

March 27, 2025

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Data Storage, Sharing, Demonstration & Discussion

Nuclear Science User Facilities

Nuclear Science User Facilities – Expanding Value to Fundamental Research Data

- NSUF program has awarded over 800 user projects awarded since 2007
- Large investment to advance the fundamental and applied understanding of nuclear energy technologies
- Yet most of the data is **not** widely available, stored on local systems, and has limited reproducibility.
- NSUF sees an opportunity to expand access to fundamental research data to support re-use and long-term storage through the **Nuclear Research Data System (NRDS)**

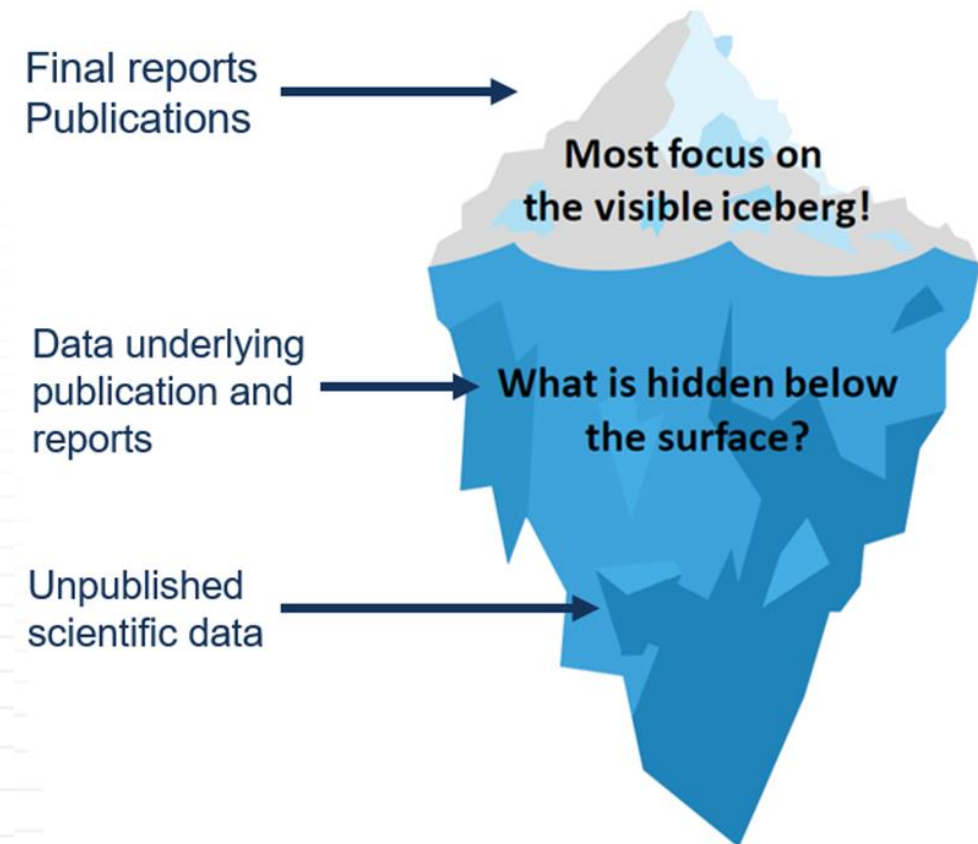


Image adapted from C. Rowan et al., NETL (2022)

Nuclear Research Data System (NRDS)



Two sites for appropriate data transfer and sharing

1. Private NRDS portal
2. Public Facing System



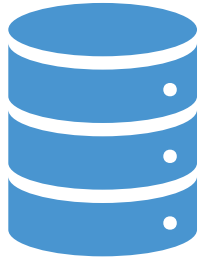
Long-term data storage and preservation



Integrated resources

- HPC capabilities at Idaho National Laboratory

Data Storage and Sharing within NRDS



Data generated at NSUF partner facilities will be uploaded to the *private* NRDS portal

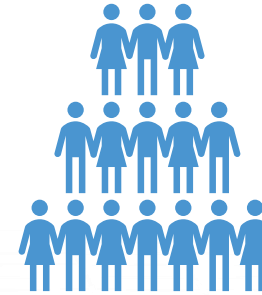
- Helps to facilitate common data formats between facilities
- Allows a consistent approach for users work and engagement with NSUF



Data will eventually be transitioned to the *public-facing* domain of NRDS

- Not applicable to any competed, active, or under evaluation NSUF user access projects.
- ✓ Proposed consideration for future user access opportunities - to be implemented in close coordination and with additional upfront communication with user community

Proposed Data Access Implementation



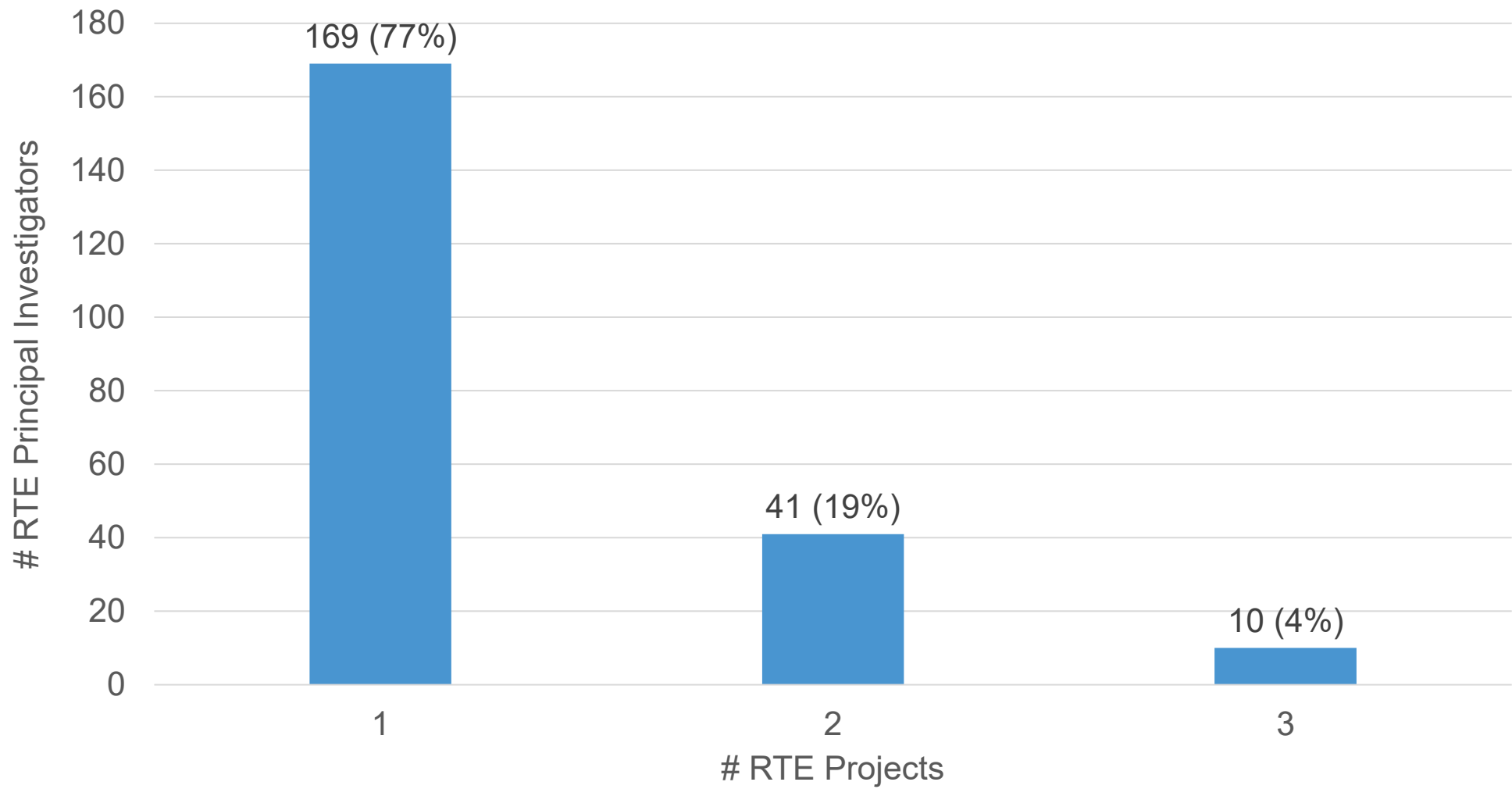
Exclusive access to data when:

