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Small Hydropower Interconnection: Decision Support Tool User Guide

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February 2024

OAK RIDGE National Laboratory

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Electrification and Energy Infrastructures Division

SMALL HYDROPOWER INTERCONNECTION: DECISION SUPPORT TOOL USER GUIDE

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Prepared by
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LIST OF ABBREVIATIONS

CH	Conventional Hydro
Cooperative	Cooperative Utility
Municipal	Municipal Utility
MW	megawatt
PSH	Pumped Storage Hydro
FERC	Federal Energy Regulatory Commission
IA	interconnection authority
IEEE	Institute of Electrical and Electronics Engineers
IOU	investor-owned utility
MS	Microsoft
NEC	National Electrical Code
PUD	public utility district
SGIP	a Small Generator Interconnection Procedures

1 OVERVIEW

1.1 WHAT DOES THE TOOL DO?

The Small Hydropower Interconnection Decision Support Tool is designed to provide specific information to small hydropower developers about the interconnection process. Developers follow this user guide to understand the general process; the Small Hydropower Interconnection Tool accompanies this user guide and provides specific knowledge of the processes and costs pertinent to specific locations.

1.2 HOW IS THE TOOL USED?

1.2.1 What Is the Tool's Purpose?

The purpose of the Small Hydropower Interconnection Tool is to provide small hydropower developers the knowledge, tools, templates, and guidance for navigating the interconnection process from licensing through interconnection. The tool focuses on interconnection processes and does not go into detail on the Federal Energy Regulatory Commission (FERC) licensing process. However, the tools, guidance, and suggestions provided within this document may help the developer to collect information earlier in the process, thus minimizing back-and-forth during the FERC process.

1.2.2 What Are the Tool's Objectives and What Does it Provide the Developer?

As a companion to the guidelines and templates, a suite of tools was developed to help small hydropower developers thoroughly complete the processes related to interconnection. These tools provide a clear understanding of the processes, procedures, studies, and stakeholders necessary to develop a small hydropower project from concept through interconnection.

Specifically, this tool provides the following:

- Tool and checklists for developers to ensure the processes are completed and information is available to make informed decisions early in the project development life cycle
  - Checklist of studies to be conducted and the responsible parties
  - Licensing process checklists

- Business case process data that allows developer to understand the costs associated with the development of the project.

The decision support tool was developed in Microsoft (MS) Access and enables the small hydro developer to

- understand the rules and regulations in the state where the small hydropower project is being developed,
- Make a preliminary identification of cognizant Interconnection Authorities,
- understand and evaluate potential interconnection studies, and
- estimate interconnection costs (e.g., substation upgrades, communication assets) and conduct preliminary feasibility studies and cost analyses.

1.2.3 What Is Included in the Tool's Scope?

The Small Hydropower Interconnection Support Tool's scope is limited to the interconnection processes and associated studies and costs. The FERC licensing process is not included in this effort, although some information may be required by both FERC and the IA.

The primary benefit of this tool for project planners, developers, owners, and operators to provide is actionable insight that will save time and money. The tool and user guide allow the user to anticipate what will be required at each step in the process and avoid needless iterations with regulators and interconnection authorities. It also gives the user an understanding of what the interconnection authority will reasonably expect of them.

1.2.4 Who is the Intended Audience for the Tool?

The audience for the tool is small hydropower developers and other stakeholders such as utilities. Other small renewable energy developers may find the information useful in navigating the interconnection process.

1.3 DOWNLOADING THE TOOL AND DOCUMENTATION

Along with this user guide, the *Small Hydropower Interconnection Best Practices Guidelines and Templates* and Small Hydropower Interconnection Decision Support Tool are available on the HydroSource website[1].

1.4 REPORTING ERRORS AND REQUESTING CHANGES

Figure 1.1 presents the process for requesting changes in the toolkit. Any user can report an error and request a change.

[1] https://hydrosource.ornl.gov/tool/small-hydropower-interconnection-decision-support-tool

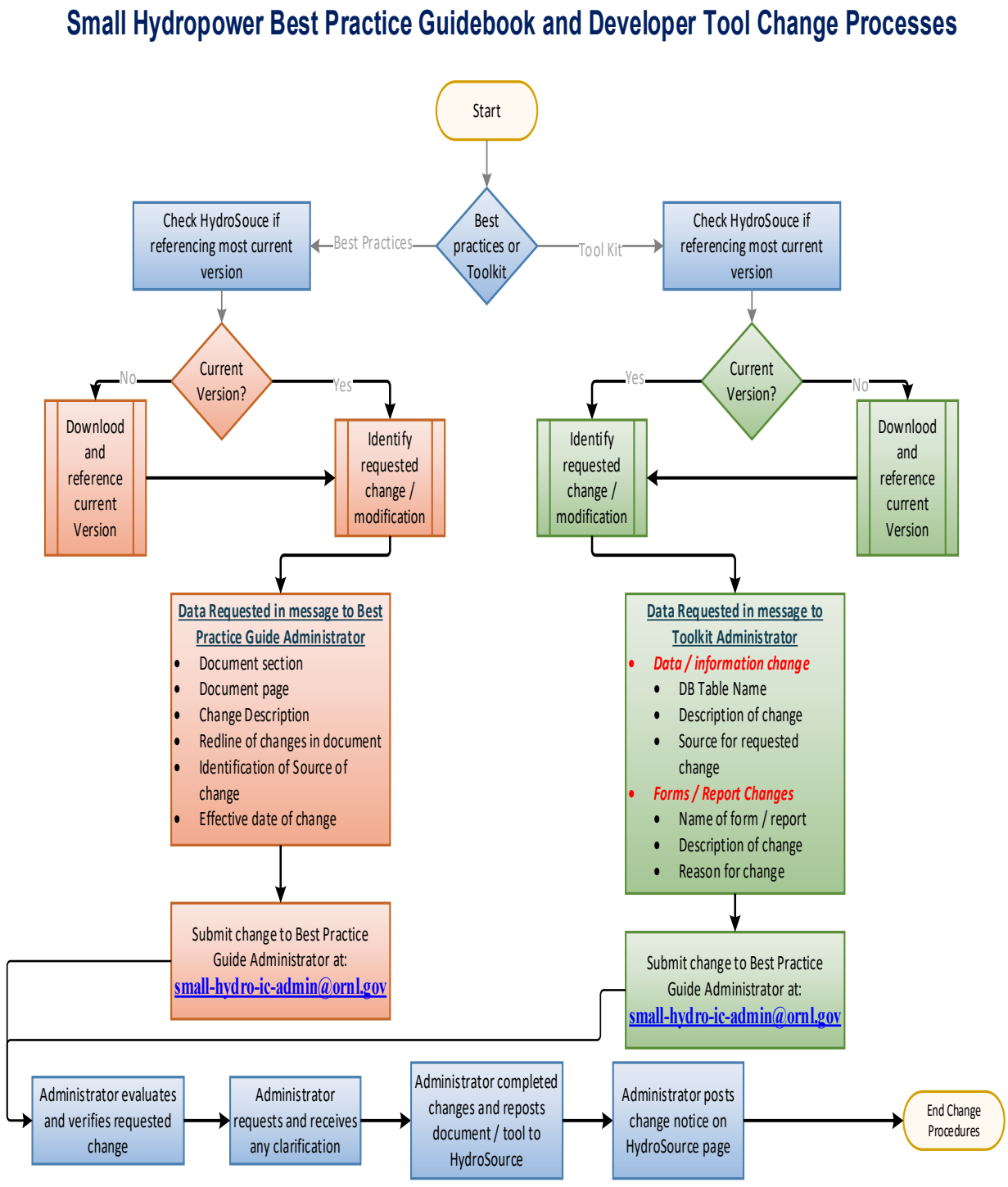

Figure 1.1. Change Process.

