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**D 4.1 Implementation of models of  
coordination  
(A.R.T.E. Genova)**

December 2012

**PART I PILOT PROJECT TECHNICAL DESCRIPTION**

**1. Description of the pilot building**

ARTE's Pilot Building is in the outskirts of Genoa in a popular area. Nowadays this neighbourhood is quite close to the centre of the town. The pilot site, which is called Via Sertoli n.9- is part of a greater whole of popular dwellings distributed in several other buildings which are ARTE's property.

To follow, some pictures of the building.





- **Building general characteristics**

Sertoli no.9 is a 1931 building, composed of six floors and of 84 public housing units.

- **Construction characteristics**

It is a building made of concrete, external walls composed of double walls (externally full bricks and internally holed bricks), with an empty inner space; pitched roof made of slate; central patio.

- **Energy initial situation**

There was no heating system; people made use of gas or electric stoves. There was no insulation neither on the roof, nor in the external walls. The amount of heat loss through the building envelope was 208 KW/m<sup>2</sup> per year .

The initial energy level is G, according to the Italian energy performance certificates. (Level G means a consumption over 200KW/h per year, referred to m<sup>2</sup>).

Via Sertoli		
Address	Via Sertoli, n.9	
Year of construction	1931	
Type of building	Six storey building	
Number of dwellings	52	
Tenure	Public	

Construction characteristics	Structure made in concrete, external walls composed of double walls (externally full bricks and internally holed bricks), with an empty inner space; pitched roof made of slate; central patio.
HVAC system	No heating and ventilation system before works.
Energy performance before renovation	208 KW/m <sup>2</sup> per year is the amount of heat loss through the building “envelope”
Expected performance after renovation	28,34 KW/m <sup>2</sup> per year obtaining A level Italian Energy performance certificate.

## 2. Description of the refurbishment project

### Description of general works

The aim of the project is to renovate the building, making 52 dwellings of various sizes, cellars for all single units and two commercial premises, along with the realization of new technical systems (lift, heating, hot water and electrical systems, plants, etc.), roof renovation with eco-friendly materials and window enlargements with the installation of double panelled, gas filled, PVC framed windows. The project aims to optimize the building's thermal performances and in particular:

- reduce energy consumption for heating and hot water production;
- reduce the operating costs;
- maintain a thermal comfort condition inside the units;
- reduce heat loss;
- maximize the new systems performance;
- avoid condensation;
- integrate the central heating – based on low temperature systems - using solar thermal or photovoltaic systems;
- assess, through the obligatory Certification, the energy efficiency of each dwelling.

### Description of energy works

ARTE's initial objective was to carry out a building characterized by level B on the Italian energy performance certificate scale. The further objective of level A certification was achieved by the improvements contained in the Companies' proposal.

The main important works about energy are the choice of a central heating based on low temperature system ("Condensing boiler"), thermostatic valves on the radiators inside every single dwelling, photovoltaic system and solar system on the roof, and wall and roof insulation.

The data below are referred to the call for tender after its award (discount as 34,39 % offered by the awarded enterprise).

Whole renovation investment in €		Energy renovation investment in €		% of renovation investment dedicated to energy saving measures
Total	Per dwelling	Total	Per dwelling	%
2.964.870,95	57.000	620.000	11.900	21%

Name of the energy saving measure	Saving		Necessary investment	Repayment period	Reduced CO <sub>2</sub> emissions
	kWh/year	€/year	€	years	t/year
Insulation external walls	157.000	17.900	224.000	12,5	96
Roof insulation	39.400	4.500	56.000	12,5	24
Total:					

Renewable Energy installed	Energy produced		Necessary investment	Repayment period	Reduced CO <sub>2</sub> emissions
	kWh/year	% bdg needs	€	years	t/year
Photovoltaic system	12.000kWh/year		37.000	17	2,4
Solar thermal system	42.000kWh/year		32.500	10	25,6

- Energy performance objectives: Thanks to a Photovoltaic system we want to produce 12.000kWh/year and guarantee the energy for the common parts of the building (staircases, cellars, etc.); thanks to the solar thermal system, we will produce 50% of the hot water needed for 52 dwellings; regarding the whole energy saving of the building we have as objective:655.120 kWh/year, 52.400 Euro/year, less CO<sub>2</sub> production : -150 Ton/year. Before the refurbishment, the building lost 200KWh7/year per mq. After the works, we are sure that it will lose 80% less of heat.).

