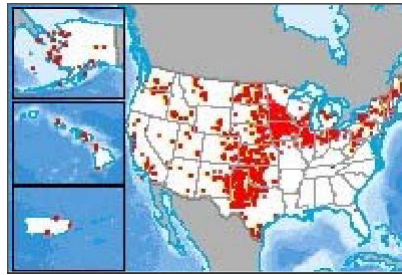# Wind Turbines - Existing

Tags
turbine, energy, shapefile, renewable, wind turbine, wind farm, wind facility, database, turbine characteristics, verified, USWTDB, national, wind, USGS, LBNL, AWEA

Summary

The purpose of this information is to provide a regularly updated, publicly available, spatially referenced, national dataset made up almost entirely of utility-scale wind turbine locations and their technical specifications. An appropriate use of the data would be for scientific analysis, research or for general interest for the public. Identification of turbines that have been retrofitted, repowered, decommissioned, and/or removed is a continual ongoing effort; thus, the dataset may contain turbines that were previously verified and subsequently removed.

Description

This dataset provides locations and technical specifications of wind turbines in the United States, almost all of which are utility-scale. Utility-scale turbines are ones that generate power and feed it into the grid, supplying a utility with energy. They are usually much larger than turbines that would feed a homeowner or business. The regularly updated database has wind turbine records that have been collected, digitized, and locationally verified. Turbine data were gathered from the Federal Aviation Administration's (FAA) Digital Obstacle File (DOF) and Obstruction Evaluation Airport Airspace Analysis (OE-AAA), the American Wind Energy Association (AWEA), Lawrence Berkeley National Laboratory (LBNL), and the United States Geological Survey (USGS), and were merged and collapsed into a single data set. Verification of the turbine positions was done by visual interpretation using high-resolution aerial imagery in ESRI ArcGIS Desktop. A locational error of plus or minus 10 meters for turbine locations was tolerated. Technical specifications for turbines were assigned based on the wind turbine make and models as provided by manufacturers and project developers directly, and via FAA datasets, information on the wind project developer or turbine manufacturer websites, or other online sources. Some facility and turbine information on make and model did not exist or was difficult to obtain. Thus, uncertainty may exist for certain turbine specifications. Similarly, some turbines were not yet built, not built at all, or for other reasons cannot be verified visually. Location and turbine specifications data quality are rated and a confidence is recorded for both. None of the data are field verified.

Credits

Credit to cooperative agreement and collaboration between the U.S. Geological Survey, the Lawrence Berkeley National Laboratory, and the American Wind Energy Association to compile and release these data.

Use limitations

Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data on any other system or for general or scientific purposes, nor shall the

act of distribution constitute any such warranty.

Extent
   West -171.713074   **East**   144.722656
   North   66.839905   **South**   13.389381

Scale Range
   Maximum (zoomed in)   1:5,000
   Minimum (zoomed out) 1:150,000,000

ArcGIS Metadata

Topics and Keywords

   * CONTENT TYPE   Downloadable Data

Citation

   TITLE Wind Turbines - Existing

   PRESENTATION FORMATS   * digital map

Resource Details

   DATASET LANGUAGES   * English (UNITED STATES)
   SPATIAL REPRESENTATION TYPE   * vector
   * PROCESSING ENVIRONMENT   Version 6.2 (Build 9200) ; Esri ArcGIS 10.6.1.9270
   CREDITS
      Credit to cooperative agreement and collaboration between the U.S. Geological Survey, the Lawrence Berkeley National Laboratory, and the American Wind Energy Association to compile and release these data.

   ARCGIS ITEM PROPERTIES
      * NAME windmill_windmotor_site_windfarm_usgs_v4
         * ACCESS PROTOCOL Local Area Network

Extents

   EXTENT
     GEOGRAPHIC EXTENT
       BOUNDING RECTANGLE
         EXTENT TYPE   Extent used for searching
         * WEST LONGITUDE -171.713074
         * EAST LONGITUDE 144.722656
         * NORTH LATITUDE 66.839905

         * SOUTH LATITUDE 13.389381
         * EXTENT CONTAINS THE RESOURCE Yes

   EXTENT IN THE ITEM'S COORDINATE SYSTEM
         * WEST LONGITUDE -19115011.960228
         * EAST LONGITUDE 16110452.372170
         * SOUTH LATITUDE 1504253.414626
         * NORTH LATITUDE 10110596.985745
         * EXTENT CONTAINS THE RESOURCE Yes

Resource Constraints

Spatial Reference

ARCGIS COORDINATE SYSTEM

* TYPE Projected
* GEOGRAPHIC COORDINATE REFERENCE GCS_WGS_1984
* PROJECTION WGS_1984_Web_Mercator_Auxiliary_Sphere
* COORDINATE REFERENCE DETAILS