1.4.1 Change Request Information or Report an Error

Stakeholders submitting change requests for the Small Hydropower Developer Tool should provide the following information. Requested changes can be submitted as photos, screenshots, and/or descriptions of the part of the tool to be updated.

For a data/information change, the stakeholder should provide the following:

- Name of the table/field(s)
- Description of change
- Source of the change (e.g., policy website), including the link
- Effective date of change
- Redline of the requested change

For a report, form, data-entry, or table change, the stakeholder should provide the following:

- Name of the field/report
- Description of the change
- Change purpose/justification
- Fields to be added or deleted

1.4.2 Where to Report Changes

Requested changes can be reported to the small hydropower best practice administrator or the Small Hydropower Decision Support Tool administrator.

- *Small Hydropower Interconnection Best Practices Guidelines and Templates*—small-hydro-ic-admin@ornl.gov
- Small Hydropower Developer Tool—small-hydro-ic-admin@ornl.gov
- *Small Hydropower Interconnection: Decision Support Tool User Guide*—small-hydro-ic-admin@ornl.gov

1.4.3 Notification of Updates

Once the request is completed and verified/validated by the tool administrator, a notice shall be placed on the Small Hydropower Page within HydroSource that changes are being incorporated. Once the changes are made to the tool, the new version will be uploaded to HydroSource with the revision number and date. The user is responsible for ensuring that they are using the current version of the tool before beginning any project.

1.4.4 Update Frequency

- Minor updates
  - Necessary minor updates published quarterly.
  - If the minor update is of limited or no impact, it may be pushed to the annual update.
- Major updates
  - Published Annually
  - These updates will be included in the quarterly update if the requested changes are material enough to cause analysis and/or decision problems.

1.5 DOCUMENT OUTLINE

This Small Hydropower Interconnection Tool user guide is organized to support a developer from the beginning of the process through implementation of the hydropower-plant interconnection with the grid. Throughout the document are forms, templates, and additional links that may be used to assist the developer in navigating the process. The document is organized into the following sections:

- Section 1, OVERVIEW
- Section 2, DEVELOPER DECISION SUPPORT TOOL STRUCTURE
- Section 3, DATA ENTRY FORMS AND TABLES
- Section 4, REPORTS

2 DEVELOPER DECISION SUPPORT TOOL STRUCTURE

2.1 OVERVIEW OF RELATIONAL DATABASE AND MICROSOFT ACCESS

The decision support tool was developed in MS Access. MS Access is Microsoft's relational database and is included as part of all Microsoft Windows computer systems. Like most other relational database software, MS Access allows database developers and users to develop database structures and add or modify data using tables. Amazon Web Services (2023) defines *relational database* as follows:

> A relational database is a collection of data items with pre-defined relationships between them. These items are organized as a set of tables with columns and rows. Tables are used to hold information about the objects to be represented in the database. Each column in a table holds a certain kind of data and a field stores the actual value of an attribute. The rows in the table represent a collection of related values of one object or entity.

Developers wanting additional information or training on developing and using MS Access can access video tutorials from the Microsoft Support website[2].

2.2 DECISION SUPPORT TOOL MAIN SCREEN

The main screen is displayed upon opening the *Small Hydropower Developer Interconnection Tool, the* main screen opens as shown in Figure 2.1.

Figure 2.1. Developer Decision Support Tool Main Screen.

[2] https://support.microsoft.com/en-us/office/access-video-training-a5ffb1ef-4cc4-4d79-a862-e2dda6ef38e6.

The Data Entry Forms option on the left side of the screen provides small project developers access to data entry forms designed to facilitate data entry into the database. Several predefined reports have been developed and are accessible through the Reports link on the right side of the main screen.

2.3 GENERAL DATA ENTRY METHODS AND THE USE OF FORMS

Small hydropower developers have two methods of entering data into the database: into developed forms or directly into the tables.

- Developed Forms
- Directly into the Tables

2.3.1 Data Entry Using Developed Data Entry Forms

The small hydropower database was developed such that data entry forms guide the user on how to enter data. Specific forms have been created to help the developer enter data. Data entry forms are visual representations of specific database tables where data are stored. Figure 2.2 shows an example of a data entry form.

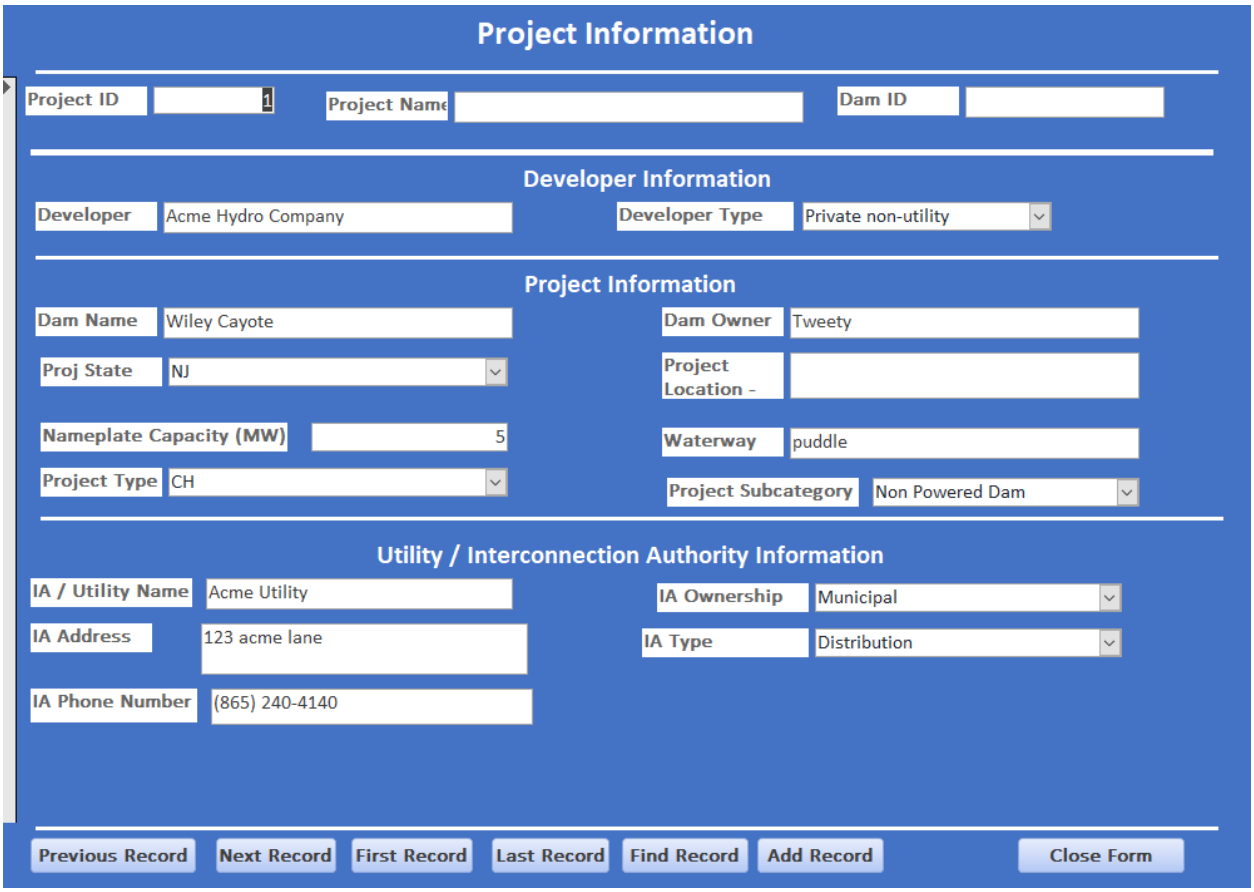

Figure 2.2. Sample Data Entry Form.

