



# DR POWER: Data Repository for Power system Open models With Evolving Resources

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### PNNL

Team

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## NRECA

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### **Global Project Overview**

- Mission: design, develop and host a data repository and web portal to:
  - Provide open-access power grid datasets and the capability to review, annotate, verify, and search submitted datasets
  - Ensure sustainable model and dataset dissemination and evolution through user-defined dataset creation and validation
  - Integrate and extend NRECA's success with OMF to include transmission modeling

## Challenges

- Evolving and proprietary models
- No standard approach to models
  - Different models used by planning and operations
  - Cutting-edge technology is not always defined in the models
- DR POWER targeting support for:
  - OMF/GridLAB-D (high-resolution distribution models)
  - PTI and MATPOWER (planning models)

#### Project Objectives Pacific Northwest

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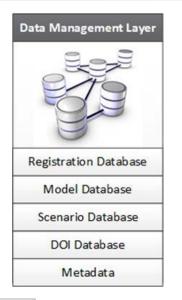
#### Web Portal

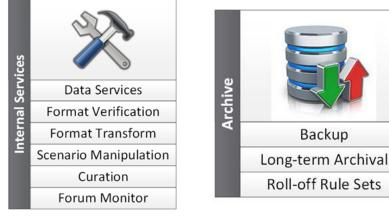
- Open-access web client for using data repository capabilities
- Execute tools for dataset generation, modification, citation, etc.
- Save results from such tools to repository and display the results to user
- Display various reports such as dataset version details, curation details, etc.
- Track upload, download, and access statistics



### **Data Repository (Back-End)**

- Download requested model and scenario data in any available format
- Upload and store datasets for different power grid models; assign DOI
- Import models of various formats, including currently available open models
- Save review of dataset and annotations performed by users
- Maintain dataset versioning after modification
- Save additional scenario information for time-series data generated





Project Objectives Pacific Northwest

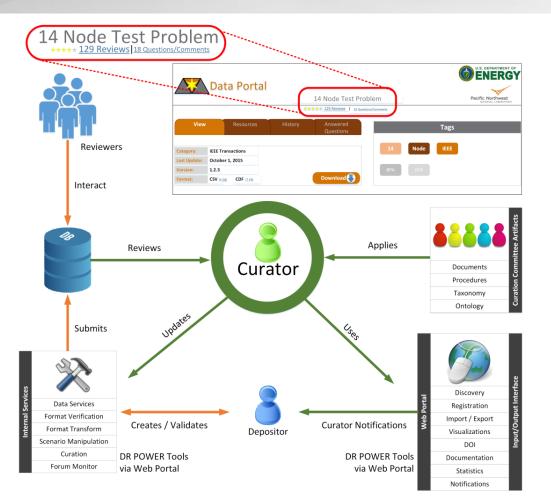
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#### **Active Curation**

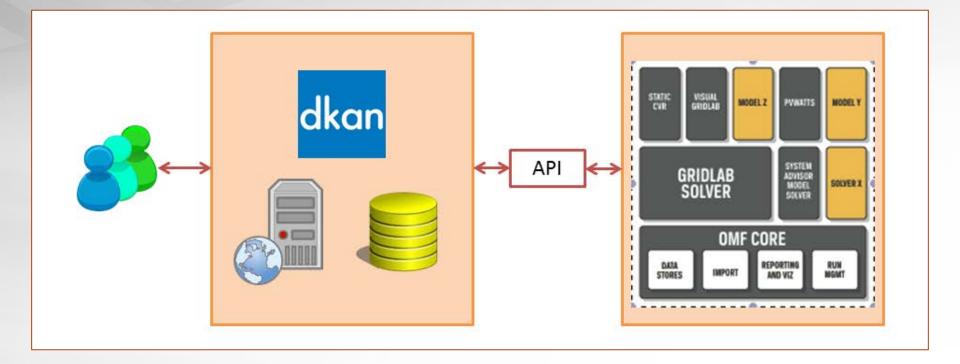
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- Based on Digital Curation Center Lifecycle Model
- Curators will review uploaded models
- Curators will help guide model creation
- Community participation in reviews, questions, comments, etc.





