INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

15 September 2023 (am)

Subject CP1 – Actuarial Practice
Core Practices

Paper Two

Time allowed: Three hours and twenty minutes

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.

If you encounter any issues during the examination please contact the Assessment Team on T. 0044 (0) 1865 268 873.

© Institute and Faculty of Actuaries

1 The government of a developed country has a policy in force that encourages the development of, and investment in, renewable energy sources for electricity generation. The policy has been successful in significantly reducing the cost of infrastructure that produces electricity from renewable energy sources. However, there are still periods when the country is critically dependent on fossil fuels for electricity generation. These periods extend from minutes up to many weeks.

The government has been encouraging renewable energy development by funding sponsors of renewable energy projects. Every year, the government encourages sponsors to submit bids and it chooses the lowest cost bid that meets its objectives. Project sponsors will seek finance from other investors as well as government funding.

The following projects were unsuccessful and did not go ahead and receive government funding in the latest round of bidding:

Project A – A large solar electric project
A project that uses solar panels to harness the sun's energy to generate electricity.

Project B – A large offshore wind farm project
A project that uses wind turbines constructed offshore, to harness wind power to generate electricity.

Project C – A tidal energy project
A project that harnesses the natural rise and fall of ocean tides and currents to generate electricity. This project involves constructing a dam on a major tidal river in the country. There are approximately two high and two low tides every day.

Project D – A hydroelectric pumped storage project
A project located in a mountainous area near the coast that would generate electricity by harnessing the flow of water between two very large lakes at different levels. The pumps can be reversed to pump water back up to the higher lake so that it can generate electricity at a later time.

Project E – A large battery energy storage project
A project that harnesses electricity already generated by charging the batteries when prices are low, then releasing it back when electricity prices are higher, to make a profit.

The government has recently decided to introduce a new eligibility requirement for projects wishing to bid in future. To be eligible to bid, projects must always be capable of generating a minimum level of electricity when instructed to by the national electricity regulator.

(i) Discuss the advantages and disadvantages for the government of introducing the requirement for each project to produce a minimum amount of electricity if required. [9]

(ii) Outline how each of environmental, social and governance factors could influence investors on whether to invest in any renewable energy project. [7]

(iii) Describe, for each of the five projects A to E, the risks and challenges they face in satisfying the eligibility requirement. [15]

(iv) Discuss how Project B's sponsors could manage the risks identified in part (iii), including any changes that could be made to the project to meet the eligibility requirement. [6]

The sponsors of Project D have approached the sponsors of Projects A and B, proposing that they combine their projects into a new Project X for the next bid.

(v) Discuss the advantages and disadvantages to the sponsors of combining Projects A, B and D into a new Project X. [8]

(vi) Describe the main features of Project X that a model will need to allow for. [4]

(vii) Suggest possible reasons why the sponsor of Project D did not wish to combine with Projects C and E. [4]

(viii) Outline why an insurance company may want to invest in Project X. [3]

[Total 56]

2 A local government wants to hold a music concert in a particular town, with three musical acts performing. Its objectives are to increase the profile of the area as well as to generate revenue. It has set up an organising committee ('the Committee') for this task to meet its objectives.

The Committee's tasks will include deciding on the venue and the ticket prices.

The Committee has also received a quotation for a cancellation insurance product in connection with the music concert, which will pay out a pre-specified lump sum should the concert need to be cancelled.

If the concert is considered to be a success, then the local government would be interested in holding another concert next year.

(i) Outline the process for how the Committee can identify and analyse the risks connected with holding the concert. [8]

(ii) Describe the risks and possible mitigations of holding the concert. [5]

(iii) Discuss how the event could be financed. [4]

(iv) Set out how an actuarial model can help the Committee to meet its objectives. [5]

(v) Describe the data that would be required for the modelling. [4]

(vi) Discuss how the Committee can assess the appropriateness of the quotation received for the cancellation insurance product. [8]

(vii) Suggest the possible criteria the Committee can use to determine the success of this year's concert. [6]

(viii) Outline how the results of the assessment in part (vii) can be used to plan for next year's concert. [4]

[Total 44]

END OF PAPER