2.3.2 Data Entry Directly into Database Tables

If the developer is experienced in using MS Access tables to enter data and or has many records to enter (e.g., previous projects or projects under development), the developer may enter the data directly into the table, bypassing the forms. The table associated with the form shown in Figure 2.2 is titled “Project Information”) can be accessed directly in the left side of the screen under Tables as shown in Figure 2.3

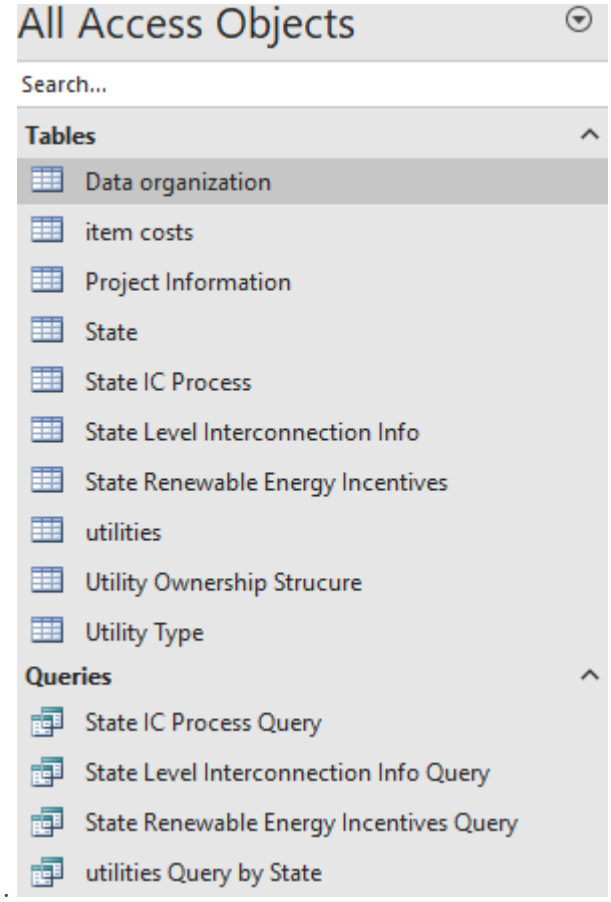

Figure 2.3. Access to data entry directly into a MS Access table.

3 DATA ENTRY FORMS AND TABLES

The primary form/table the developer will use is titled “Project Information.” The remaining forms/tables are described in Section 3.2. In most cases, these will not need to be modified or will need to be modified infrequently.

3.1 PROJECT INFORMATION DATA ENTRY FORM

The Project Information data entry form is designed to allow small hydropower developers to enter specific project data and use this information as the basis for developing cost estimates and feasibility studies and for understanding specific regulatory information based on location, size, and operating profile. Figure 3.1 presents the Project Information data entry form. Because the data entry form represents the associated Project Information table, the field descriptions apply to both the form and the table.

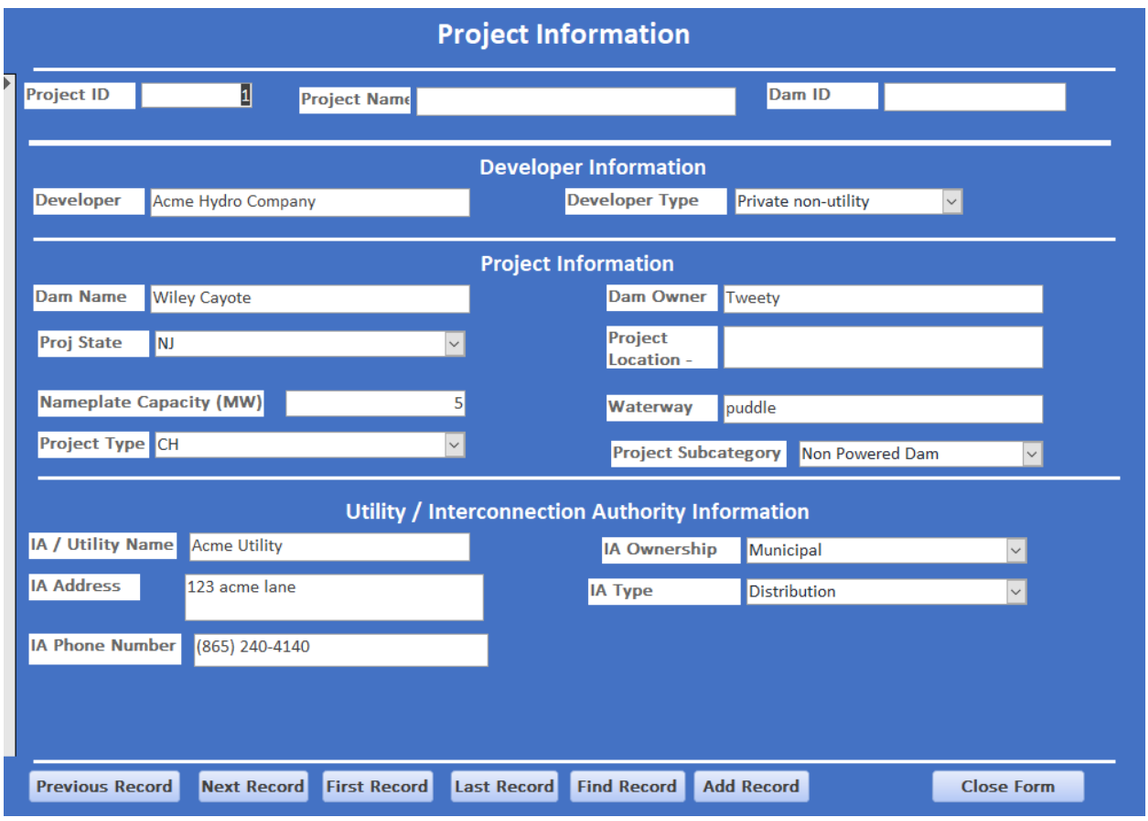

Figure 3.1. Project Information Data Entry Form.

Table 3.1 describes each field to be entered by the developer.