### Architecture



# **Digital Object Identifier (DOI)**

Digital Object Identifier (DOI) is a alphanumeric string assigned to uniquely identify an object

	DOI	
Name	URL	Metadata

- DataCite Metadata Store is a service for data publishers to mint DOIs and register associated metadata
- Repository will submit:
  - 📕 a name
  - a metadata description following the DataCiteMetadata Schema (current version 4.0)
  - at least one URL of the object to create a DOI
- Will use DataCite's application programming interface (API) to mint DOIs
- The Repository will integrate minting and updating DOIs within our metadata management infrastructure



### **Web Portal Security**

- FISMA compliant
- Content web proxy firewall
- System is scanned at least weekly (usually daily) for vulnerabilities
- Data in transit is protected via encryption using Open SSH and Open SSL
- Daily, weekly, and monthly backups
- Web registration to add new data and participate in the community
- Accept Terms and Conditions upon registration, upload of data sets, etc.
- Licensing is visible, and during new data uploads, is a required field
- Site will be reviewed by the PNNL Website Review Committee to ensure it meets DOE's information release, markings, and protection information
- Additional Drupal's built-in security features
- RBAC roles for users



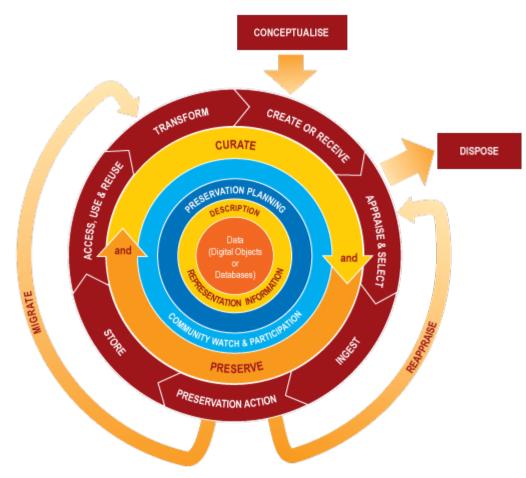
### **Curation Working Group**

# Conceptualize

- Power System data dictionary
- Taxonomy and tagging

# Create or receive

Selection of different models in particular formats



DCC Curation Lifecycle model

http://www.dcc.ac.uk/resources/curation-lifecycle-model| 10



A data provider will certify that the uploaded file does not contain any CEII or Proprietary Information into the data repository

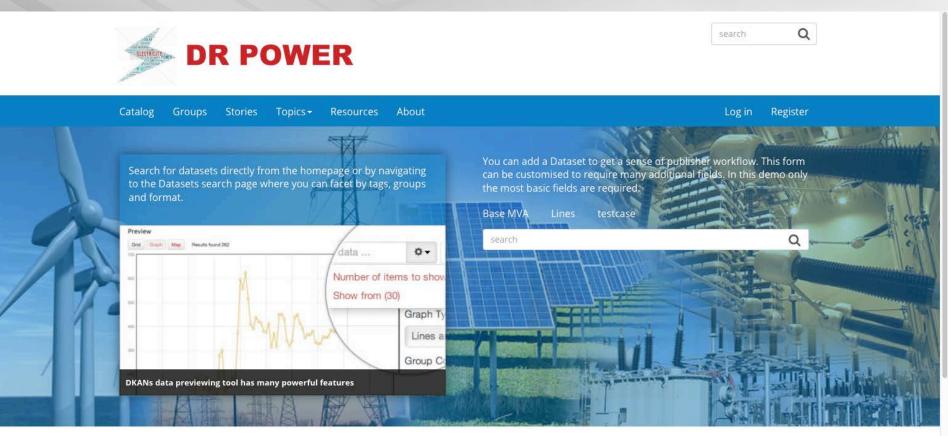
CEII

- Human curators will review the uploaded file(s) in the context of possible CEII and other data quality issues
- Data that is found to be CEII or Proprietary will be immediately removed from the public repository and any backups



