WITSML Product Certification Program: Overview and Process Guide

For WITSML v1.4.1

WITSML Overview	Data object definitions and a Web services specification for the right-time seamless flow of well data between operators and service companies to speed and enhance decision making.
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Prepared by	Energistics and The Open Group
Abstract	This guide describes the certification process developed for WITSML 1.4.1, which includes a series of automated tests. This certification process supersedes all previous WITSML certification processes. Currently, it applies only to WITSML v1.4.1 server products (not client products).
Document type	Business case and process guide
Language	U.S. English
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Amendment History		
Document Version	**Date**	**Comment**
1.0	December 2014	First publication for version 1.0 of the WITSML Product Certification Testing Tool and the Certification Program
1.1	January 2016	The Energistics logo and the WITSML Certification mark have been updated
1.2	September 2021	Updated logo, WITSML Certification mark, URLs and steps. Applied latest Energistics document template. Deleted Appendix A Certification Review Team; no longer applicable.
1.3	August 2023	In January 2022, Energistics became a consortium under The Open Group. This move resulted in changes to the WITSML v1.4.1.1 Certification Program. The main change is that certification testing is performed by a third party, with the role of Recognized Testing Provider. Previously, certification testing was conducted by Energistics staff. Energistics' role is the Certification Authority, and its responsibilities updated or specified. All previous Energistics email addresses have been updated to The Open Group email domain. EXAMPLE: certification@Energistics.org IS NOW energistics-cert-auth@opengroup.org . Main changes to this Certification Program result from these new roles and other changes (for example, different technology infrastructure) resulting from Energistics now being part of The Open Group.

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Executive Summary

A fit-for-purpose product certification program has been developed for WITSML servers, API version 1.4.1. The cornerstone of the WITSML Certification Program is the WITSML Product Certification Testing Tool. The Testing Tool (software developed by the former Energistics Consortium and WITSML SIG using open source technology) automates running a suite of tests that use standard WITSML queries, data object definitions, and behaviors defined in the *WITSML Store Application Program Interface (API)* v1.4.1.1. If a server passes all required testing performed by the Recognized Testing Provider and the company executes the required legal agreements and pays any applicable fees, the server will be designated WITSML certified by Energistics.

This behavior-based, automated software Testing Tool and Certification Program replaces all previous self-certification programs and eliminates the variable nature of those programs by bringing consistency and objectivity to the testing process. The program is expected to deliver the ease-of-use and reliable results needed to drive certification, ultimately improving the interoperability and data reliability provided by WITSML.

This guide:

- Explains why companies should certify their servers, describing the business benefits to both server vendors and server users/customers.
- Provides an overview of the process (so companies can understand the "big picture process") and detailed instructions for the steps a company must take to get its WITSML server product certified.

Certification is available to any company that has a WITSML server product. Before registering to be certified, a company that wants to have its WITSML server certified must download the Testing Tool (which includes all related components for testing) to first test its server in its own environment.

Performing self-testing first, in a company's own environment, highlights the transparency of the Testing Tool and process, streamlines the certification process, and increases a company's confidence that its server will pass when the official tests are conducted by the designated third-party testing provider.

Benefits of Product Certification

Product testing and certification have several benefits both to the vendor companies developing server (and client) products and to the consumer companies (both energy and service companies) that depend on those products to provide reliable data delivery from and across their drilling operations.

For energy companies and end-users, benefits include:

- **Enhanced interoperability between deployed solutions**. WITSML Version 1.4.1 has been streamlined and "tightened" to specifically enhance interoperability.
- **Ability to more accurately compare server products, feature by feature**. Consumers of WITSML server products can effectively and confidently compare the advertised functionality and capabilities of those products. Consumers can expect an appropriate level of compliance to the WITSML specification from vendor products that have been certified.

For vendors of WITSML servers, benefits include:

- **Demonstration of compliance**. Passing the certification tests demonstrates that a server product complies with a subset of behaviors of the specification and is capable of the enhanced interoperability of WITSML v1.4.1.
- **Potential to provide a competitive advantage** in the marketplace because it is anticipated that, for many consumer companies, certification by Energistics will become a prerequisite for provisioning (purchasing or leasing) a WITSML server.
- **Streamline development of compliant solutions**, especially for WITSML Working Group members. Member companies can test their products during the development/implementation phase of WITSML to maintain an appropriate level of compliance with the standard from early in the life cycle of the server product.

1 Introduction

For WITSML v1.4.1 servers, Energistics has developed a program that lets a company apply to have its server product(s) certified as operating in conformance with the *WITSML Store Application Program Interface (API)* specification and the WITSML schemas. This is known as the WITSML Certification Program.

This guide explains the business case for this program, provides an overview of the certification process, and lists detailed procedures that a company must follow to have its WITSML v1.4.1 server product certified.

A key component of the Certification Program is the WITSML Product Certification Testing Tool, referred to hereafter as the "Testing Tool". The Testing Tool is software developed by the former Energistics organization and its WITSML special interest group (SIG) using open source technology. This software automates running a suite of tests that uses standard WITSML queries, data object definitions, and behaviors defined in the *WITSML Store Application Program Interface (API)* v1.4.1 to test that a server conforms to the prescribed behavior defined in the specification.

If a server product passes all required testing performed by the Recognized Testing Provider and the company executes the required legal agreements and pays any applicable fees, the server will be designated WITSML certified by Energistics.