- Tendering procedure: Open procedure as per article 55 of the Legislative Decree 163/2006, to be awarded by applying the principle of the most favourable bid from an economic point of view as per article 83 of the Legislative Decree 163/2006, on the basis of the criteria and sub-criteria of valuation and relevant weights and sub-weights.



## PART II IMPLEMENTATION OF THE ALTERNATIVES TO THE CURRENT COORDINATION MODEL

### 1. **Reminder of main conclusions from TU Delft study and targeted problems that the pilot project will try to overcome.**

The results from TU Delft analysis (see deliverable 3.1), have highlighted that more attention is needed to be given to “Maintenance” and “Tenants” . We decided to face these problems including them in the tender and considering them as very important elements for saving energy and money.

Once a year ARTE’s technicians, meet the neighbourhood representatives, who highlight all the problems the tenants find in the running of their units. Considering that the type of construction of the Pilot site is very similar to those nearby, we decided to take into account the complaints about them.

So the decision to introduce the remote transmission of the data regarding energy consumption is based on the fact that it was difficult for tenants to pay their relative bills in a single payment, without realizing how much they consume for each energy supply (gas, electricity, etc..). In this way, the people who will live in Sertoli n.9, will know how much they are consuming and at the same time if it is necessary for them to save energy and money by changing their behaviour.

Moreover ARTE will prepare a particular document for tenants explaining the correct use of the heating system, hot water production and the right behaviour to be used in managing their dwelling, to run their units better.

### 2. **Analysis of the chosen alternatives (phase by phase)**

#### 2.1 **Alternatives affecting the planning phase**

*The choice of TENDER* was the most important “alternative” ARTE has implemented. Within the tender ARTE paid attention to the different aspects to achieve the best energy saving possible, in the most economic way for the PRINCIPAL (ARTE). The subjects involved were all ARTE Internal Staff (Technical Deptmt. -dealing with design and maintenance- , and Administration Deptmt.).

#### **Description of the Tender**

Term of execution: 540 calendar and consecutive days starting from the date of stipulation;  
Requirements for bidding: certification of qualification for categories and classes required for the works (valid, effective and issued by a duly authorized classification society SOA).

Awarding Criteria: 1) Economic bid (30 points), 2) Technical bid (20 points), 3) Technical bid for energy saving (50 points).

A synthesis of the method of bid evaluation can be seen below.

There is a valuating commission that gives points on the basis of the best energetic practises. The points range from 1 to 50, giving a numerical “score”; the same for the best practises offered for building solutions.

The score for technical improvement, not concerning energy saving, ranges from 1 to 20. The total of the two “scores” gives a numerical value, that characterizes the technical bid.

Another score is given to the economic bid on the basis of the discount offered about the price indicated in the tender. The score ranges from 1 to 30.

The last thing to do is to add together the three “scores” and single out the highest bidder.

In particular:

1) the economic bid includes the offer;

2) the technical bid includes a detailed technical offer for the requirements of the Special Specification of the executive draft, with specific reference to the elements that have to be evaluated by the Valuating Commission; the parameters that will take interest are: Total term of execution of works(8 points), Methods for setting up the building site (2 points), Quality of sheeting materials (8 points), Quality of electric system (2 points);

3) the technical bid for energy saving concerns:

I) Efficiency of the heating and hot-water system – 6 points - in terms of thermal output, performing elements of the system and suggested materials.

- The score shall be assigned on the basis of the quality that the suggested system is considered to ensure, on the basis of all the components suggested, in terms of reliability and environmentally friendly materials. In this case the score shall be assigned globally in consideration of the entire system.

