TRAINING AND CERTIFICATION IN ITALY

Anna Moreno^, Salvatore Castello^, Patrizia Pistochini*, Liliana Bonfiglio°
^) ENEA Research Centre Casaccia, via Anguillarese 301 – 00060 Roma, Italy
*) ENEA Laboratories of Research Ispra, via E. Fermi – 21020 Ispra VA, Italy
°) Mesos, via del Pigneto 303 h- 00176 Roma, Italy

ABSTRACT: The ongoing phase of the Italian "Conto energia" Programme highlights a large participation and a high increase of PV installations. A preliminary evaluation of PV power installed in Italy during 2011 amounts to around 11.000 MWp. In this situation it is important that the design, installation and maintenance of PV Power Plants is properly done according to technical norms and standards.
In Italy different institutions are working together to define how to fulfil the guidelines expressed in the 2009 EU Directive on the promotion of the use of energy from renewable sources. The Italian certification, will be managed by regional administrations supported by ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development. As art. 13 foresees, the installers of PV plants will receive a certification after having followed a training programme and an examination of competences by the institutional bodies. The "certified installers" will be inserted in a national register under control of ENEA and of the regional administrations.
ENEA with Mesos, which is an ENEA spin off, have set up blended system courses (e-learning and face to face lessons) which are qualified by CEPAS, a national professional certification body.
Keywords: Education and Training, Dissemination, Photovoltaic Plant Installer, PV Market

1 INTRODUCTION

With a very attractive incentive scheme, at the end of 2010 Italy became the world's second largest PV market. This year has been, in fact characterized by impressive growth of installations alternate to "tumultuous" moments, especially related to the approval of institutional measures that represented moments of discontinuity for the entire market: At the same time during this year excellent investment conditions had caused a surge in installations, as a way for best rate income.

According to GSE the total installation in 2010 amounted to about 2 321 MWp, resulting in a cumulative installed and operating power of 3 502 MWp, with an increase around 296 % as respect to the previous year. Moreover, in the framework of the "salva alcoa" decree sworn declarations of construction completion recorded until 31 December 2010 refer to further 54,106 installed plants, corresponding to a declared capacity of 3,771 MW, still not connected to the grid within 2010, but with a 90% operating at present.

This framework has been generated an impressive turnover: The budget for the 800 Italian companies operating in PV sector was very positive although there were some speculative and opportunistic behaviors.

On the other hand, the growth of the photovoltaic industry has recorded a positive effect on employment:. Estimated PV-related labour places added to an amount of 50.000 jobs. (MIP – Solar energy Report)

In the light of this growth, the high quality of training became extremely important for professionals and technicians in photovoltaic filed.

2 MARKET SITUATION IN ITALY

2.1 Solar PV in Italy

The trend of the cumulative installed PV Power, from 2008 to August 2011, broken down into four phases of the "Conto Energia" Program is shown in Fig. 1

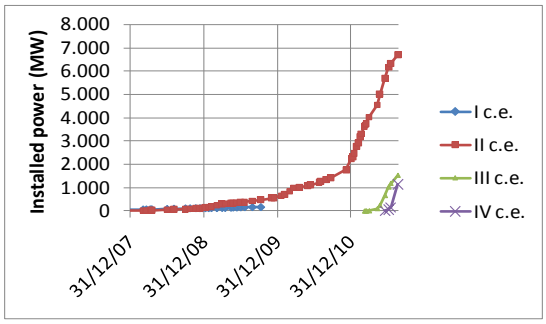

Figure 1: Installed power in the framework of the four phases of the "Conto Energia" program

The cumulative installed PV power sums up to around 9550 MW corresponding to about 259 thousand installations. In this contest, the governmental target of 8 GW of PV installations by 2020 has been already reached before the end of this year.

As a consequence, a new decree (the fourth "Conto Energia") issued in May 2011 has redefined a target of 23 GW by 2016, annual caps for large plants and a significant reduction of tariffs during the years.

