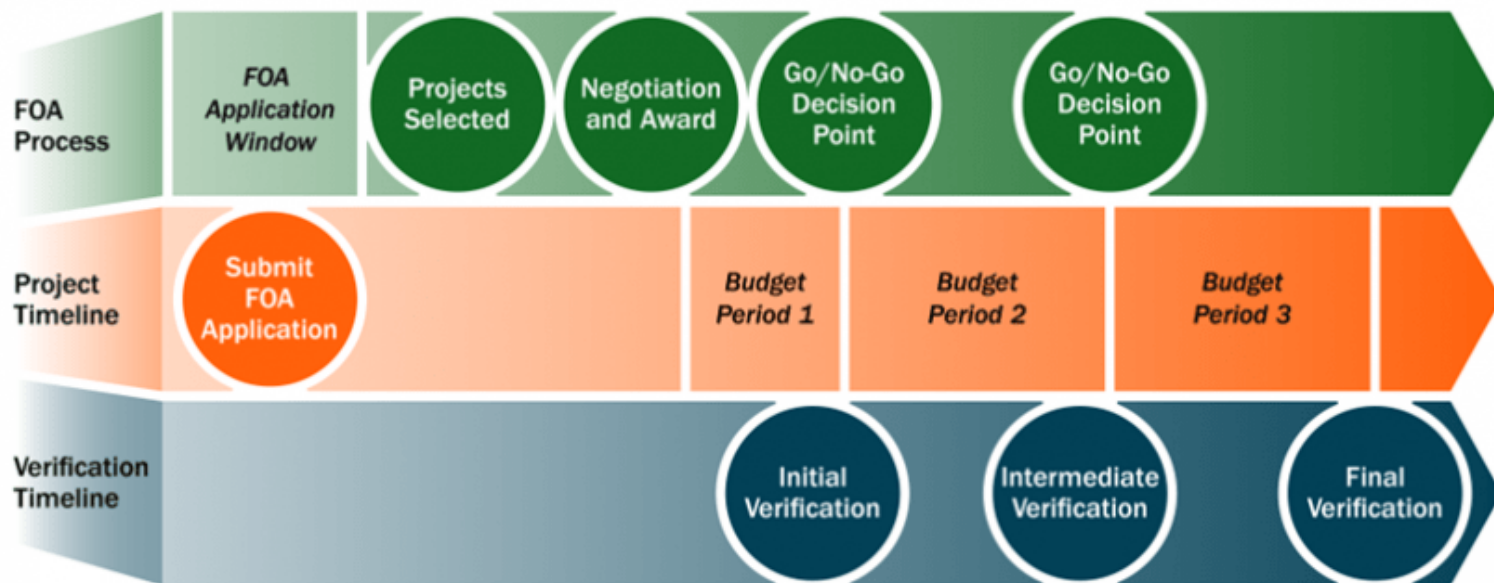




Photo from iStock-627281636

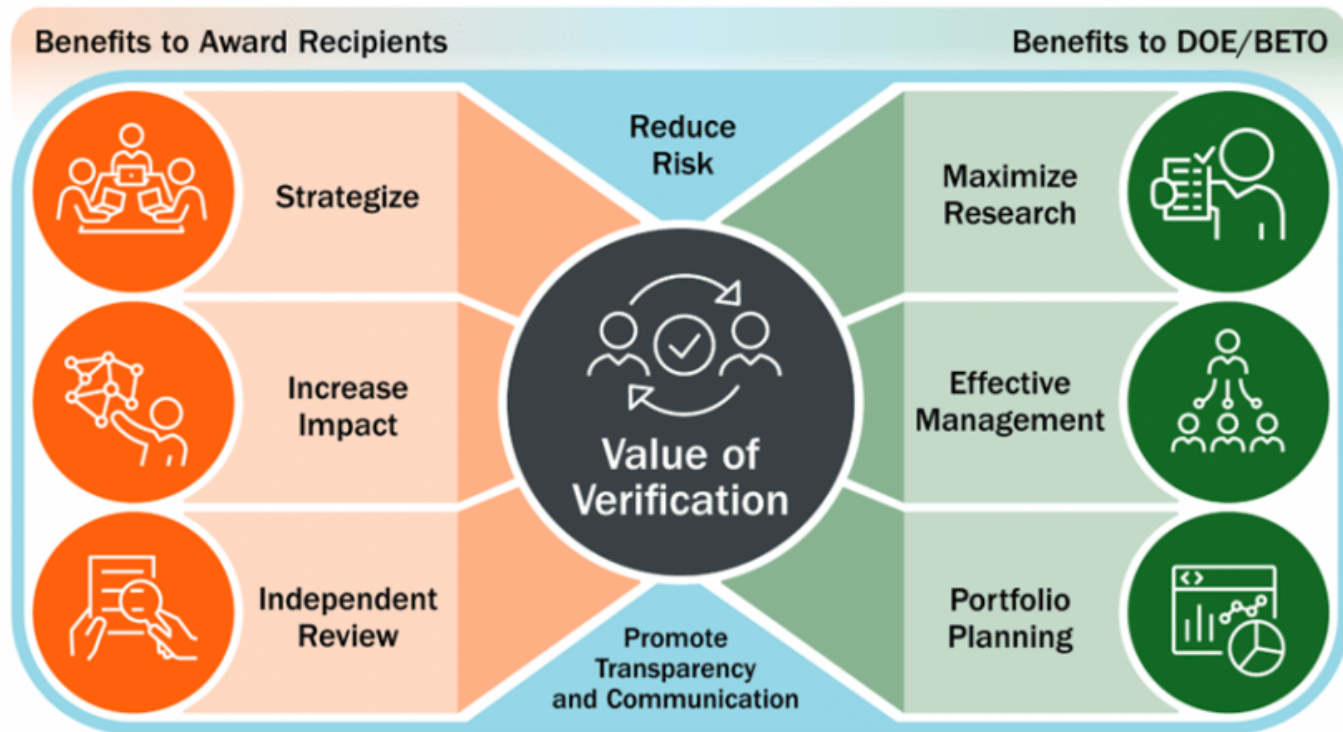
Technology Verification Process



Bioenergy Technology Verification Process:

<https://www.energy.gov/eere/bioenergy/bioenergy-technology-verification-process>

