Appendix 2

CULTURE AND PROSPERITY OVERVIEW AND SCRUTINY COMMISSION 15 November 2005

Quad energy : Answers to the Questions for Cllr Dhindsa

In order to assist the discussion, I have assembled this information on the questions notified by the Commission.
All of the calculations assume that the rise in energy costs will be 2.5% higher than standard inflation.

Q1. What is the estimated overall energy consumption of QUAD – summer and winter?

Separate summer and winter figures have not been calculated, so our estimates are for a full year. Our current estimate is:

Galleries, participation, office areas and foyers: 1894m2 @ £8/m^2 = £15,150

Cinemas: 358 seats @ £75/seat = £26,850

Total Annual Cost = £42,000

Q2. What 'green' features were incorporated in the original QUAD design? In percentage terms, how much of the overall energy requirement of the building would these features have provided and what would have been the cost of installing them?

The original design used a range of features:

1. high insulation values
2. minimal use of mechanical ventilation
3. heat recycling within the various spaces
4. photovoltaic cells on the roof
5. a borehole to capture geothermal energy

Numbers 4 and 5 were not taken beyond the architectural competition stage. They were not included in the detailed design at Stage C and Stage D as the budget did not allow their inclusion. To illustrate the dilemma, a limited array of photovoltaic cells would have produced 100,000 kilowatts per year. This is 27% of the electrical energy requirement of the building

The costs of installation for that array are estimated at £660,000 .

As the the array would save £7,000 (at 7p/kWh) and is likely to be eligible for ROC generation (a further 3p/kWh revenue), so the payback period for the cells would be about 40 years.

A series of boreholes capable of producing 100% of the energy for heating would cost £300,000. To achieve this, 50 boreholes would be needed. This would save £11,200 per annum on gas although the cost of electrical power would rise by £8,800 to run the heat pumps. Consequently, the payback period would be about 60 years

If, instead of targeting 100% of the heating requirement from boreholes we installed a limited supplementary source of geothermal energy through a small array of 5

boreholes the capital cost would be £28,000 and the payback period is calculated at 67 years.

The capital cost of a high efficiency gas boiler capable of heating the whole building is £31,000.

Q3. What green features have been incorporated into the current QUAD design? In percentage terms, how much of the overall energy requirement of the building will these features provide and what will be the cost of installing them? By how much do these measures exceed the current requirements under UK Building Regulations etc?

In optimising energy efficiency and onsite energy generation the architects and design team:

- are exploiting the added measure of massing the building into a single block to create a smaller outer surface area.
- are working to meet and exceed wherever possible the requirements of Approved Document L (2006) of the Building Regulations, which defines stringent new standards for the energy performance of buildings.
- have incorporated exposed thermal mass throughout the building: this will temper fluctuations in internal temperature and reduce the likelihood of mechanical cooling being required.
- have included a small array of photovoltaic panels within the cladding.
- will include heat recovery on all mechanical ventilation systems ensuring that energy is not wasted, but is used to preheat incoming air.
- have designed the building to achieve very high levels of air tightness – again this reduces heat loss through air leakage.
- stipulate access to the building via a revolving door: whilst these are not always popular they have a significant impact on heat loss from entrance areas and avoid the use of warm air curtains which are unsustainable.
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- included on/off and dimming lighting controls according to presence/daylight detection – aim to reduce lighting load by 20% minimum.
- included occupancy-controlled ventilation with recirculation
- introduced advanced, multi-zone heating controls – aim to reduce heating load by 20% minimum.
- stipulated improved boiler efficiency (up to 85% seasonal efficiency)
- rejected centralised mechanical cooling – passive methods used instead to alleviate high, peak summer temperatures (N.B. this is not necessarily favourable in terms of L2 compliance as the CO_2 emissions target is effectively lowered for a building without cooling)

Many of these measures contribute to energy saving rather than production, so it is not possible to say how much of the energy requirement they will meet. The advice from our design specialists is that large-scale photovoltaic cells and geothermal energy options do not represent the sensible way forward for this

building. The energy efficiency features listed here bring the total CO_2 emissions 28% below current L2 (2002) regulations.

As well as measures that address building direct energy use, the architect and design team have integrated additional green measures by:

- sourcing materials locally wherever possible: much of the cladding uses Derbyshire sandstone.
- Incorporating cement replacement in concrete throughout the building. Cement has a very high embodied energy and reducing its use is beneficial.
- avoiding PVC wherever feasible: PVC is toxic in production and disposal.
- minimising the use of products and finishes which are high in volatile organic compounds: the release of VOCs into the internal environment has a significant impact on air quality and can contribute to sick building syndrome.
- requiring the contractor to have clear policies in place on materials sourcing and transportation and on the separation and recycling of waste.

Q4. What are the estimated energy savings attributable to each of the green features – and how have these savings been derived?

The approach of the architect has been to incorporate energy saving techniques at every level and stage, and the result is a building which incorporates best practice. The approach has not been to seek to incorporate conspicuous gestures towards the environment, nor has it been to create comparisons between professional best practice and the less acceptable alternative.

For these reasons a comparison between the building as designed and an inferior version has not been produced

Q5. What are the additional costs of the 'green features' that have been used and what is the payback period for them?
As noted above in previous questions, environmental considerations have been integrated into the design at every stage. There is no separate costing for them.

Q6. What is the estimated cost/year of the energy required to operate QUAD?
Total Annual Cost = £42,000 (see Question 1)

Q7. How will these energy costs be met by the Council?
These costs are met by Quad, the company who will be operating the Quad building

Projected income streams for Quad in 2008-09 are:

Earned income - £1,483,636 – 68%

City Council grants - £374,688 – 17%

Other Grants - £325,495

The Council will not be directly responsible for the energy costs

Q8. Will the additional energy costs of QUAD have any detrimental impact on other Council services?

If energy costs increase between now and the opening of Quad the pressure will be on the company to find ways of mitigating the problem and/or seeking more income.

The extent to which any of that pressure would be accepted by the Council would be a matter for Member decision at the time.

Q9. How much money does the Council currently pay each year to support the Playhouse?

£411,563

Is it proposed to support QUAD in the same way and if so to what extent and for how long?

Derby Playhouse receives the Council's funding as a recipient of a Council Arts Grant. It would be fair to assume that Quad would have the same status.

Arts Grants are agreed by Council Cabinet annually on the basis of business plans submitted to the Arts and Events Team. Levels of grant alter from year to year.

At the Council meeting on 26th January 2005 the Council received an estimate of the revenue funding requirement for Quad as follows:

2006-07: £94,000

2007-08: £186,000

2008-09: £194,000

This is in addition to the current funding (2005-06) to Q Arts of £110,00 and to Metro Cinema of £53,743.

What impact will this have on other Council services?

At this stage it is impossible to be precise about impacts of this spending requirement. Budget proposals for 2006/7 will be consulted shortly with the Overview and Scrutiny Commission as part of a process which will inform a Full Council decision in March.

We continue to work closely with the Quad Design Team and their specialist advisers so that we take advantage of every opportunity to make the Quad building an example of best practice.

Hardyal Dhindsa

14 November 2005