Table 3.1. Project Information field description

Field/Form	Description
Project ID	Autogenerated project unique identifier
Dam ID	Developer or FERC designated
Dam Name	Designated by developer, owner, or other party
Dam Owner	Name of dam owner. May be the same as the developer
Proj State	State in which project is being developed. This field will be used to identify regulatory and other requirements.
Project Location City/County	Assists in identifying potential interconnection authorities, potential costs, etc.
Nameplate Capacity (MW)	Maximum generating capacity of the hydro generator. Used for sizing requirements for interconnection and negotiations with the interconnection authority
Waterway	River, stream, or waterway used to power the dam. Will also allow the developer to determine any additional studies (ecological, environmental, tribal, etc.) necessary to develop project

Field/Form	Description
Project Type	Drop-down menu. Conventional Hydro (CH) or Pumped Storage Hydro (PSH)
Project Subcategory	Drop-down menu. Nonpowered Dam, Conduit, Capacity Uprate/Increase, New Stream Reach, Capacity Derate/Decrease, or Existing New Stream Reach – Unlicensed, Relicense, or Repower
IA/Utility Name	Name of utility or interconnection authority the project will be interconnecting with
IA Address	Street address of interconnection authority
IA Phone	Phone number of the interconnection authority point of contact
IA Ownership	Drop-down menu. Investor Owned, Municipal, or Coop
IA Type	Drop-down menu. Transmission, Distribution, or T&D

3.2 SUPPORT INFORMATION LINKS

The Support Information Data Entry page shown in Figure 3.2 provides access to tables and data relevant to small hydropower developers, including data on utilities, state regulations and incentives, and interconnection cost estimates. In most cases, these will not need to be modified frequently and thus are presented separately.

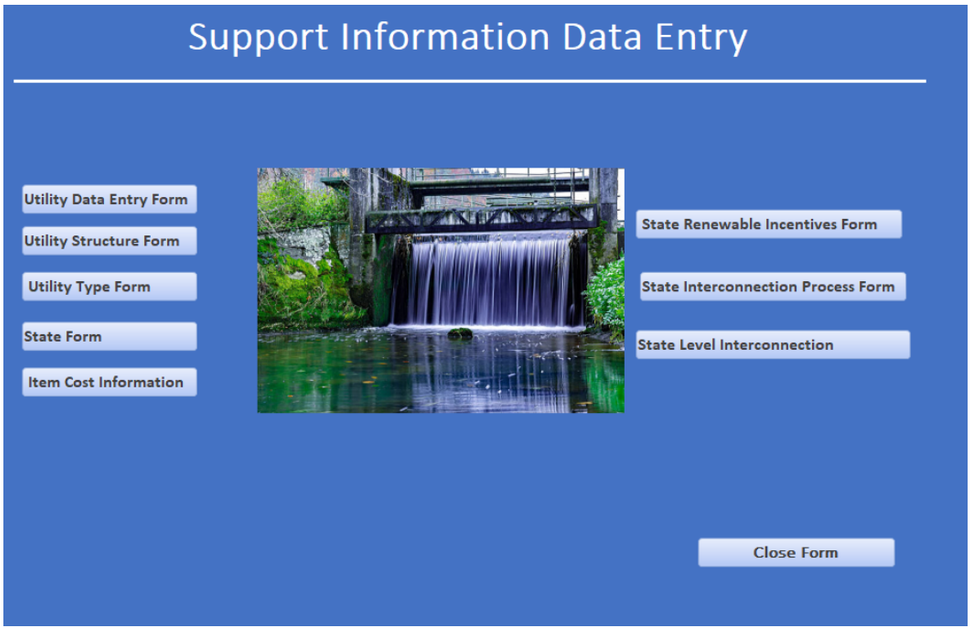

Figure 3.2. Support Information Data Entry Page.

Support information data entry forms/tables are linked from the Support Information page shown in Figure 3.2. These forms/tables are described in the subsections that follow. These forms and associated database tables are used to store data that rarely change and are used in lookup tabs and drop-down menus.

- Utility Data Entry form (Section 3.2.1)
- Utility Structure form (Section 3.2.2)
- State form (Section 3.2.3)
- Item Cost Information form (Section 3.2.4)
- State Renewable Incentives form (Section 3.2.5)
- State Interconnection Process form (Section 3.2.6)
- State-Level Interconnection form (Section 3.2.7)

3.2.1 Utility Data Entry Form

This form and its associated database table are used to enter and manage utility-specific information as described in the following list and as shown in Figure 3.3.

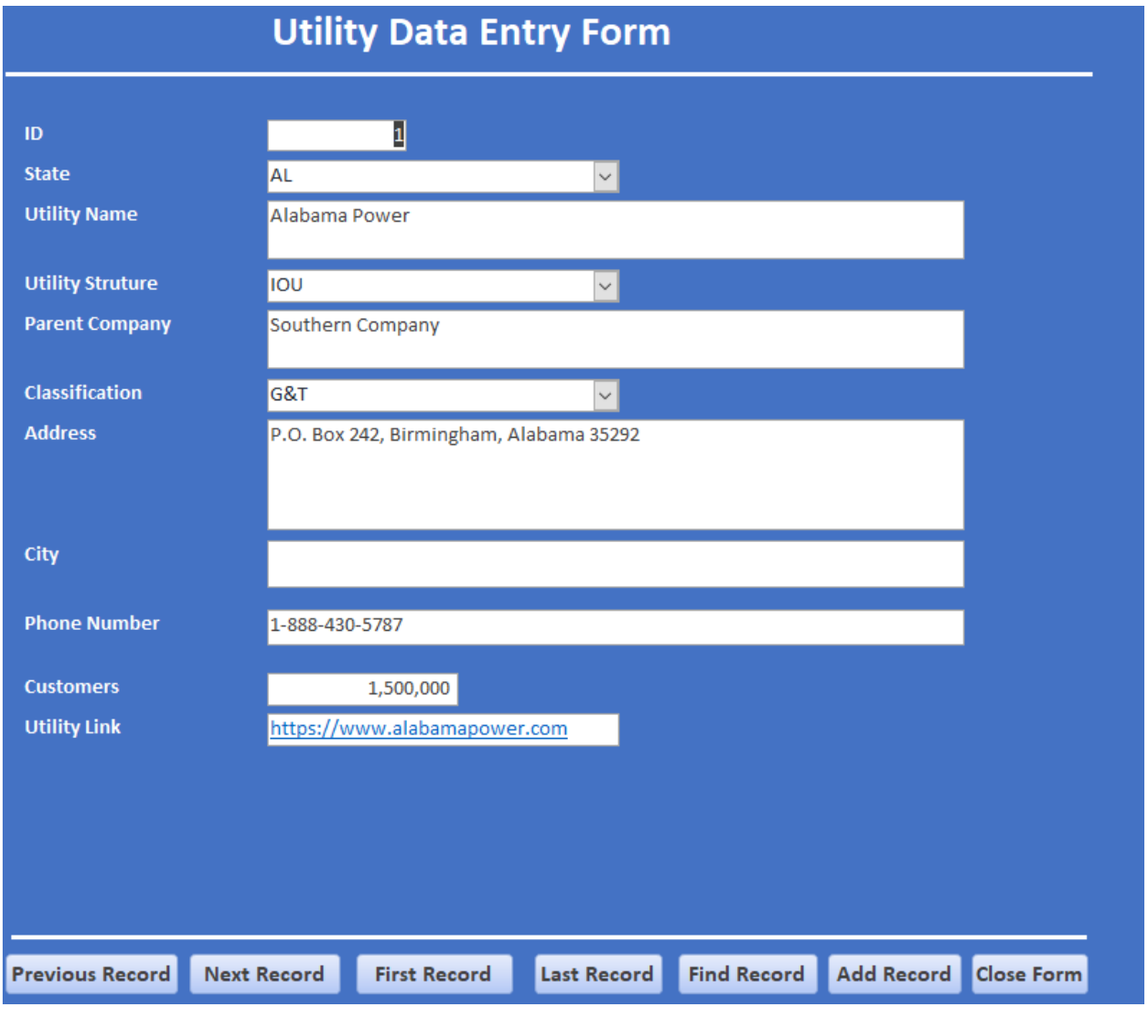

Figure 3.3. Utility Data Entry Form.

