



# Mainland Interconnector Capacity Assessment: Phase 2

A report for Wight Community Energy

Final Report for Wight Community Energy

ED 14513 | Issue number 2 | Date 19<sup>th</sup> August 2021

Ricardo Confidential

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Date: 19/08/2021

Ref: ED 14513

Ricardo is certified to ISO9001, ISO14001, ISO27001 and ISO45001

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## Glossary

Abbreviation	Definition
DNO	Distribution Network Operator
SSEN	Scottish & Southern Electricity Networks
NGESO	National Grid Electricity System Operator
LV	Low Voltage

# 1 Introduction

## 1.1 Project context

Ricardo was engaged to provide technical support services to WCE in October 2020.

The works were divided into two phases.

## 1.2 Ricardo Phase 1 works

As part of Phase 1 Ricardo completed work on:

- Understanding the modelling techniques and assumptions SSEN use to assign capacity to the interconnectors and to determine under what conditions the application of constraints on the island's renewable generation become necessary
- Understanding what is driving SSEN's approach to the network operational management and network development on the island
- Understand how the Active Network Management system works and in particular the decision-making processes and logic incorporated in the system

On completion of this work and submission of a corresponding report Ricardo received further instructions from WCE to proceed with Phase 2 of the engagement. The findings, conclusions, and recommendations arising from the Phase 1 works can be found in Ricardo's report "Mainland Interconnector Capacity Assessment" which was submitted to WCE on the 17<sup>th</sup> March 2021.

## 1.3 Ricardo Phase 2 works

For the Phase 2 works WCE instructed Ricardo to:

- Investigate the extent to which battery energy storage schemes could be introduced on the same physical connection and under the same connection agreement as an existing solar PV plant on the island.
- Develop responses to SSEN's proposals for ED2 and as these may affect the IoW council's aspirations to achieve a carbon neutral position for electricity consumption on the IoW.
- Engage with RWE to gain, if possible, an understanding of their future plans for the Cowes power plant; and the potential for access for renewable generators on the island to the firm capacity assigned to the Cowes power plant

This report summarises the findings and outputs from the Phase 2 work.

## 2 Battery storage on existing connections

### 2.1 Potential for battery storage

The cost of batteries has been coming down and the potential for deriving a return on grid scale batteries connected at the distribution level have been increasing. WCE therefore asked Ricardo to determine what, if any, barriers there may be to installing grid scale batteries on existing Solar PV connections to the local distribution network and under the same DNO connection agreements.

### 2.2 Technical solutions for battery installation

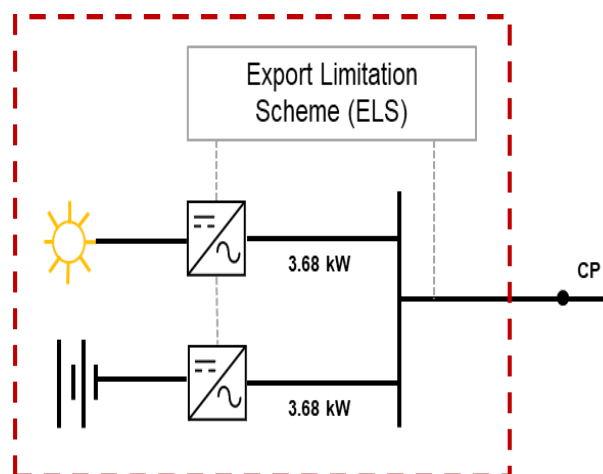
After a number of attempts a meeting was set up with one of SSEN's technical specialists who explained that so long as there was a scheme in place to limit the total export from a site (plant) to the value stated in the connection agreement then SSEN did not have any objections to the size of a battery installed in parallel with an existing solar PV plant. However, SSEN would also insist on the installation of an independent protection relay set to operate if the export limitation scheme failed. Should the relay operate typically it would disconnect the plant from the grid. In addition, SSEN may carry out some voltage and fault studies to confirm that there were no conditions under which the new plant configuration would over stress the local network.

Typically, solar panels in a solar farm are connected in strings to an inverter and the inverters feed into a common ac "busbar" which may be connected by a step-up transformer and then a circuit breaker to the point of connection to the local distribution network. The cost of implementing an export limitation scheme will be dependent on how easy it is to incorporate individual solar panel inverters and the inverter or inverters associated with the battery into the export limitation scheme plus the cost of any studies carried out by SSEN, the protection relay, and demonstrating that the scheme works.

The exact service or services the battery would support and how this would affect the operation of the solar farm would require an investment assessment.

Figure 2-1 shows a typical and common technical solution to accommodate battery technologies in conjunction with the solar PV.

Figure 2-1 Connection set up with battery device in conjunction with solar PV from EREC G98



The ELS setup will need to comply with the requirements set out in EREC G100. Reference to this standard should be made to ensure that the installation and operation of the ELS meets the requirements as this will need to be approved by SSEN before connection is granted.

