Combined Heat & Power

An opportunity for everyone

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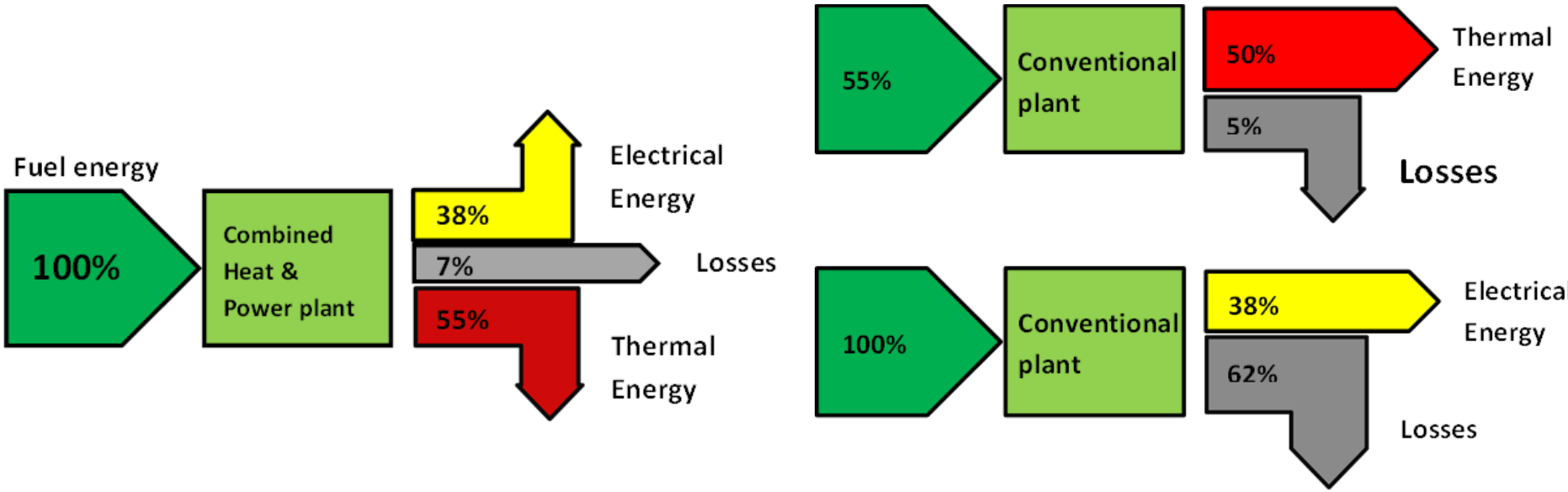
WHAT'S COMBINED HEAT AND POWER

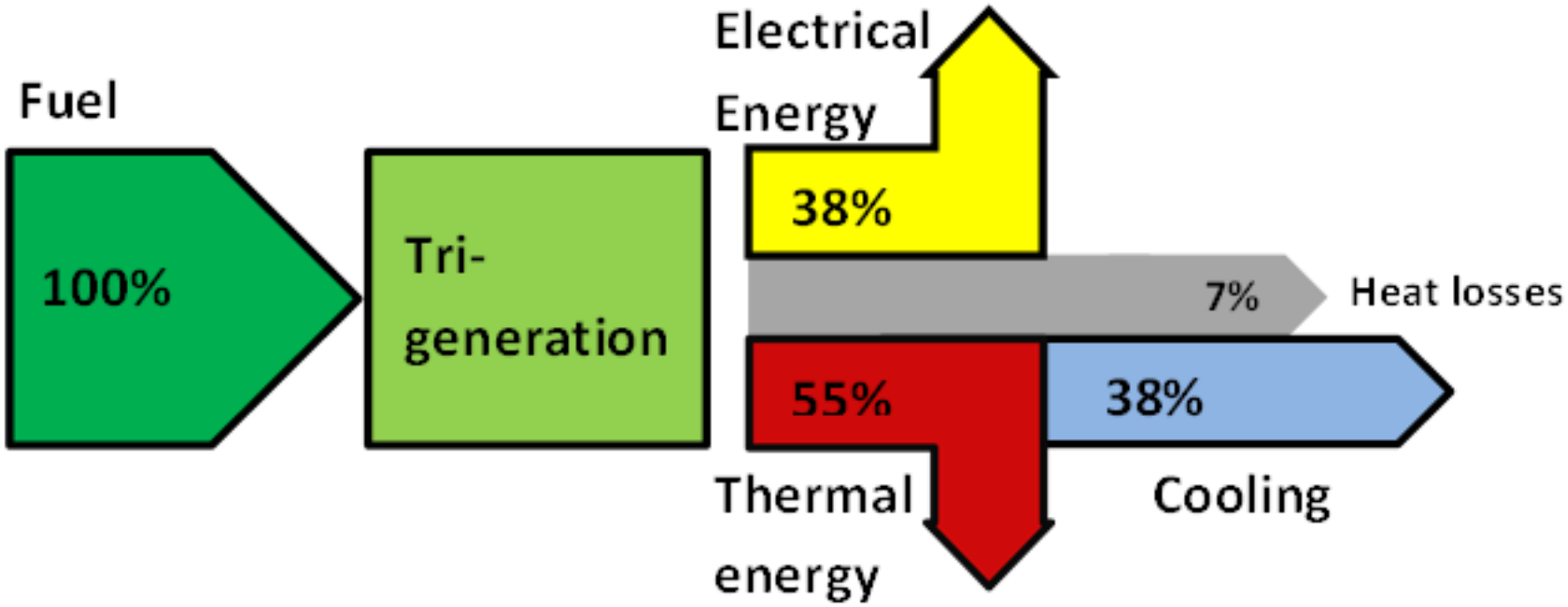
Combined generation, also known by the acronym CHP (Combined Heat and Power), is **joint generation** and simultaneous of **electrical energy** (or mechanical) and usable **heat** from **a single energy source**, carried out in a single **integrated system**. Using the same fuel to two different ends, enables a more efficient use of primary energy, with inherent **economic savings** where a **strong contemporaneity** exist between **electrical demand** and **thermal demand**.

