THE USE OF BUILDING ENERGY SIMULATION FROM THE BUILDING OWNERS PERSPECTIVE

James E. Butler, B.Sc., CPM

Marathon Realty Company Limited, Toronto, Ontario.

ABSTRACT - A brief outline of some of the concerns, from the businessman's perspective, of the Energy Simulation Programme.

As a Property Manager, I tend to view the underlying topic of this Conference - "Building Energy Simulation" - as an element of energy conservation. Energy conservation to the real estate investor and to the property manager has been a pretty significant factor since the oil crisis of 1973 drastically revised the cost of operating our buildings and, subsequently, of course, our design criteria.

My company, Marathon Realty Company Limited, is the real estate arm of the Canadian Pacific Family. We came into being in 1963 when it was decided that the natural resources of Canadian Pacific, of which real estate was but one, would be more effectively managed and developed by professionals in the various resource sectors. Today, Marathon has book assets of about 1.4 billion dollars, or almost 24 million sq. ft. of space. This includes some 9 million sq. ft. of office space and about 7 million sq. ft. in shopping centres. We operate across Canada and in several locations in the United States. Our growth in the first 22 years has been significant and we intend to be around for a long time.

In general terms, Marathon is very much aware that energy, universally, is a finite resource. We believe that conservation of energy is our responsibility as a good corporate citizen and we take this responsibility seriously. But energy conservation is also good business. Effective control of the consumption of energy in our properties permits us to better control our operating cost. Since operating cost of the building in turn, directly or indirectly, affects the overall cost of occupancy to our tenants, energy conservation is beneficial to our tenants as well. In the long run, and sometimes in the short term, energy conservation has an impact on the bottom line for tenant and owner and that's good business.

Our property portfolios are pretty much a mixed bag. We have multi and single use office buildings, commercial and industrial buildings, shopping centres - in fact, pretty well all areas of income producing real estate, except that our residential portfolio is very small. Some of these properties we developed ourselves. Developed properties can be thought of, for our purposes today, in terms of those that were designed and built prior to and subsequent to the oil crisis of 1973. We also have many properties that were acquired from other owners and developers; these, of course, can be grouped in the same fashion. As the company's growth pattern continues, our portfolio expansion will continue to be accomplished by acquisition or, in selected opportunities, by the development of new buildings.

Generally, those properties which were designed prior to the early '70s were pretty energy inefficient. Energy was very cheap in those days. In the early '60s, many of the buildings I managed were heated with bunker oil. We used to buy it for about 5¢ a gallon. Gasoline for the car, round about 37¢ per Canadian gallon, which is roughly 20% larger than the American. We heated our homes with No. 2 domestic fuel oil at a cost of about 17¢ a gallon. The electricity bill would average roughly $15 a month; and if you burned roughly 1,500 gallons of fuel oil through the year, the total energy cost for the average dwelling might be about $450 a year. Today, the cost would be 4 times as much, or close to $2,000 Canadian for homes that waste considerably

less energy. As for bunker oil, I don't know anyone in our area who can afford it as a heating fuel these days - the last I heard, it was running about 85¢ a gallon. But natural gas is very expensive too!

Consequently, it makes good business sense to go back and retrofit those pre-1973 structures to reduce energy consumption - and a lot can be accomplished. For example, we acquired a small office building (about 220,000 sq. ft.) in Toronto in 1978 and the energy consumption of this building for that year was 11.1 million kilowatt hours or about 50 kilowatt hours per sq. ft. Some of the comparatively simple conservation measures that we took subsequently reduced the consumption by about 37%, to roughly 31 kilowatt hours per sq. ft., by the end of 1983.

By contrast, buildings were being designed for energy efficiency by that time and two slightly larger office buildings which we brought on stream in 1979 and 1980 were designed for a projected total energy consumption of 22 - 24 kilowatt hours per sq. ft. With continued design improvement, our most recent building in my part of the portfolio, a 325,000 sq. ft. building in downtown Toronto was designed for a total consumption of about 15 kilowatt hours per sq. ft.

The final factor in this equation, though, is energy management; and by energy management, I mean the computerized control of lighting, heating, ventilation, and air-conditioning systems, which has become feasible through technological progress as well as the increasing proliferation of computer hardware, software, etc. in an electronic age. Like many of our competitors, we operate today through a host computer in our divisional offices with stand-alone units in each of our profit centres which permit us to programme each building for the most energy efficient operation of the environmental and lighting systems. These units are monitored via telephone line and the computer operates the systems and will contact one of our Property Managers by telephone from a pre-programmed list in the event of problems in the building. These systems of course can also be programmed to monitor fire detection systems, intruder alarms, and things of this nature, but their primary function is energy management.