Products that have been certified can use the following logo on their marketing materials and are listed on the Energistics website as a WITSML-certified product.

In 2022, Energistics became an affiliate of The Open Group. This process has been modified to align with The Open Group best practices for certification and related testing.

Figure 1. Energistics WITSML certified product logo.

1.1 Context for Certification

In WITSML v1.3.1, interpretation of parts of the API document could be ambiguous. This ambiguity led to what have commonly been referred to as "dialects" in WITSML servers. These dialects are effectively different server behaviors for the same task, and they impede the server's ability to communicate and exchange data consistently with other WITSML servers or clients.

One of the main goals of WITSML 1.4.1 was to eliminate or reduce this ambiguity by clearly specifying deterministic behavior. Part of this process includes the introduction of standard queries with clearly defined expected responses thereby defining expected behavior from a server.

These standard queries play an important role in the certification test procedures. Where possible they are used either singularly or in groups to test elements of the schema and behavior that is defined by "MUST" statements in the API document. In some tests, these standard queries are combined with known defined (or in the case of GetFromStore-only servers, server specified) data sets to test both the prescribed behavior and the ability of the server to pass actual real-world data correctly.

With the specification of clear behaviors, the focus is on validating the behavior of servers per the 1.4.1 specification. This automated testing and certification process completely replaces the former "Self Certification" (released against v1.2 of the standard) and "v1.3.1 Tested Certification" programs.

1.2 Benefits of Product Certification and Testing

Product certification and testing have several benefits both to the vendor companies developing server (and client) products and to the consumer companies (both energy and service companies) that depend on those products to provide reliable data-delivery solutions from and across their drilling operations.

In general, the certification program eliminates the variable nature of previous programs by bringing consistency and objectivity to the certification process.

For energy companies and end-users, benefits include:

- **Enhanced interoperability between deployed solutions**. WITSML Version 1.4.1 has been streamlined and "tightened" to specifically enhance interoperability.
- **Ability to more accurately compare server products, feature by feature**. Consumers of WITSML server products can effectively and confidently compare the advertised functionality and capabilities of those products. Consumers can expect an appropriate level of compliance to the WITSML standard from vendor products that have been certified.

For vendors of WITSML servers:

- **Demonstration of compliance**. Passing the certification tests demonstrates that a server product complies with a subset of behaviors of the specification and is capable of the enhanced interoperability of WITSML v1.4.1.
- **Potential to provide a competitive advantage** in the marketplace because it is anticipated that, for many consumer companies, certification by Energistics will become a prerequisite for provisioning (purchasing or leasing) a WITSML server.
- **Streamline development of compliant solutions**, especially for WITSML members. Member companies can test their products during the development/implementation phase of WITSML to maintain an appropriate level of compliance with the standard from early in the life cycle of the server product.

1.3 Audience, Purpose, and Scope

1.3.1 Audience

This guide is for:

- **Consumer/end-user companies of WITSML servers.** Intended for IT managers, developers, and domain experts/end-users of WITSML servers to help them understand the business value of and process for certification.
- **Companies that want to certify their WITSML servers** (referred to as Certification Applicants). Intended for IT people, such as software developers and product architects, who develop WITSML-enabled products and need to understand the details of the certification process.

1.3.2 Purpose

This guide was developed to:

- Provide an overview of the product certification process (which includes the testing process) and explain the business value for both consumers and vendors of WITSML server products.
- Explain in detail the product certification process and everything that a company must do to prepare and apply to Energistics for certification.

1.3.3 Scope

- WITSML server products, version 1.4.1.

- Does NOT include previous versions of WITSML server products or any WITSML clients.
- Supersedes any previous WITSML testing and certification processes (see Section 1.1).

1.4 Documentation Conventions

This document observes the following conventions.

Convention	Description
Document Hyperlinks: Internal	Though no special text-formatting convention is used, all section numbers and page numbers in this and related documents are hyperlinks.

1.5 Resource Set

The table below lists available resources for the WITSML Certification Program. For additional information see these pages on the Energistics website:

- More information about the Certification Program, https://www.energistics.org/standards-certification/
- To download the WITSML standard and Testing Tool, https://publications.opengroup.org/standards/energistics-standards

	Document/Resource	Description
1.	*WITSML Store Application Program Interface (API) v1.4.1*	The document that specifies the server behavior that the Certification Program is attempting to test and confirm.
2.	WITSML Schemas v1.4.1	The schemas that define the data object formats that are defined by WITSML.
3.	*WITSML Product Certification Program: Overview and Process Guide* (this document)	Describes the business case for certification, all necessary background, roles and responsibilities in the process, and the process and procedures for how companies register their server products to be certified.
4.	*WITSML Product Certification Testing Tool: Installation and Usage Guide*	Explains how to download, install, configure and use the Testing Tool, the software used to conduct tests.
5.	WITSML Product Certification Testing Tool	The software that is used—both by candidates seeking WITSML certification and Recognized Testing Providers—to conduct tests to determine if a particular server product conforms to behaviors as specified in the WITSML API document.
6.	Register Intent to be Certified	A web-based form available from this page on the Energistics website: https://www.energistics.org/standards-certification/ To start the certification process, a customer must complete this form.

