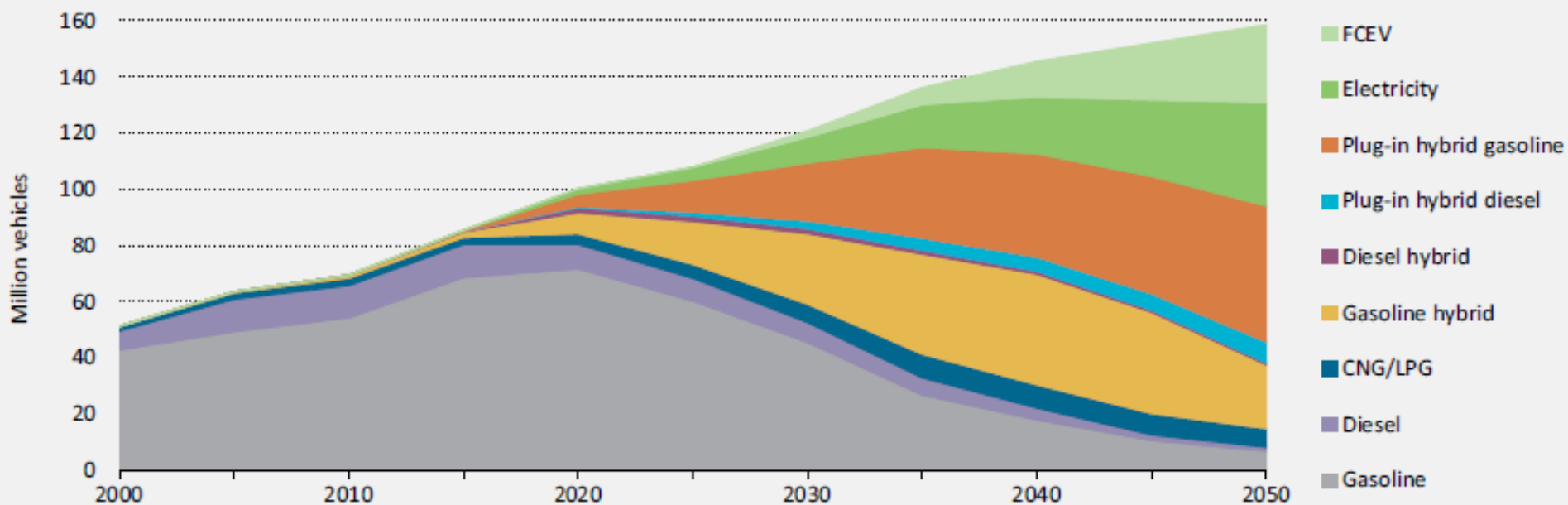


- Transport emissions have been driven by **strong continued growth**
 - 75 million new passenger light-duty vehicles (PLDVs) added to roads in 2012.
- The transport sector consumes nearly **two-thirds** of final global oil consumption
 - having increased nearly by 25% since 2000, while oil consumption in power, industry and buildings stagnated or even declined over this period.
- Since 2013, sales of all road vehicles in OECD non-member economies have exceeded those of the OECD members.
- The transport sector is still more than **90% dependent on oil products**, a level practically unchanged since the 1970s