Our experience to date with all of this parallelled our earlier experience with the simpler conservation measures; notwithstanding fairly significant retrofit cost, we are still working with pay-back periods which range from 1½ - 3½ years. A fact which suggests to me that we are still chipping away at the tip of the iceberg.

But the focus here is intended to be energy simulation programmes - an area in which I claim no particular expertise and about which I hope to learn a lot more in the course of the next couple of days. Oh sure! Our consultants have used this new tool; several variations of it in fact, in assessing design alternatives for new developments. On a fairly crude basis, the results have been acceptable. We have spent some time considering the potential of this tool in assessing retrofit possibilities although we have not, to my knowledge, actually employed the simulation concept successfully in any of the retrofit studies we have conducted to date. In theory, simulation would be an ideal approach. In practice, the problem is that there is a tremendous amount of fairly detailed information that must be gathered and fed into the programme before the design alternatives can be assessed. When this process is completed, the parameters of the ideal solution will create a fairly rigid scenario which in a multi-use building cannot be sustained because of the need to satisfy the demand for flexibility, imposed by a wide variety of tenant uses. This is in the office building field where conditions can be comparatively controlled. The real heavy duty energy consumers, shopping centres, because of the design variations brought about by tenant mix and the load variations brought about by the sometimes unpredictable customer volume fluctuations simply cannot be fitted into the neat little box of the simulation concept with cost effectiveness.

The difficulty, as I understand it, is that to maximize the effectiveness of the simulation concept, the use of the building must be determined up front and the owner must then control the use of the building to ensure that it remains within the pre-established parameters - and that makes sense. Those systems cannot be required to deal with infinite variety. However, when it gets down to the crunch, the purpose

of the building is to house and accommodate its tenants. As a building operator, I must maintain maximum flexibility in permitted uses in order to maintain my options on the utilization of this space by its tenant users - so we have a conflict.

In resolving the conflict, you weigh the factors involved. The cost of total energy consumption can vary between $1 and $2.50 per sq. ft. of gross leasable area per year. I cannot eliminate this cost, but if I can cut it in half, I can save between 50¢ and $1.25 per year; and if we are talking about two hundred thousand to one million sq. ft. buildings, this is a very considerable number. However, rental rates can range between $10 and $40 per sq. ft. If in order to maintain the parameters established by the energy simulation programme, I must lose sufficient flexibility to satisfy the needs of some of my tenants and therefore, must carry vacant space in my building, any savings in energy cost will be offset very quickly.

Consequently, from my perspective as a real estate investor and as a property manager, simulation is a useful tool to preview on a gross basis, the energy implications of alternate designs in terms of skin, configuration, fenestration, HVAC distribution systems and other potential variables of a new development. I say on a gross basis, of course, because I will not permit its findings to reduce the flexibility which I need to maintain the leasability of the building.

I see a very limited potential for the simulation concept in the ongoing retrofit programme, however, because in a retrofit situation, most of these elements are givens, and we have very little opportunity to change them.

It is also true that we have been spoiled by the substantial rewards which we have been able to obtain historically by comparatively simple and very cost effective conservation measures. The very short-term paybacks which we <u>have</u> accomplished may tend to blind us to the value of the slower progress inherent in more sophisticated measures. This, to some extent, will be a learning process as we move into the second phase. It is, of course, a factor that the extremely dramatic energy cost increases which we experienced over the past decade have tapered off with the loss of influence by OPEC and there is less economic incentive for herculian measures at this time.

The second problem is the lack of an effective relationship between the remaining potential savings and the potential rental loss on vacant space which we believe would result from the loss of flexibility in the potential use of the space.

In some ways, I believe that the energy crunch has been a blessing in disguise. It has made all of us aware of our dwindling sources of energy and has created an incentive for conservation measures as well as for the development of new energy sources. I have been impressed by the response from the scientific world, from the public sector and from the private sector to this crisis. I believe the gains that have been made have been truly substantial and I greatly admire the ongoing search for more innovative and sophisticated techniques - a search which all of you, by your attendance at this conference, are clearly a part of. On behalf of my industry, I thank you.