	Document/Resource	Description
7.	Certified Product License Agreement	The legal document that specifies the terms and conditions of the certification process. An applicant requesting product certification must complete and sign this agreement before the certification process can begin.
6.	Certified WITSML v1.4.1 Products Web page https://www.energistics.org/witsml-v1411-certified-products	Web page listing WITSML v1.4.1 certified products. That is, the products listed have completed and passed the certification process described in this document.
8.	Product Certificate and Certified Product Logo	These are the artifacts that an applicant receives after it has successfully completed the certification process.
9.	Problem-Reporting Process	If you discover an issue or bug with any component of the tests or the Testing Tool, please send an email to energistics-cert-auth@opengroup.org according to the process described in the *WITSML Product Certification Testing Tool: Installation and Usage Guide*.

2 Overview of the Certification Process

This chapter provides a high-level overview of key aspects of the WITSML v1.4.1 certification process.

- For benefits of certification, see Section 1.2.
- For details about the Testing Tool, Test Scripts and other key components of the testing environment, and instructions on how to get your WITSML server version 1.4.1 tested and certified, see Chapter 3 (page 13).

2.1 Who can be Certified?

Certification is open to all companies in the upstream oil and gas industry that have a WITSML v1.4.1 server product. A company seeking certification is called a Certification Applicant.

2.2 Prerequisites and Fees

Before you can begin the certification process, you must:

- Have a publicly accessible WITSML v1.4.1 server.
- Download and install the WITSML Product Certification Testing Tool and conduct self-testing on your server product and ensure it passes all tests required for your server product (see Section 2.2.2 below).
- Complete and submit the Register Intent to be Certified online form; for the link to this form, see Section 1.5.
- Pay any applicable certification fee (see Section 2.2.1 below)

2.2.1 Fees for Certification and Testing

For Energistics members, certification is a benefit of membership (no additional cost). Non-members must either become an Energistics member or pay the applicable Certification Fee as defined in Schedule C of the Certified Product License Agreement When a Certification Applicant applies for certification, Energistics verifies the company's membership status and notifies the Certification Applicant of options to become a member or required fees.

2.2.1.1 Testing Fee

NEW! Because testing is now performed by an independent third-party known as a Recognized Testing Provider, there is a cost for this service for BOTH members and non-members. The Recognized Testing Provider sets the testing fee.

2.2.2 Test Yourself Before Requesting Certification

Before registering a WITSML server product to be certified, a Certification Applicant must first download the Testing Tool and run the tests on its WITSML server in the applicant's own environment.

This approach provides transparency and helps streamline the certification process, because companies can use the Testing Tool for troubleshooting products, thereby helping to ensure that their server products are ready when they request certification.

For information on how to download, install, and use the Testing Tool in your own environment, see the *WITSML Certification Testing Tool: Installation and User Guide*.

2.3 What is the Certification Process?

The WITSML Certification Program requires a legal agreement between the company requesting certification—the Certification Applicant—and Energistics as the Certification Authority. The Certified Product License Agreement is the document that spells out the roles and responsibilities of the parties involved in the process. Both the Certification Applicant and Energistics (Certification Authority) must sign this document before the certification process can begin.

The program includes the WITSML Product Certification Testing Tool (Testing Tool) and a suite of automated Test Scripts that are run against a server to test basic server behavior for mandatory functionality as specified in the *WITSML Store Application Program Interface (API)* for WITSML version 1.4.1. The specific tests run for a server product are based on the server product's WITSML capabilities—a mechanism required by the WITSML Specification that a server uses to state which WITSML functions it can perform.

As explained in Section 2.2.2 above, the Certification Applicant must download the Testing Tool and test its server product in its own environment before requesting certification from Energistics. When the product passes all tests in a Certification Applicant's own environment, then the Certification Applicant can register with Energistics to be certified.

This certification process includes "official testing" conducted by a Recognized Testing Provider, which is an independent third party. When a Certification Applicant registers for certification, Energistics will send the applicant the contact information for the Recognized Testing Provider. The Certification Applicant then must coordinate with the Recognized Testing Provider to schedule the test, etc.

If the server passes all required tests (based on its server capabilities object) run by the Recognized Testing Provider, the test results are submitted to the Energistics Certification Authority.

The Energistics Certification Authority will send the Certification Applicant a WITSML-certified logo (see Figure 1, page 6) and a WITSML Product Certificate to use in marketing materials for the tested server product, and lists the certified WITSML server product on the Energistics website (To see the list of certified products, see the link in Section 1.5.

For information on how to download, install, and use the Testing Tool in your own environment, see the *WITSML Certification Testing Tool: Installation and User Guide*.

For processes and procedures on how to get a WITSML server certified, see Section 3.3.

2.3.1   Testing Tool and Test Suite Overview

The Testing Tool was developed with the open source programming language, Python, (www.python.org) and the suite of Test Scripts in the Python scripting language. The Testing Tool runs specific tests linked to standard queries and, where applicable, defined data sets for that data object or data objects.

All components of the testing technology are maintained and administered by Energistics, with help from the WITSML Working Group. Testing is conducted against the currently approved version of the Test Suite.

To ensure consistency for testing procedures and results, both the tool and scripts (along with test data and other supporting materials) are versioned and maintained in a version control system.

For a detailed list of all components of the Testing Tool environment, see Section 3.2.