II) Efficiency of the photovoltaic system – 3 points - in terms of final energy output and of panel compacting onto the roof surface (the smallest size of integrated panels producing the same or more energy shall be awarded).

III) Efficiency of the solar thermal system for the production of hot water (that shall ensure at least 50% of the yearly requirements of sanitary hot water) – 3 points - in terms of final thermal output and of panel compacting onto the roof surface (the smallest size of integrated panels producing the same output shall be awarded).

IV) Most valuable energy saving in terms of thermal inertia of the shell insulating the building – 8 points – The score shall be assigned as follows:

- Value of the thermal resistivity of insulation to be inserted in parametric walls – 4 points

- Value of the thermal resistivity of insulation to be inserted (although not provided in the plan) in the thermal bridges of the building, such as the covering of pillars and parametric edge beams – 4 points -

V) Energy saving/recovering lifts – 3 points – The criteria of valuation shall be the ones as the global valuation of the system suggested on the basis of all the components offered, in terms of durability, reliability and environmental friendly materials.

VI) Energy saving in thermal performance of windows, French windows and landing doors, frames included. – **points 5** - The valuation shall consider the coefficient of thermal transmittance (as per the legal obligation:  $K \leq 2.4 \text{ W/m}^2\text{K}$ ).

- 1) For doors and windows having  $2.0 < K \leq 2.2 \text{ W/m}^2\text{K}$  – 1 point
- 2) For doors and windows having  $1.9 < K < 2.0 \text{ W/m}^2\text{K}$  – 3 points
- 3) For doors and windows having  $K < 1.9 \text{ W/m}^2\text{K}$  – 5 points

VII) Increase in the global energy performance of the building in terms of energy saving, which shall be evaluated on the basis of the recalculation of the certification of energy saving through “programma celeste”, the official software of the Regione Liguria, by comparing the performance elements of the suggested systems with the ones provided in the executive plan under the Tender Specifications – **10 points** - The valuation shall be in  $\text{KWh/m}^2$  on a yearly basis through the index of global energy performance of the building ( $E_{pi}$ ).

- 1) For the increase of  $1 \text{ KWh/m}^2$  per year – 1 point
- 2) For the increase of  $10 \text{ KWh/m}^2$  per year, corresponding to the achievement of the Energy Class A – 10 points

The bidders shall enclose to their bid a magnetic support with the calculation of the index of global energy performance of the building ( $E_{pi}$ ) carried out using the above-mentioned software “programma celeste”. The principal shall be entitled to check the data and their correspondence with all the materials and the systems suggested. Any miscalculation shall imply the cancellation of the score for this paragraph. Also in case of awarding, any negative result of this check shall imply the cancellation of the score for this paragraph and the final score of the bidder shall be recalculated (the awarding may be consequently cancelled).

The bidders shall enclose to their bid for the plan the technical specifications regarding all the following materials: internal covering and floors, external floors, engineering components of electric, heating and hot-water systems, of photovoltaic panels, of solar-thermal panels, insulating materials, lifts, components of data communication system, external windows and doors with particular reference to their thermal transmittance value; bidders shall consider that these elements shall be evaluated and points shall be assigned accordingly.

- *MAINTENANCE*. To guarantee better working of the plants within the dwellings, we asked the bidders to offer longer maintenance periods than usually offered; 36 months rather than the usual 18 months: we asked the bidders to indicate a particular term of maintenance exceeding the term provided in the Special Specifications (18 months after the effective work completion, including any execution of finishing). The indication of 18 months is due to the consideration on the basis of which the complete running of the building site is done within that period. The supplementary time offered by the bidders is a guarantee for ARTE of an efficient and “free” maintenance (this particular service we asked for, is a maintenance that the selected contractor has to assure through periodic controls of the various systems and resolute interventions in case of breakdown; in these cases there isn’t any “malus” system for the repair needed, but all the costs are assumed by the bidder obtaining the

tender. If the enterprise should not make the needed repairs, ARTE will charge the enterprise for any damages caused. After the requested period, the maintenance will be carried out by an other enterprise which will be chosen by ARTE, thanks to another tender, called every 3 years, for the maintenance of all ARTE's heritage. Needless to say, it is an independent call for tender from the one regarding the Pilot site.