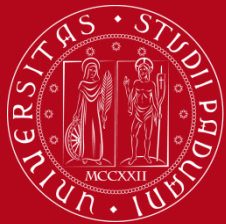




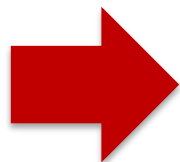
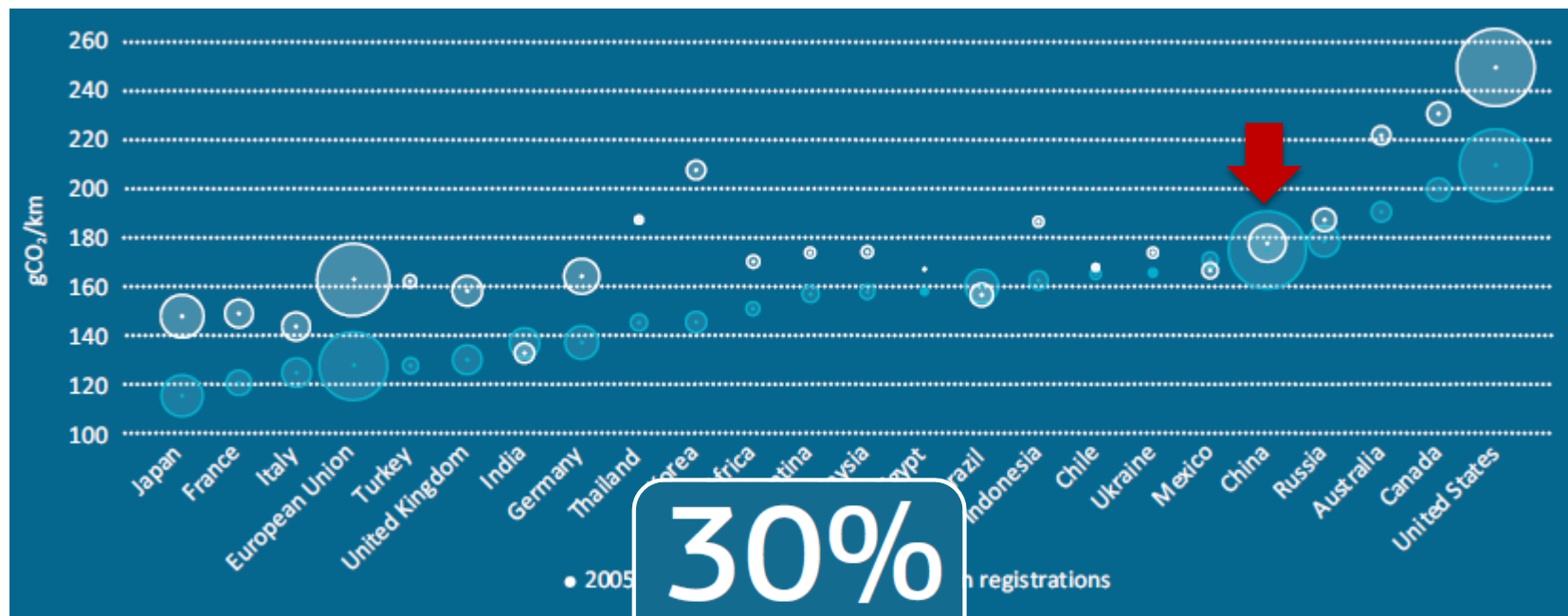
A scenario



Note: CNG – compressed natural gas; LPG – liquefied petroleum gas.



Increasing efficiency

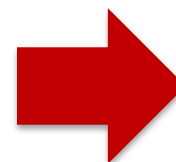
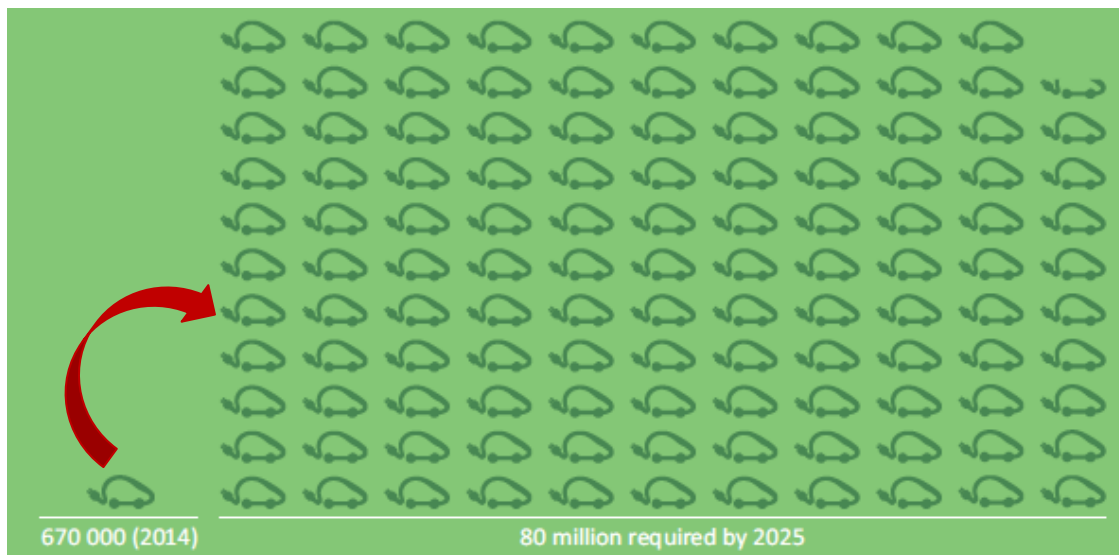


