

## D5 Final Test Scenario 2022

### 1 Introduction

Flood Recovery Inc. have developed a small-scale portable flood defence system that they can deploy in emergencies, dubbed “FloodBlock” that can be rapidly dispatched to areas of the world suffering from floods.

Each FloodBlock has its own small solar farm, a wind turbine and a battery bank for energy storage. It also has a small substation that provides access to local distribution networks.

The facility has three primary electrical loads that are purely resistive in nature:

1. Load 1: Pumps for clearing water from around the homes (**1.2A**)
2. Load 2: Lifting equipment for deploying sandbags (**2A**)
3. Load 3: Outdoor and indoor lighting for the defenders (**0.8A**)

Note: The maximum mains capacity is **2A**. Battery charging and discharging current are **1A** per hour only with infinite capacity.

The wind turbine can produce a maximum of **3A** and the solar farm a maximum of **1A**.

### 2 Emergency Scenario

Due to ongoing torrential rain and high winds in Hampshire, the power has been knocked out across the county and is only intermittently coming back online. The local environment agency services are overwhelmed so 8 FloodBlock Teams will be deployed to help reduce the risk to homes of flooding.

Your smart meter is required to manage both the demand and sources of generation such that over a 24 minute test (24 hours of test scenario), the number of houses saved from flood is maximised.

Modelling has shown that the existence of a fully installed and operational FloodBlock facility can theoretically protect up to 250 houses per day, where the following holds (where  $t$  is hours for the test scenario or minutes for the model):

- Loss of the pumps (load1) alone when it is in demand
  - This reduces the number of houses saved to  $250-(4*t)$
- Loss of the lifting equipment (load2) alone when it is in demand
  - This reduces the number of houses saved to  $250-(3*t)$
- Loss of BOTH the pumps AND the lifting equipment whilst they are in demand
  - This reduces the number of houses saved to  $250-(10*t)$
- Loss of power to the lighting (Load 3)
  - This reduces the number of houses saved to  $250-(1*t)$

Please note that to avoid overwhelming other areas, the pumps (load 1) will only be used from 08:00 – 22:00 during the day of the trial.

### 3 Details of the Final Test Process

The trial will start at 00:00 on FloodBlock time and your smart meter should activate without external prompting. The smart meter performances will be graded with a relative score across the groups in the following categories and distribution of credit:

Category	Measured Quantity	Percentage Credit
House flood rate	Final number of unflood houses (n)	35%
Minimal requests for mains power by FloodBlock	Mains current integral	30%
Optimal use of renewable energy	Mains and storage current outputs	15%
Maintenance of busbar voltages	Integral of voltage difference from 240V	20%