- Project is active
- Data is actively being used by the project team with the intent to publish

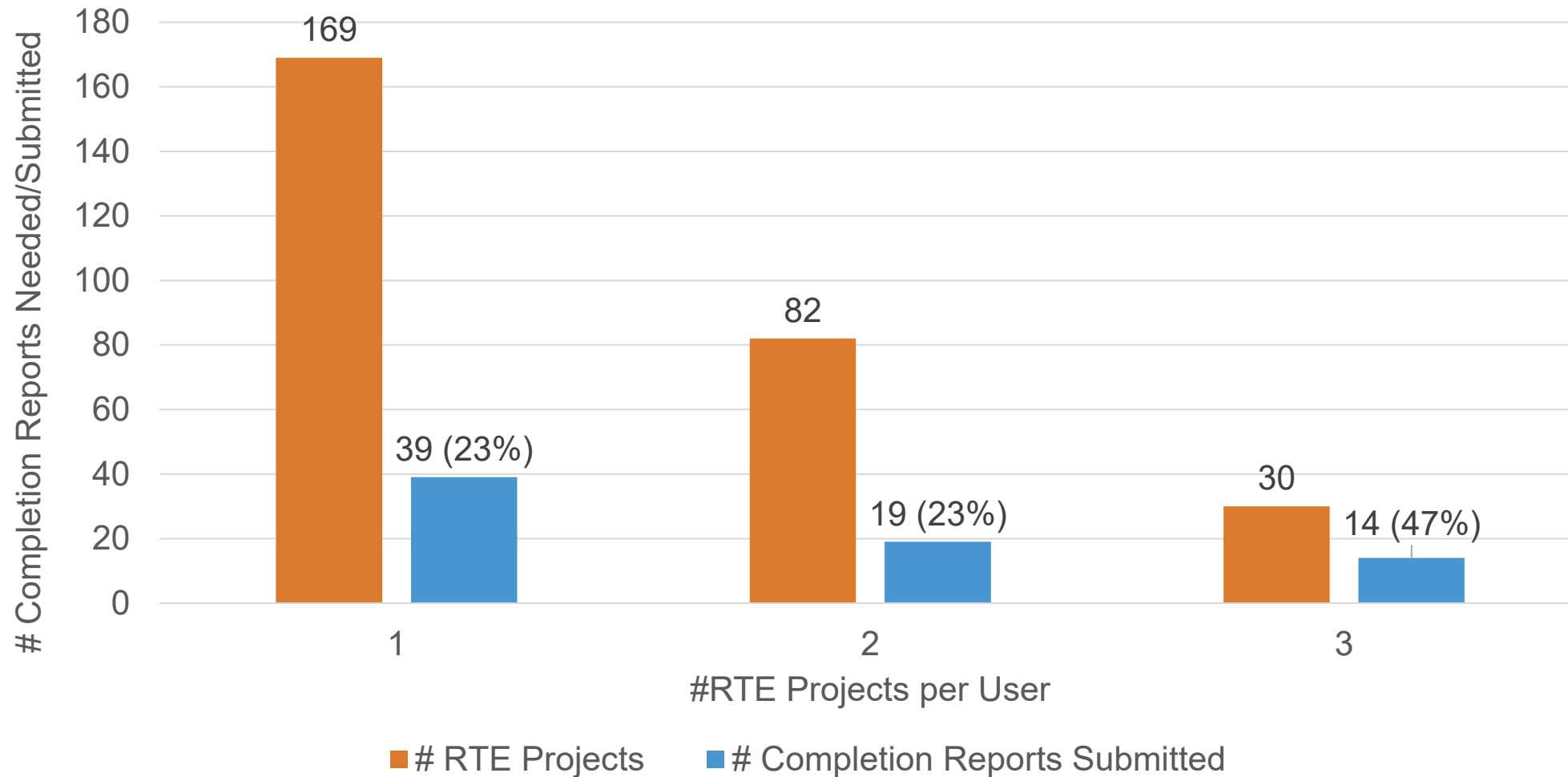
Public access to data when:

- Project is no longer active
- Data is not in use by the project team
- An appropriate exclusivity period has lapsed

NSUF Users with 1, 2 or 3 Awarded RTE Projects



Completion Reports Submitted (FY20 - present)



Period of Exclusivity *Discussion*



- Exclusivity for 6 months after RTE physical work is complete, then:
 - If a completion report is submitted and accepted, data will be released in 2 years
 - If a completion report is submitted and accepted **and** papers are being drafted or publications pending, data release will be delayed after consultation with PI and after publication is released
- If no completion report is submitted within 6 months, data will be released



NRDS Portal

data

NRDS

- Site for registered NSUF PIs or co-PIs users
- Requires NSUF account to sign in
- Workspace for data uploads to allow for project user collaboration
- Place for datasets metadata