30%

DISCREPANCY
BETWEEN
TESTED VEHICLE
FUEL ECONOMY
AND REAL ON-
ROAD FUEL
ECONOMY



Electric vehicles

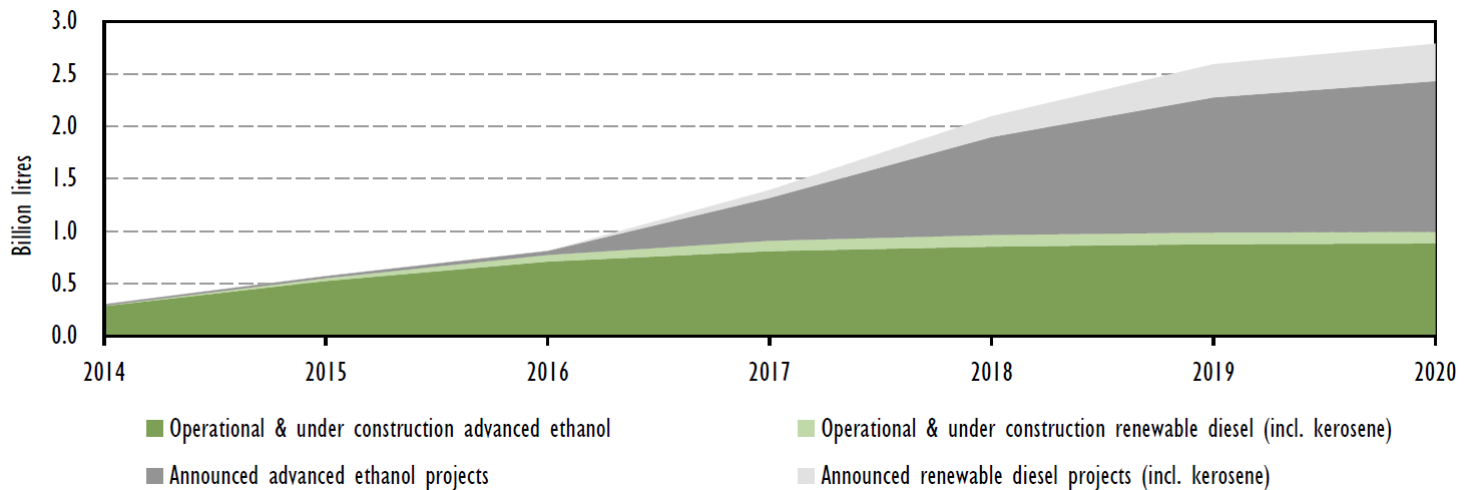
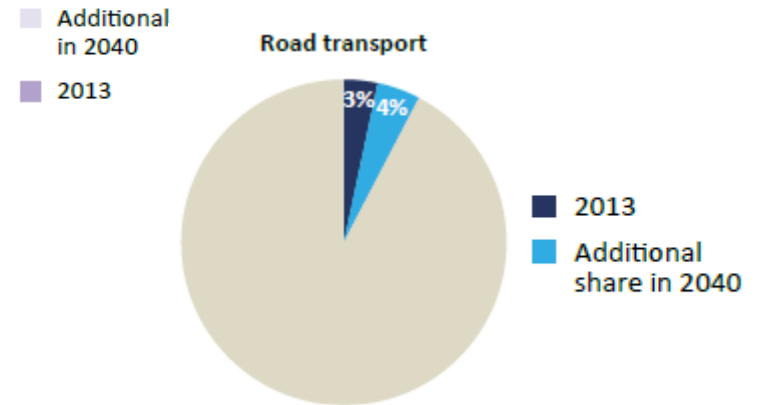
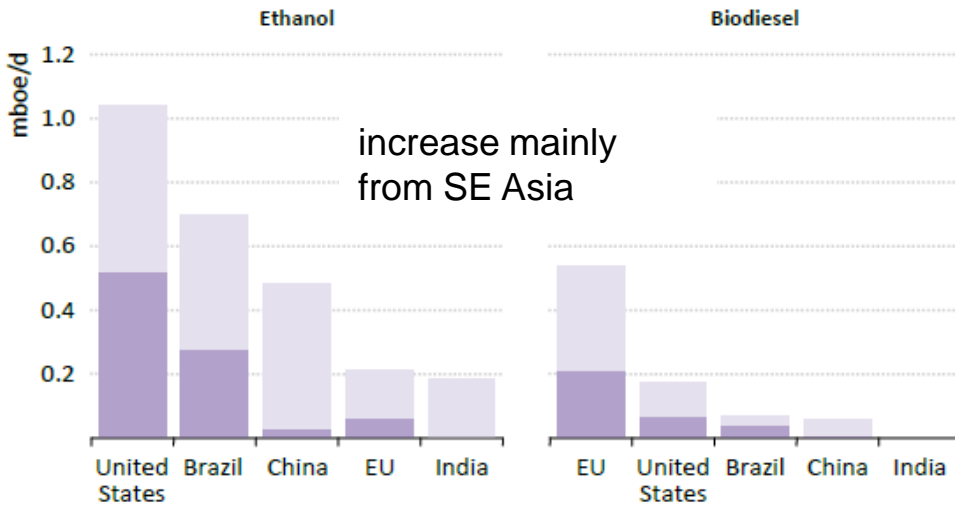