Comparison between CHP and separate thermal/electrical production



WHAT'S TRI-GENERATION

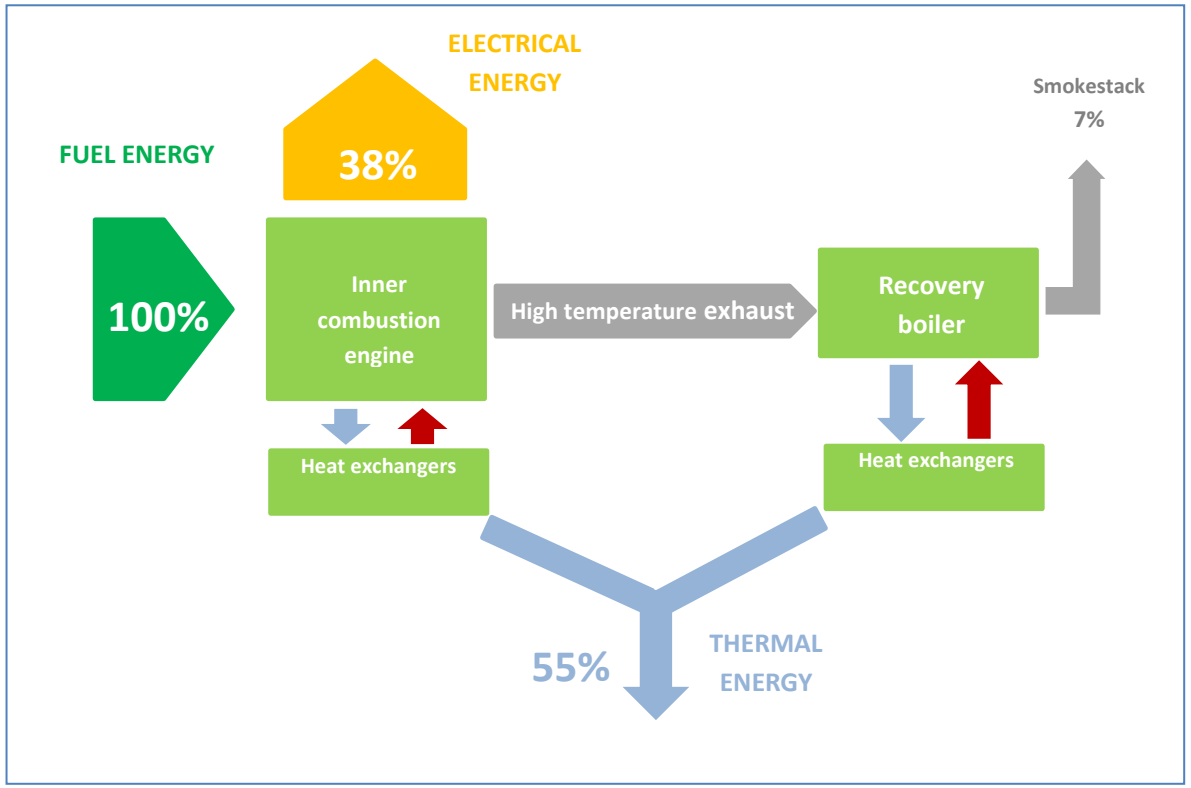
From CHP systems the more recent **trigeneration** system are born: in addition to CHP advantages, tri-generation enables transformation of **recovered heat** in **refrigerating energy** thanks to implementation of absorption refrigerating cycle whose operation is based on phase transitions of the cooling fluid (water) coupled with the substance (lithium bromide) used as absorber. Tri-generation is thus highly recommended for all the users where seasonal conditions completly modify air conditioning needs of work places, residential ones or where in and industrial process is needed a cooling keeping temperatures below environmental ones.



