ENVIRONMENT, SOCIAL, GOVERNANCE

MARKING GUIDE

Syllabus Performance Outcome:
(A list of elements of the syllabus that are covered by the case/question)

- A1 – Context - legal, societal, political
- A2 – Key drivers and models
- A3 – Holistic risks
- A5 – Medium Term projections
- A8 – Contextualise – communicate for understanding, for all possibilities

Key Points or Issues to be covered by a Distinction Pass:

The first part of the question is a simple dam modelling exercise. The student should develop a monthly model showing dam levels under various rainfall, usage and electricity sales assumptions. The key uncertainty is around future rainfall, i.e. whether the drought in the spring of 2015 becomes the new normal in a climate change scenario (and this is sort of implied by the question).

However, the 2015 drought is clearly an abnormal event and it would be too extreme to assume that such a drought will apply ever year forever. (Note that, if this were the case, no sales to Capland are possible at all until wind and solar become a little larger).

This should lead to a recommendation about the introduction of a monitoring scheme, to be overseen by the government that ensures that dam levels are maintained at adequate levels and not allowed to get too low in the pursuit of energy sales to Capland. This will be quite political and needs to be sensitively handled, especially given the friendships involved. The good answer will seek to protect the Minister while still giving frank and fearless advice.

From studying the data in Attachment 1, the student should identify the major trends:

- Overall consumption of energy in Alasia is reducing over time. Presumably this is due to growing energy efficiency. This should be kept in mind when making future investment recommendations and when considering future usage requirements when setting the PSL.
- The contribution of wind and solar to Alasia's energy needs is increasing strongly over time. This will continue and could be increased with more investment. This means the PSL limits could start to reduce as domestic reliance on hydro-electricity reduces.
- Sales of electricity to Capland have jumped in the past few years, which seem to coincide with the appointment of the new CEO (and the new bonus system?). It has presumable contributed to the run down in the dam storage levels.

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Nonetheless, it is still hydro-electric power that is doing the bulk of the energy generation for Alasia's needs.

The student should design a Prudent Storage Level monitoring system that ensures that Alhydra does not "oversell" energy to Capland, leaving it vulnerable to Connector failures or to droughts. This should be monthly, reflecting the range of rainfall expectations.

Scenarios should be built around climate change impacts on rainfall. From my modelling work, under the historic rainfall pattern, the dam storage level can be run down from January through to about June, then goes back up to the January levels. Under the climate change extreme scenario, the dam needs to start being built up from May onwards and peak storage occurs in September, ready to meet the low rainfall for the next six months. No sales are possible to Capland, unless usage reduces (say due to solar).

The second part of the question is more open ended. The better students will think about the best way to spend the $1 billion, in light of the modelling they have done in Section 1, and assuming that their recommendation in Section 1 is implemented.

- A second Connector is probably not needed once the PSLs are in place and it is expensive as a form of insurance against breakage. However, there may be opportunity to sell more renewable energy to Capland assuming that Alasia demand continues to reduce and a second generator may facilitate this. Could the extra $500m be sourced from Capland as they benefit from the power sales? Could the existing Connector be retrofitted with monitoring points cheaply, so that future breakdowns are fixed much easier?

- A billion dollars would go a long way towards subsidising more solar and wind installations. In the last year, solar and wind provided over 12% of Alasia's energy usage. Using the investment towards this would also help Alasia meet renewable energy targets and Capland would be happy to buy any excess generated.

- Expanding the gas generator seems like a bad idea given how expensive it is to run and that underlying demand for energy is reducing. If the PSLs had been in place, it would not have been necessary.

- New dams sounds like a very unpalatable idea to the Minister, given the public are against it and he wants to be re-elected.

Sample numerical approaches or numerical aspects required of the question

- In the first part of the question, the basic model equation is:

- Dam levels at end of month = Dam levels at start of month + Rainfall over month*0.8 – Usage of power in Alasia – Sales of power to Capland. [Note of course that rainfall is converted to energy using the 0.8 factor].

- If target storage levels (Prudent Storage Levels) are set for the end of each month, then the sales to Capland are the solving factor (i.e. sell as much energy as possible without breaching the PSLs for that month.) The way I did it was to solve for a PSL that maximized sales each month without it ever falling negative through a year and ending up with the same storage level at the end of the year.

- The student should model how their recommended PSLs behave under different rainfall situations and also consider how to manage the tails (i.e. an extreme drought event).

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Possible Alternative Approaches

The second part of the question is very open ended, but in the first part I really want to students to do some monthly modelling around rainfall scenarios.

END OF MARKING GUIDE

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