4
COUNTRIES
HAVE EV SALES
SHARES OVER
1% OF TOTAL
NEW CAR
SALES

2012
MEM CUB
1001-1015



Biofuels





Comments

- Energy usage in the transport sector is still only marginally dented by alternative energy sources
- Alternative fuel vehicles and transport means rely on:
 - electricity
 - biomass-based liquid and gas fuels
- Electric drivers mainly address passenger and (partially) freight road transport (electric vehicles – EVs)
- Several technology issues still to be addressed
 - the core issue is the battery energy density and lifetime
- Environmental impact of EVs tightly related to power generation technology and primary energy utilisation
- Biofuels are quite flexible in their usage, but potential productivity and environmental impact are still questionable
 - second generation ethanol is the most mature “sustainable” technology; but investment costs and feedstock supply are still an issue
 - third-generation microalgae-based fuels have great potential but costs and technology reliability are still an issue



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Project 1 (PhD)

Investing in biomethane: incentive design, optimal diet and energy efficiency. Market comparison Italy vs EU member states

- Biomethane has great potential for increasing the share of energy from renewable sources in the transport sector
- However, in our country **biomethane** does not seem to have a bright future ahead of itself, when compared to other EU countries
- Objective: assessing biomethane issues in the Italian market through:
 - Comparative analysis of EU member States regulation and incentives on the production and use of biogas and biomethane
 - Techno- economic analysis of biomethane production, transport and distribution
 - Economic evaluation of biomethane production and biogas purification processes
- Work in progress:
 - Analysis of legislation and normative prescriptions in EU Countries, particularly with concern to renewables and biogas
 - Analysis of the Italian legislation on biomethane and identification of possible normative constraints
 - Analysis of the technologies currently adopted to produce biomethane and identification of operative/construction costs related to biogas power plants



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Project 2 (PhD)

Towards a new scenario for electric mobility: dynamic wireless charging systems

- Batteries are the bottleneck that today slows down the diffusion of EVs due to their unsatisfactory energy density, limited lifetime and high cost
- A possible solution is to charge the battery of an EV while it is in motion, getting the required power **wirelessly** from a stationary electrical supply system (Dynamic Wireless Power Transfer – DWPT)
- The biggest challenge to the commercialization of the DWPT is to transfer high power from the road in an efficient, economic a safe way
- Objective 1: studying the aspects relating to modelling, designing and building a DWPT system
- Objective 2: setting up a prototypal DWPT system for a study-case and executing experimental tests on it
- Work in progress:
 - Literature review
 - Practice with computer-aided analysis of DWPT systems