PROJECTED COORDINATE SYSTEM

WELL-KNOWN IDENTIFIER 102100
X ORIGIN -22041257.77387803
Y ORIGIN -30241100
XY SCALE 144148035.89861274
Z ORIGIN -100000
Z SCALE 10000
M ORIGIN -100000
M SCALE 10000
XY TOLERANCE 0.001
Z TOLERANCE 0.001
M TOLERANCE 0.001
HIGH PRECISION true
LATEST WELL-KNOWN IDENTIFIER 3857
WELL-KNOWN TEXT PROJCS["WGS_1984_Web_Mercator_Auxiliary_Sphere",GEOGCS ["GCS_WGS_1984",DATUM["D_WGS_1984",SPHEROID ["WGS_1984",6378137.0,298.257223563]],PRIMEM["Greenwich",0.0],UNIT ["Degree",0.0174532925199433]],PROJECTION["Mercator_Auxiliary_Sphere"],PARAMETER ["False_Easting",0.0],PARAMETER["False_Northing",0.0],PARAMETER ["Central_Meridian",0.0],PARAMETER["Standard_Parallel_1",0.0],PARAMETER ["Auxiliary_Sphere_Type",0.0],UNIT["Meter",1.0],AUTHORITY["EPSG",3857]]

REFERENCE SYSTEM IDENTIFIER

* VALUE 3857
* CODESPACE EPSG
* VERSION 8.8(9.3.1.2)

Spatial Data Properties

VECTOR

* LEVEL OF TOPOLOGY FOR THIS DATASET   geometry only

GEOMETRIC OBJECTS

FEATURE CLASS NAME windmill_windmotor_site_windfarm_usgs_v4

* OBJECT TYPE   point
* OBJECT COUNT 60576

ARCGIS FEATURE CLASS PROPERTIES

FEATURE CLASS NAME windmill_windmotor_site_windfarm_usgs_v4

* FEATURE TYPE Simple
* GEOMETRY TYPE Point
* HAS TOPOLOGY FALSE
* FEATURE COUNT 60576
* SPATIAL INDEX TRUE
* LINEAR REFERENCING FALSE

Distribution

Fields

DETAILS FOR OBJECT windmill_windmotor_site_windfarm_usgs_v4 ►
* TYPE Feature Class
* ROW COUNT 60576
DEFINITION
Table containing attribute information associated with the data set.

DEFINITION SOURCE
Producer defined

FIELD OBJECTID
* ALIAS OBJECTID
* DATA TYPE OID
* WIDTH 4
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
Internal feature number.

* DESCRIPTION SOURCE
Esri

* DESCRIPTION OF VALUES

Sequential unique whole numbers that are automatically generated.

FIELD Shape
* ALIAS Shape
* DATA TYPE Geometry
* WIDTH 0
* PRECISION 0
* SCALE 0
* FIELD DESCRIPTION
Feature geometry.

* DESCRIPTION SOURCE
Esri

* DESCRIPTION OF VALUES
Coordinates defining the features.

FIELD case_id
* ALIAS case_id
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0
FIELD DESCRIPTION
unique stable identification number

DESCRIPTION SOURCE
Producer defined

RANGE OF VALUES
MINIMUM VALUE 3000001
MAXIMUM VALUE 3093501
UNITS OF MEASURE 1

FIELD faa_ors
* ALIAS faa_ors
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0
FIELD DESCRIPTION
faa unique identifier for each turbine for cross-reference to the faa digital obstacle files (faa

dof)

DESCRIPTION SOURCE

FAA, https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dof/

DESCRIPTION OF VALUES

identifier with the first two digits indicating a state, then a dash, with a sequential number

following; "missing" records are ones with no known DOF identifier

FIELD faa_asn

* ALIAS faa_asn
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

faa obstruction evaluation airport airspace analysis (oe-aaa) aeronautical study number (asn)

DESCRIPTION SOURCE

FAA, https://oeaaa.faa.gov/oeaaa/external/public/publicAction.jsp

DESCRIPTION OF VALUES

year-region-number-case type (faa regional boundaries id across the country such as: AAL, ACE, AEA, AGL, ANE, ANM, ASO, ASW, AWP, WTE and WTW) (case types: Nonrule Making Airport. (NRA), Nonrule (NR), or an Obstruction Evaluation (OE) study; "missing" records are those with no known asn value

FIELD usgs_pr_id

* ALIAS usgs_pr_id
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

unique, stable object number for cross-reference to a prior dataset

DESCRIPTION SOURCE

USGS https://doi.org/10.5066/F7251G8Q

DESCRIPTION OF VALUES

unique, stable object number for cross-reference to the USGS Onshore Industrial Wind Turbine Locations for the United States 2013 and 2014 products; -9999 values were not part of the referenced dataset, from the USGS https://doi.org/10.5066/F7251G8Q

FIELD t_state

* ALIAS t_state
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

state where turbine is located

DESCRIPTION SOURCE

U.S Census https://www.census.gov/geo/maps-data/data/cbf/cbf_state.html

CODED VALUES

NAME OF CODELIST US Postal 2-Letter State
SOURCE US Census / US Postal Service (http://www.census.gov/tiger/tms/gazetteer/zips.txt)

FIELD t_county

* ALIAS t_county
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION

county or county equivalent where turbine is located

DESCRIPTION SOURCE

U.S Census https://www.census.gov/geo/maps-data/data/cbf/cbf_counties.html

County or county equivalent, based on spatial join of turbine points with US state and county shapefile

FIELD t_fips ▶
* ALIAS t_fips
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
state and county fips where turbine is located, based on spatial join of turbine points with US state and county shapefile.

