

Installation of solar photovoltaic panels and associated works in public buildings in Co. Tipperary

Background

Tipperary Energy Agency was established in 1998 by North and South Tipperary Local Authorities (which have since been amalgamated into one central public authority) and LIT Tipperary (then Tipperary Institute), as an independent social enterprise. The goal of Tipperary Energy Agency is to support sustainable energy use in all sectors by providing a comprehensive range of energy services to achieve this goal. To date Tipperary Energy Agency has led social & private housing retrofit schemes, pioneered community wind farm developments and developed a number of biomass projects.

Procurement objectives

Prior to 2014 Tipperary Energy Agency had successfully improved the energy efficiency of all public buildings in Co. Tipperary on behalf of Tipperary Local Authorities. This was carried out by improving insulation levels, replacing windows, implementing low energy lighting, replacing old heating boilers with biomass boilers, installing heatpumps, and implementing further smaller changes. The Tipperary Energy Agency recognised the need to go a step further to improve the energy efficiency of public buildings and launched a restricted procurement procedure for photovoltaic (PV) solar panels for up to 12 public buildings in Co. Tipperary. The Tipperary Energy Agency carried out market research to investigate if there were suppliers on the market who could install PV panels and in 2014 they published a works contract to procure them.



Criteria used

Subject Matter of Contract: A contractor was procured to design, install and maintain up to 199kW of PV panels and associated works on up to 12 Tipperary public buildings to eliminate base load energy use.

The use of PV solar panels instead of traditional non-renewable energy sources meant that this project will offset a total of 91 tonnes of CO₂ emissions.

The main function of the display is that it is educational, and displays real time production, cumulative total kWh, annual cost and the CO₂ impact of the solar panels.

This procurement is the largest project for PV solar panels in Ireland to date and has increased Ireland's total PV capacity by 44%.

Background to requirement:

Tipperary Energy Agency recognised that without making significant changes to the trading structure and introducing a renewable energy feed in tariff, it would not be economically viable to export renewable electricity from its buildings. Therefore, it was deemed appropriate that an installation, at its maximum output, would meet the minimum day time energy consumption of the building, without any excess energy consumption being produced. In Ireland it is currently not economically viable to feed this excess back into the grid. A well sized PV base load reduction project will seek to eliminate 5% - 10% of the total annual units of a building and 7-12% of the cost of the bill for the buildings.

Technical specification:

To fulfil the monitoring and verification requirements, each PV system was required to have a display on the inverter (located on the side of each building) demonstrating the minimum kWh being generated. In addition to this, a public display was included as part of the project to increase the educational value of the project with a display of real time production, cumulative total kWh, annual cost

Environmental impacts

The generation of electricity from fossil fuels is responsible for a substantial proportion of greenhouse gases and other emissions. As there is an ever growing demand for electricity, combined with a depletion of non-renewable energy sources, this issue continues to worsen.

The main difference between PV panels and solar thermal panels is that PV directly converts the sun's light into electricity. Solar thermal panels heat hot water from the sun's energy. PV systems have some significant advantages over solar water heating systems in that they are easier to design, install, operate and maintain.

While producing electricity, renewable energy sources such as wind, hydro, geothermal and solar produce no CO₂ emissions. The use of PV solar panels instead of traditional non-renewable energy sources meant that this project will offset a total of 91 tonnes of CO₂ emissions. It also will have a longer lasting impact as it will demonstrate to the wider public and private sector how PV is now a cost effective option in the Irish climate.

and the CO₂ impact of the solar panels which should also be integrated into the display based on real data. For larger installations a data log was also required, providing information on peak power, the amount of solar electricity generated, the reduction in greenhouse gas emissions, alarm faults, disconnections, fault protection trips, etc. This data had to be provided on both a daily and weekly basis.