We have to remember that to better take into account the aspects linked to "*Maintenance*" while carrying out the definitive Pilot project, ARTE involved the technical staff, who usually attends to the good running of plants. Moreover, it must be said that it is not permitted by Public Procurement rules to involve an enterprise before it has been awarded a tender.

Coming back to the tender chosen, the following explains the procedure for evaluating the Maintenance offer.

The offer will be valuated as a maximum of 9 points. In particular the points are:

l) Free maintenance of the heating and hot-water system:

- 1) Up to 24 months: 1 point
- 2) Up to 30 months: 2 points
- 3) Up to 36 months: 3 points

Free maintenance of the Photovoltaic System:

- 1) Up to 24 months: 1 point
- 2) Up to 30 months: 2 points
- 3) Up to 36 months: 3 points

Free maintenance of the Solar Thermal System:

- 1) Up to 24 months: 1 point
- 2) Up to 30 months: 2 points
- 3) Up to 36 months: 3 points

- *TENANTS*. To avoid energy and money wastes, we asked to the bidders a more efficient data communication system connected to the terminals of the technical offices of ARTE (Management Office). Data transmitted must be about hot water and heating consumption. Hereby the points to be given to the bids:

Efficiency of the data communication system connected to the terminals of the technical offices of ARTE – Ufficio Gestione (Management Office) – **3 points** - in terms of final thermal output.

- a) 2 points for the efficiency and reliability of the system.

b) 1 point for the supply – free of charge – of the phone line for the data communication (and any relevant costs thereof) in the years after the effective work completion (max 36 months).

- Description of its implementation.

The reason for this implementation is to obtain more energy efficiency from a project, thanks to an important and deeply thought out draft together with a complex tender, involving a large part of ARTE departments and other actors involved in the project.

- Quantitative and qualitative achievements, impact of the alternative on the refurbishment project (on project costs, project duration, on the communication flow between actors, on building design and technical decisions, on final energy performance of the buildings, etc.).

As we have just described, the achievements are qualitative regarding the type of performance that the building will have after the renewal works, and quantitative on the basis of the result in terms of money saved by the Principal and by the tenants; moreover for ARTE it will be easier to manage its own propriety, and the relationship with tenants too.

Finally is to consider the great saving in Co2 emissions (Ton/year)

### **Analysis of barriers encountered.**

Difficulties were found in drawing up the Tender, choosing all the elements for the criteria to fit our goal. Moreover it was difficult to know what kind of tender could be used according to the Italian Public Procurement. The difficulties incurred drawing up the tender were mainly to choose the suitable awarding criteria, which could turn to good advantages for ARTE and its tenants; we received 27 offers and analyzing 26 (one Company didn't have the right SOA certification), it took about 6 months; the quality of the offers was satisfactory. However, it could have been better as far as energy saving was concerned. For example, we didn't find great professional skills in energetic efficiency index calculating.

In the usual procedure we carry out, we have never asked for any energy or building improvements. In fact ARTE, in the past, awarded the tender only on the basis of the economic bid.

### **2.2 Alternatives affecting the construction phase**

At this moment we are not in the phase of construction: we had evaluated the offers and chosen the winner Company. Nevertheless, we know that the whole construction phase will have effects thanks to the chosen alternatives. In fact the renovation will be carried out on the basis of an executive project drawn by ARTE improved and implemented by the proposals made by the awarded enterprise.

### **2.3 Alternatives affecting the maintenance/exploitation phase**

At this moment we are not in this phase, because we are going to start with works. However all the "alternatives" we have chosen about maintenance, will be explained into the contract signed by the bidder obtained in the tender.

