



WES Knowledge Capture

AWS Project Know-How

WES_KH02_ER_Project Overview (AWS)

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Executive Summary

This document is intended as a brief guide to the contents of the reports produced for Wave Energy Scotland (WES) by AWS Ocean Energy as part of Project Know-How. Project Know-How is part of the on-going knowledge capture work within WES and was commissioned to capture lessons, knowledge and key operational experiences from the wave energy sector in Scotland, and in particular the technology development companies based there.

These documents are to be shared with participants in WES funded development programmes, to prevent participants having to go through the same learning exercise. This approach meets a number of the WES objectives – ensure that the learning gained from support for wave device development and deployment to date, in particular the learning from Scotland’s leading wave technologies, is retained and used to benefit the wave energy industry and to avoid duplication in funding, encourage collaboration and foster greater standardisation across the industry.

The AWS Ocean Energy reports cover the experience gained by AWS on a variety of wave energy projects, and discuss some of the drivers for technology decisions during their device development process.

This report provides a brief synopsis of the documents produced to act as a ‘sign post’ for the reader. A table in Section 8 gives details of the deliverables available from the project.

Note that additional reports, documents and data files referenced here and in the deliverables may not be currently available.

1 AWS Wave Power Development Experience

File Name: 15-001 AWS Wave Power Development Experience rev5.pdf

WES Executive Summary

The report was produced in August 2015 and reviews the experience of AWS Ocean Energy Ltd from May 2004 to the time of writing. It also references the earlier experiences gained from the work by Teamwork Technology (Netherlands) in the initial development of the Archimedes Waveswing™ in the period from 1994 to 2004.

Much of the report is technical and requires a reasonable level of understanding of wave power principles and technology on the part of the reader. The report does not however provide all of the background technical information, much of which is proprietary intellectual property of AWS Ocean Energy Ltd.

The report is however intended to give an overview of the development experience and the key decisions and to provide a signpost to more detailed technical information so that Wave Energy Scotland may be aware of the existence of our work and therefore avoid repetition and promote future collaboration.

2 Technology Description and Status – Waveswing

File Name: 15-007r4 Technology Description and Status – Waveswing.pdf

Executive Summary

This report is one of a suite of reports provided to WES and the reader is recommended to read AWS Ocean report *15-001 AWS Wave Power Development Experience* to further understand the background to the development of the Archimedes Waveswing™ technology.

The purpose of this report is to provide a description of the current design for the Waveswing™ technology (now known as Waveswing™ MK IV) and to provide a TRL assessment of the major sub-systems, together with an assessment of AWS Ocean Energy's confidence of achieving TRL 9 for that system. The report also provides an assessment of the overall TPL of the system.

This information is intended to provide WES with a snap-shot of the current state-of-the-art in relation to the Waveswing™ technology.

The report is structured as follows:

- Section 2 provides a general description of the technology and its operation;
- Section 3 provides a sub-system breakdown of the technology, a gap analysis and high-level TRL assessment;
- Section 4 provides a technology assessment in line with DNV RP-A203 and a subjective view on the development challenges for the system;
- Section 5 addresses the operational aspects of construction, deployment operation and maintenance of the device;
- Section 6 provides a TPL assessment of the system;
- Section 7 addresses the challenges to achieving a commercial system;
- Section 8 provides an outline technology development plan;

3 Technology Description and Status – AWS III

File Name: 15-008r5 Technology Description and Status - AWS-III.pdf

Executive Summary

This report is one of a suite of reports provided to WES and the reader is recommended to read AWS Ocean report *15-001 AWS Wave Power Development Experience* to further understand the background to the development of the technology.

The purpose of this report is to provide a description of the current design for the AWS-III and to provide a TRL assessment of the major sub-systems, together with an assessment of AWS Ocean's confidence of achieving TRL 9 for that system. The report also provides an assessment of the overall TPL of the system.

This information is intended to provide WES with a snap-shot of the current state-of-the-art in relation to AWS-III technology.

This report is structured as follows:

- Section 2 provides a general description of the technology and its operation;
- Section 3 provides a sub-system breakdown of the technology, a gap analysis and high-level TRL assessment;
- Section 4 provides a technology assessment in line with DNV RP-A203 and a subjective view on the development challenges for the system;
- Section 5 addresses the operational aspects of construction, deployment operation and maintenance of the device;
- Section 6 provides a TPL assessment of the system;
- Section 7 addresses the challenges to achieving a commercial system;
- Section 8 provides an outline technology development plan;

4 Technology Description and Status – Electric Eel

File Name: 15-009r4 Technology Description and Status - Electric Eel.pdf

Executive Summary

This report is one of a suite of reports provided to WES and the reader is recommended to read AWS Ocean report *15-001 AWS Wave Power Development Experience* to further understand the background to the development of the technology.