NSUF at INL



NSUF Partner



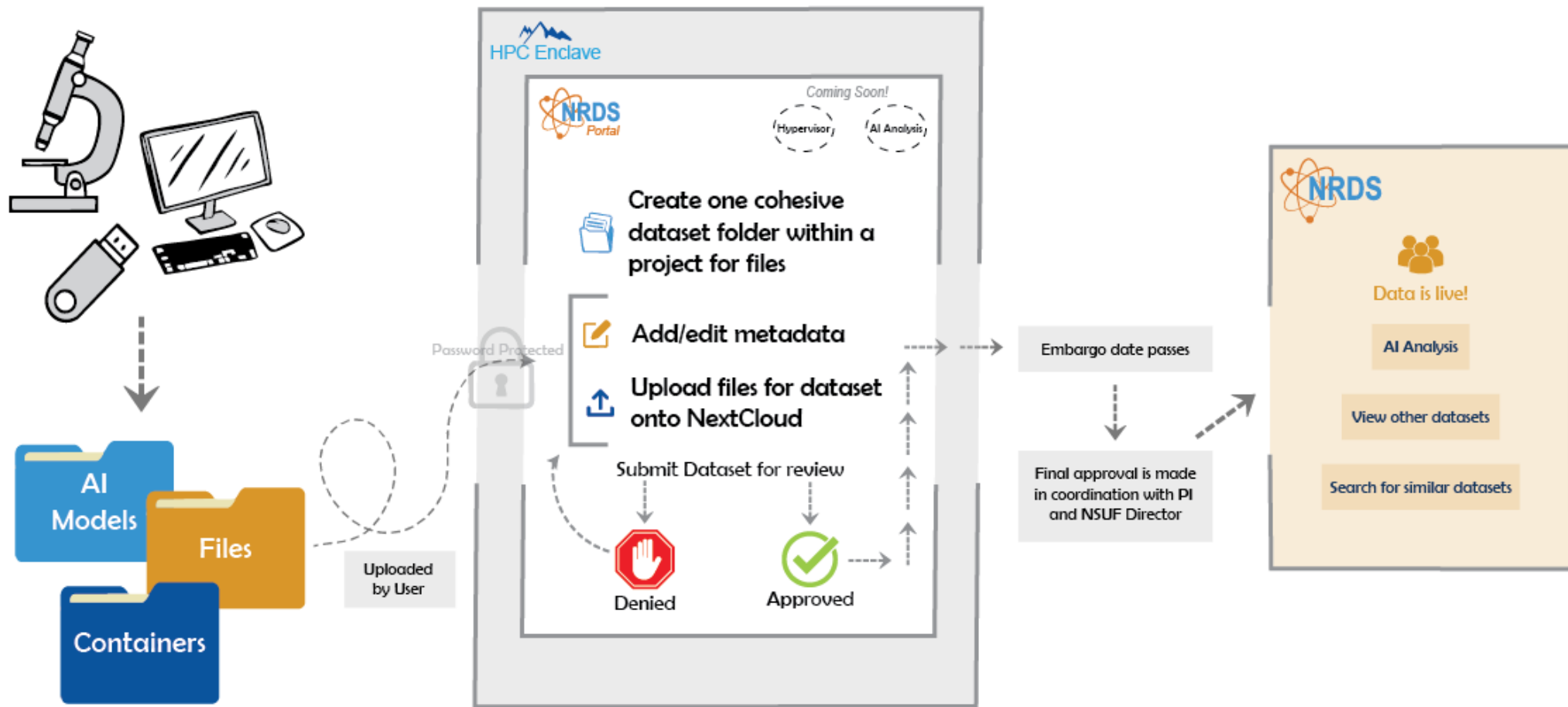
<https://nrds-portal.inl.gov/>

- Public science data gateway
- No password required
- Use of FpAIRe for data allowing for data to be:
 - Downloaded
 - Previewed
 - Enhanced through AI

Public

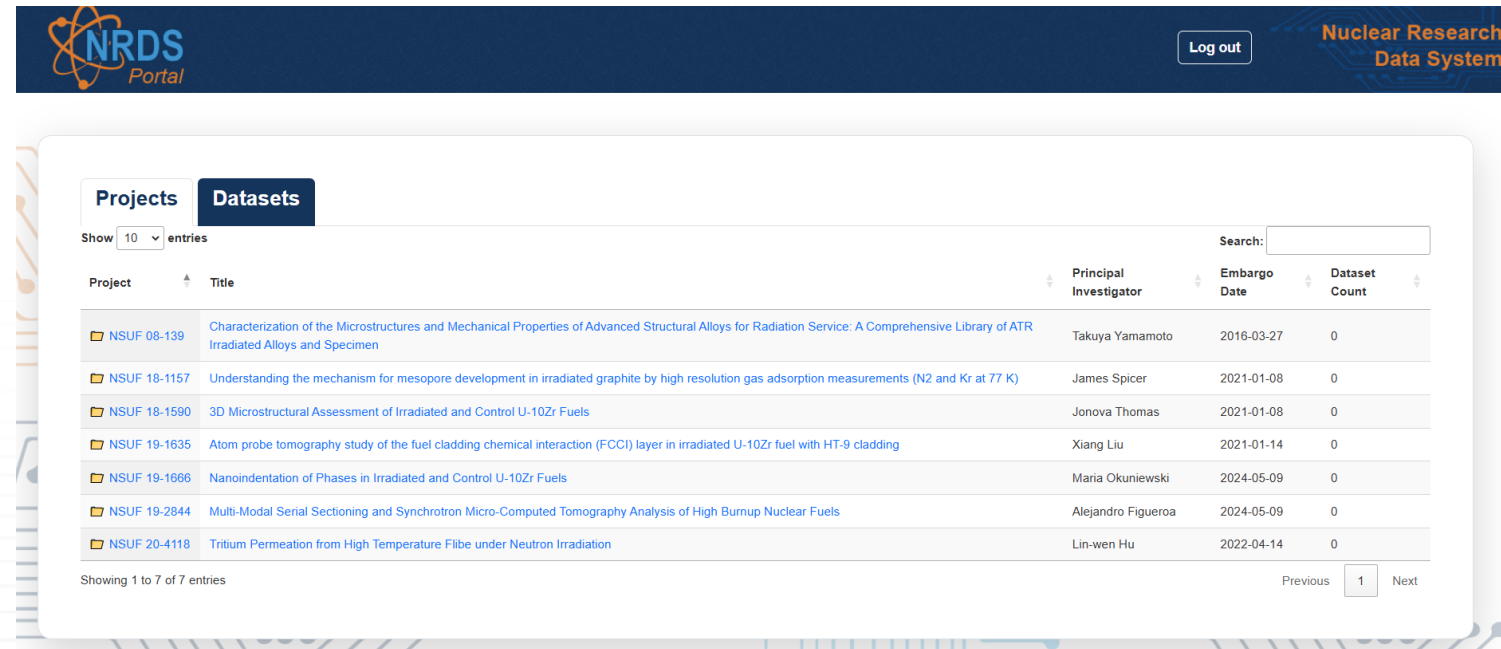


<https://nrds.inl.gov/>



NRDS Portal

- Collaborative space
- Metadata collection
- Embargos will be enforced
 - Length to be decided
- DOIs will be automatically created for each dataset
- Allows drag and drop for files
- The project PI and NSUF review team will both have to either approve or reject dataset before it is published to NRDS



The screenshot displays the NRDS Portal interface. At the top, there is a dark blue header with the NRDS Portal logo on the left, a 'Log out' button in the center, and the text 'Nuclear Research Data System' on the right. Below the header, the main content area has two tabs: 'Projects' (selected) and 'Datasets'. A 'Show 10 entries' dropdown is visible. A search bar is located on the right side of the table. The table itself has columns for 'Project', 'Title', 'Principal Investigator', 'Embargo Date', and 'Dataset Count'. It lists seven projects, each with a folder icon and a project ID. The first project is 'NSUF 08-139' with the title 'Characterization of the Microstructures and Mechanical Properties of Advanced Structural Alloys for Radiation Service: A Comprehensive Library of ATR Irradiated Alloys and Specimen' by Takuya Yamamoto, with an embargo date of 2016-03-27 and a dataset count of 0. The last project is 'NSUF 20-4118' with the title 'Tritium Permeation from High Temperature Flibe under Neutron Irradiation' by Lin-wen Hu, with an embargo date of 2022-04-14 and a dataset count of 0. At the bottom of the table, it says 'Showing 1 to 7 of 7 entries' and has 'Previous', '1', and 'Next' navigation links.

Project	Title	Principal Investigator	Embargo Date	Dataset Count
NSUF 08-139	Characterization of the Microstructures and Mechanical Properties of Advanced Structural Alloys for Radiation Service: A Comprehensive Library of ATR Irradiated Alloys and Specimen	Takuya Yamamoto	2016-03-27	0
NSUF 18-1157	Understanding the mechanism for mesopore development in irradiated graphite by high resolution gas adsorption measurements (N2 and Kr at 77 K)	James Spicer	2021-01-08	0
NSUF 18-1590	3D Microstructural Assessment of Irradiated and Control U-10Zr Fuels	Jonova Thomas	2021-01-08	0
NSUF 19-1635	Atom probe tomography study of the fuel cladding chemical interaction (FCCI) layer in irradiated U-10Zr fuel with HT-9 cladding	Xiang Liu	2021-01-14	0
NSUF 19-1666	Nanoindentation of Phases in Irradiated and Control U-10Zr Fuels	Maria Okuniewski	2024-05-09	0
NSUF 19-2844	Multi-Modal Serial Sectioning and Synchrotron Micro-Computed Tomography Analysis of High Burnup Nuclear Fuels	Alejandro Figueroa	2024-05-09	0
NSUF 20-4118	Tritium Permeation from High Temperature Flibe under Neutron Irradiation	Lin-wen Hu	2022-04-14	0

All users' view

Projects

Datasets

Filter by Status

1 Adding

1 Under Review

0 Needs Revision

0 Completed

0 Live

2 All

Create Dataset

Review Datasets

Show 10 entries

Search:

