HydroSource Data Model, Version 1 - *Database Schema*

A Relational Database System for US Water Power

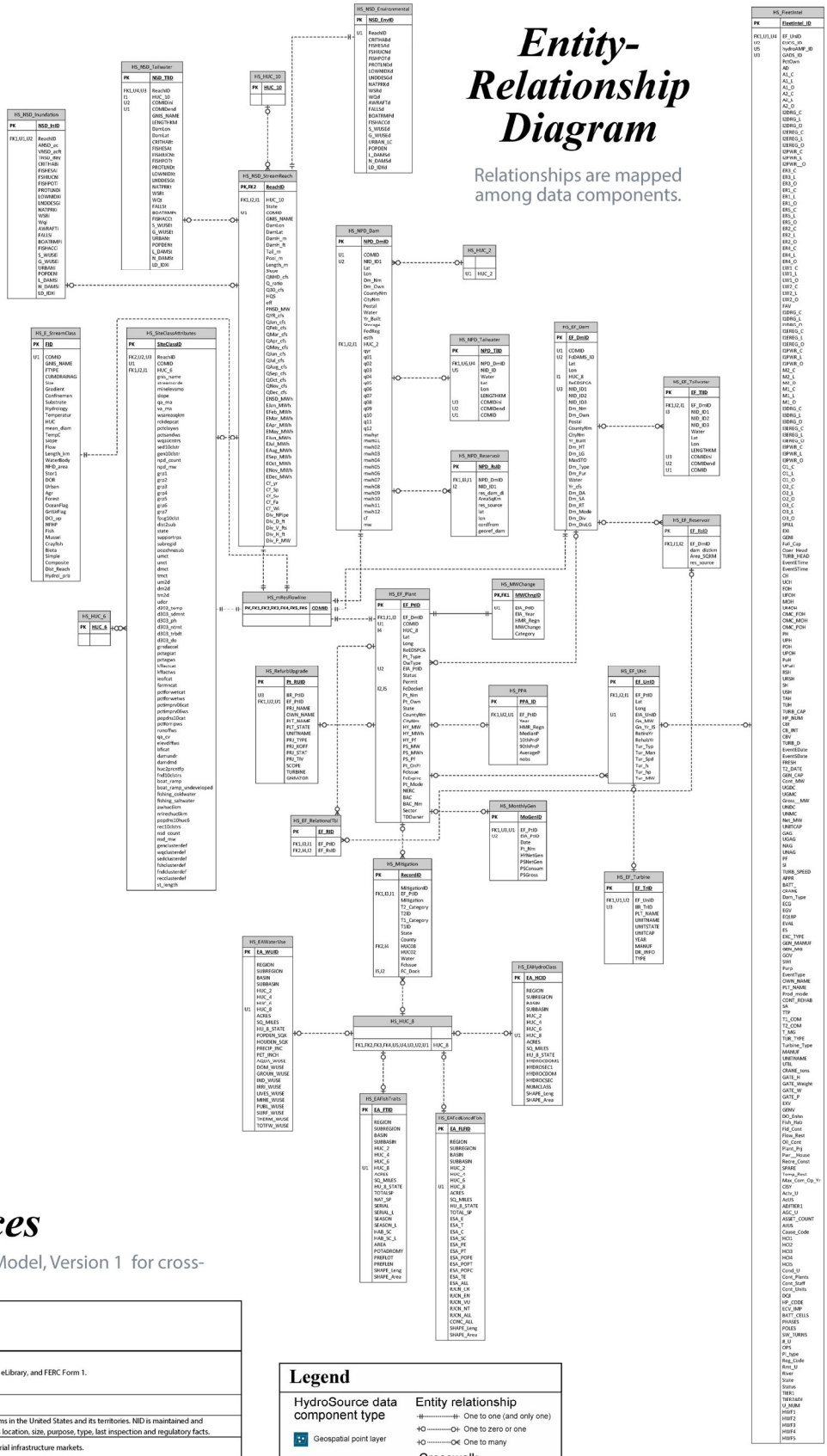
HydroSource Database

Layers are ascertained based ORNL's lowest-level water power datasets to allow for scalable analyses.