Verification Process: Purpose



Bioenergy Technology Verification Process:

<https://www.energy.gov/eere/bioenergy/bioenergy-technology-verification>

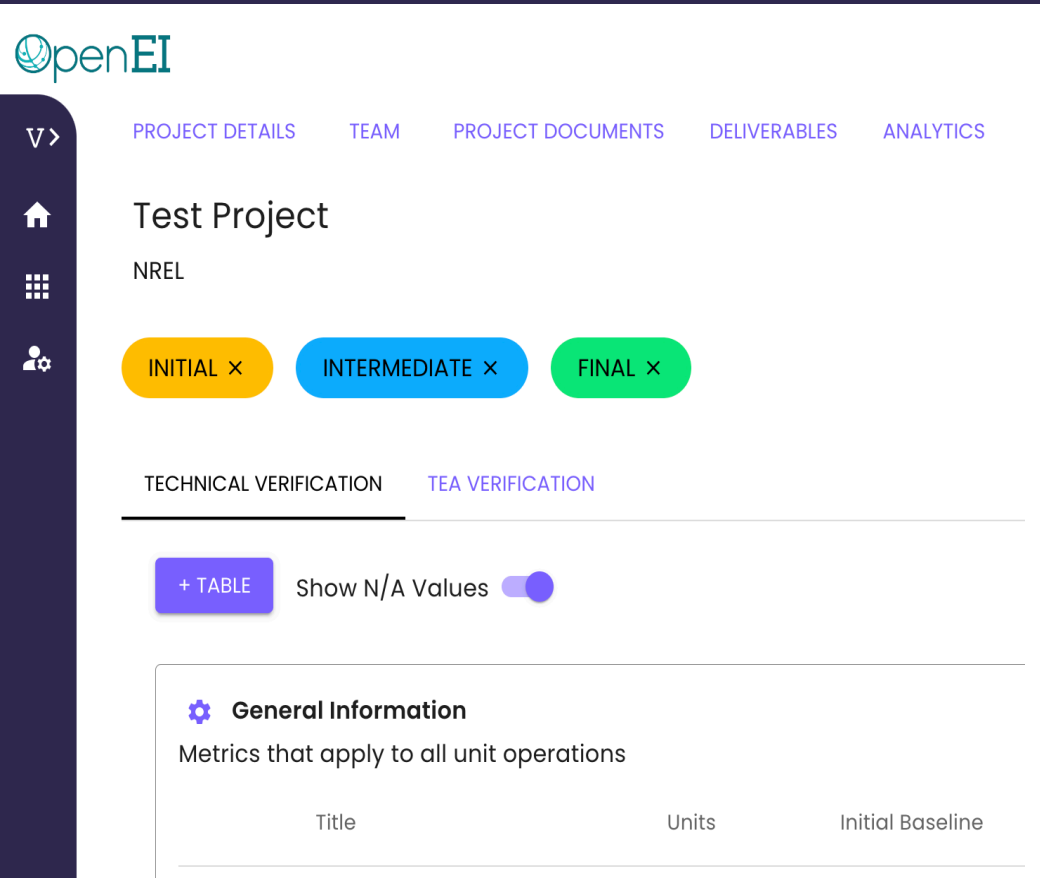
Verification Process: Technical Datasheets