The conclusions and Ricardo's understanding of the battery situation on the IoW is subject to final confirmation with SSEN. Ricardo have contacted SSEN to confirm that the conclusions drawn are correct but have received no response.

## 2.3 RWE Cowes Gas Turbine Power Plant

Ricardo had a meeting with relevant staff from RWE Generation, the owners of the Cowes Power Plant on the IoW, to understand the likely future of the Cowes power plant and whether RWE Generation have plans to transition away from using fuel oil as the main fuel type. In addition, Ricardo asked if RWE Generation were interested in exploring how they could make a proportion of their existing firm capacity agreement with SSEN available to renewable generators on the island.

From these discussions Ricardo understood that:

- RWE Generation advised that there were no plans to close the Cowes Plant or to transition from using fuel oil to a greener alternative fuel to power the gas turbines. RWE indicated that the only circumstance under which this would occur was if there was no longer a market in the UK for electricity production fuelled by fuel oil.
- RWE Generation indicated that they were interested in discussing, with an appropriate counter party, how they could establish a commercial arrangement that would make some of their firm capacity available to renewable generators on the IoW. RWE Generation stressed that they were interested in establishing some form of long-term agreement with a consortium of generators.

## 2.4 NGESO

Ricardo have maintained dialogue with National Electricity System Operator (NGESO) throughout this engagement. Following a meeting where part of the discussion covered the reasons for SSEN deducting the Cowes plant firm capacity from the total interconnector capacity when calculating the spare capacity available for new generation on the IoW, NGESO agreed to see if they could obtain a better understanding of SSEN's firm connection agreement with RWE. However, when approached by NGESO, SSEN reconfirmed that due to commercial sensitives, they were unable to share any information on the RWE Cowes connection agreement with NGESO and in particular why SSEN effectively prohibits access to RWE's 140 MW firm capacity when it is not required by RWE.

From data seen by Ricardo, RWE's connection capacity is not required by RWE for approximately 99.5% of the time per year, resulting in SSEN's assets being grossly underutilised. It is likely that there is a prohibiting clause in the connection agreement, and as a result SSEN has no room to manoeuvre.

In addition, NGESO were queried about the nature of the support services NGESO calls upon the Cowes power plant to provide during periods of network stability issues. Due to commercial sensitives, NGESO were unable to share this information.

NGESO mentioned that part of their plans going forward is to install a new super-grid transformer at Fawley substation on the mainland and add a new overhead grid transmission interconnection to relieve network constraint that also adversely impacts on the energy that that could be exported off the IoW even if SSEN's network assets had the capacity. The new transformer is expected to be installed in 2023 and the erection and commissioning of the transmission network overhead line may be complete by 2029.

### 2.4.1 SSEN ED2 Business Plan

Currently the SSEN investment plan for ED2 price review period indicates that no further investment is required in the network infrastructure on and to the IoW as SSEN are only forecasting a growth of 10 MW in local renewable generation capacity on the island.

WCE and the IoW council are of the opinion that because there is so little spare capacity in the existing infrastructure this is discouraging further investment in renewable generation on the island.

WCE and the IoW Council are looking at how they can demonstrate the correctness of their view in this regard and thereby persuade SSEN that additional investment in the IoW electricity infrastructure is warranted during the forthcoming electricity price review period.

## 2.5 Conclusion

The work undertaken by Ricardo during Phase 2 of their engagement with WCE reveals that:

- **Installing Batteries on Existing Solar PV Sites:** SSEN will accept a grid scale battery installed in conjunction with an existing solar PV plant that uses the same physical connection to the local SSEN network as the original plant provided that an export limitation scheme (ELS) is deployed that limits the total energy export from the solar + battery to the value stipulated in the existing connection agreement. In addition, a back-up protection relay must be installed to ensure that, should the ELS fail to keep the total export under the proscribed limit, the plant will be disconnected from the SSEN network. Note this is subject to final confirmation from SSEN that Ricardo's understanding is correct.
- **RWE Generation:** RWE have indicated that they are interested in developing a long-term commercial agreement with a consortium of generators on the IoW that provides access to some of RWE's firm capacity. In support of this Ricardo have introduced WCE to a lawyer experienced in this type of negotiation who it is understood has started a dialogue with RWE.
- **NGESO Engagement:** NGESO were unable to share any new information on the stability support services provided by the Cowes plant with Ricardo due to commercial sensitivities
- **SSEN ED2:** Following a review of SSEN's draft proposal for the forthcoming ED2 price review period, it is clear that SSEN do not propose to invest in additional capacity for the IoW electricity network as their forecasting models predict a small increase in renewable generation capacity. In order to convince SSEN to invest in increased network capacity for the island, WCE and the IoW Council will have to provide evidence that shows that if the additional network capacity is made available, investment in additional renewable generation will follow.





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