The fields in this form are described as follows:

- ID: Database unique identifier for the utility—autogenerated
- State: The specific state or territory in which the utility is located
- Utility Name: Name of utility
- Utility Structure: Drop-down menu. Investor-Owned Utility (IOU), Municipal Utility, Cooperative, Public Utility District (PUD), IOU & Cooperative, IOU and Municipal Utility, Any Regulated Utility, Other, or All of the Above. (Additional categories can be added; see Section 3.2.2.)
- Parent Company: Name of utility parent company (if any)
- Classification: Drop-down menu. Distribution, Transmission, Generation, or G&T
- Address: Physical address of the utility
- Phone Number: Phone number of the utility
- Customers: Total number of customers
- Utility Link: Link to utility website

3.2.2 Utility Structure Form

Utility ownership structures and owners fall into several categories. This form and its associated table define those categories and are used predominantly to enter data used in the drop-down list. There should be little need to change the data in this form/table.

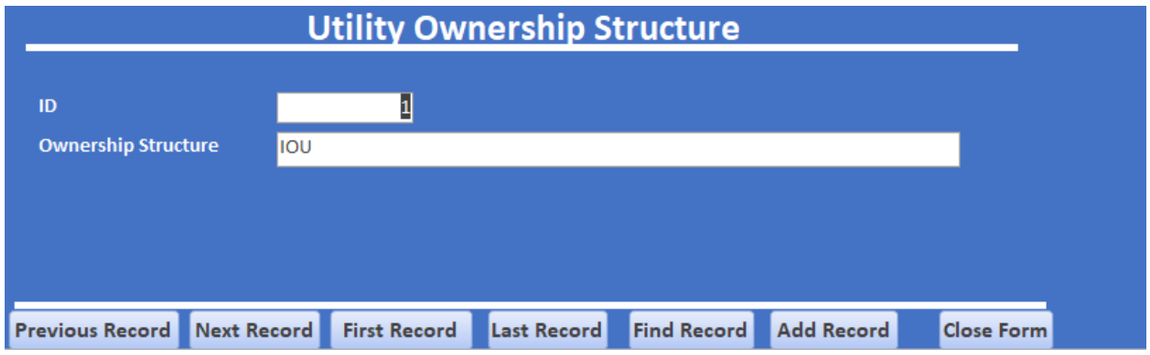

Figure 3.4. Utility Ownership Structure Form.

The fields in this form are described as follows:

- ID: Database unique identifier for the utility—autogenerated
- Ownership Structure: This field describes the ownership structure of the utility and currently includes the following categories:
  - IOU
  - Municipal – City Owned
  - Cooperative
  - PUD
  - IOU & Cooperative
  - IOU & Municipal
  - Any Regulated Utility
  - All
  - Other

3.2.3 State Form

The State form and table (Figure 3.5) are used to define the state and state abbreviation. There should be little need to change the data in this table / form unless a new territory needs to be added.

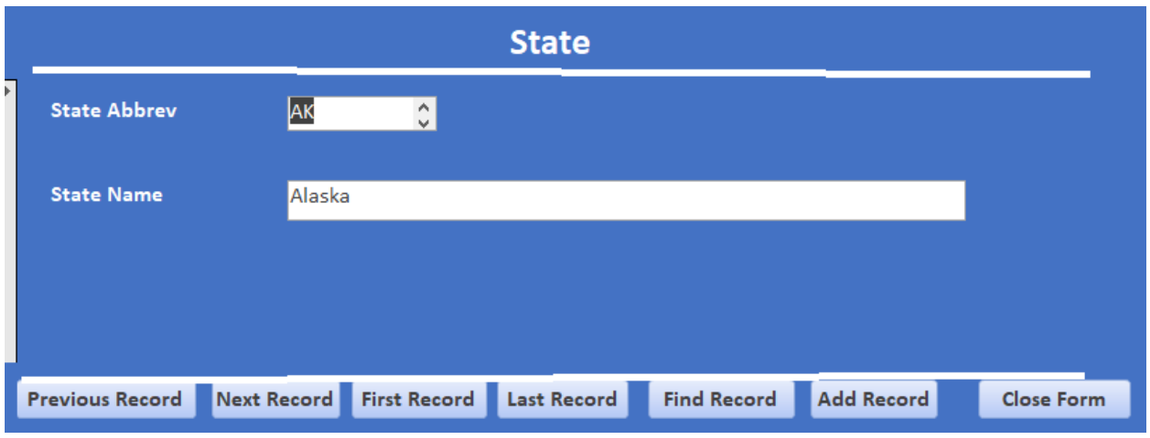

Figure 3.5. State Form.

3.2.4 Item Cost Information Form

The Item Cost Information form and table (Figure 3.6.) are used to collect cost-related data for specific items such as pole installation costs, communication equipment, substation upgrades, etc. This will allow the developer to develop cost estimates and conduct feasibility studies. Because cost may vary significantly by utility, geography, project-specific requirements, etc., the purpose of this form/table is to provide the developer a place to save cost data for use in determining costs for current and future projects; thus, any costs may be project specific or utility specific, related to procurement-specific requirements, etc.

This table may be updated by the developer to meet their specific needs. As with all default data in the tool, if the user determines that their own cost estimates are of value to the larger developer community, they are encouraged to follow the process outlined in Section 1.4 to submit a change to the data.

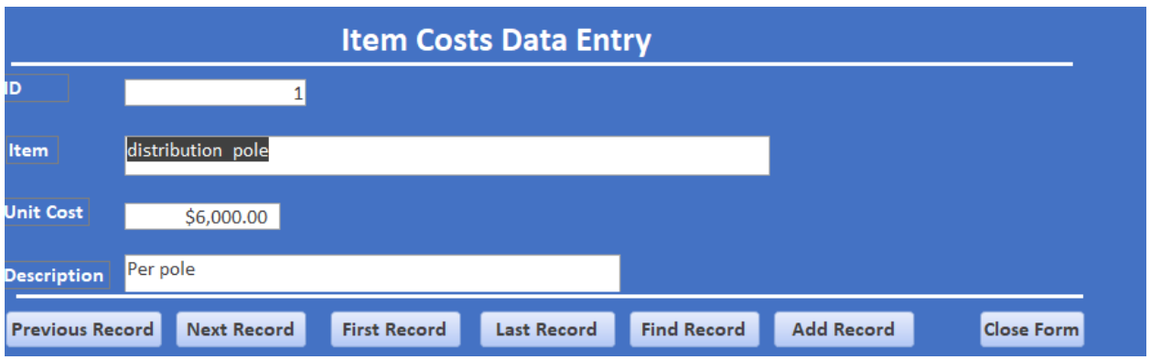

Figure 3.6. Item Costs Form.