	Title	Project	Embargo Date	Status	Creator	
	Report Files	NSUF 08-139: Characterization of the Microstructures and Mechanical Properties of Advanced Structural Alloys for Radiation Service: A Comprehensive Library of ATR Irradiated Alloys and Specimen	2016-03-27	Under Review	Jeremy Sharapov	Add Files
	Mesopore Images for 2021-01-14	NSUF 18-1157: Understanding the mechanism for mesopore development in irradiated graphite by high resolution gas adsorption measurements (N2 and Kr at 77 K)	2021-01-08	Under Review	Jeremy Sharapov	Add Files
	Research files	NSUF 19-1635: Atom probe tomography study of the fuel cladding chemical interaction (FCCI) layer in irradiated U-10Zr fuel with HT-9 cladding	2021-01-14	Under Review	Bradlee Rothwell	Add Files
	Irradiation Files	NSUF 20-4118: Tritium Permeation from High Temperature Flibe under Neutron Irradiation	2022-04-14	Completed	Jeremy Sharapov	View Files
	June Dataset 2	NSUF 20-4118: Tritium Permeation from High Temperature Flibe under Neutron Irradiation	2022-04-14	Needs Revision	Jeremy Sharapov	Add Files
 	Analysis Report	NSUF 19-2844: Multi-Modal Serial Sectioning and Synchrotron Micro-Computed Tomography Analysis of High Burnup Nuclear Fuels	2024-05-09	Adding	Bradlee Rothwell	Add Files

https://nrds-portal-dev.hpc.inl.gov/home

PI's view

[Home](#) / [Review](#)

Datasets Waiting for Approval

All Datasets

Datasets Waiting for Approval

Click on the title of a dataset to review it

Show 10 entries

Search:

Title	Project	Uploaded By	Upload Date		
TEM Characterization of Neutron Irradiated HfAl3-Al Composite Specimens	NSUF 19-2844 - Multi-Modal Serial Sectioning and Synchrotron Micro-Computed Tomography Analysis of High Burnup Nuclear Fuels	Bradlee Rothwell	2025-02-25	Review Dataset Information	See Files

Showing 1 to 1 of 1 entries

Previous

1

Next

[Home](#) / [Reviewers Page](#) / [Display Dataset](#)

TEM Characterization of Neutron Irradiated HfAl3-Al Composite Specimens

Status: **Under Review**

Project Association:
NSUF 19-2844 - Multi-Modal Serial Sectioning and Synchrotron Micro-Computed Tomography Analysis of High Burnup Nuclear Fuels
PI: Alejandro Figueroa

Uploaded On:
2025-02-25

Uploaded By:
Bradlee Rothwell

Description:
Particles comprised of a thermal neutron absorbing material (HfAl3) are dispersed in a metal matrix material with high thermal conductivity (aluminum) to conduct the heat...

Dataset Fields

Field name	Explanation	Required?
Title	A descriptive title that the dataset will be released as on the main NRDS website.	Yes
Description	Some useful information about the data, similar to a project abstract.	Yes
Instruments	The device(s) used to collect/generate the data, including any model numbers.	No
Tags	Keywords that describe the dataset and will be able to be used as filters.	No
License	The copyright license this dataset will be released under.	Yes
Project Association	The project that this data was collected as part of and funded by.	Yes
Embargo Expiration	The date the data associated with this dataset will be released for the public.	No
Author(s)	The author(s) of the dataset to be listed on the main NRDS website.	No
Statement of Credit	The statement that others will use to give you credit for/cite your work.	Yes
Dataset DOI	If no DOI is entered, NRDS will automatically generate one and email it to you.	No



[Log out](#)

Nuclear Research Data System

[Home](#) / [Create dataset](#)

Create Dataset

Add Details

* Title:

Please use only alphanumeric characters with spaces/dashes/underscores for the title. It also cannot end with a space.
eg. A descriptive title

* Description:

eg. Some useful notes about the data

Instrument:

Instrument used to collect data

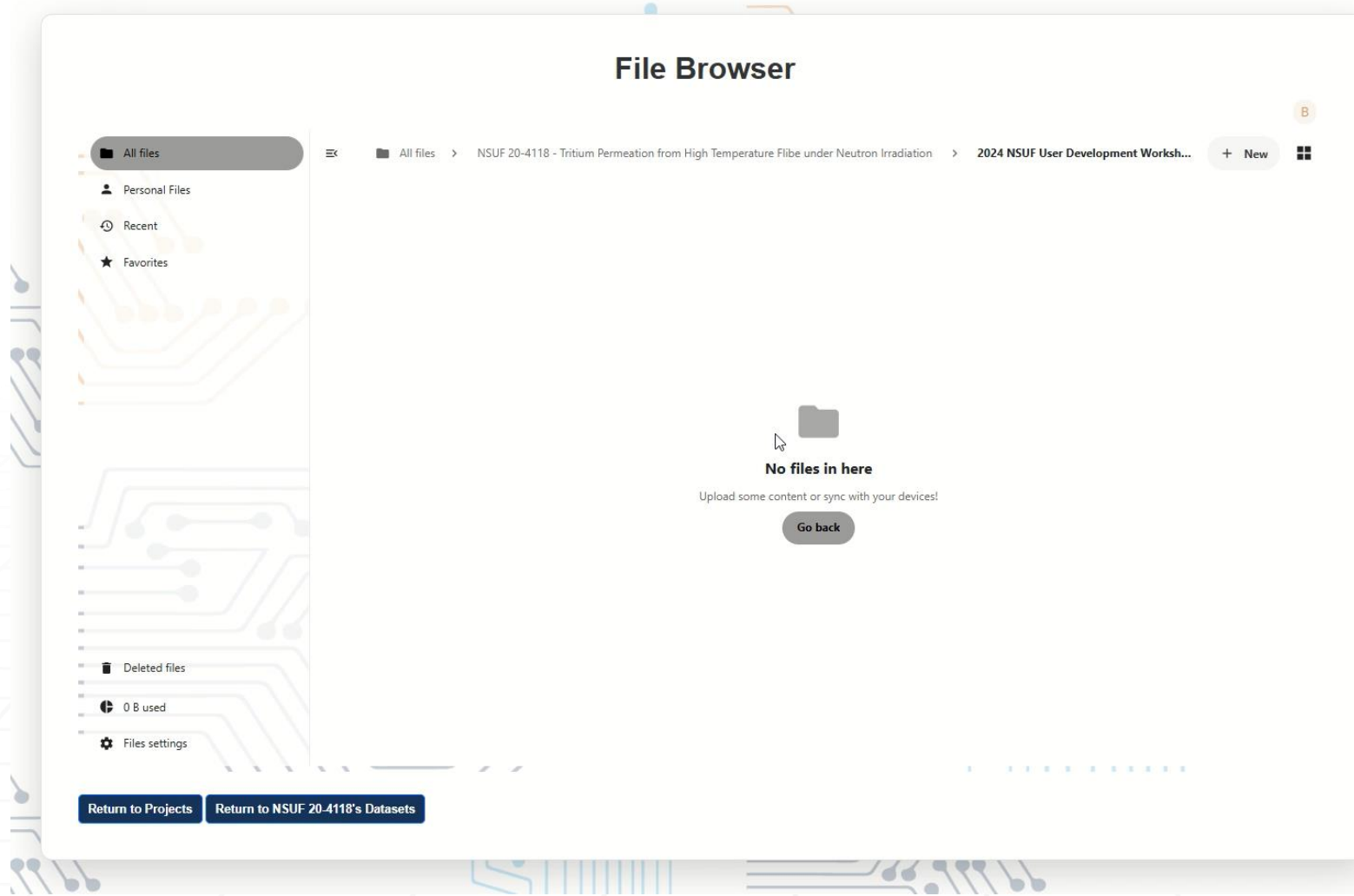
Tags:

