Decision-making aid for the selection of renewable/sustainable energy systems for buildings

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Liverpool John Moore’s University (LJMU) recently played a part in the pre-tender activities for the new Alder Hey Children’s Hospital which is now in construction. LJMU’s role was to assist Alder Hey Trust’s bidding team in their assessment of the proposals offered by competing consortiums. This assistance took the form of a Knowledge Transfer Partnership, the aim of which was to research sustainable technologies. The Trust had set a brief for a hospital that would not only deliver “world-class” health care, but would also provide a low energy iconic building. Technology has a significant role in modern health care buildings and the Alder Hey Trust set ambitious carbon targets for the performance of the engineering services that would support the hospital infrastructure.

Experience from the tendering procedure revealed that selecting the most sustainable option for a multi-million pound, heavily engineered project was not straightforward. Gone are the days when the lowest tender price offer was selected from those bids that met the specification. In fact, it became apparent that to determine which proposal could meet sustainability targets over a project lifetime, new skills and knowledge were required.

This “knowledge gap” led to the development of a spreadsheet tool which could compare commercially available low carbon/renewable technologies against each other. This comparison should not solely be by first cost, but also in life cycle performance terms and carbon emission potential. It is proposed to develop the spreadsheet tool into a more intuitive software system.

The decision tool presents data in graphical form so as to clearly demonstrate the trade-offs between carbon and cost. Because the hospital trust set challenging operational goals (35-45 GJ/100m³), energy costs were heavily weighted. The decision tool was used to support the Trust Professional Team in interrogating the design proposals of competing tenderers. This has resulted in an increase in site-generated electrical power. Some of the waste heat from CHP drives an absorption chiller. Bidders also had to include 10% renewables rising to 20% by 2020. Of course negotiations regarding energy implications had to factor in the requirements of other stakeholders for this proposed health care facility.

This paper outlines the background to the project that led to the development of the decision-tool and discusses the nature of the data that which supports the decision process. The paper will also re-examine pre-tender proposals against the actual engineering plant selection.

Keywords: Sustainable building services engineering; renewable; life-cycle analysis; energy benchmarks