The fields in this form/table include the following:

- ID: Database unique identifier for the utility—autogenerated
- Item: This may be any cost item such as new utility poles, communication equipment, substation upgrades, etc.
- Unit Cost: Cost per unit of the item (e.g., cost per pole, cost per foot of communication cable, cost of annual insurance)
- Description: Other relevant information such as the units (e.g., per pole, annual)

3.2.5 State Renewable Incentives Form

The State Renewable Incentives form/table (Figure 3.7.) provides the developer and other stakeholders information about current incentives offered within a specific state. As with all default data in the tool, if the user finds that information is missing or outdated, they are encouraged to follow the process outlined in Section 1.4 and Figure 1.1 to submit a change or addition to the data.

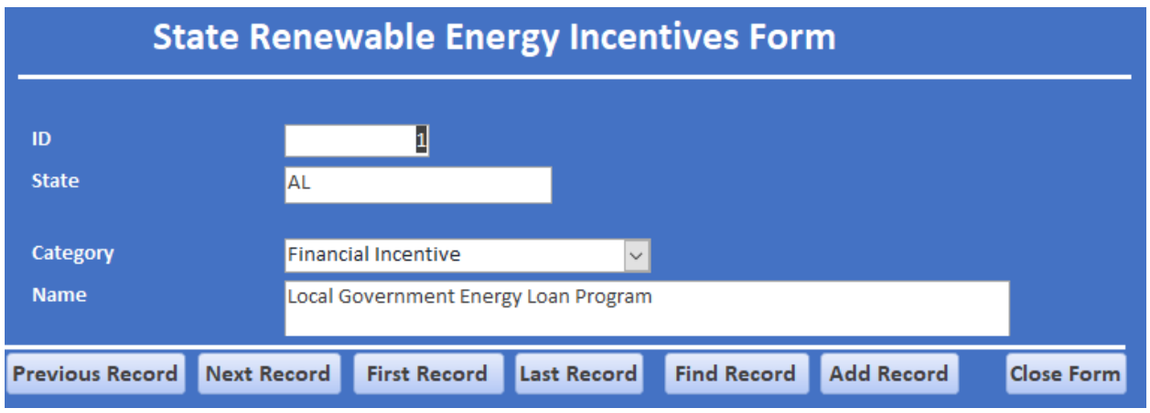

Figure 3.7. State Renewable Incentives Form.

The fields in this form/table are as follows:

- ID: Database unique identifier for the utility—autogenerated
- State: State where the incentive is applicable
- Category: Drop-down list of incentive categories that includes Financial and Regulator
- Name: Name of the program
- Policy/Incentive Type: Drop-down list of incentive types and specifics
- Created: Date the incentive was created
- Last Updated: Date the incentive list was last updated
- Link: Link to incentive(s)

3.2.6 State Interconnection Process Form

This form/table provides a high-level description of state-level interconnection process requirements. Figure 3.8 presents the form. These interconnection process data are presented by state/territory. Although a utility may operate within multiple states, it still must follow regulations in the state where it is operating.

As with all default data in the tool, if the user finds that information is missing or outdated, they are encouraged to follow the process outlined in Section 1.4.1 and in Figure 1.1 to submit a change or update to the data.

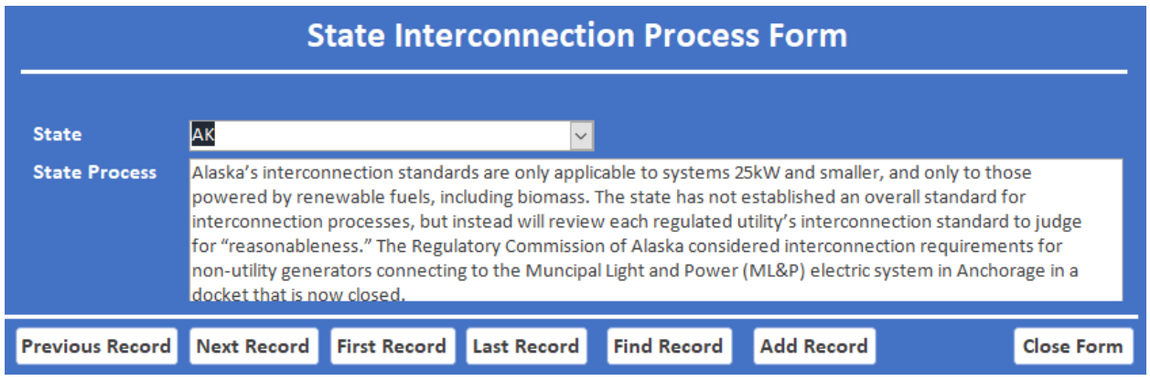

Figure 3.8. State Interconnection Process Form.

The fields associated with the State Interconnection Process form are as follows:

- **State**: Applicable state
- **State Process**: Process-specific information for the state

3.2.7 State-Level Interconnection Form

The State-Level Interconnection form/table shown in Figure 3.9 contains detailed information related to state-specific interconnection requirements. These interconnection process data are presented by state/territory. Although a utility may operate within multiple states, it still must follow the state regulations where it is operating. As with all default data in the tool, if the user finds that information is missing or outdated, they are encouraged to follow the process outlined in Section 1.4 to submit a change to the data.