Please separate tags with commas
eg. economy, mental health, government

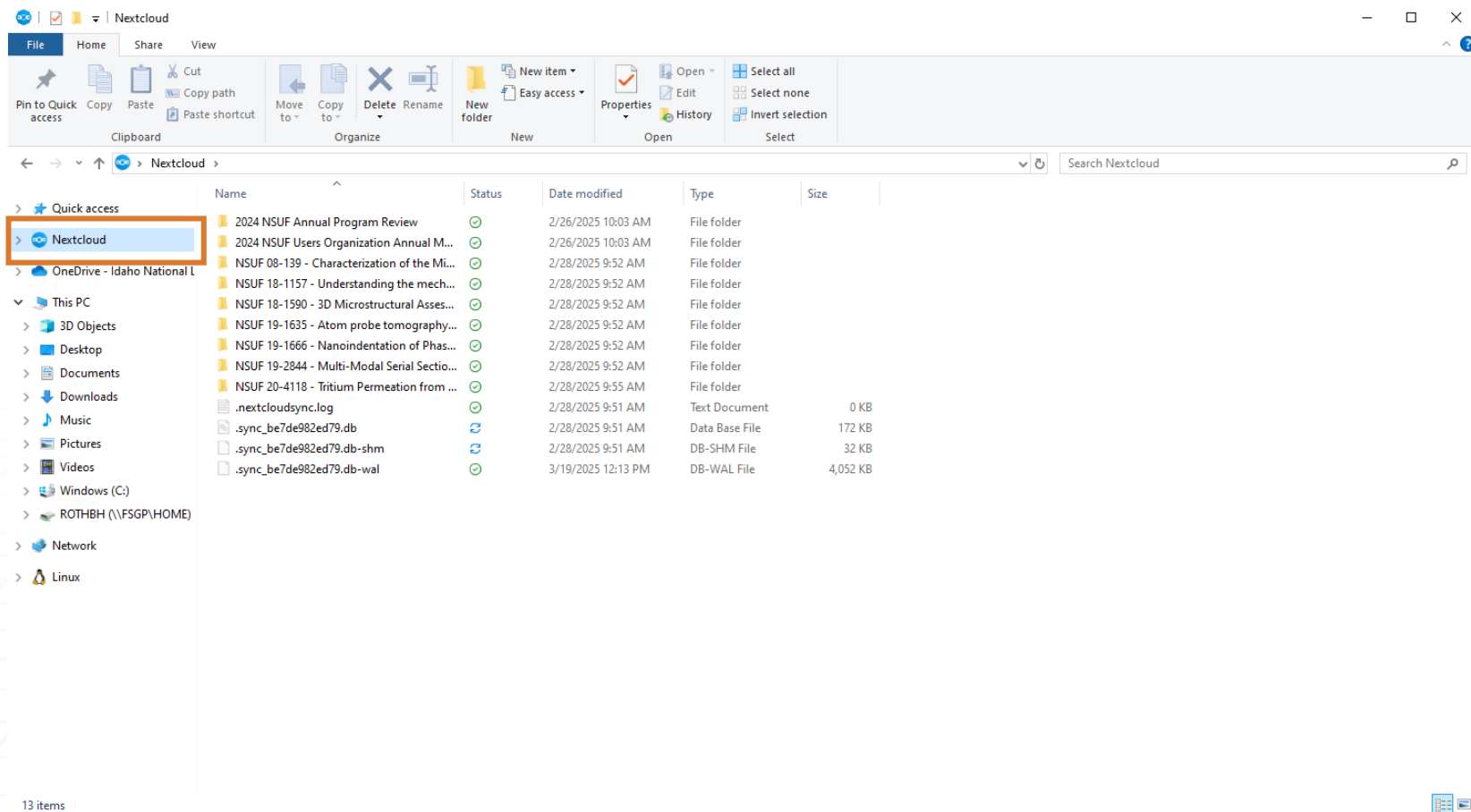
License:

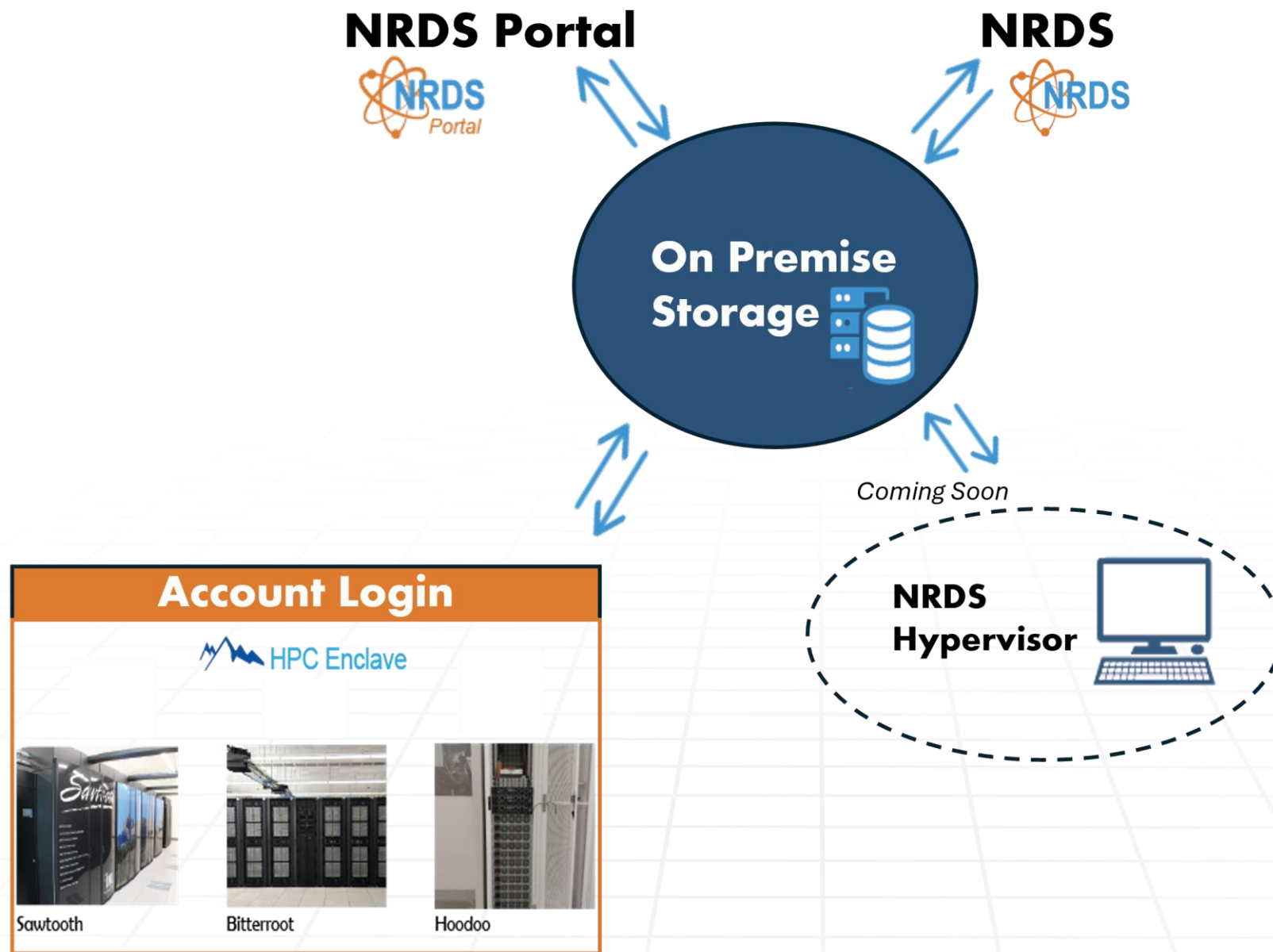
UK Open Government Licence (OGL)