2.3.2   Availability of the Testing Tool

Any company that wants to certify a WITSML server product can download the Testing Tool from the Energistics website, Standards Download page (see Section 1.5).

The Testing Tool includes all testing technology components (e.g., test scripts, data, etc.). For information on how to download, install and run the Testing Tool in your own environment, see the *WITSML Certification Testing Tool: Installation and User Guide*. For process details, see Section 3.3.

2.4   What is Tested?

2.4.1   Combination of Components that is Tested and Certified

Certification of an applicant's WITSML server product is specific to the version of that server product and to a combination of:

- WITSML API version.

- WITSML schema version.
- Certification Test Suite version (including the version of the Testing Tool).

NOTE: Certification testing is NOT performed against the operating system (OS) nor the hardware on which the server runs. However, if an applicant offers multiple versions of servers running exclusively on specific operating systems or hardware, then each version is considered a separate product and must be individually tested and certified. Other than this case, certification is completely independent of OS and hardware.

2.4.2   Server Behaviors

Mandatory behaviors that are tested include:

- Behaviors specified with the "MUST else error code" convention in the WITSML API document.
- Expected response to Standard queries (listed in the WITSML API document (Section 6.6.5).
- Ability to accurately store and retrieve data sets within a prescribed level of accuracy.

Not all servers have the same capabilities, so the particular Test Scripts that are run are determined by a server's capabilities, as defined by the server's capabilities object (for more information, see the WITSML API document).

Companies with GetFromStore-only servers (which cannot load a WITSML data set by means of the AddToStore interface) must supply a server configuration file and populate the server with a data set meeting the minimum requirements; for more information see, *WITSML Certification Testing Tool: Installation and User Guide*

2.4.3   Pass and Fail Criteria

PASS: A server must pass all applicable tests for that particular server.

A server passes a test if the response from a particular Test Script meets the expectations for that test as defined in the Test Plan document. (To see an example Test Plan, see the link in Section 1.5.) As part of this process, any test using specific data expects that the data be returned with a numerical accuracy equivalent to 0.01% of the data value. This variation is allowed to account for variation in returned data numeric values due to rounding or unit-conversion-introduced errors. The primary expectation for a data-based test is that the data returned by the server under test is useable and accurate.

FAIL: If a server does not return the results as specified for ALL test scripts OR a server times out, then it fails the tests and cannot be certified.

Failures resulting from a time out will be retested; however, if that particular test (or tests) consistently times out, it will be documented as a fail.

2.4.4   Process for Re-testing and Contesting Results for Failed Tests

Pass or fail, the Recognized Testing Provider gives a Certification Applicant the log of results from the tests.

- If a server fails, the applicant can use the results log to troubleshoot its server. Applicants can address issues and re-submit a server for testing. For process details, see Section 3.3.
- Or, if an applicant disagrees with the results, the company can contest them. For details, see Section 3.3.6.

2.5   Re-Certification Requirements

As described in Section 2.4, certification is for a specific version of a WITSML server product.

New versions of a previously certified product must be certified again.

3 Certification Procedures

This chapter lists roles and responsibilities of the parties involved in the certification process, explains the key components of the Testing Tool and the testing environment, and specifies all procedures in the certification process.

3.1 Roles and Responsibilities

The key roles involved in the certification process are listed here with responsibilities for each described below:

- **Certification Applicant:** the company/organization that wants to have a server certified.
- **Certification Authority:** The Open Group provides this service on behalf of Energistics.
- **Recognized Testing Provider:** a third party that conducts the official testing for the certification process.
- **WITSML Working Group:** Initially developed the Testing Tool and Test Suite and adjudicates test results contested by the Certification Applicant.
- **Energistics Business Team:** If a Certification Applicant disagrees with the test results from the Recognized Testing Provider, they may appeal to the Energistics Business Team.

3.1.1 Certification Applicant

An applicant that wants to certify a server must:

- Download and install the Testing Tool and Test Suite and use it to test your server before registering for certification from Energistics. For all inquiries and questions about Certification, email energistics-cert-auth@opengroup.org.
- For each WITSML server product to be certified, complete and submit the WITSML Register for Intent to Certify form; the form is available at the link in Section 1.5.
- Sign the Certified Product License Agreement, which is a legal agreement that describes the roles, responsibilities, and rights of parties with respect to the WITSML Certification Program.
- Follow all procedures and instructions described in the Certified Product License Agreement and in this document.
- During active testing of your server or when actively working an issue related to testing, respond to notices or requests for information from the Recognized Testing Provider, and/or Energistics within 5 business days.

3.1.2 Certification Authority (Energistics)

Energistics has these responsibilities in the certification and testing process:

- Maintains and disseminates information about the Certification Program, testing, and the process.
- Serves as the coordinator and point of contact for all matters related to WITSML certification; email energistics-cert-auth@opengroup.org.
- Authorizes third parties as Recognized Testing Providers to conduct official certification tests using the Testing Tool.
- Executes the Certified Product License Agreement with the Certification Applicant. Verifies a company's Energistics membership or collects the applicable Certification Fees.
- Upon receipt of successful test results from a Recognized Testing Provider

  - Issues the Product Certificate and Certified Product logo to the Certification Applicant.
  - Publishes a Certification Applicant's certified server test results on the Energistics website; the results can be accessed from at the link in Section 1.5.