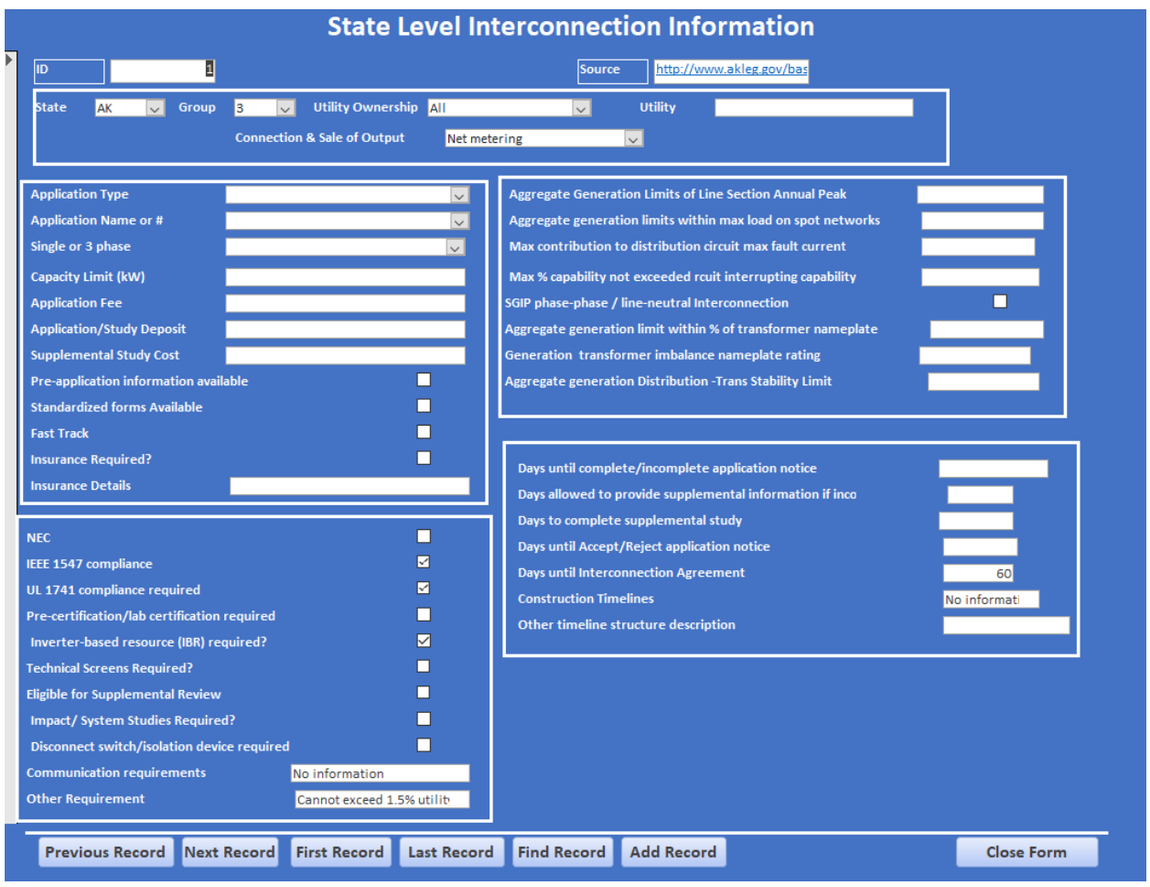

Figure 3.9. State-Level Interconnection Information.

To view the information of interest, users should use the Previous Record and Next Record functions to scroll through the records or use the Find Record function. Changing the state on this form changes the data associated with the current record; it does not take the user to that state's records.

This form/table consists of the following fields and data collected during the development of a small hydropower interconnection project.

- Basic Information
  - ID: Database unique identifier for the utility—autogenerated

    - Source: Hyperlink to the source of information
    - State: State where the information is applicable
    - Group:
        - Group 1: California
        - Group 2: Tiered process
        - Group 3: States offering limited or no guidance
    - Utility: If the information applies to a specific utility, then the utility name is in this field.
    - Connection and Sale of Output: Drop-down list of possible sale/output
- Interconnection Application Information
    - Application Type: Drop-down list of application types
    - Application Name: Drop-down list of application names
    - Single or 3-Phase: Drop-down list
    - Capacity Limit (kW): Capacity limit of unit to qualify
    - Application Fee: Utility interconnection application fee (US dollars)
    - Application/Study Deposit: US dollars
    - Supplemental Study Cost: US dollars
    - Pre-Application Information Available: Checkbox
    - Standardized Forms Available: Checkbox—checked if the state/utility has standardized forms
    - Fast Track: Checkbox—checked if there is a fast-track interconnection process
    - Insurance Required: Checkbox
    - Insurance Details: Any specific types or amounts of insurance required
- Technical Interconnection Requirements/Compliance
    - NEC: Checkbox—checked if National Electrical Code (NEC) compliance is required
    - IEEE 1547 Compliance: Checkbox—checked if yes
    - UL 1741 Compliance Required: Checkbox—checked if yes
    - Pre-Certification/Lab Certification Required: Checkbox—checked if any equipment needs to be certified or pre-certified?
    - Inverter-Based Resource Required: Checkbox—checked if the interconnection requires an inverter-based resource
    - Technical Screens Required: Checkbox—checked if yes
    - Eligible for Supplemental Review: Checkbox—checked if yes
    - Impact/System Studies Required: Checkbox—checked if yes
    - Disconnect Switch/Isolation Device Required: Checkbox—checked if yes
    - Communication Requirements: Any specific communication system requirements (e.g., SCADA fiber optic communication cabling / network equipment,)
    - Other Requirements: Any other requirements for interconnection
- Technical Limits – determined by IAs at a state level
    - Aggregate Generation Limits of Line Section Annual Peak.
    - Aggregate Generation Limits within Max Load on Spot Networks
    - Max Contribution to Distribution Circuit Max Fault Current – How much does the generation contribute to fault current.
    - Max % Capability Not Exceeded Circuit Interrupting Capability
    - SGIP Phase-Phase/Line-Neutral Interconnection
    - Aggregate Generation Limit within % of Transformer Nameplate
    - Aggregate Generation Distribution -Trans Stability Limit
- Schedule/Timeline Information following are Technical Limits – determined by IAs at a state level.
    - Days until Complete/Incomplete Application Notice-
    - Days Allowed to Provide Supplemental Information If Incomplete
    - Days to Complete Supplemental Study
    - Days until Accept/Reject Application Notice
    - Days until Interconnection Agreement
    - Construction Timelines
    - Other Timeline Structure Description

4 REPORTS

Several state-level reports have been developed to help small hydropower developers identify rules, regulations, renewable incentives, and state-level interconnection information. Although utilities may operate across state lines, the reports are structured by state because a utility operating within the jurisdiction of a given state must adhere to the regulations and laws within that state.

Figure 4.1 presents the top-level State Level Reports screen and list of reports. The State Level Reports page is accessed from the Small Hydropower Developer Interconnection Tool screen (initial screen when opening the database). ***Note: the user must select a state from the drop-down list at the top of this form for the reports to be generated.***

