The electricity debate continues: Yelland versus Eskom

It is a few months since I've published a series of articles entitled: "*Debating our future electricity supply*". The gist of these articles was that we should avoid emotional issues and arguments and rather focus on strategic issues as outlined in the Department of Energy's IRP as the guiding document. It was with interest that I read the recent article by Chris Yelland on the levelised cost of energy ("LCOE") for Medupi, Kusile, the envisaged nuclear build as well as independent power producers (mainly solar and wind). I was also fairly intrigued, this morning, to read Eskom's reaction to that article and the numbers it contained. Let me start off to say that I think this debate is now heading in the right direction – at least we are talking about rands and cents and what the true cost of our (future) electricity supply options are. This is much more important than a whole host of emotional issues, without any factual basis, that have been raised in the past. There are some issues stemming from the article by Chris Yelland that I believe warrants further comment and discussion. The same applies to the reaction by Eskom (and that of their consultants Deloitte).

My first comment is this: the LCOE is the better way to compare the different options for our future supply technologies. So thanks to Chris Yelland for bringing this sanity to the table. The reason why I say the LCOE is the better way to compare these options is that it enables us to directly compare options with different capital cost profiles as well as different operations and maintenance cost profiles. Nuclear, for example, is a high capital cost option but with a low operating cost profile. Coal, on the other hand, has a lower initial capital cost than nuclear but with substantially higher operating costs. Which of these two is the cheaper option in terms of the cost of the electricity supplied to the public? One can only determine that through calculation of the LCOE. Don't get me wrong, there are other methods (such as discounted cash flow analysis) through which one could also compare different options but in my opinion the LCOE has got definite advantages.

LCOE analysis also allows us to add some other complexities to the equation. Nuclear, has some significant rehabilitation costs that can run for many years after the facility has stopped producing. How would one include these rehabilitation costs in the evaluation and specifically the cost of electricity from day one? This is important, as consumers must contribute to this cost throughout the life of the plant. Coal, also has some rehabilitation costs associated with it. This includes cleaning of the emission gasses and removal of sulphur and even carbon dioxide from the emissions. These are fairly simple to include in the analysis, as they will contribute to the initial capital cost as well as the operating costs. But too often it is forgotten that a coal-fired power station also poses some significant rehabilitation costs that will also run

for many years after the power station has been shut down. LCOE analysis allows us to include all these costs in the analysis and to see what the impact is on the price of electricity sold to the public.

This is so simple, logical and straight forward that I can hear the collective question: *what is the problem*? To my mind there are two key problems. The first problem is that as for any analysis, LCOE suffers from the "garbage in, garbage out" syndrome. The less accurate the input figures, the less accurate the LCOE calculation will be. If certain key figures (costs) are not included in the analysis, then the LCOE calculated becomes meaningless and of course there is a danger that one will make the wrong decision or choose the wrong option. It seems to me that this is where Chris Yelland has hit a raw nerve as his figures show that the LCOE for Medupi and Kusile are significantly higher than those reported by EsKom. Eskom's reaction to this was to ask their consultants, Deloitte "to do a principle-based review and given their experience in dealing with LCOE calculations." This I don't understand at all. Why not simply ask Deloitte to examine Chris Yelland's analysis and then examine Eskom's analysis and express an opinion about which figures are more correct? This is one of the benefits of LCOE analysis – where two models differ one can quickly identify the reason(s) for such difference. So, I believe the challenge is out to Eskom to have their figures reviewed and critically compared to the Chris Yelland calculations.

The second problem with LCOE analysis is this: nobody does it! When it comes to infrastructure development, levelised cost analysis ("LCA") is the best way (in my opinion) to evaluate a project or to compare project options. This is especially true for infrastructure through which a service will be rendered directly to the public and for which the public will pay on a consumption basis. Water supply, electricity supply, sanitation services and refuse removal are typical examples of such services. LCA should be the *de facto* standard method used by government (and their consultants) to analyse project options. Go on, go and look in any municipality, government department or government agency for this type of analysis conducted (on a sound basis) to evaluate projects and their financial feasibility. You will not find it! To be sure, you will find a lot of rubbish. For example, the Department of Water and Sanitation (and most of their consultants) utilises a method referred to as the Unit Reference Value ("URV") to compare project options. At the first glance it may appear as if the URV is a (type of) LCA, but it is not. It is a method developed specifically to pre-select low capital cost options over higher capital cost options. And it simply has no merit as a mechanism to compare and choose project options – yet its use is widespread. This is a disastrous state of affairs in our country and leads

to significant capital waste and efficiency. If Chris Yelland achieves only one thing through his initial article and that is to refocus our attention towards the use of LCA for all infrastructure development, he will have done this country a great service.

When it comes to electricity supply, LCOE analysis has one significant drawback. It cannot (and should not!) be used to compare base load supply (24/7 supply such as nuclear, coal fired or gas fired) with intermittent supply (such as photovoltaic solar and wind). Let me explain this through an example. You would like to buy a car for your daughter going to university and have settled on a preferred make and model. When enquiring about the price, the salesman offers you two options. Under option 1, the car costs R200 000 and under option 2 the car costs R100 000 with the proviso that the car is totally inoperative before 10:00 in the morning and after 15:00 in the afternoon. Which car do you buy? Everything else being equal, there is no doubt that LCA will indicate option 2 to be cheaper on a per kilometre travelled basis. But does that matter? I am sure that for the far greater majority of buyers option 2 will simply not be an option.

In my example, the two cars may be exactly the same make and model etc. but they differ in one significant respect: when they can be used. In spite of what I said previously that LCA can be used to compare options that differ significantly, this is one difference that only the most sophisticated type of analysis (such as real option analysis) can handle adequately. So the golden rule is this: never quote the LCOE of a base load supply option together with the LCOE of an intermittent supply option without the qualification that they cannot be compared. In fact, I go one step further: I never quote the two together in the same context. This is my only comment (read criticism) of Chris Yelland's analysis and I am concerned that many people reading his article would come to the incorrect conclusion that photovoltaic solar power (for example) is so much cheaper than nuclear (or coal for that matter).

If one would like to compare the LCOE of photovoltaic solar or wind power with that of any base load supply option one would have to include, with the costs of the solar power, all the costs of changing the intermittent supply to a continuous (base load) supply. A good example of this is concentrated solar plants ("CSP") that can supply electricity for extended hours after sunset. The LCOE of CSP is significantly higher than that of nuclear or coal. Another way would be to combine the costs of photovoltaic solar with the costs of a gas peaking plant. These two technologies combined can provide base load supply, the LCOE of which could be compared to the LCOE of any other base load supply option. I have not done any of the calculations

but my gut feel is that the LCOE of such a combined technology will be significantly higher than that of either nuclear or coal.

I hope this analysis will assist you the reader to follow this debate and hopefully start participating! One thing is for sure: we need this type of debate to ensure that government makes the correct infrastructure choices that will impact on all of us for a very long time.