HOW A PLANT IS MADE

The “heart” of a CHP plant can include two main kinds of machinery:

1. **Internal Combustion Engines** operating on Otto cycle (fed with natural gas) or on Diesel cycle (fed with fuel oil, vegetable oils, biodiesel, etc);
2. **Turbines** (fed with gas, fuel oil, vegetable oils, etc).



Fuel is **transformed** by means of such machinery in **mechanical energy**. Mechanical energy is then transformed in **electrical energy** by means of electricity generators which are coupled with engines or turbines. Fuel energy cannot fully transform in electrical energy: most of it (62% on average) is transformed in **heat** in the form of hot exhaust, hot water in cooling circuits (about 55%) and **losses** (7%). Thermal energy is recovered by means of exhaust/water and water/water heat exchangers from heat contained respectively in combustion exhaust and engine cooling circuits. Recovered heat (in the form of hot water or o in some cases as steam) is available to various kind of use :

1. in **industrial processes;**
2. for producing **sanitary hot water** and **heating;**
3. as “energy” source to be put in heat absorbers and **produce cool water** at 8-9°C for refrigerating uses (thus moving from Combined Heat and Power to Tri-generation).

CHP plants in tertiary

Above mentioned examples make for implementation of CHP concept in industrial environment or in tertiary (Gavirate feeds a district heating grid to which schools and private buildings are connected).

CHP can be implemented in every context where **simultaneous consumption of electrical energy and heat and/or cooling** (hotel, swimming pools , malls, etc) exist, thus not strictly in industrial environment. Besides, in recent years, technology enabled development of CHP units of **progressively smallersizes** while retaining high values for efficiency and reliability.

Technology evolution with engines, turbines, heat recovery,heat absorber (cooling), thermal and electrical (batteries) energy storage now enables adjustment of plant sizes to the most diverse needs, enabling opportunity for gaining operational savings with the energy sphere for a **broader class of users**.

Advantages with CHP\Tri-generation

- Primary **Energy saving** (fuel), thanks to combined production of electrical energy and heat, up to 20%;
- **Global efficiency** of cycle with efficiency in the 80-90% range;
- Generation of electricity and heat nearer places of use with **reduction of grid losses**;
- Availability of **safe and practical thermal sources** for users in industry, tertiary and civil sector;
- Exploitation of renewable energy sources (biogas, biofuels, etc.) in full compliance with **Kyoto Protocol**;
- Possible coupling with **ORC turbogenerators**;
- Admission to **incentivation schemes** according to national laws;
- Possible implementation with many **industrial processes** and excellent integration with **tertiary sector**.

Plant sizes

Laborex thanks to experience accumulated over the recent years enjoys a know-how capable of **working out and perfecting** the choice of **plant size** most suitable to customer needs and for **plant profitability**.
We can offer plants with **power output from 10 kWe to 20 MWe** integrated in district heating systems, with steam production and heat exploitation.

Company profile

Laborex is a company capable of coordinating and managing projects in energetic field from feasibility study, to construction and to plant management after conduction of trials.
Laborex has accumulated relevant experience with management of supply contracts for fuels and also for management of sales contract for electrical energy and heat.
Know how and continual update with incentivation schemes (Emission Trading, etc..) boost Laborex knowledge energy sector available to own customers.

Erected CHP plants

Laborex has erected several CHP plants both from fossil sources (natural gas) and renewable sources (vegetable oils) of various sizes from 3 to beyond 20MWe.

- Gavirate plant (VA – ITALIA) –natural gas – 16,6 MWe
- Occimiano plant (AL – ITALIA) – vegetable oil – 3,2 MWe
- Guarcino plant (FR – ITALIA) – vegetable oil – 20,6 MWe
- Chivasso plant (TO – ITALIA) – vegetable oil – 18,1 MWe