Uploading Files – Website App



Uploading Files – NextCloud App

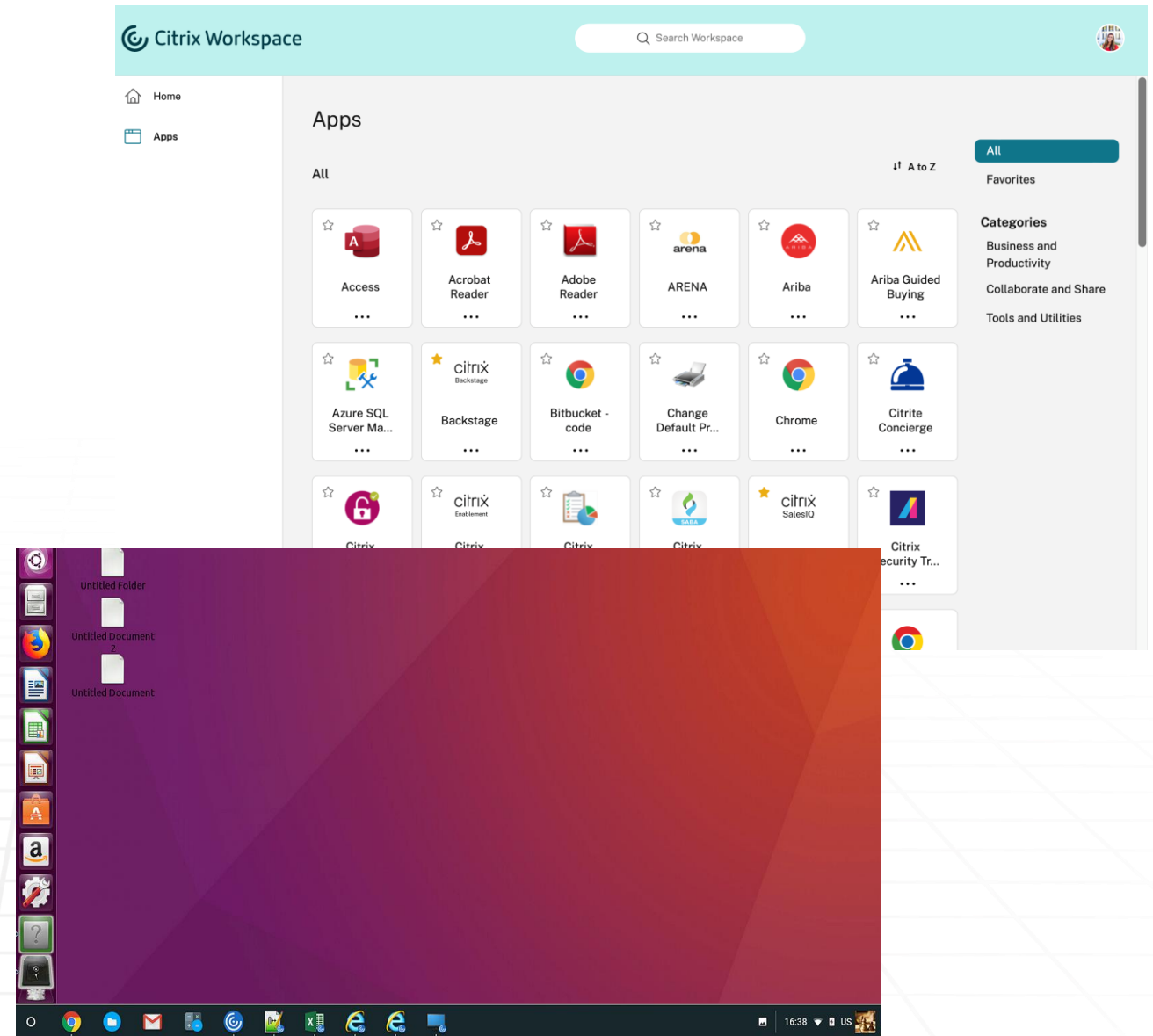




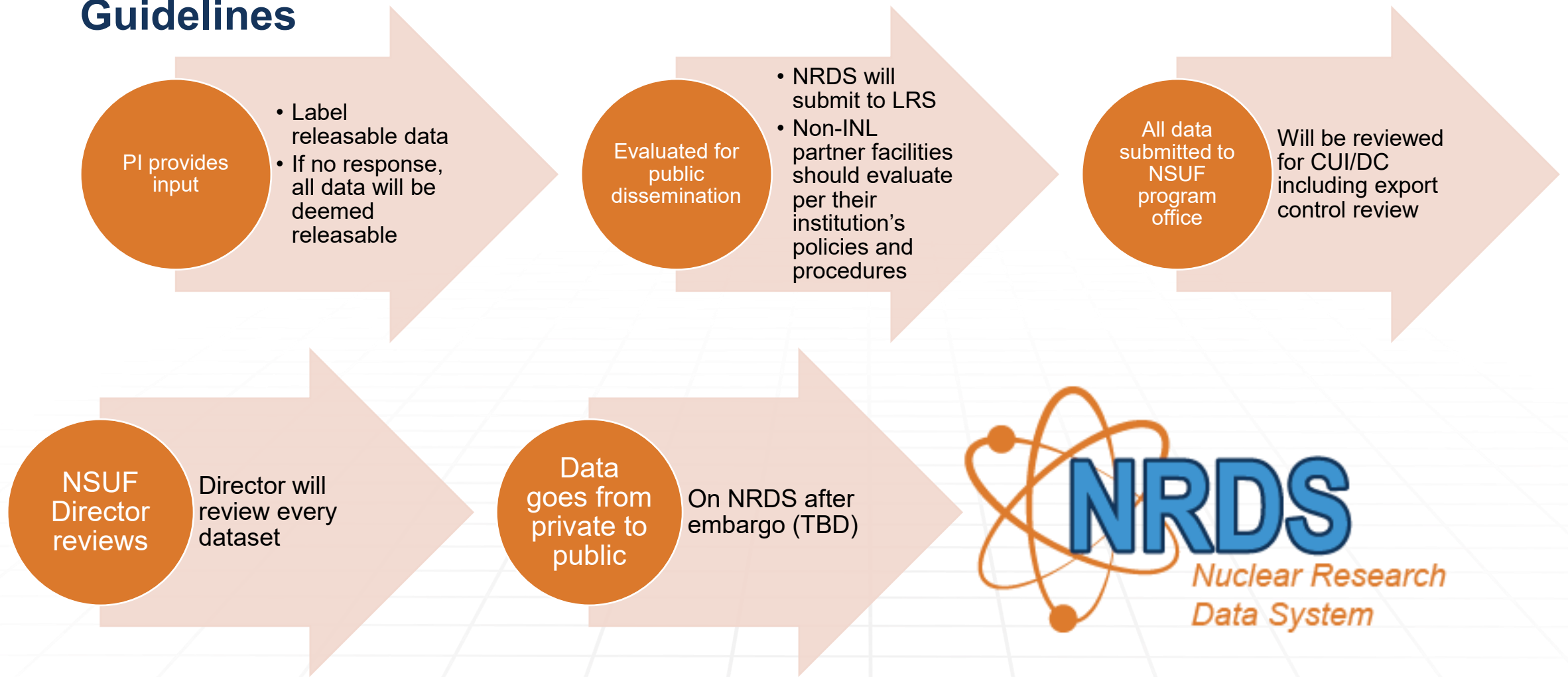
NRDS Portal Hypervisor

(coming soon)

- Will allow HPC access via Citrix Hypervisor which will include:
 - Virtual Windows desktops
 - Direct access to GPUs
 - Access to run software such as Avizo and VGStudioMax
- All data available to the user is accessible here
- Only users within the specific project can view or use the data for the project
- Access to AI Models



NRDS Public Domain Guidelines



NRDS.inl.gov



[Datasets](#)[Organizations](#)[Projects](#)[About](#)

Welcome to NRDS

The Nuclear Research Data Search (NRDS) site is a public-facing, long-term data storage solution and science data gateway featuring integrated compute resources such as artificial intelligence enabled hardware, and access to graphics processing units (GPUs). Operated out of the US Department of Energy Office of Nuclear Energy's Nuclear Science User Facilities (NSUF) program, NRDS takes publicly funded data from NSUF research and makes it accessible to the public without requiring a paywall or account and ensure all data meets the pFAIR criteria.