2.2 The fourth "Conto Energia"

The decree regulating the fourth "Conto Energia" (DM 5 May 2011) [8] has been issued by the Minister of Economic Development and the Minister of the Environment in May 2011. The most important aspects are:

- a total spending limit for the period 2011-2016, corresponding to a total capacity of 23 GW with cap every six months;
- a reduction of the incentive tariffs starting in June this year;
- the same power class of the previous phase of the "Conto Energia";
- more generous tariffs to plants on building especially for building integrated photovoltaic systems with innovative features. Higher tariffs are also provided for concentrated photovoltaic plants;

- two kind of plants; 1) the "small plants" installed on buildings not exceeding 1 MW , 2) ground-mounted up to 200 kW and the "large plants" (all the other ones). Until the end of 2012, large plants are allowed to receive incentive tariffs in the framework of cost limits, while small plants, can benefit of the tariff without such limits. In any case, the exceeding of the limit for a given period does not restrict access to the incentive tariffs, but results in an additional reduction of the next period limit;
- from 2013onwards, an all-inclusive tariff will be introduced. At which will be added a tariff for self-consumption. Moreover, from 2013, the exceeding of the budget limit will results in an additional reduction of the incentive for the next period;
- an increase of tariffs, for plants owned by small municipalities with, installation on brownfield sites, landfills, etc and for modules that replace asbestos. A further novelty regards a tariff increase for plants using components manufactured within the European Union.

3 TRAINING AND CERTIFICATION IN ITALY: THE STATE OF THE ART

3.1 Overview

The certification of installers is a way to promote the quality and safety of PV installations, though it does not ensure that every system is properly installed.
The RES Directive oblige all Member States (article 14 of the RES Directive) to certify PV installers in order to guarantee quality installations and satisfied customers, which in turn will spur further market deployment.
Moreover, the European Qualification Framework, published in April 2008, has underlined how important it is to establish the knowledge, the skills and the competences which are needed in order to be considered "good professionals".

3.2 Comparison of the courses

The updated survey of the previous, made in 2009 [7], shows a wide range of courses from master courses, to higher technical education financed by regional funds, to courses offered by companies working in the sector and to courses organized by educational institutions. Searching on the Web, the 50 most evident courses provided between 2010-2011 in Italy, both in public sector and in private sector are analysed. Some interesting remarks arise from the promoters of the courses, the benefits for the attendees, the duration as well as regarding the geographical distribution of the courses.

We have observed that almost all courses are organized in the centre-north of Italy. Respect to the previous survey, the number of courses increased in the centre and in the south of Italy respectively from 30% to 34% in the Center and from 12% to 23% in the South. To complete this statistic overview we report that a percentage of 12% refers to courses provided on-line.

In Figure 2 we are considering the providers of PV courses. The great majority of them corresponding to about 40% is organized by Educational Agencies, 15% by professional associations, 13% by private associations with or without university or research centers. It is important to notice the relevant occurrence of PV companies (18%), especially manufacturers, within PV providers.

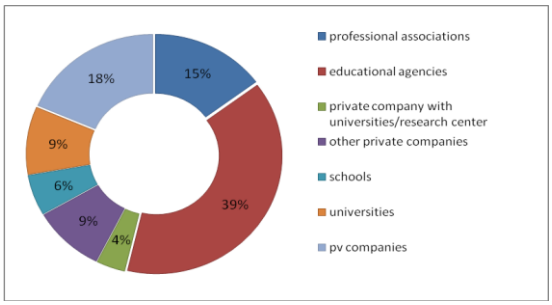

Figure 2: Providers of education and training in PV sector.

Very often, the offered courses are simultaneously aimed at designers and installers of photovoltaic plants, who require training to acquire specific, and very different, skills, even though the two professions are regulated differently. Most of them are provided for installers.

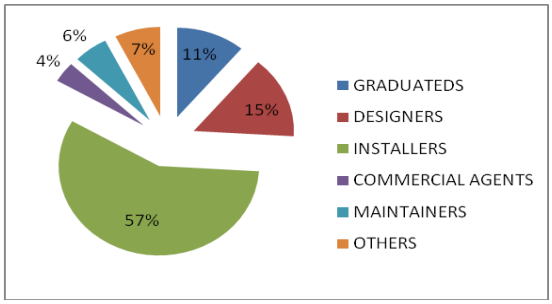

Figure 3: Target of trainees

The courses have been sub-divided in 3 groups based on duration. Most courses (38%) have a *short duration* between 8 and 24 hours, followed by 36% referred to the medium duration, between 27 and 80 hours, and finally 26% with a duration longer than 500 hours, for example the Master.