- Intimidating for the project team
- Challenging to navigate and analyze
- Nearly impossible to discuss / visualize

The screenshot shows a Microsoft Excel spreadsheet titled "Template_Technical_and_Economic_Data_Tables". The spreadsheet is a template for technical and economic data, organized into sections like "Validation Table", "General Information", "Process Feedstock", "Technology Readiness Level (TRL)", "Mode of Operation (Batch/Continuous)", "Basis of data for this unit operation", "Insert Other Key Performance Parameters Relevant to the proposed scope of work", "Unit Operation Material Streams In", and "Unit Operation Material Streams Out". The spreadsheet includes various input fields, instructions, and formulas, with a status bar at the bottom showing "Ready" and "Accessibility: Investigate".

Validation Table		Instructions		Units		Benchmark (Current)		Intermediate Target		Final Target	
Parameter/Performance											
General Information											
Process Feedstock		e.g. Unpretreated corn stover, Hydrolysate, Pyrolysis Oils, Biogas									
Technology Readiness Level (TRL)		Use TRL definitions provided in the TRL tab to describe the state of the proposed unit operation									
Mode of Operation (Batch/Continuous)		experiment used to generate benchmark data. For the intermediate and final targets provide envisioned scale or rate.									
Scale for batch operations or feed rate for continuous operations (L, 200L, 10 g/hr, 5 kg/hr, etc.)											
Salable Fuel Product		e.g. butanol, diesel blend stock									
Salable Co-Product 1		e.g. succinic acid, paraffin wax									
Salable Co-Product 2											
Insert rows to add additional fuels or co-products											
Basis of data for this unit operation		Briefly describe the source of the benchmark data used to obtain the relevant Key Performance Parameters below (e.g. bench experiments, PDB runs, literature references)									
Insert Other Key Performance Parameters Relevant to the proposed scope of work (move entire section up)											
Net Product Yield		fed)		wt. %							
% Theoretical Yield		Yield relative to the theoretical maximum yield for the proposed conversion step		%							
Temperature				°C							
Pressure				psi							
Residence Time				min							
Insert additional key performance parameters tailored for the proposed scope of work		See the "KPP Examples" tab for a list of suggested parameters to include									
Unit Operation Material Streams In:											
Input stream 1		Mass flow rates entering the unit operation		kg/hr							
Input stream 2				kg/hr							
Insert rows to add additional mass input streams											
Stream 1											
Mass composition component A		Provide the compositional make up of the input streams		wt. %							
Mass composition component B											

The Data Solution



The screenshot displays the OpenEI web application interface. On the left is a dark sidebar with navigation icons: a magnifying glass, a home icon, a grid icon, and a user icon. The main content area has a white background. At the top left is the 'OpenEI' logo. Below it is a navigation bar with tabs: 'PROJECT DETAILS' (active), 'TEAM', 'PROJECT DOCUMENTS', 'DELIVERABLES', and 'ANALYTICS'. The main heading is 'Test Project' with the identifier 'NREL' below it. There are three colored buttons: 'INITIAL' (yellow), 'INTERMEDIATE' (blue), and 'FINAL' (green), each with a close icon. Below these are two tabs: 'TECHNICAL VERIFICATION' and 'TEA VERIFICATION' (active). A '+ TABLE' button and a 'Show N/A Values' toggle switch are present. At the bottom, a 'General Information' section is titled 'Metrics that apply to all unit operations' and contains a table with headers 'Title', 'Units', and 'Initial Baseline'.