The energy requirements of each building were defined as follows. Tipperary Energy Agency also provided an estimation of what the likely PV size per building would be, however, it was also determined that this was indicative and that bidders were required to maximise energy generation and efficiency, and calculate this based on their site visit. The minimum efficiency specifications were developed together with a technical engineer, but this did not determine the actual efficiency as the award criteria (which are described below) encouraged bidders to offer the highest efficiency PV solar panels possible:

Building	Annual kWh	Day Base Load (kW)	PV Size Max (kW)
Nenagh Civic Offices	489,714	45	45
Nenagh Leisure Centre	337,000	20	45
County Hall Clonmel	265,000	16	35
Clonmel Machinery yard	212,480	26	26
Clonmel Fire Station	110,300	15	15
Tipperary Town Civic Offices	TBC	TBC	7
Nenagh Fire Station	63,456	12	7
Cashel Library	33,729	7	7
Nenagh Library	34,416	7	6
Roscrea Fire Station	28,655	1	1
Roscrea Library	13,569	3	3
Thurles Fire Station	12,658	2	2
Total	1,600,977	154	199



Image: Joe MacGrath, Tipperary Energy Agency

The inverters were required to have the following minimum specifications:

Efficiency (%)	93
Harmonic Distortion (%THD)	<3
Standby Losses (W)	<20
Power Factor	>0.99
Output Voltage	400/231V ± 1%
Output Frequency	50Hz ± 1%

The PV modules were required to be of the mono or poly-crystalline type and comply with the following criteria:

Minimum Peak Power (Pm) output per m2	120
Maximum Power Tolerance (Pm Tol.)	±2.5%
Minimum efficiency η	12%
Minimum Fill Factor (FF)	0.7
Operating temperature range	-40oC to +85oC
Fire Safety Classification	Class II

- PV modules and associated structures shall have a minimum life expectancy of 30 years and inverters shall have a minimum life expectancy of 15 years. The tenderer shall be required to submit evidence that the solar panels provided can meet the claimed life expectancies.
- PV modules shall have a product warranty of at least 5 years.
- PV modules shall also have a minimum power warranty of 25 years and inverters 10 years. The first 10 years warranty shall guarantee at least 90% of the specified minimum power output rating and at least 80% of the specified minimum power output rating during the period of time of 25 years from the handover of the installation.
- Components, installation and testing were required to conform to applicable Irish, European or international standards relating to PV modules and systems, micro-generating plants and electrical installations

Award criteria:

The contract was awarded to the most economically advantageous offer. The price offer was calculated based on the following aspects for each individual location. Bidders were required to submit a financial offer stating the price of:

- Proposed kW to be installed
- kWh generated per annum
- Total cost / kWh over 10 years
- Total cost / kWh over 20 years
- Areas in m²
- Panel efficiency
- Assumed orientation
- Assumed pitch

The award criteria for this procurement procedure were then divided:

- 75% for the Overall Capital Cost per kWh
- 25% for the electricity produced

The 25% allotted to the electricity produced, prevented bidders from only specifying projects for the larger buildings and ensured that the efficient use of the roof spaces was maximised.

Results

Upon further examination Tipperary Energy Agency recognised that 3 of the 12 proposed buildings could not be taken into consideration due to the uneconomical offering of these smaller sites. Nine buildings now have PV solar panels installed on their roofs including Clonmel County Hall, Fire Station and Machinery Yard, Nenagh Leisure Centre, Fire Station, Civic Offices and Library, Cashel Library and Tipperary Town Civic Offices.

This procurement is the largest project for PV solar panels in Ireland to date and has increased Ireland's total PV capacity by 44%. Additionally, this procurement is currently being used as an example to roll out a similar project in Dublin, Ireland as part of the SMART Cities project.

This investment in renewable energy results in average savings of 11% on electricity costs for the buildings in question in Tipperary County Council. The total value of this procurement was €325,000. Each bidder was invited to attend all sites in order to submit a design offer. A total of 4 bidders submitted applications to the 2nd stage of this procurement procedure. The winning bidder was a consortium made up of a local renewable energy installer and a PV supplier.

Lessons learned

Tipperary Energy Agency recognised from their market research that the market for PV solar panels in Ireland is still quite immature in comparison to other European countries. Many of the companies' who were in a position to supply PV solar panels, were not familiar with the process of applying to a public tender and many of the companies that were familiar with public tendering did not have the relevant expertise in PV solar panels to submit an offer.

For more information, please see European GPP criteria for [Electricity](#).

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