3.1.3 Recognized Testing Provider

Energistics recognizes qualified independent third parties to conduct testing using the Testing Tool. When Energistics moved to governance under The Open Group, this role was created based on The Open Group certification processes and best practices. (Previously, Energistics served as both Certification Authority and Testing Provider.) The Recognized Testing Provider:

- Initiates a contract with the Certification Applicant to conduct the official testing required for certification.
- Runs the official certification tests using the Testing Tool and responds to the Certification Applicant with test results within 5 business days.
- In the case of failed tests, coordinates with the Certification Applicant for retesting or contesting of results.
- When testing has been successfully completed, informs the Certification Applicant and reports the test results to Energistics.

3.1.4 WITSML Working Group

WITSML Working Group members (formerly SIG members in the Certification Testing Team (CTT)):

- Developed the Testing Tool, Tests Scripts, and test procedures based on the WITSML API document and schemas.
- Reviews and helps resolve cases where a Certification Applicant is contesting the results of the official test run by the Recognized Testing Provider.

3.1.5 Energistics Business Team

As required, the Energistics Business Team helps adjudicate issues when a Certification Applicant is contesting test results.

3.2 Overview of Testing Tool and Environment

Figure 2 shows key components of the WITSML certification testing environment, which are explained in the table below.
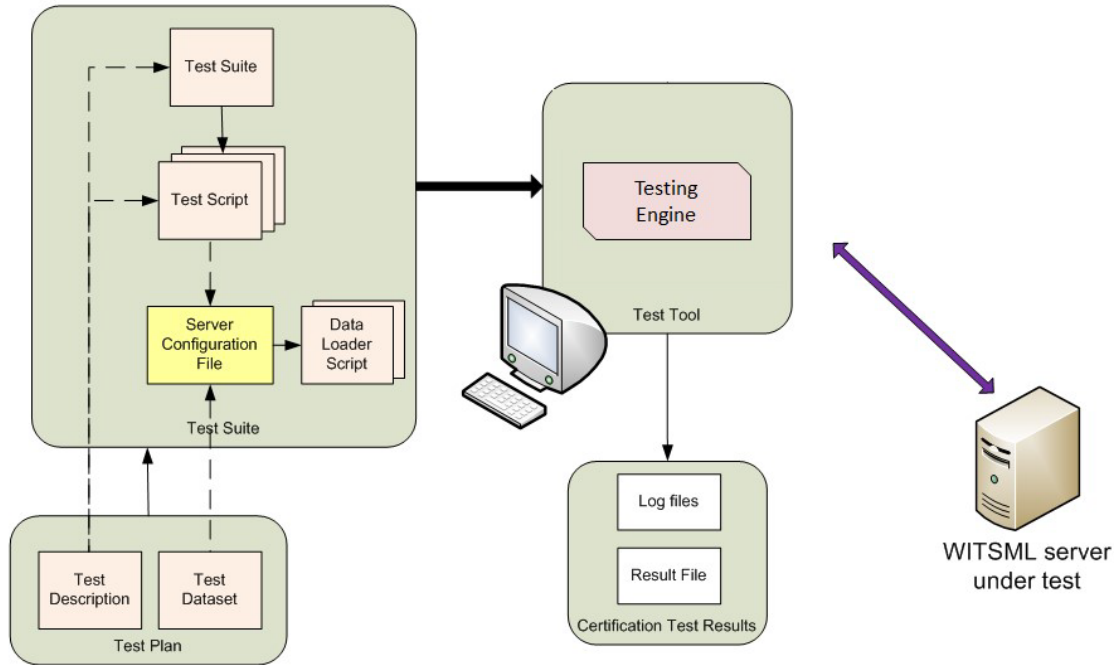

Figure 2. Overview of the WITSML Certification Testing Tool and environment.

3.2.1 Testing Tool Integrity and Reliability with Version Control System

IMPORTANT! To ensure testing integrity and reliability, most components described in the following table are kept in GitLab an open source version control system. However, you download the Testing Tool from the Energistics website/Standards Download page. These materials listed below are included (unless otherwise specified below). For information about how to download, install, and use these components, see the *WITSML Certification Testing Tool: Installation and User Guide*.

Certification Testing Component	Description/Link to More Information
Testing Tool	The software that Certification Applicants and Recognized Testing Providers use to conduct tests against a WITSML server for the WITSML Product Certification Program. All required tests can be conducted using the Testing Tool. Underlying components are explained below.
Test Plan	A matrix of all tests available by WITSML function (as defined in the API document). A server's capabilities object (which specifies the tasks or functions a server can perform) is used to determine which specific tests in the Test Plan are actually run.
	Currently an Excel spreadsheet.
	For easy review and access, a copy of the Test Plan is available from the link in Section 1.5.
	However, when conducting self-testing, always use the Test Plan downloaded with the Testing Tool. For more information, see Section 3.2.2.

