# Appendix B

# Provisioner APR

To accurately estimate the APR, it is essential to consider the token issuance, distributed rewards, and the total amount of tokens staked.

The total issuance of DUSK is designed to decrease every four years, following a geometric sum function. This reduction directly affects the number of tokens available for distribution as rewards to the provisioners. We will illustrate the evolution of the APR for a provisioner, assuming a total supply of 500M tokens.

In this system, , the block reward should be partitioned as 10% to Dusk Development Fund, 10% to voters, and 70% fixed with an extra 10% conditional on the addition of extra votes. Moreover, the burning of gas fees can influence the final rewards received by the provisioners.

To analyze this, we simulate different scenarios considering the total network stake and the stake of the provisioner node. We will calculate the best case scenario in which the provisioner receives 128 credits and includes all votes. The APR is defined as:

$$APR = \frac{Provisioner_{Total\_Reward}}{\text{Stake of the node}} \tag{B.1}$$

where $Provisioner_{Total\_Reward}$ are the annual earnings.

To calculate these earnings, we will estimate the amount of DUSK issued in each block over the course of one year using the Scenario 1 from section 1.2. We will assume that each block takes 10 seconds [1] to be created. Based on the provisioner's participation percentage, we will assign a role as generator or voter and calculate the rewards received according to the formulas in section 2.2.

The rewards received in each role are summed and distributed based on the proportion of the node's stake relative to the total network stake:

$$Provisioner_{Total\_Reward} = (generator_{reward} + voter_{reward}) \times \frac{\text{Stake of the node}}{\text{Total network stake}}$$

Since the provisioner can be chosen as either a generator or a voter in each block, the total rewards at the end of the year will be the sum of the rewards received in each of these roles.

Assuming a total supply of 500M tokens we explore different scenarios. We consider three node's stake representing 5%, 10% and 20% of the total network stake. For each scenario we will vary the total stake of the network and we will provide a plot of the APR received.

[1] This duration is currently enforced by the protocol as blocks cannot be generated before 10 seconds after the previous block.

It is important to note that in scenarios where the total network stake is lower, the APR is higher. This is because, as the total network stake increases, the absolute amount of the node's stake also increases (since it always represents 10% of the total), leading to a higher total investment. However, the rewards received remain constant.

Figure B.1 depicts the evolution of the APR as a function of the stake invested by the node for all the scenarios.

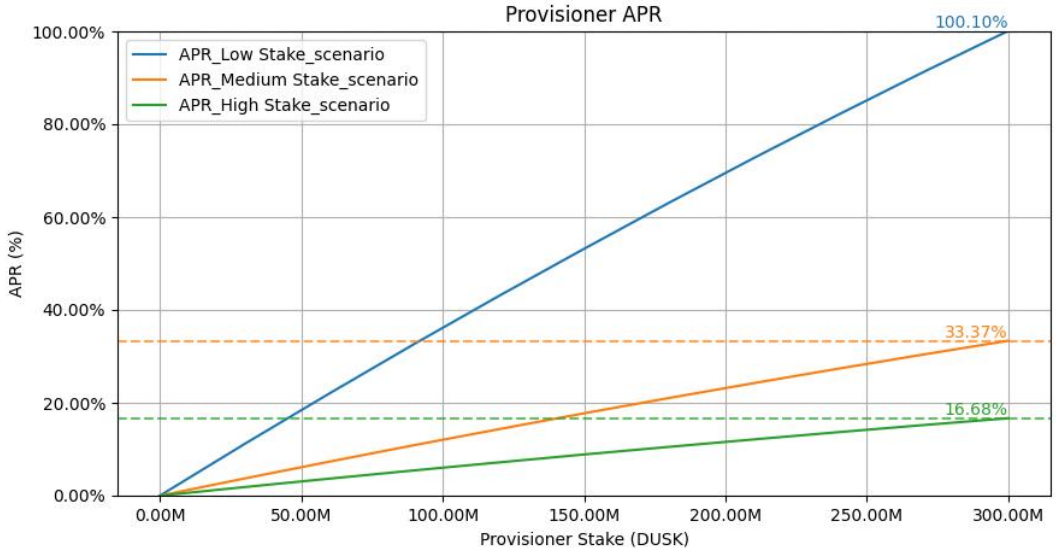


Figure B.1: Provisioner APR for each scenario

Figure B.2 depicts the evolution of the APR as a function of the total stake of the network.

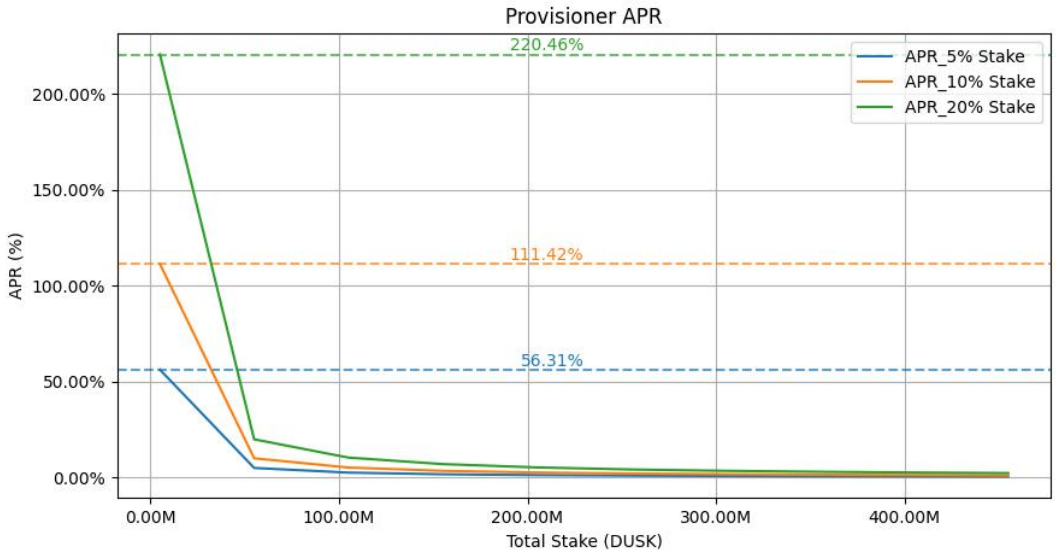


Figure B.2: Provisioner APR for each scenario

For example, suppose the total network stake is 10% of the total supply, meaning the total stake is 50M DUSK. If the provisioner decides to stake 20% of that, that is 10M

DUSK, then by the end of the year he will earn 2198668 DUSK. Using (B.1) he will obtain earnings of approximately

$$APR = \frac{2198668}{10M} \simeq 22\%.$$