Journal Comment

PORTFOLIO PLANNING AND PIPE DREAMS

No matter how carefully you plan your goals
they will never be more than pipe dreams
unless you pursue them with gusto
W. Clement Stone

There is a paper in this issue that rates among the most interesting contributions that have come my way in the *Journal*: 'CFB technology provides solutions for reducing CO_2 emissions', from: Foster Wheeler Energia Oy, Finland.

There are also a number of news items that are particularly topical and contributed to the theme of this Comment. Somewhat irritating but highly significant is an item from *Engineering News* that the Canadians have beaten us to the draw in successfully growing biofuel crops on several mining slimes dams. This initiative was promoted by Mining Innovation, Rehabilitation and Applied Research Corporation (MIRARCOR), apparently advanced thinking mining research consultants, specializing in techniques using virtual reality computer protocols from Laurentian University in assessing multidimensional feasibility studies. Several mines were involved and the slimes dam experiments were compared with conventional agricultural methods adjacent to the slimes dams; the results were most promising.

Another news item was about the well recognized methods of electrical power generation using methane from landfill operations. This claimed that electric power could be generated from biomass at a low cost of R0.12/kWh, comparing favourably with Eskom's published figures.

The paper from Foster Wheeler dramatically amplifies the role of biomass in the energy equation and prompted me to believe that it was appropriate to revisit the energy strategy for coal, electricity generation, and biofuels in SA.

Coal, the dominant source of electric power, is the lifeblood of this country. With Sasol producing 50% of motor fuels and a high proportion of our fertilizers and chemicals and a backbone of our electro-metallurgical industries, it is by far the most strategic commodity produced by the mining industry.

But understandably we are the worst offenders in producing greenhouse gases in relation to our GDP. Sasol produces three times as much carbon dioxide by making liquid fuels than the oil barrel itself. At the moment we are sheltering under the umbrella of a developing country and are not subjected to the penalties of the Kyoto agreement. By the Government's own admission, this will not last much longer, so without some positive move to show we are attempting to reduce emissions of carbon dioxide, we could well be subjected to carbon dioxide penalties.

With prompting from The Fossil Fuel Foundation, I formulated concepts for production of biofuels to earn credits and at the same time create farming clusters at mining operations and create sustainability benefits in the form of rural villages generating large numbers of jobs. These concepts were totally ignored for a few good reasons such as non-existent experimental demonstration, and many bad ones such as that production of biofuels would jeopardize food production. Biofuels are relegated to a matter of trivial proportions by several Government strategy directives. Attempts to produce ethanol from maize and diesel from oilseed plants have come to next to nothing.

But enticingly, this paper on CFB technology has opened the door to prospects for the way forward. Using proven fluidized bed plants from Foster Wheeler, coal discards, and refractory biomass from agricultural byproducts (such as bagasse from the sugar industry) electric power can be generated on a reasonable scale and cost. The proportion of biomass that translates to acceptable 'green' carbon dioxide emissions can represent a carbon credit in comparison to that from fossil fuels. The impact on our thinking is profound.

The conflict between fuels and foods is shown to be a nonsense. The two objectives complement each other. Biofuels are not only ethanol and esters of vegetable oils. The biomass is a form of biofuels and in growing food crops inevitably much biomass is produced. The proposal to develop cluster farms whether on slimes dams or in rural villages was based on a zero waste principle. Crops that were not used as food for humans or in animal feedlots are in the form of biomass for anaerobic digestion to methane (a fuel in its own right) and any remaining biomass to 'green' bioenergy.

Even more interesting is the imminent planned new extension of the CFB concept to high pressure systems, which will be able to convert biomass into 'green syngas' for the production of diesel or other clean liquid fuels.

There is no space to go into detail. The paper has it all and is well worth reading. I prefer to consider how best to explore the potential indicated in this paper. There are a number of strategic questions to be asked. Firstly, is there any hope of producing sufficient biomass to make a significant difference? I must remind readers of previous comments where I quoted an authoritative article by Briggs pointing out that the total transport fuel requirements of the USA could be produced by sunlight photosynthesis over a small fraction of the area of the smallest desert in the US. We have the sunlight in plenty and provided that we adopt the modern approach of hydroponic fertigation, we will have enough land and water to talk about biomass of the order of millions of tons per year from small lot cluster farming. A zero waste culture from commercial agriculture and forestry could increase the amounts to exceed 10 million tons per annum. For example, the biomass from commercial maize production alone is of this order of magnitude if properly collected. The 2 billion tons of waste coal fines already accumulated, could easily yield 20 million tons of clean coal fines per annum and with current production could last the life of our coal industry. Thus the answer is, yes, it will make a big difference.

Journal Comment *(continued)*

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The second question is, is the concept likely to be economically affordable?

Water is the key risk factor and this will invoke a large number of projects in water purification and domestic effluent treatment. My estimate is that with a similar zero waste philosophy from mines and industry we could muster well over 10 thousand megalitres per day of treated water for agricultural irrigation at very acceptable prices.

But this will demand a much needed large portfolio of water treatment undertakings.

There are a host of agricultural R&D projects and almost all the farm clusters could be associated with rural schools and agricultural colleges with jobs galore for microbiological scientists and technicians and in time skilled farmers. There is also a fascinating suite of R&D projects on hydrometallurgy to upgrade the coal fines and to utilize the by-products in terms of the zero waste culture that we must develop.

We are dealing with a portfolio comprising a matrix of R&D options, risk evaluations, critical paths and interactions. I can list only some of the keywords for most of the projects, to indicate its scope.

Mine megawatts: CFBs, coal waste, clean coal, farming methods, crops, food, biomass waste, transport, methane, clusters, slimes dams, water, mine effluents, jobs, and sustainability. This portfolio can be undertaken only with participation of a host of Government departments and their research facilities. This means that this must find priority in the national R&D portfolio. My perception from the DST information sheets is that the main components in this are: astrophysics, pebblebed reactors, quantum physics, nanochemistry, microbiology, solar and wind energy, electric motor cars. There is much more going on within each department, but in terms of coordinating a national effort on my proposed topics, I am not optimistic.

Perhaps some 'virtual reality' is needed. Perhaps Eskom and our coal mining industry should invite MIRARCOR to tender for a preliminary multi-dimensional study. If SA is not interested, I am sure the Canadian interests in Botswana coal should be.

Otherwise this portfolio could dissolve into pipe dreams. ◆

R.E. Robinson