Certification Testing Component	Description/Link to More Information
Testing Engine	The program that executes the individual Test Scripts (or the Test Suite) to be run against a specific server being tested. A version of the Testing Engine is part of the Testing Tool download.
Test Scripts	The scripts that are run to test a server. Each test (as defined in the Test Plan) has its own script and has minimum requirements for data contained within the server. For more information on Test Scripts and the Test Suite, see Section 3.2.4.
Test Suite	The Test Suite is a versioned collection of all Test Scripts. For y testing conducted by a Recognized Testing Provider, the entire Test Suite is run; however, only the Test Scripts relevant for the server being tested (based on the server's capabilities object) are actually executed. Versioned and maintained in version control software and included in the Testing Tool download. For more information on Test Scripts and the Test Suite, see Section 3.2.4.
Test Dataset	The Test Scripts require a minimal data set to be accessible from the server being tested. • For servers that support WMLS_AddToStore, the Testing Tool contains functionality to populate the server with the required data set. • For servers that do not support WMLS_AddToStore, the Certification Applicant must populate their server with data that meets the minimum requirements of all tests as specified in the Test Plan. In addition, on request for certification, the Certification Applicant must supply the Recognized Testing Provider with a server configuration file that details the data set contained in their server. For more information, contact the Recognized Testing Provider. Test Data is downloaded with the Testing Tool. For more information, see Section 3.2.3.
Certification Test Results	The output of the Testing Tool's execution of Test Scripts is captured in the Certification Test Results file. The Testing Tool has a default file name, which users may change when performing self-testing. For more information, see Section 3.3.4. After official testing by a Recognized Testing Provider, the Recognized Testing Provider sends the test results to the Certification Applicant and sends successful test results to the Certification Authority (Energistics).

3.2.2 Test Plan

The Test Plan comprises a tabulated list of the behavioral or data-based responses expected from a compliant WITSML 1.4.x server. Each test in the Test Plan comprises an English language description of these components:

- Test Purpose: Description of the behavior ("MUST" statement from the API document being tested).
- Tested Interface: For example applicable to the WMLS_GetFromStore(), WMLS_AddToStore(), WMLS_DeleteFromStore() and WMLS_UpdateToStore() interfaces.
- Prerequisites: Requirements (data or otherwise) for the server to undertake this test, for example, must contain a Trajectory data object with at least one entry.
- Procedure: Detail of how the test is executed and if applicable, which standard queries are used.

- Expectation: Expected behavior/data delivered to constitute a pass of that test.

Updates to the Test Plan are versioned in version control software so that it is clear what components are included under each release of the certification testing workflow.

For easy reference, an example of the Test Plan is available at the link in Section 1.5.

3.2.3 Test Data Set/Data Model

The Test Dataset and data model include details of specific data object-related data sets and the "data model" required to run non-object-specific "behavioral" tests.

For individual tests that ascertain the ability of the server to pass/deliver data of a particular type, the test requests a data object from a pre-defined test data set.

- For servers supporting AddToStore, the data can be loaded to the server by the Testing Tool.
- For Servers not supporting AddToStore, the Certification Applicant must pre-populate the server with this data set in accordance with Test Plan's expected data model. An example data model is available as a tab on the Test Plan at the link in Section 1.5. The current version of the data model is part of the Testing Tool download. For more information, see the *WITSML Certification Testing Tool: Installation and User Guide*.

3.2.4 Test Scripts/Test Suite

Each test in the Test Plan has a corresponding Test Script that allows the Testing Tool to execute the procedure (as detailed in the English language description in the Test Plan) associated with that particular test. The Test Suite is a versioned collection of all Test Scripts.

In many cases, the Test Script can include calling a particular standard query or queries (as defined in the *WITSML Store API*) to run against a particular data item or set of data items from the data model. The Test Scripts are written in the Python scripting language and correspond to the versions of the English-language tests in the Test Plan.

Each individual script was written by a member of the WITSML Working Group and has undergone a formal review process including verification against at least 2 reference servers. The Test Scripts and Test Suite are also versioned in version control software.

3.2.5 Testing Tool

The Testing Tool is the program that executes the individual Test Scripts to be run against a specific server. This approach—a "test engine" that runs individual test scripts—was chosen so that the integrity of the Testing Tool does not have to be re-confirmed (and recompiled) each time new testing functionality is added. This approach allows phased test development and allows new test scripts to be easily added as WITSML server functionality changes and grows.

For information on how to download and use the Testing Tool, see the *WITSML Certification Testing Tool: Installation and User Guide*.