Table 1 makes a comparison of the 3 different courses with respect to type of training, number of participants, stage, average costs, final examination and finally qualification.

Table 1 : The differences of the courses with respect to their duration

	SHORT COURSES	AVERAGE TIME COURSES	LONG COURSES / MASTERS
%OF THE TOTAL	38%	36%	26%
DURATION	8-24 h	27- 80 h	500 – 1500 h
TYPE OF TRAINING	100% face learning	16% on line 21% blended	12% on line
PARTICIPANTS	20-40	Max 20	12-45
STAGE	no	10,5%	46%
AVERAGE COSTS	378 euro	1394 euro	3600 euro
FINAL EXAMINATION	Very few cases	Some cases	Yes
QUALIFICATION	Very few cases	31,6%	Only for Master's degree

The survey shows that the *short-duration courses* (38%) have a generic nature and are organized by

companies in the sector, have no more than 2 speakers and almost always provide a visit to the company's plant. The educational panorama offers a multitude of informative seminars, symposia and workshops of the duration of half a day to a day, often organized by associations, local authorities (municipalities, provinces and regions), schools or banks aimed at raising awareness on the issue of PV amongst citizens or inform them of the possibilities of investments and State incentives offered by the so-called "Feed in Tariff".

The *mid-time courses* representing 36% of the courses are the ones that last more than 3 days; most of them are organized by training institutions often associated with universities or research centres.

Some mid-time courses are addressed to engineers and designers, they are given by researchers or academic speakers and are primarily aimed at professionals who already work in the field and who require updates and/or depending of their knowledge on the design of photovoltaic systems or on technical regulations.

This category include 80 hours blended learning course (40 hour classroom and 40 hours e-learning) organized by Mesos in cooperation with ENEA and certified by CEPAS.

The remaining 26% of the educational courses offered on the Italian market are falling in the category *long courses* with a duration from 1 month to 3 years. They include masters at the Universities but also two year courses requiring a significant financial commitment, which can range from two to eight thousand Euros per student. These masters are aimed at young science graduates and issue a university degree or consist of courses financed by public funds aimed at young unemployed persons. In this latter case they could be free of charge. The majority includes a stage and the cost depends on the selected number of students. For instance a course for 12 specialized professional may cost 1200 € and includes about 600 hours of training.

For those who have little time to follow long masters degrees and limited possibilities to travel they can choose one of the e-learning courses (12% of the analyzed courses are provided on line), such as the course in photovoltaic energy available on ENEA's platform. (http://192.107.92.31/fadivgen2/). ENEA will develop a user-friendly learning platform, in which learning resources could be easily found.

Excluding on-line lessons, only 38% of the total examined course has a maximum limit of participants, 52% of them have a maximum of 20 participants, 38% up to a maximum of 40 participants and the remaining 10% reports a limited number of participants.

From our analysis emerges that only 4 out of 50 courses are qualified by an independent third party.
In particular, CEPAS (an Italian non-profit association, is a Personnel and Training Courses certification body) recognizes 3 courses on PV sector under the ISO/IEC 17024 standard (ex EN 45013) "General requirements" organized by:

- ENEA - Mesos, since 2008;
- ICIM, since 2010;
- Centro Studi Galileo, since 2011.

Table 2: Training program qualified by CEPAS

Company	Type Course	CEPAS Register Number	Target	Duration Of The Training	Number Of Lectures
MESOS - ENEA	Blended learning course	n. 94	Designers, Installers, Maintainers	50e-learning 50 face to face	6/8
ICIM	Face to face course	n. 111	Installers	28 hours	2
Centro Studi Galileo	Face to face course	n. 114	Designers, Installers	32 hours	1/2

ESAcert (European System for Accreditation of Certification Bodies in the field of energy and environmental and based on CEN standards UNI EN 45011) recognizes the course organized by C.R.E.A. (Energy saving and environmental quality research centre).

Training institutions may be accreditated by Regions or other public institutions and their courses may be funded in other cases they may be accreditated by AIFOS, an Italian Association of training agencies.

In order to promote the skills of the new engineers and architects in PV sector, a training agency has launched a national competition aimed at obtaining scholarships to attend the course "Technical Design, construction and operation of Photovoltaic systems scheduled for the end of 2011 at the Faculty of Engineering "University of Naples". One Scholarships cover totally the courses of 52 hours and the other 3 part of it.