OpenEI

PROJECT DETAILS TEAM PROJECT DOCUMENTS DELIVERABLES ANALYTICS

Test Project

NREL

INITIAL × INTERMEDIATE × FINAL ×

TECHNICAL VERIFICATION TEA VERIFICATION

+ TABLE Show N/A Values

General Information

Metrics that apply to all unit operations

Title	Units	Initial Baseline
-------	-------	------------------

The Verify Database

Collects high level data that is important for project teams and DOE to communicate and demonstrate success.

Verify Database Design

1. Accessible and Flexible Data Collection

Data is easily collected and shared from the project team to the Verification team and DOE.



2. Secure and Centralized Data

Data shared between project teams (national labs, private entities etc) and DOE is secure and in a centralized location hosted on the cloud.



3. Enable Project and Portfolio Analysis

Data from projects is comparable and easily exported for data analysis.




1. Accessible and Flexible Data Collection


Data is easily collected and shared from the project team to the Verification team and DOE.

- Accommodate unique project and metric models
- Intuitive UI/UX





Data Model - Tables





[V>](#)[PROJECT DETAILS](#)[TEAM](#)[PROJECT DOCUMENTS](#)[DELIVERABLES](#)[ANALYTICS](#)[NOTES](#)



Test Project

NREL

INITIAL ×

INTERMEDIATE ×



FINAL ×

TECHNICAL VERIFICATION




TEA VERIFICATION

+ TABLE

Show N/A Values ☐

 **General Information** 

Metrics that apply to all unit operations

Title	Units	Commercial Benchmark	Initial Baseline	Initial Verified Value	Intermediate Target	Intermediate Verified Value
   Scale	-	-	-	-	-	-

NREL | 8

Data Model - Tables

OpenEI

PROJECT DETAILS TEAM PROJECT DOCUMENTS DELIVERABLES ANALYTICS

NOTES

Test Project

NREL

INITIAL × INTERME

TECHNICAL VERIFICATION

+ TABLE Show N/A

General Information

Metrics that apply to

Title Benchmark Value Intermediate Target Intermediate Verified Value

Scale - - - - -

Create table

DETAILS COLUMNS

Title *

Description

DELETE CANCEL CREATE

Data Model - Tables

OpenEI

PROJECT DETAILS TEAM PROJECT DOCUMENTS DELIVERABLES ANALYTICS

NOTES

Test Project

NREL

INITIAL × INTERME

TECHNICAL VERIFICATION

+ TABLE Show N/A

General Inform Metrics that apply to

Title Benchmark Value Intermediate Target Intermediate Verified Value

Scale - - - - -

Create table

DETAILS COLUMNS

Title *
Unit Operation 2

Description

DELETE CANCEL CREATE

Data Model - Tables

OpenEI

PROJECT DETAILS TEAM

Test Project

NREL

INITIAL x INTERMEDIATE x FINAL x

TECHNICAL VERIFICATION

+ TABLE Show N/A

General Information

Metrics that apply to

Title

Scale

Create table

DETAILS COLUMNS

Phase Applicable Columns

Verified Value x

INITIAL + INTERMEDIATE x FINAL x

+ ADD COLUMN

Commercial Benchmark Columns

Commercial Benchmark x

+ ADD COLUMN

DELETE CANCEL CREATE

Data Model - Tables

OpenEI

PROJECT DETAILS TEAM

Test Project

NREL

INITIAL X INTERMEDIATE X FINAL X

TECHNICAL VERIFICATION

+ TABLE Show N/A

General Information

Metrics that apply to

Title

Scale

Intermediate Target

Intermediate Verified Value

NOTES

Create table

DETAILS COLUMNS

Phase Applicable Columns

Verified Value X

INITIAL + INTERMEDIATE X FINAL X

+ ADD COLUMN

Commercial Benchmark Columns

Commercial Benchmark X

Column Name

Xcel Commercial Benchmark

DELETE CANCEL CREATE



Data Model - Tables

	Units	Benchmark	Initial Baseline	Verified Value	Target	Verified Value
TRL	-	2	3	4	-	-