### 3. Legal/technical expertise

ARTE decided to be supported by a technician, -an engineer expert about plants- to valuate that part of bids concerning energy saving. Then we'll have an expertise to evaluate the energy performances of the building after the assignment of the works, in terms of costs and performance.

Feedback:

Regarding the type of tender described, it isn't the first time that ARTE choose it. The new aspect is the application of this kind of tender on energy efficient solutions

## PART III CONCLUSIONS

### 1. Impact (See annex 1)

*Impacts of implementation of the alternatives to the current coordination model, in terms of Cost, Energy savings (and emissions), process time, compared to usual operations.*

Impacts of implementation of the alternatives are:

a) better result in terms of energy and money saving, without more charges to ARTE; this thanks to the bidders' proposals which should be quantified by an expert consultant ;

b) more delay in comparison with the current procedure (6 months)

This delay is compensated by a faster construction period, offered by the bidder obtained the tender: in fact this company offered 11,5 months to carry out the works. In this way ARTE could recover the 9 months lost in evaluating bids.

c) less heat loss through the external wall.

Note 17. Another expected gain thanks to the longer maintenance period: saving money and a faster maintenance interventions.

	Usual process	New process
Process time in months (specifications and in-house design phase)	Definitive design: 6 months Executive design: 8 months Total: 14 months	Definitive design: 6 months Executive design: 8 months Total: 14 months
Process time in months (evaluation of the offers)	No Executive design tender Tender process: 3 months <b>Total: 3 months</b>	Executive design award: 2 months Work tender valuation: 9 months <b>Total: 11 months</b>
Number of internal staff implied	4	7 (medium value) - Sometimes the members of the Evaluating Commission could coincide both

		in the tender for design and in the one for works; moreover the members number can be five instead of three)
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## 2. Future possible improvements and replication

### - Possible further improvements of the model at SHO level.

ARTE is willing to repeat this experience with tender, improving the way of defining criteria and sub criteria on the basis of the kind of project carried out. However, this tendering procedure is easier to apply in new constructions, rather than in restoration and renewal

In fact regarding the replication of the experience on the first kind of works mentioned above, A.R.T.E.'s technicians are thinking about the possibility of calling for tender using a definitive draft of a project, characterised by a low level of energy performance. In that way, they are sure to achieve a better energy level thanks to the participating enterprises' proposals. No extra charges are to be supported by the Principal.

Concerning the replication on restoration and renewal works, the Company will have two different attitudes. The type of tender described above is adapted to manage individual blocks, so it will be used for restructuring whole buildings which are located in the outskirts of the town and not the ones standing in the historical centre. In the suburbs it's easy to find buildings which can be considered as a single entity and so the perfect subject of a global and complete design also from an energetic point of view, without the risk to damage its historical and architectural characteristics. Conversely, buildings standing in the old area of the town have more complex issues.

This ancient part of Genoa, in which the Company has lot of properties, is characterised by buildings that date back to many centuries ago. A great part of the area was bombed during the centuries, and large and empty spaces were created between the constructions. Along the years new buildings filled the spaces and often the new constructions were build on, over and around the existing ones, causing an overlapping effect. This shows how the structure of the buildings and their architectural characteristics can be varied within a single unit. So the building cannot be studied as an individual one, because of its structure and stability. Therefore all projecting decision are subject to these limitations, particularly from a technical point of view. In addition to that, many old buildings have been declared UNESCO heritage and so are protected and tutored and any interference is closely monitored by local and national bodies authorities. For example there are buildings which -being supervised because of their great historical value - will not allow the installation of double glazing, floor central heating, insulation or solar panels.

Due to these reasons, it is difficult to fit the kind of tender to be awarded by applying of the most favourable bid on the basis of various criteria, to all the cases of restructuring that A.R.T.E. has to manage.

- **Recommendations at national and/or European level (legislation, financing schemes, training of professionals, professional certifications, public procurement rules, etc)**

It could be interesting to study how to improve the way of calculation of the certification of energy saving through a new official software, but the gap between theoretic and real efficiency will come out only when works will be finished and the consumption monitoring will be done.