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# PERSPECTIVES FOR THE USAGE OF SECONDARY FUELS IN ITALY

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## Overview

Secondary fuels, coming out as by-products of many industrial activities or produced as waste materials of generic human activities, can be properly used ad actually they are, as useful energy sources. In fact many waste materials contain a significant amount of energy, generally coming both from fossil and renewable sources. Their classification, in Italy, is defined according to specific regulations (DLgs 387/2003, DLgs 152/06). This legislation has recently been revised and collected in a framework law on environmental protection, which includes the definition for CDR and CDR-Q as refused derived fuels, coming from specific processes and having well defined characteristics. They differ from the more general definition of solid urban wastes (RSU) just the level of quality obtained through the different treatments they receive.

The usage of these materials, along with others coming from many industrial sectors, are similarly regulated by the previously cited legislation, which allows their use as secondary fuels for power generation in devoted plants, such as waste incinerators, or in co-combustion with traditional fuels in power stations or in kilns for the production of cement. These secondary fuels are acquiring an increasing importance for many industrial sectors, since they represent a low cost source of energy in a market characterised by the very high and constantly increasing prices of the conventional fuels. In the recent past the use of these secondary fuels has been favoured by a system of national incentives, which have been now cancelled or reduced only to the fraction of bio-genic origin. This change can partially modify the previously defined trends. The present paper wants to analyse the current situation and its possible evolutions also in the perspective of the just born emission market.

## Methods

First of all it is useful to focus on the different characteristics of the conventional and secondary fuels, both in terms of chemical composition and energy content. These characteristics are very important because they allow to calculate the emission factors (Ke) of CO2 produced per unit of generated energy. This is a relevant parameter for all those industries subjected to the emission trading regulations, with a critical impact on the economical performances of their production. The chemical composition and the energy values for the conventional fossil fuels are variable within a known and generally limited range, which allows to estimate a priori their emission factors, without large errors. On the contrary the composition and energy content of secondary fuels are much more variable and they strongly depends on the specific characteristics of the material, according to its origin and type of treatment. Therefore a more accurate and frequent analysis of their main characteristics is necessary to correctly estimate the corresponding Ke. In this work different classis of materials have been studied: their chemical composition and heating values are reported along with the relative uncertainties on these values due to the intrinsic variability of the materials and the analytical uncertainty.

## Results

In order to comply with the emission trading regulations, power and industrial plants have to certify their emissions of greenhouse gases (mainly CO2), starting from the carbon content of the fuels they use. Anyway the bio-genic carbon dioxide, coming from the

carbon fraction of renewable origin can be excluded from this calculation, reducing in this way the CO2 stocks required by each plant. This can be done as far as it is possible to demonstrate the bio-genic origin of the fuel. Secondary fuels often contain a considerable amount of bio-genic carbon, manly coming from some biomass fraction present in them or in the starting materials which they are originated from.

Many analytical methods have been developed for the complete characterisation of secondary and recovered fuels and many of them have been or are going to be adopted as European standards. A specific importance is related to the methods adopted to quantify the amount of bio-genic carbon; this determination is neither simple and straightforward nor the all methods are suited for any kind of materials. Many limitations and difficulties arise when different methods are compared and even when the same method is applied by different laboratories and on different samples. This complexity is manly due to the native inhomogeneity of the analysed materials and to the intrinsic difficulty in discerning among materials which are chemically and physically quite similar, but which have a different origin. In this paper a brief summary of the European situation concerning these methods, their availability and reliability is reported.

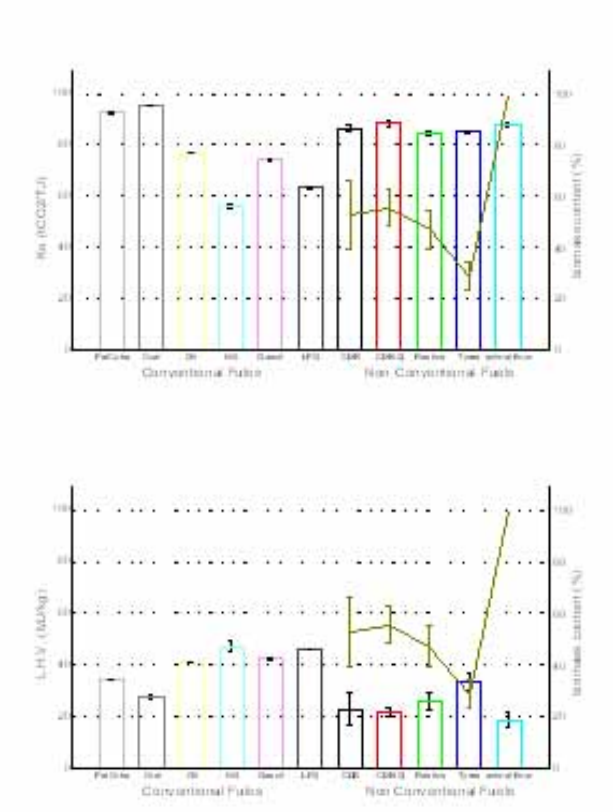


**Figure 1** a- emission factors for carbon dioxide from different conventional and non-conventional fuels; b- low heating values (energy content) of conventional and non-conventional fuels. Both diagrams report the biomass fraction of each non conventional fuel (brown line)

Figure 1 summarises some results of the present work, expressed in terms of CO2 emission factors and heating values of some conventional fossil fuels and non conventional secondary fuels. The percentage of bio-genic matter (biomass) present in each secondary fuel is also reported, in order to point out the positive contribution that these fuels may offer, in the short term, to the overall reduction of the greenhouse gas emissions.

**Conclusions**

A general overview of the total emissions of greenhouse gases, produced in the different industrial sectors in Italy, is reported along with their disaggregation in terms of fuel sources and plant sources. The current and potential contribution to the reduction of greenhouse emissions due to the usage of secondary fuels are estimated for the present and possible future scenarios, accounting for possible perspectives of evolution of the emission trading market and regulatory issues.