Advanced Test Reactor



Search data

Current AI Analysis Features

- Super Resolution** - Low resolution to high resolution photos
- Activity Detection** - Locating temporal activities within a video
- Dislocation Segmentation** - Segment dislocation loop and line defects in an image

About NRDS

CKAN Association

The data at this site comes from research conducted through the U. S. Department of Energy's (DOE) Nuclear Science User Facilities (NSUF) program. The data provided at this site is for information only and is not provided for any particular purpose or use. Neither the U. S. Government nor any agency thereof (including DOE), Battelle Energy Alliance, LLC (BEA), nor any other entity makes any warranties, representations, or guarantees, express or implied, regarding the data provided at this site, including, without limitation, that the data is fit or safe for any use or purpose or that its use would not infringe privately owned rights. Neither the U. S. Government nor any agency thereof (including DOE), BEA, nor any other entity associated with DOE's NSUF program assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any data on this site. Reference herein, if any, to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not constitute or imply its endorsement, recommendation, or favor by the U. S. Government or any agency thereof (including DOE), BEA, or any other entity.

Vulnerability Disclosure Program



NRDS FpAIRe Data

- Findability
 - DOI Links, tags, search
- Peekable
 - pdfs, excel, txt, images, videos
- Accessibility
 - Licensing attribution
- Interoperable
 - NRDS Portal collaboration
- Reusable
 - 1.2 PB storage initially
- Extensible

The screenshot displays the NRDS website interface. The top navigation bar includes links for Datasets, Organizations, Projects, and About, along with a search bar. The main content area is titled 'Datasets' and features a sidebar with filters for Organizations, Projects, Tags, and Formats. The main panel shows a search bar and a list of 8 datasets found, ordered by Relevance. The datasets listed are:

- TEM Characterization of Neutron Irradiated HfAl3-Al Composite Specimens**
Particles comprised of a thermal neutron absorbing material (HfAl3) are dispersed in a metal matrix material with high thermal conductivity (aluminum) to conduct the heat...
- Focused Ion Beam Tomography of Alloy 617 Corroded in Molten Chloride Salt**
Materials qualification of reactor structural materials is a critical step in rapid implementation of advanced nuclear reactor technologies, particularly to assess the corrosion...
- 2024 NSUF User Development Workshop on Irradiation Testing**
Monday, May 20 – Thursday, May 23, 2024 at Center for Advanced Energy Studies at Idaho National Laboratory, Idaho Falls, Idaho. This pilot workshop was hosted to expand the NSUF...
- NSUF 19-CINR-16567 Final Report**
This document serves as the final report for NSUF Project 19-16567 (Reference 1) and its supporting contracts (References 2 and 3). It documents completion of testing of...
- Atom probe datasets from neutron irradiated Fe-Cr alloys**
A series of model Fe-Cr alloys containing 3–18 at.% Cr was neutron irradiated at a nominal temperature of 563 K to 1.82 dpa. Solute distributions were analyzed by atom probe...
- Transmission electron microscopy of ion irradiated ODS MA956 samples**
Oxide dispersion strengthened (ODS) alloys are promising candidate materials for the next generation advanced nuclear reactors due to their superior irradiation resistance and...
- 2024 NSUF Annual Program Review**

AI Analysis

- Currently Available
 - **Predictive Automation of Novel Defect Anomalies (PANDA)**
 - Super Resolution
 - Activity Detection
- Coming Soon
 - Dislocation Line Segmentation
 - Anomaly Detection
 - Object Detection
 - Stitching



Dislocation Segmentation

Dislocation Segmentation

Segment dislocation loop and line defects in an image

Images will be deleted after one day of generation. Please make sure to download the image or else the image will have to be regenerated

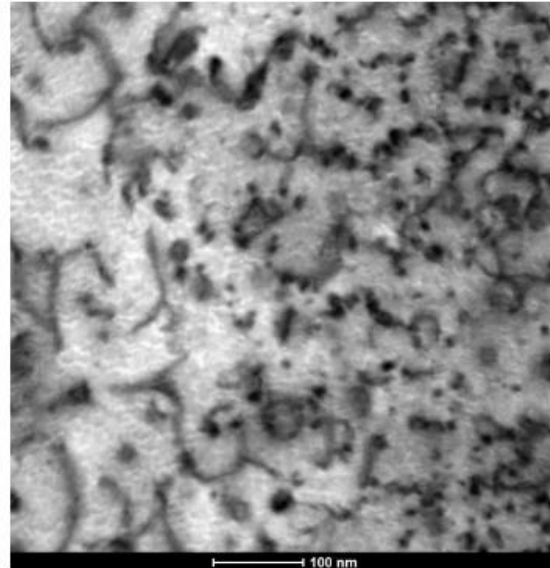
Generated label files are in the YOLO format. Please see [Ultralytics YOLO format](#) for more details. For this model a class index of 0 corresponds to dislocation lines and a 1 corresponds to dislocation loops.

Segment

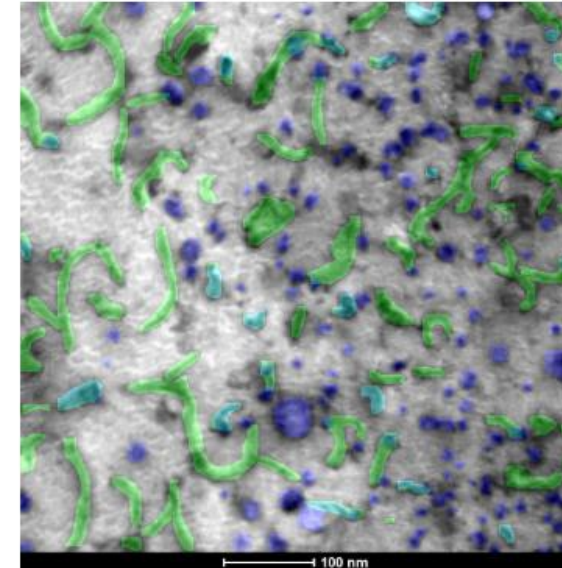
- Dislocation Loop
- Dislocation Line
- Prediction Loop/Line Overlay

Compare Images

Original



Dislocation



Loops: 228 Lines: 157

Download Predicted Labels

Super Resolution

Super Resolution

Low resolution to high resolution photo

Images will be deleted after one day of generation. Please make sure to download the image or else the image will have to be regenerated

