Responses to Examiner 2

1. **Decreasing system outage vs improved lifetime are two different goals**

   Author's response: I thank the examiner for pointing this out. Depending on the problem at hand, it is true that system outage can be regarded as different to improved lifetime. The problem at hand in this dissertation is of modelling Radio Frequency (RF) energy that can be used as the main power source for cooperative relaying devices. From the literature ([34]-[36]), it has been found that network relays add reliability and reduced system outages as compared to non-cooperative networks. Therefore, in the process of modelling relay powers from harvested RF energy, it was found that not only does RF energy extend network lifetime but the system outages are decreased in the aim thereof. This is due to the fact that the signal-to-noise ratio between the relay and the destination node is the function of the relay transmit power from the RF energy harvested from the source node.

2. **The point that using single relay, same diversity order of K can be achieved requires more elaboration.**

   Author's response: The author is thankful to the examiner for making mention of this fundamental principle. For more clarification on this principle, section 2.5 of Relay Selection page 27 may be referred. It should be noted that choosing the best relay out of a set of available relays is equivalent to the problem of choosing the best antenna out of a set of available antennas and is known to yield the same diversity gains as if all antennas had been used [122], [123].

3. **What is the difference between Max-min Relay selection in successive relaying with interference and without interference?**
   Author's response: In max-min relay selection in successive relaying, the k^{th} relay performs interference cancellation (IC) when selected to receive from the source based on the equation 2.2 in sub subsection 2.5.2.4 page 32. On the other hand, with max-min successive relaying without interference the k^{th} relay cannot perform IC and would be selected after competing with the rest of the relays as per equation 2.3 in the same subsection of the revised dissertation. The sub subsection 2.5.2.4 of Max-min Relay Selection in Successive Relaying may be referred.

4. **Define these two states (1,j) and (i,1)**

   Author's response: For E_0 which is the required minimum relay energy for transmission if either relay R_1 or R_2 is chosen for transmission then energy states (i,1) and (1,j) are attained. These energy states are such that i is the energy factor of relay R_1 and j is the energy factor of relay R_2. For more clarification and better understanding, figure 4.4 in section 4.2.3 page 64 has unpacked energy evolutions on both R_1 and R_2 and state transitions of energy factors (i,j).

5. **How is it possible that R_1 is not selected for transmission when R_2 is at the minimum in Fig. 4.5 ?**

   Author's response: Selection of relays entirely depends on the channel fading coefficients although having a higher energy puts a relay on a better chance of being selected because of *a better SNR. Whether R_2 or R_1 being at the minimum or maximum, there will always be transitions from one relay at the transmitting state to the receiving state. Figures 4.4 (page 64) and 4.5 (page 66) can be referred for more explanations.*

6. **Why assuming that jump in energy /states is by a single unit?**

   Author's response: In practical scenarios, the energy jump does not have to be discreet or unity as assumed in this work. However, this is done here for the sake of reducing complexity in the analytical framework. Irrespective of the jump value the main criteria of selection is mainly influenced by the harvested RF energy from the source as shown in equation 4.28 page 70.

7. **Do relays require energy to maintain buffers?**

   Author's response: The author is thankful to the examiner for such an interesting question. In this research perspective, harvested RF energy is not used to maintain respective relay buffers but rather both stored RF energy and buffer states are considered in the decision of performing the best relay to forward to the destination node as shown in figure 5.7 (page 113) and figure 5.8 (page 115). For the relays to forward the packets they must have sufficient energy harvested from the source, however in this research both energy and buffered data are considered at one time to analysing the performance of a system.

8. **Elaborate more on why only the states in Figure 5.9 amongst all possible states**

   Author's response: The states in figure 5.9 (page 117) are the only possible states when the buffer sizes of both relay 1 and relay 2 is 4 with energy states {(2,1),(1,2)}. For a particular maximum buffer state there can only be a specific set of buffer states for relay 1 and 2. For example, if both relays 1 and 2 have the same number of buffers then a table of possible set of states can drawn like the one here below where those possible states will in a columnar fashion.

0,4	1,4	2,4	3,4	4,4	
0,3	1,3	2,3	3,3	4,3	8
0,2	1,2	2,2	3,2	4,2	7
0,1	1,1	2,1	3,1	4,1	6
0,0	1,0	2,0	3,0	4,0	5
0	1	2	3	4	

If the maximum buffer size of both relays 1 and 2 is 4 as used in the dissertation then a possible set of states will be a column with a total of 4 on the above table as {(0,4),(1,3),(2,2),(3,1),(4,0)}. Since in figure 5.9 there are only two energy states {(2,1),(1,2)}, all possible states would therefore be {(0,4,1,2), (0,4,2,1),(1,3,1,2), (1,3,2,1),(2,2,1,2), (2,2,2,1),(3,1,1,2), (3,1,2,1),(4,0,1,2), (4,0,2,1)} as shown in figure 5.9. The author hopefully believes the examiner's question has been answered.