3.3 Qualification Profile, Skills and legal requirements

Demand for PV highly qualified personnel partly consist of persons explicitly specialized in photovoltaics trained within the PV sector, partly of skilled labours.

The required qualifications will differ depending on the stage of the value chain at which personnel to be employed in the PV sector will be active.

- PV plants design: highly skilled staff (engineering and other technical backgrounds) is required to provide services such as management, contracting, design and marketing issues.
- Installation: qualified technicians or electricians.
- Operation and maintenance**:** no academic or scientific background required.

In order to practice the profession of "designer of photovoltaic systems" the person has to be either, an engineer, an architect or a technician. They must be enrolled in a 'professional society', either the association of engineers or the society of technicians, or the architects society. The registration in these 'professional societies' is obligatory, they have the right to authorize projects, execute evaluations, consults and certification.

For the installers, professional requirements range from University technical degree to 6 years of experience as owner of an installing company.

If the designers in Italy don't need to be qualified, the installers - according to the recent legislative decree n. 28 of 3 March 2011 – from the 1th August 2011 will need to pass a final examination after a specific course in PV sector in order to receive the qualification as PV installer.

3.4 Training programs provided by PV companies

Companies that are active in the PV industry, due to their troubles in finding trained personnel on the labour market, are currently setting basic requirements on the

training of employees working in the PV sector. According to these companies employees should have a technical education, and an additional training in photovoltaic energy. They emphasize the importance of practical training in photovoltaics.

Most of the companies in the PV sector organize internal trainings for installers, new recruits or clients, or set up paid courses for non-staff for the duration of 1 or 2 days.

PV companies understood the importance of training not only their internal workers, but also external partners, such as installers or distributors spread out all over the country. Sometimes PV companies also provide the training of their designers, that is, for example, the case of Solsonica Energia.

Table 3: Training programs by PV companies

TYPE OF COMPANY	TARGET	HOURS	LECTURERS	QUALIFICATION - CERTIFICATION	GOALS/ BENEFITS
Module producer #1	installers, distributors, structured companies	32	technical staff of the company + external experts	yes	training on products, incentives, installation - become partner
Module producer #2	companies that aim at become partners	not found	technical staff of the company	yes	structured training program - training on products - become partner
Module producer #3	installers, designers, distributors	40	technical staff of the company	yes	training on products, installation and safety - become partner
Module producer #4	installers	16	technical staff of the company	yes	training on design and installation - become partner
Module producer #5	installers	8	technical staff of the company + external experts	yes	training on products, regulatory and market trends. become a partner
Distributor - Installer #1	installers	8	technical staff of the company + staff of the manifacture companies	yes	technical training -become a partner
Distributor - Installer #2	installers and professionals	8	technical staff of the company		training on installation - become a partner
Inverter producer #1	installers, clients	16	technical staff of the company		training on own products and safety requirements installation
Inverter producer #2	installers, technicians and distributors	16	technical staff of the company		training on own products

In some cases the courses are essential for the installer to learn the correct use / installation of the products. For that reason, in addition to the basic topics on PV technology, very often PV companies choose to train the people on their own products. The lecturers are, mostly, technical staff of the companies themselves, and almost always provide a visit to the company's *plant* or show the company products, as you can see in Table 3.

Within these courses the characteristics of the modules or inverters and installation techniques are described and often also the procedures on how to access incentives.

For some applications related to the installation of the inverter it is necessary for the installer to contact the manufacturer to acquire the skills for the right installation. For example, Electronica Santerno, SMA and Power One regularly organize courses for designers and installers on the technical characteristics of their products, on the safety requirements for inverter installations, or system monitoring, etc.

Most of the module producers offer installers, distributors and, in a few cases, designers the opportunity to join their network as qualified technicians, but at condition the installers attend training courses organized by PV companies.

So the installer can now boast of the quality brand of a producer, and become a "Solar Pioneers qualified installer" rather than "a technician qualified by Solsonica" or "a Proinso qualified installer".

For technicians that belong to the network, the company provides technical support and marketing consulting, but asks the installer to respect of quality standards typical of the company, as in the case of Sunpower.