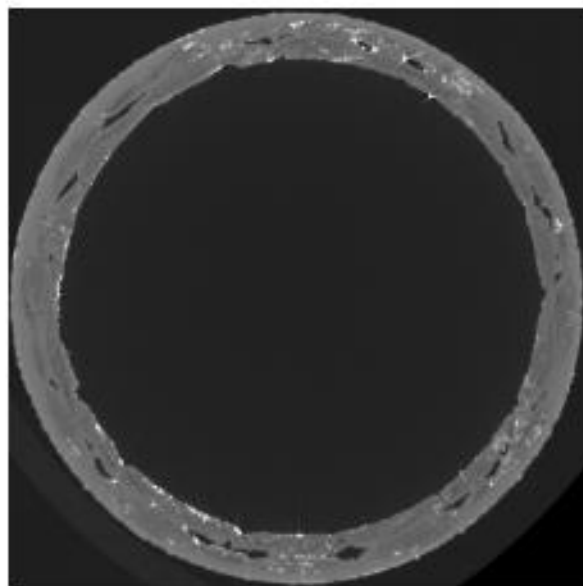
Upscale

Sharpen

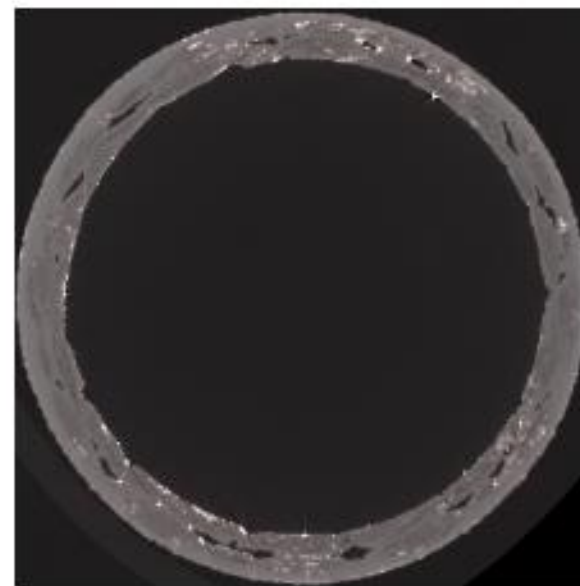
Compare Images

rot0625_low_res.png

Original ▼

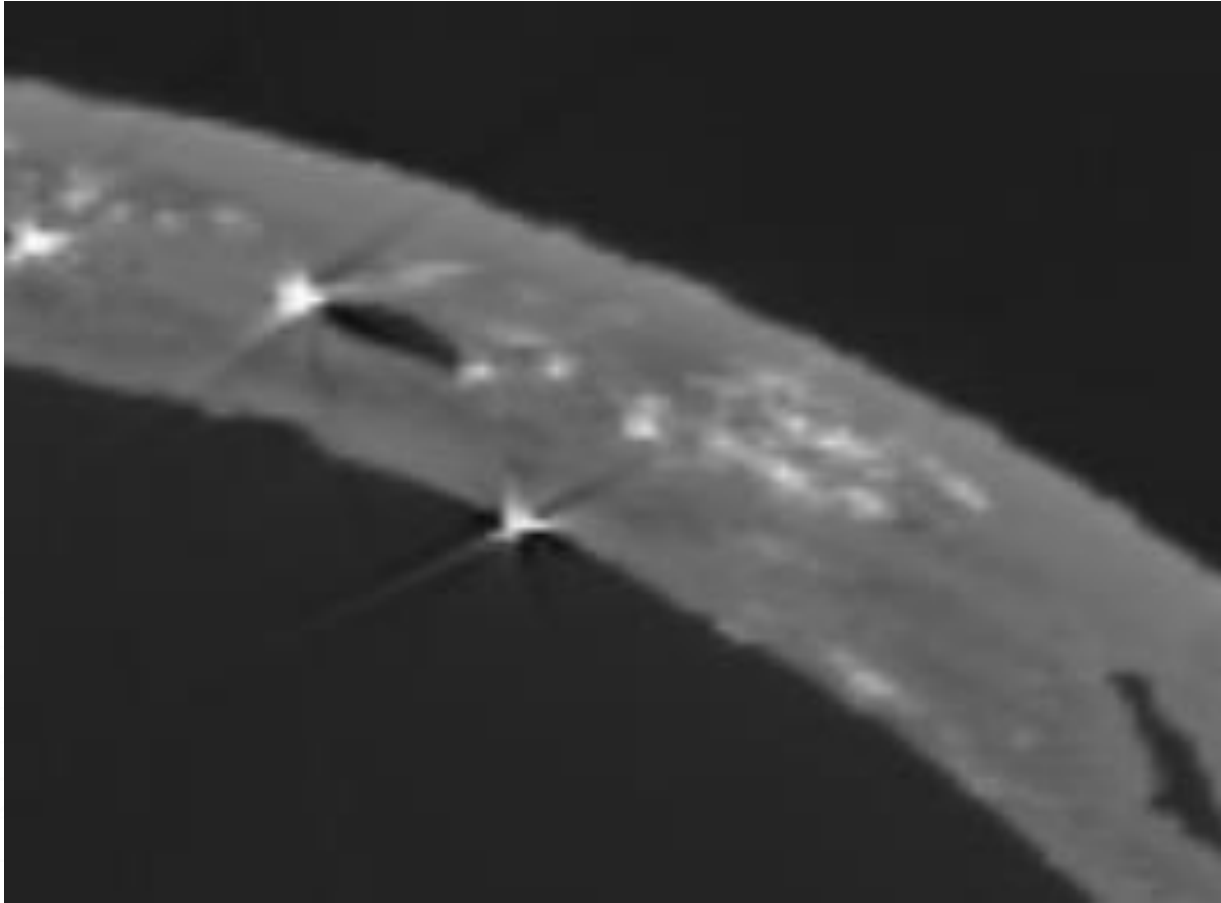


Upscaled ▼

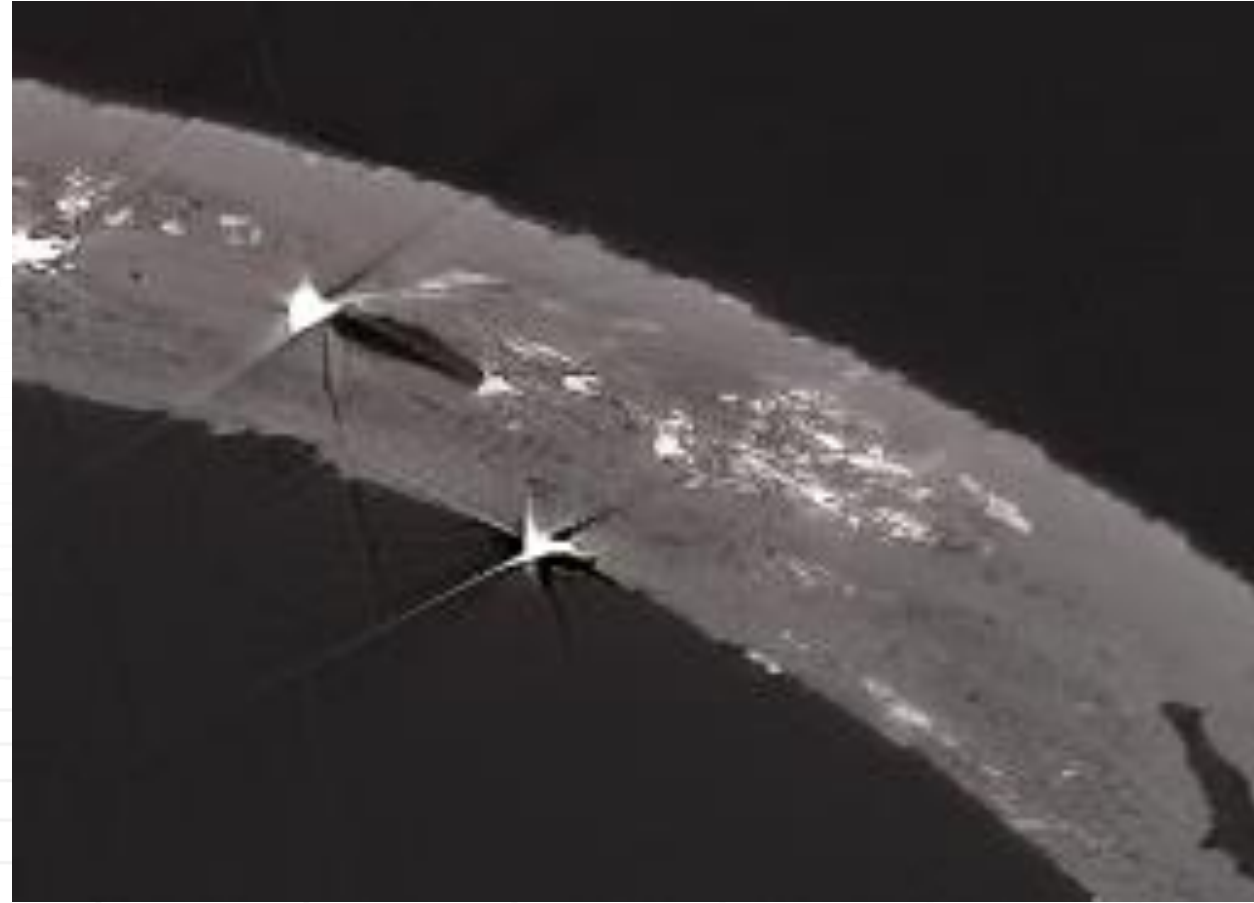


Super Resolution

Before



After



Questions?

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