Unit Operation 2

Title	Units	Commercial Benchmark	Xcel Commercial Benchmark	Initial Baseline	Initial Verified Value	Intermediate Target	Ir

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Developer Services

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Data Model - Metrics

Title

TRL

Unit Operation 2

Title

Commercial

Initial

Intermediate Target

Intermediate Verified Value

Initial

Intermediate Target

Intermediate Verified Value

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Verify is an application for Pro

Renewable Energy Laboratory.

Create Metric

DETAILS

VALUES

Title *

TRL

Description

Technology Readiness Level

Units

Go / No-go Metric

Tags:

Enter Tag...

DELETE

CANCEL

CREATE



Data Model - Metrics

Title

Units

Commercial Benchmark

Initial Baseline

Initial Verified Value

Intermediate Target

Intermediate Verified Value

TRL

-

-

Unit Operation

Title

Initial Verified Value

Intermediate Target

Intermediate Verified Value

Partners & Sponsors

Contact

Create Metric

DETAILS

VALUES

COMMERCIAL BENCHMARKS

INITIAL

INTERMEDIATE

FINAL

Commercial Benchmark

2

Xcel Commercial Benchmark

3

DELETE

CANCEL

CREATE

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Data Model - Metrics

Create Metric

DETAILS VALUES

COMMERCIAL BENCHMARKS INITIAL INTERMEDIATE FINAL

Initial Baseline Value

Initial Verified Value

DELETE CANCEL CREATE

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2. Secure and Centralized Data

VERIFY <

Home

Projects

Manage

< PROJECT DASHBOARD

Test Project

PROJECT DETAILS

TEAM

PROJECT DOCUMENTS

DELIVERABLES

ANALYTICS

Team

Principle Investigator

⚙️

Hanna Fields
hanna.fields@nrel.gov

ADD USER

Project Team Member

ADD USER

Data shared between project teams (national labs, private entities etc) and DOE is secure and in a centralized location hosted on the cloud.



3. Data Analytics

Data from projects is comparable and easily exported for data analysis.



PROJECT DETAILS

TEAM

PROJECT DOCUMENTS

DELIVERABLES

ANALYTICS

Analytics

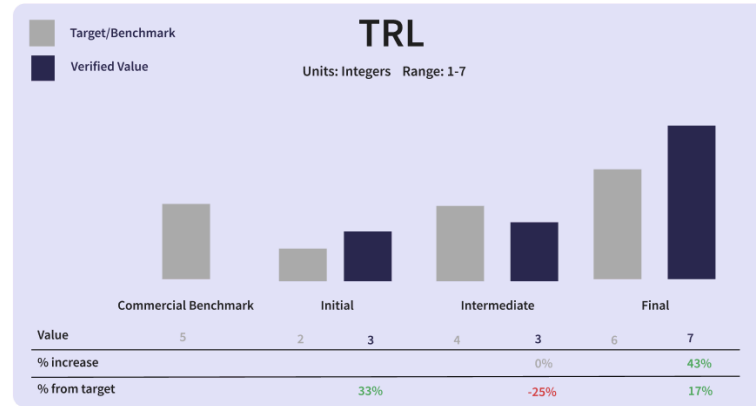
[DOWNLOAD GRAPHS](#)

[DOWNLOAD ALL METRICS](#)

Metric*

TRL

Select a metric to compare across project phases



Project wide stats

Percentage of completed data for current phase

60%

Percentage of metrics that have met or surpassed their target

80%



VERIFY

Thank you!

Visit The Verify Database at: <https://verify.openei.org/>

Acknowledgment

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U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

BIOENERGY TECHNOLOGIES OFFICE