3.3 Certification Process and Procedures

Figure 3 shows the high-level process flow for product certification. The sections below explain related procedures.
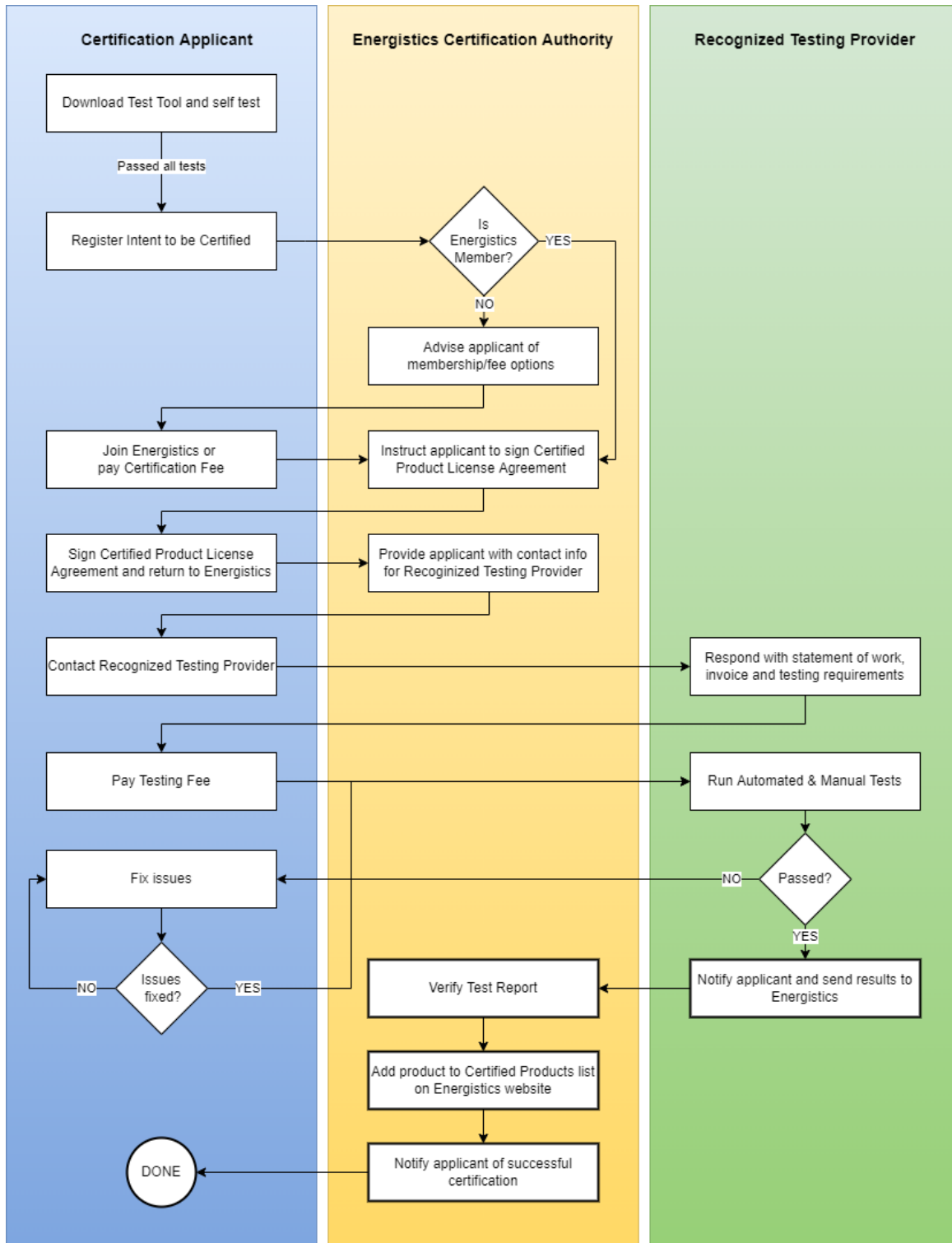

Figure 3. Overview of WITSML certification process.

3.3.1 Prepare for Certification: Download the Testing Tool for Self-Testing

Done by: Certification Applicant

Use the Testing Tool to first test your WITSML server in your own environment. When your server has passed all tests, you are ready to register your for intent to certify.

For complete instructions on how to download, install, and use the Testing Tool, see the *WITSML Certification Testing Tool: Installation and User Guide*.

3.3.2 Register Intent to Certify a Product and Sign Legal Agreement

After a Certification Applicant has successfully self-tested, they can initiate the certification process. Complete the steps below.

Done by: Certification Applicant and Energistics Certification Authority

1. On the Energistics website, complete the Register Intent to Certify form, which is available at https://www.energistics.org/standards-certification/ (scroll down to the table at the bottom of the page). .

   This is a form that will generate an email and send it to the Energistics Certification Authority at energistics-cert-auth@opengroup.org. Enter all data as indicated.

2. Click the Submit button on the form.

   The form is emailed to Energistics; receipt of the form is acknowledged automatically.

3. Sign the Certified Product License Agreement and send it to energistics-cert-auth@opengroup.org for counter-signature.

4. The Energistics Certification Authority will:

   a Respond to your Intent to Certify within 5 business days.

   b Counter-sign the Certified Product License Agreement and send a fully executed copy of the agreement to the Certification Applicant.

   c Verifies whether Certification Applicant is a member in good standing of Energistics. If not, Certification Applicant must either become an Energistics member or pay the applicable Certification Fee.

   d Upon execution of the Certified Product License Agreement and receipt of applicable fees, sends contact information for the Recognized Testing Provider(s) to the Certification Applicant.

   e Support current and potential Certification Applicants throughout the certification process.

3.3.3 Arrange for Certification Testing with a Recognized Testing Provider

Done by: Certification Applicant

The Recognized Testing Provider is an independent third party that conducts the testing for certification. The Recognized Testing Provider sets the terms, conditions, and fees for testing the Certification Applicant's product.

A Certification Applicant must work with a Recognized Testing Provider to fulfill all requirements so the Recognized Testing Provider can conduct the testing. The Recognized Testing Provider will provide all information, specify processes, etc. so that the Certification Applicant understands what is required and what they must do.

3.3.4 Run the Certification Testing, Process the Results, and Notify Certification Applicant and Energistics

Done by: Recognized Testing Provider

The Recognized Testing Provider:

1. Determines the tests that must be run based on the Certification Applicant's server capabilities object (which is a data structure that specifies the capabilities of the product to be certified).