The purpose of this report is to provide a description of the current design for the Electric Eel and to provide a TRL assessment of the major sub-systems, together with an assessment of AWS Ocean Energy's confidence of achieving TRL 9 for that system. The report also provides an assessment of the overall TPL of the system.

This information is intended to provide WES with a snap-shot of the current state-of-the-art in relation to the Electric Eel technology.

This report is structured as follows:

- Section 2 provides a general description of the technology and its operation;
- Section 3 provides a sub-system breakdown of the technology, a gap analysis and high-level TRL assessment;
- Section 4 provides a technology assessment in line with DNV RP-A203 and a subjective view on the development challenges for the system;
- Section 5 addresses the operational aspects of construction, deployment operation and maintenance of the device;
- Section 6 provides a TPL assessment of the system;
- Section 7 addresses the challenges to achieving a commercial system;
- Section 8 provides an outline technology development plan;

5 Technology Description and Status – Self-drilled Pile System

File Name: 15-010r4Technology Description and Status – SDPS.pdf

Executive Summary

This report is one of a suite of reports provided to WES and the reader is recommended to read AWS Ocean report *15-001 AWS Wave Power Development Experience* to further understand the background to the development of the technology.

The purpose of this report is to provide a description of the current design for the SDPS and to provide a TRL assessment of the major sub-systems, together with an assessment of AWS Ocean Energy's confidence of achieving TRL 9 for that system. The report also provides an assessment of the overall TPL of the system.

This information is intended to provide WES with a snap-shot of the current state-of-the-art in relation to the SDPS technology.

This report is structured as follows:

- Section 2 provides a general description of the technology and its operation;
- Section 3 provides a sub-system breakdown of the technology, a gap analysis and high-level TRL assessment;
- Section 4 provides a technology assessment in line with DNV RP-A203 and a subjective view on the development challenges for the system;
- Section 5 addresses the operational aspects of construction, deployment operation and maintenance of the device;
- Section 6 provides a TPL assessment of the system;
- Section 7 addresses the challenges to achieving a commercial system;
- Section 8 provides an outline technology development plan;

6 Report on Parametric Cost Modelling

File Name: 15-011r3 Report on LCOE Parametric Modelling.pdf

Executive Summary

This report is one of a suite of reports provided to WES and the reader is recommended to read AWS Ocean report to WES number 15-001 *AWS Wave Power Development Experience* to further understand the context within which this modelling work sits.

This report provides a description of the modelling techniques used by the AWS Ocean team when seeking to optimise the Archimedes Waveswing™ device in 2007. This early work is referenced as the results of the modelling exercise drove key decisions by AWS Ocean in relation to the Waveswing™ technology at that time. The report also provides a description of a generic modelling tool that has been provided to WES in order to illustrate the techniques used. The overall structure is as follows:

- Section 2 provides an introduction to parametric modelling;
- Section 3 describes the work carried out by AWS Ocean during the modelling of the Archimedes Waveswing™;
- Section 4 provides general recommendations for parametric cost modelling;
- Section 5 describes the generic model tool and provides instructions for use;
- Section 6 provides recommendations for future LCOE model development.

7 Summary Table of Available Documents

The following table lists the documents referenced in this overview.

Filename	Short Title	No. Pages	File Size [MB]
15-001 AWS Wave Power Development Experience rev5.pdf	AWS Wave Power Development Experience	38	11.6
15-007r4 Technology Description and Status - Waveswing.pdf	Technology Description and Status – Waveswing	35	1.5
15-008r5 Technology Description and Status - AWS-III.pdf	Technology description and status – AWS III	34	13
15-009r4 Technology Description and Status - Electric Eel.pdf	Technology Description and Status – Electric Eel	25	10.9
15-010r4 Technology Description and Status – SDPS.pdf	Technology Description and Status – Self-drilled Pile System	28	22.6
15-011r3 Report on LCOE Parametric Modelling.pdf	Report on Parametric Cost Modelling	28	1.7
XL15-015r1 Example Parametric Model.xlsm	Spread sheet to accompany 15-011r3		1.2