3.4 Example of volunteer qualification system

ENEA with its spin-off company Mesos – Innovation and training advice, has already developed a certification path for designers and installers of photovoltaic plants. The training course on Photovoltaics have been qualified in 2007, as the first in Italy, by CEPAS - an Italian certification body for personnel and training courses- under ISO/IEC 17024 standard.

CEPAS certification represent a voluntary certification of personnel, that provides a set of national standards by which PV designers or installers with skills and experience can distinguish themselves from their competition. It is not intended to replace national licensure requirements, but it could represent a pioneer experience in qualified PV training.

It consists in a professional blended learning program aimed to qualified professional skills by a third party according to precise rules fulfils specified competence requirements, defined with the interested parties

The general criteria identified by ISO 17024 are related to the participation of all the stakeholders to the definition of the competences needed, the competence of the teachers, absence of conflict of interest among certification body and trainers, transparency, impartiality, confidentiality and security.

The lecturers are researchers working in ENEA's photovoltaic research centre, qualified by CEPAS. The course is primarily attended by engineers and professionals who wish to acquire technical and practical competences and specialize or qualify.

Up to now ENEA and Mesos have organized 12 editions of the designers course and 7 for installers of PV plants, and they have trained more than 300 people, as designers and installers of PV systems.

Most of trainees have a technical background, in particular 40 % of the participants are engineers, 34% have a technical decree.

They have attended the course in order to specialized in PV sector and enlarge their possibilities of business.

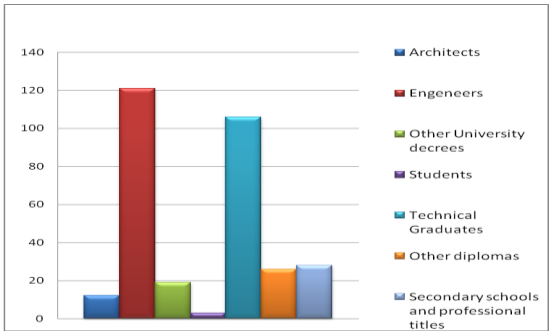

Figure 4: Mesos trainees background

4 ITALIAN FRAMEWORK AND LEGISLATION

4.1 Overview

Under the RES Directive 2009/28/EC of the European Parliament and Council dated 23 April 2009, Member States are obliged to develop certification schemes for installers of small-scale renewable energy installations by the end of 2012.

According to the recent Italian Legislative Decree on Renewables, the Italian certification, will be managed by

regional administrations supported by ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development.

ENEA is partner of the "QUALICERT" project that aims at developing mutually recognisable and common recommendations in order to facilitate the implementation of certification or equivalent qualification of installers of small-scale Renewables (RES), including PV.

4.2 The Italian Legislative Decree on Renewables

Legislative Decree no. 28 of 3 March 2011, implementing directive 2009/28/EC, on the promotion of the use of energy generated from renewable sources, was published on the Official Gazette on 28 March 2011, and has entered into force the day following its publication, with particular reference to the impact of this new legal framework upon the incentive systems currently provided for purposes of supporting investments in the renewable energy sector.

The purpose of the DL 28/11 is to define instruments, mechanisms, incentives and the institutional, financial and legal frameworks necessary for achieving the 2020 goals as regards the total quota of renewable energy in final consumption and in transport.

As art. 15 foresee, the installers of PV plants will receive a certification after having followed a training programme and an examination of competences by the institutional bodies. The "certified installers" will be inserted in a national register under control of ENEA and of the regional administrations.

Article 14 - Training and information

Within six months from the date of entry into force of the Decree, GSE will implement, in collaboration with ENEA, a portal with detailed information on national incentives for renewable sources to produce electricity, heat and cold, about net benefits, cost and energy efficiency of equipment and systems for the use of heating, cooling and electricity from renewable energy sources, etc..

Article 15 – Qualification system for installers

Relevant for the qualification of installers of small scale photovoltaic plants is the Article 15, that orders the requirements to keep the activities of installations and maintenance of photovoltaics plants.