2. Runs the Test Suite.

3. Communicates results of the Test Suite to the Certification Applicant.

    a. If a server fails one or more of its required tests (as determined by the server's capabilities object), the applicant is notified by email, which includes the output described in Section 3.3.4.1 and procedures for retesting or contesting the results, which are described in Section 3.3.6.

    b. When the applicant's server product successfully completes all required tests, the Recognized Testing Provider informs the applicant and officially notifies Energistics and sends the output log of the test results. For Energistics next steps and actions, see Section 3.3.5.

3.3.4.1   Output from Certification Test
The output of the test includes this information:

- The server capabilities information for the product that has been tested.
- List of tests run and status of each test (pass/fail). Output from tests includes the SOAP output (request/response).
- Current versions of these components:
    – Testing Tool
    – Testing Engine
    – Test Suite
    – Test Plan
- Testing Tool environment: Details of the environment from which the tests were run, including the operating system and any key application version details.

3.3.5   Award of Certification

Done by: Energistics Certification Authority

After the Recognized Testing Provider sends successful results to Energistics, the Energistics Certification Authority:

1. Verifies that the test results indicate that the product to be certified has demonstrated conformance with the applicable requirements.

2. Notifies the Certification Applicant that certification has been approved, and:

    a. The Certified Product has been added to the list of WITSML 1.4.1.1 Certified Products list (see Section 1.5). Each product listed on the certified product page also links to more detailed results that show a human readable list of the server's WITSML capabilities and a results log of the specific tests run.

    b. The Certification Applicant is now eligible to use the WITSML Certified Product Logo in association with the Certified Product

    c. The Certification Authority will send the Certification Applicant a Certificate indicating their product is certified.

3.3.6   Process for Retesting and Contesting Test Results

If a server fails, the Recognized Testing Provider notifies the Certification Applicant and provides specific information about which test(s) failed. An Applicant can address issues and submit a server for retesting (see Section 3.3.6.1). Or, if an Applicant disagrees with the results, the company can contest the results, working with the Certification Authority (see Section 3.3.6.2).

3.3.6.1   Submit for Retesting
Done by: Certification Applicant and Recognized Testing Provider

To submit for retesting:

- If your server fails any required test, you are required to re-run ALL tests (not just those that failed initially).

- You have up to 3 months to make corrections and request a retest from the Recognized Testing Provider. You may request up to 3 retests in a 3-month period. If your product does not pass the re-test in the allotted 3 attempts within 3 months, then a 3-month "lock-out" period is initiated, during which your server product cannot be resubmitted for testing.
  - Your 3 retests are covered by your initial testing fee. However, if you enter a "lock-out" phase, there is an additional fee for subsequent testing.

- When you are ready to retest, contact the Recognized Testing Provider.

- The Recognized Testing Provider will review, retest, and respond to a retest request within 5 working days.

3.3.6.2   Contesting the Test Results
Done by: Certification Applicant and Energistics Certification Authority

If as a Certification Applicant you have previously self-tested your server (see Section 2.2.2) and disagree with the results from the Recognized Testing Provider, you may contest the results of the test and petition for a pass status.

3.3.6.2.1   Types of Issues
Currently, 2 types of testing issues are defined:

- **Type 1: Issue with testing technology or environment**. You think there is a bug or error in the Testing Tool or a Test Script. In this case, the test should have passed when you did self-testing in your own environment. Be prepared to submit your self-test results.

- **Type 2: Issue with interpretation of the API specification.** You think the logic of a Test Script does not correctly test the behavior described in the API document.

3.3.6.2.2   Contesting Process
To contest the results, follow these steps:

1. Email your issue to the Energistics Certification Authority at energistics-cert-auth@opengroup.org. This email must include:

   - The name, email, and phone number of the person to contact regarding this issue. (Energistics or a member of the review team may need to follow up with you for more information.)
   - The server product name and version.
   - Identification of the results of the test that failed that you are contesting (your results from the Recognized Testing Provider).
   - An explanation of your issue with the test results (e.g., a problem with the tool or specific test or misinterpretation of the API document, etc.).
   - A copy of the specific test results from your self-test.

2. The Energistics Certification Authority forwards the Applicant's email and supporting data to the WITSML Technical Working Group to investigate the issue, attempt to determine why the results are different, and determine if it is a Type 1 or Type 2 issue (as described above).

3. **If the issue is determined to be Type 1** (issue with the Testing Tool or Test Suite), the Technical Working Group follows the code change process for Testing Tool and Scripts (Energistics-internal document).

4. **If the issue is determined to be Type 2** (issue interpreting the API document):

    – **If the Technical Team agrees with the applicant,** the test will be corrected per the Testing Tool and Scripts change process.

    – **If the Technical Team does NOT agree with the applicant**, then the applicant can follow the Energistics process to raise a change request (CR) against the Testing Tool and the Test Suite. (NOTE: Because WITSML v2.0 and v2.1 have been published, change requests for WITSML v1.4.1.1 are no longer allowed.)

5. **If no error or reason can be found for the failure/discrepancy in environments**, the Certification Applicant can raise the issue to the Energistics Business Team, and they will decide the outcome of the case (e.g., pass or retest, etc.). The decision of the Business Team is final.

6. Depending on results of the review, the Applicant's certification status will be updated or the retesting process begun. The Energistics Certification Authority will coordinate all communication, activities, and updates, as necessary.

    The WITSML Working Group is committed to providing feedback within 1 month of the issue being raised and a final decision from the Business Team within 2 months of the issue being raised.