**Web Portal Version 1** 

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Transmission

Distribution



### **Web Portal Version 1**

#### Lines (4)

Areas (3)

Generators (3)

Loads (3)

power flow (3)

testcase (3)

Zones (3)

Owners (2)

Shunts - Fixed (2)

Transformers - Adjustable (2)

Transformers - Fixed (2)

#### Buses (1)

Converters - Line Commutated (1)

IEEE - 118 (1)

IEEE - 14 (1)

IEEE - 30 (1)

IEEE - 300 (1)

Shunts - Switchable (1)

Transformers - Three Winding (1)

Format	
cdf (4)	
tif (4)	
jpeg (3)	
psp (1)	
pti (1)	

#### IEEE 30 Bus Power Flow Test Case

A Datasets from University of Washington

Transmission

The IEEE 30 Bus Test Case represents a portion of the American Electric Power System (in the Midwestern US) as of December, 1961.

cdf tif

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#### IEEE 118 Bus Power Flow Test Case

 $\ensuremath{\,\mathbb{B}}$  Datasets from University of Washington

Transmission

Original data can be found at the University of Washington Power Systems Test Case Archive at:

#### cdf tif <mark>jpeg</mark> psp

#### IEEE 14 Bus Power Flow Test Case

A Datasets from University of Washington

Transmission

Original data can be found at the University of Washington Power Systems Test Case Archive at:

#### cdf tif jpeg

#### IEEE 300 Bus Power Flow Test Case

 $\ensuremath{\,\underline{O}}$  Datasets from University of Washington

Transmission

Original data can be found at the University of Washington Power Systems Test Case Archive at: https://www2.ee.washington.edu/research/pstca/pf300/pg\_tca300bus.htm



### **Web Portal Version 1**

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Home / Datasets / IEEE 300 E	Bus Power Flow Test Case	
👁 View 🕞 Revisions		
	IEEE 300 Bus Power Flow Test	Case
UNIVERSITY OF WASHINGTON	書 Transmission	
electrical engineering	Original data can be found at the University of Washington Power	Systems Test Case Archive at:
	https://www2.ee.washington.edu/research/pstca/pf300/pg_tca300	)bus.htm
Datasets from University	The IEEE 300 bus test case was developed by the IEEE Test Systems	s Task Force under the direction of Mike Adibi
of Washington	in 1993.	
This group contains datasets from the University of Washington Electrical	The IEEE Common Data Format version was obtained from Fernan	ndo Alvarado at the University of Wisconsin.
Engineering Power Systems Test Case Archive.	The PTI format version was provided courtesy of Joan Staron of PT	1.
License	Data and Resources	
Other (Public Domain)	<b>IEEE 300 Diagram</b> 600 DPI TIFF format	📥 Download
Other Access	IEEE 300 CDF Format File	ᆂ Download



#### **Web Portal Version 1**

#### What are datasets?

Datasets are simply used to group related pieces of data. These can then be found under a single url with a description and licensing information.

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Edit dataset	2 Add dataset 3 Additional data	
Edit dataset	2 Add dataset 3 Additional data	L
Dataset Information		
lata catalogs published on	e with DCAT, an RDF vocabulary designed to facilitate interoperabili the Web. These fields are also compatible with the Common Core	
schema from Project Open Author	Data.	
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for more info. Add data manually	ON NO MN Ottawa	NL
for more info. Add data manually	ND ND SD WI MI MI Toronto NY	NE
for more info. Add data manually	ON NO SD ON OItawa Ottawa ME Toronto	NS



- NRECA led phone interviews with all GRID DATA PI's
- Build programing interface that can be used with on demand model/data set creation
- Eager to work with those that have unique data schema's to prove out the concepts of evolution that our repository is built on
- Talking to DOE Sponsors about need for the data repository
- Working the IEEE Power Engineering Society Test Case Working Group



### Thank you!

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