The article 15 introduces the following principal rules:

- Before 1st August 2013, installers of photovoltaic plants must respect specific technical and professional requirements , as:
- university decree or technical degree with 2/4 years of experience in PV sector, according with the exiting article 4 of the Ministerial Decree 37 of the 2008.
- certificate of professional training course and final examination in order to demonstrate competences is in accordance with Annex IV of the DL 28/2011.
- Within the 31st December 2012 the training courses for the RES installers should be provided directly by Italian Regions or by their accreditated bodies - in agreement with the Annex 4.
- In order to promote the consistency with the Annex 4 criteria and the homogeneity at national level, within the 31 December 2012, Regions together with ENEA will design training courses to issue certification of installers of RES.

Annex IV- Installers Certification and training criteria

The certification schemes referred in article 15 of the Italian decree n.28 are based on the following criteria:

- the qualification should be made by a transparent and clearly defined procedure and assure regional coverage of the training program offered by the supplier;
- the training courses should include both theoretical and practical parts.
- The training provider should have adequate technical facilities to provide practical training.
- the Training provider can be the manufacturer of the equipment or system, institutes or associations;
- the qualification of installers has a limited duration and qualified installers should attend every year refresh courses in the form of a seminar or event
- the training courses should end with an examination leading to a certificate or a qualification. The examination shall include practical assessment of installations in order to demonstrate competences in installation.

4.3 Barriers to certification of installers and the role of ENEA

In Italy it is common that different associations develop their own vocational and educational training with different rules and different objectives. Therefore it is difficult to identify the strategy to reach a unique qualification/certification scheme accepted by all the stakeholders. For the time being the RES Directive N°28 has been implemented with the Italian legislative decree of the third March 2011.

What is important to notice is that, in the comma 4 it is written that the Regions and the autonomous Provinces have to establish a certification schema by December 2012 but they can ask the support of ENEA which would help them to set in place the certification/qualification schema.

For this reason ENEA is now addressing all the effort to receive endorsement letters by all the stakeholders. In the following list there are the organizations which have already signed the endorsement letters.

The endorsement campaign will continue after the end of the QUALICERT project and hopefully with the "WISE roadmap"- a new Italian project which foresees a national roadmap for the certification/qualification of all the workers working in the energy efficiency of buildings.

5 CONCLUSIONS

The PV market growth rates experienced in recent years has resulted in an increasing demand for competent specialists able to install faultless and PV systems. According to the Italian L.D. 28 of 3 March 2011 on the promotion of the use of energy from renewable sources each installer has to reach a certification/qualification. The "certified installers" will be inserted in a national register under control of ENEA and of the regional administrations. The qualification as an installer will encompass developed practical skills and a profound understanding of the theoretical backgrounds, ecological and economical aspects and rational use of small-scale renewable energy systems in buildings.

As demonstrated by our investigation, in Italy providers of educational and training programs range from private institutions, to universities or PV companies, as well as the contents of training very often depend on the particular provider. Analyzing ten of the most

significant manufacturers that provide training courses it is possible to notice that all of them teach about their own products and technologies.

Being in this situation we expect a high demand of certifications of installers of small-scale photovoltaic plants in the upcoming years. As a consequence, the regional administrations and the providers of training should be prepared to guarantee high quality of training to the numerous installers that need to be qualified. Therefore, in order to guarantee the homogeneity of the programs, ENEA – that has already set up a volunteer certification program with Mesos and CEPAS - aims at training the trainers of the various institutions and companies that intend to provide training courses, in accordance with Annex 4.

4.3 References

[1] S. Castello, A. De Lillo, S. Guastella, F. Paletta "National Report of PV Power Application in Italy 2010", IEA PVPS report, 2011.

[2] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009.

[3] Decision 2009/548/EC of the European Commission of 30 June 2009.

[4] Italian Legislative Decree n. 28, dated 3March 2011

[5] Manual - "A common approach for certification or equivalent qualification of small scale RES in buildings" Qualicert Project www.qualicert-project.eu

[6] Recommendation 2008/C 111/01 of the European Parliament and of the Council of 23 April 2008.

[7] P. Pistochini, A. Moreno, S. Castello, L. Bonfiglio, " Knowledge, skill and competence in PV installations", 24th European Photovoltaic Solar Energy Conference, 21-24 September 2009, Hamburg, Germany

[8] Decree 5 May 2011 defined the IV Conto energia

[9] MIP, Solar Energy Report – 2011

All requests regarding the preparation of the paper should be addressed:
Liliana Bonfiglio
Mesos, via del Pigneto 303 h - 00176 Rome, Italy
E-Mail: mesos@enea.it