HydroSource data component	Description
HS_EF_Plant	Geospatial point locations and attributes of hydropower plants that are preoperational, operational, and retired.
HS_EF_Unit	Turbine-generator units and attributes geospatially referenced to locations of existing hydropower fleet plants within the HydroSource Database.
HS_EF_Turbine	Data integrated from the Industrial Information Resources (IIR) Database on US turbine installations.
HS_EF_Dam	Geospatial locations and attributes of preoperational, operational, and retired hydropower dams in the United States.
HS_EF_Reservoir	Geospatial polygons of reservoirs impounded by existing hydropower fleet dams within the HydroSource Database.
HS_EF_Tailwater	Geospatial polylines of tailwaters below each existing hydropower fleet asset within the HydroSource Database.
HS_MonthlyGen	Monthly hydropower generation of preoperational, operational, and retired hydropower plants in the United States.
HS_RefurbUpgrade	Data integrated from the IIR Database on refurbishment and upgrade investment projects.
HS_MWChange	Annual hydropower plant capacity changes from Energy Information Administration's (EIA) Form 860.
HS_PPA	Data integrated from the Federal Energy Regulatory Commission's (FERC) Form 1 data on power purchase transactions between electric utilities and hydropower plant owners.
HS_FleetIntel	Alignment and correlation of fleetwide asset management databases.
HS_NPD_Dam	Geospatial point locations of non-powered dams >1 MW.
HS_NPD_Reservoir	Geospatial polygons of reservoirs impounded by non-powered dams >1 MW.
HS_NPD_Tailwater	Geospatial polylines of tailwaters below each non-powered dam >1 MW.
HS_NSD_StreamReach	Geospatial point locations of New Stream-Reach Development (NSD) potential within stream reaches.
HS_NSD_Inundation	Geospatial polygons of reservoirs impounded by locations of NSD stream reach within the HydroSource Database.
HS_NSD_Tailwater	Geospatial polylines of tailwaters below each NSD stream reach within the HydroSource Database.
HS_NSD_Environmental	Environmental attributes geospatially associated with the NSD inundated area, NSD stream reach, and NSD Tailwater layers within the HydroSource Database.
HS_SiteClassAttributes	Attributes compiled from multiple layers geospatially referenced to NHDPlus v2 stream-reach data hosted within the Standard Modular Hydropower (SMH) Explorer, a geovisual analytics platform that empowers user-guided energy-water-environment-module data analysis and inquiries in support of ORNL's SMH research project.
HS_Mitigation	Mitigation requirements and associated licensing information collated from FERC hydropower licences issued from 1998 through 2013.
HS_E_StreamClass	The Eastern Stream Classification (ESC) is a characterization of the biophysical settings of stream environments including hydrology, temperature, geomorphology, and disturbance regimes.
HS_EAFedListedFish	Maps of fish species listed under the Endagered Species Act (1973) or by the International Union for the Conservation of Nature (IUCN) per 8-digit Hydrologic Unit Code (HUC-8) created as part of the DOE/ORNL NSD Resource Assessment.
HS_EAFishTraits	Maps of fish traits per HUC-8 created as part of the DOE/ORNL NSD Resource Assessment.
HS_EAHydroClass	Maps of hydrologic classes per HUC-8 created as part of the DOE/ORNL NSD Resource Assessment.
HS_EAWaterUse	Maps of estimated water use (2005), population density, housing density, precipitation, and potential evapotranspiration per HUC-8 created as part of the DOE/ORNL NSD Resource Assessment.
HS_mResFlowline	HydroSource medium resolution geospatial polyline.
HS_HUC_8	HydroSource HUC-8 geospatial polygon.
HS_HUC_6	HydroSource HUC-6 geospatial polygon.
HS_HUC_2	HydroSource HUC-2 geospatial polygon.
HS_RelationalTbl	HydroSource relational table between the HS_EF_Plant and HS_EF_Reservoir layers.

Entity-Relationship Diagram

Relationships are mapped among data components.



Crosswalk to External Sources

Various linkages are established within the HydroSource Data Model, Version 1 for cross-walking data to key external data sources.

HydroSource data component	Crosswalk ID	External source	Source description
HS_EF_Dam	FcDAMS_ID	SO_FERC	The Federal Energy Regulatory Commission's (FERC) FERC DAMS Database (nonpublic), FERC eLibrary, and FERC Form 1.
HS_EF_Plant	FcDocket		
HS_Mitigation			
HS_PPA	*FcForm1ID		
HS_EF_Plant	EIA_PtID	SO_EIA	Forms 860, 906, 920, and 923 from the Energy Informaiton Administration (EIA).
HS_EF_Unit	EIA_UnID		
HS_EF_Dam	NID_ID1	SO_NID	The National Inventory of Dams' (NID) congressionally authorized database documenting dams in the United States and its territories. NID is maintained and published by the US Army Corps of Engineers (USACE) and contains information about dam's location, size, purpose, type, last inspection and regulatory facts.
HS_NPD_Dam			
HS_RefurbUpgrade	IIR_PtID	SO_IIR	Industrial Info Resources (IIR) Database containing information on power, energy, and industrial infrastructure markets.
HS_EF_Turbine	IIR_TiID		
HS_FleetIntel	EUCG_ID	SO_EUCG	The Electric Utility Cost Group's (EUCG) Hydroelectric Productivity Committee (HPC) Database containing hydropower performance and cost data.
HS_FleetIntel	hydroAMP_ID	SO_hydroAMP	Hydropower Asset Condition Assessments (hydroAMP) from the US Bureau of Reclamation (USBR) and USACE.
HS_mResFlowline	COMID	SO_NHDPlus	The National Hydrography Dataset Plus (NHDPlus) is a geospatial. hydrologic framework dataset built by the US Environmental Protection Agency's (EPA) Office of Water, assisted by the US Geological Survey.
HS_HUC_8	HUC_8		
HS_HUC_6	HUC_6		
HS_HUC_2	HUC_2	SO_WBD	The Watershed Boundary Dataset (WBD) defines the areal extent of surface water drainage to a point, accounting for all land and surface areas.
HS_HUC_8	HUC_8	SO_NRCS	Watershed boundary data generated by the Natural Resources Conservation Service (NRCS).
HS_FleetIntel	*GADS_ID	SO_GADS	Reliability information for total unit and major equipment groups from the North American Electric Reliability Corporation's (NERC) Generating Availability Data System (GADS).

Legend

HydroSource data component type

- Geospatial point layer
- Geospatial polyline layer
- Geospatial polygon layer
- Nonspatial table
- Timeseries
- Relational table

Entity relationship

- One to one (and only one)
- One to zero or one
- One to many

Crosswalk source type

- Public
- Public and nonpublic
- Nonpublic
- Potential future linkage

*This schematic diagram was designed for planning purposes only, prior to the development of the HydroSource Database. A new diagram version will be released in the future to reflect the schema of the final database as implemented.

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