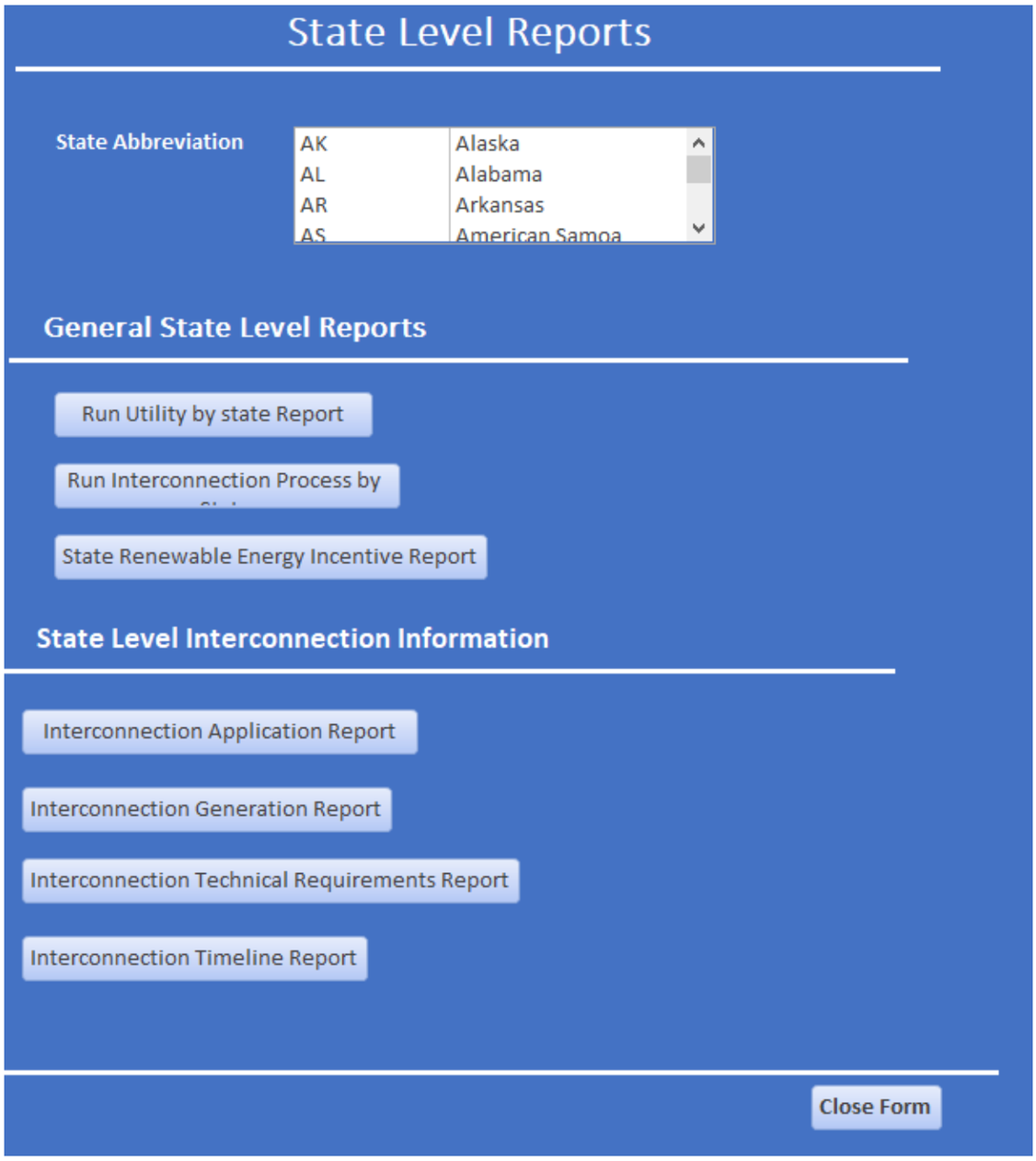

Figure 4.1. State-Level Reports.

The reports section on the homepage provides access to several types of reports, including general state-level reports and state-level interconnection information reports. The reports under each area are outlined in the following list and described in detail in the following sections.

- General state-level reports (Section 4.1)
  - Utilities by state report (Section 4.1.1)
  - Interconnection process report (Section 4.1.2)
  - State renewable energy incentives report (Section 4.1.3)
- State-level interconnection information reports (Section 4.2)
  - Interconnection application report (Section 4.2.1)
  - Interconnection generation report (Section 4.2.2)
  - Interconnection technical requirements report (Section 4.2.3)
  - Interconnection timeline report (Section 4.2.4)

4.1 GENERAL STATE-LEVEL REPORTS

4.1.1 Utility by State Report

This report provides a list of utilities within the state or territory selected by the developer from and includes the following information: The specific state / territory (in the case of Washington DC or Puerto Rico) are selected through a drop-down menu. This report and provides the following information to help the developer determine the correct interconnection authority:

- Utility name
- Type: IOU, municipal, cooperative, etc.
- Name of parent company (if applicable)
- Classification: G&T, distribution, transmission, etc.
- Physical address
- City
- Phone number
- Number of customers
- Link to utility web page

4.1.2 Interconnection Process Report

This report provides a high-level description of the interconnection processes implemented within the state/territory selected by the user through a drop-down menu.

4.1.3 State Renewable Energy Incentives Report

The state renewable energy incentives report provides information to the user on existing incentives within the state selected by the user through a drop-down menu. This report was developed to ensure developers apply for any renewable incentives available within a state/territory. The report provides the following:

- Incentive Category: defined as either Financial or Regulatory
- Program Name: Name of program
- Policy/Incentive Type: Incentive types and specifics
- Created: Date incentive was created
- Last Updated: Date incentive list was last updated
- Link: Link to incentive(s)

4.2 STATE-LEVEL INTERCONNECTION INFORMATION REPORTS

The state-level interconnection reports provide state-level information for the state selected from a drop-down menu and include specific interconnection information by utility within the state. Specific reports include the following:

- Interconnection application report
- Interconnection generation report
- Interconnection technical requirements report
- Interconnection timeline report

4.2.1 Interconnection Application Report

The interconnection application report provides the user with the following utility-specific application information for a selected state/territory:

- Connection and sale of output—output applicable for type of application, export, net metered
- Application type
- Application name
- Single or three-phase applicability
- Fast track option available
- Capacity limit for application

4.2.2 Interconnection Generation Report

This report is similar to the application report but provides information on generating limits. Specifically, this report provides the user with utility-specific generation requirements and limit information for a selected state on the following:

- Aggregate generation limits of line section annual peak - aggregated generation on the line section, annual at annual peak – IA defined Maximum
- Aggregate generation limits within max load on spot networks -IA defined Value
- Max contribution to distribution circuit max fault current - IA defined Maximum
- Max percent capability not exceeded circuit interrupting capability - IA defined maximum
- SGIP (Self-Generation Incentive Program) phase-phase/line-neutral interconnection - IA defined maximum
- Aggregate generation limit within percentage of transformer nameplate - IA defined limit
- Generation transformer imbalance nameplate rating - IA defined rating
- Aggregate generation distribution—trans stability limit - IA defined rating

4.2.3 Interconnection Technical Requirements Report

This report is similar to the application report but provides information on specific technical requirements. Specifically, for a selected state, this report provides the user with utility-specific application information on the following:

- Utility ownership type
- NEC compliance - Required to be NEC compliant? Yes/No. Checked is Yes and require by the utility.
- Institute of Electrical and Electronics Engineers (IEEE) Standard 1547 compliance Required to be IEEE compliant 1547? Yes/No. Checked is Yes required and required by the utility.
- UL 1741 compliance required. - Required to be UL 1741 compliant? Yes/No. Checked is Yes and required by the utility.
- Precertification/lab certification required? - Required to be Precertification/lab certification? Yes/No. Checked is Yes and required by the utility.
- Inverter-based resource required? - Required to be inverter base required Yes/No. Checked is Yes and required by the utility,
- Technical screens required – are utility technical screens required? Yes/No Checked is Yes and required by the utility.
- Supplemental review eligibility – Is a supplemental review available? Yes/No. Checked is Yes and required by the utility,
- Impact/system studies required – is a system impact study required? Yes/No. Checked is Yes and required by the utility.
- Other requirements – list of other utility specific interconnection requirements
- disconnect switch/isolation device required? Does the IA require a disconnect switch/isolation device? Yes/No. Checked is Yes and required by the utility.

If the checkbox is selected, then the utility technical requirement must be satisfied.

4.2.4 Interconnection Timeline Report

The final state interconnection requirement report is structured similarly to the other reports. It provides information on timeline requirements and response times for both the applicant and the utility. This information is based on utility commitments that have been published or historical data and does not include any FERC timing. Specific information provided in this report includes the following:

- Days until complete/incomplete application notice,
- Days allowed to provide supplemental information, if incomplete,
- Days to complete supplemental study.
- Days until accept/reject application notice.
- Days until interconnection agreement,
- Construction timelines,
- Other timeline structure description,

5 REFERENCES

Amazon Web Services. 2023. What is a Relational Database? Amazon Web Services (AWS). Accessed October 25, 2023. https://aws.amazon.com/relational-database/#:~:text=A%20relational%20database%20is%20a,tables%20with%20columns%20and%20rows.

IEEE 1547. 2018. *IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces*. Institute of Electrical and Electronics Engineers.

O'Reilley, Christopher J., Hope J. Corsair. 2023. *Small Hydropower Interconnection Best Practices Guidelines and Templates*. ORNL/TM-2023/3149 Oak Ridge: Oak Ridge National Laboratory.

UL 1741. 2021. *Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources*. UL Standards.