DESCRIPTION SOURCE
U.S. Census

CODED VALUES
NAME OF CODELIST FIPS Code (5-Digit State &; County ID)
SOURCE US Census / US Postal Service (http://www.census.gov/tiger/tms/gazetteer/zips.txt)

FIELD p_name
* ALIAS p_name
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
name of the wind power project that the turbine is a part of

DESCRIPTION SOURCE
Producer defined

DESCRIPTION OF VALUES
Project names are typically provided to AWEA by the developer; some names are identified from other internet resources, and others are created by the authors to differentiate them from previous projects. If no project name can be identified via these methods, authors assigned one based on the county where the turbines are located.

FIELD p_year
* ALIAS p_year
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
Year the wind power project became operational and began providing power. In some cases, the year is estimated based on the year the turbine was erected, which will precede when it became operational, and sometimes fall in the preceding year; -9999 values are unknown

DESCRIPTION SOURCE
Producer defined

RANGE OF VALUES
MINIMUM VALUE 1981
MAXIMUM VALUE 2019
UNITS OF MEASURE Year

FIELD p_tnum
* ALIAS p_tnum
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
number of turbines in the wind power project

DESCRIPTION SOURCE
Producer defined

RANGE OF VALUES
MINIMUM VALUE 1
MAXIMUM VALUE 1722
UNITS OF MEASURE Count

FIELD p_cap
* ALIAS p_cap
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
cumulative capacity of all turbines in the wind power project, in megawatts (MW); -9999 values are unknown

DESCRIPTION SOURCE
Producer defined

RANGE OF VALUES
MINIMUM VALUE 0.05
MAXIMUM VALUE 495.01
UNITS OF MEASURE Megawatts

FIELD t_manu
* ALIAS t_manu
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
turbine manufacturer - name of the original equipment manufacturer of the turbine

DESCRIPTION SOURCE
Producer defined

DESCRIPTION OF VALUES
E.g., Vestas, Siemens, Suzlon, etc.; "missing" values are unknown

FIELD t_model
* ALIAS t_model
* DATA TYPE String
* WIDTH 254
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
turbine model - manufacturer's model name of each turbine

DESCRIPTION SOURCE
Producer defined

DESCRIPTION OF VALUES
E.g., 1.5SLE, V100_1.8, Z50, etc.; "missing" values are unknown

FIELD t_cap
* ALIAS t_cap
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0

FIELD DESCRIPTION
Turbine rated capacity in kilowatt (kW). The manufacturer's stated output power at rated wind speed. Data from AWEA, manufacturer data, and/or other internet resources; -9999 values are unknown values are unknown

DESCRIPTION SOURCE
  Producer defined

RANGE OF VALUES
  MINIMUM VALUE 50
  MAXIMUM VALUE 6000
  UNITS OF MEASURE kilowatt

FIELD t_hh
  * ALIAS t_hh
  * DATA TYPE Double
  * WIDTH 8
  * PRECISION 0
  * SCALE 0

  FIELD DESCRIPTION
  turbine hub height in meters (m). Data from AWEA, manufacturer data, and/or other
  internet resources; -9999 values are unknown

  DESCRIPTION SOURCE
  Producer defined

  RANGE OF VALUES
  MINIMUM VALUE 18.2
  MAXIMUM VALUE 130
  UNITS OF MEASURE meter

FIELD t_rd
  * ALIAS t_rd
  * DATA TYPE Double
  * WIDTH 8
  * PRECISION 0
  * SCALE 0

  FIELD DESCRIPTION
  turbine rotor diameter in meters (m); -9999 values are unknown

  DESCRIPTION SOURCE
  Producer defined

  RANGE OF VALUES
  MINIMUM VALUE 17
  MAXIMUM VALUE 150
  UNITS OF MEASURE meter

FIELD t_rsa
  * ALIAS t_rsa
  * DATA TYPE Double
  * WIDTH 8
  * PRECISION 0
  * SCALE 0

  FIELD DESCRIPTION
  turbine rotor swept area square meters (m^2); -9999 values are unknown, calculated as
  3.14159 (([rotor_dia] /2)*([rotor_dia] /2)

  DESCRIPTION SOURCE
  Producer defined

  RANGE OF VALUES
  MINIMUM VALUE 95.03
  MAXIMUM VALUE 17671.46
  UNITS OF MEASURE square meter

FIELD t_ttlh
  * ALIAS t_ttlh
  * DATA TYPE Double
  * WIDTH 8
  * PRECISION 0
  * SCALE 0

  FIELD DESCRIPTION
  turbine total height - height of entire wind turbine from ground to tip of a vertically extended
  blade above the tower. Computed as the hub height plus half of the rotor diameter, in

meters, when t_hh and t_rd are non-missing. Otherwise, the total height as provided by the FAA DOF or FAA OE/AAA is used, which can be considered a maximum height; -9999 values are unknown

DESCRIPTION SOURCE
Producer defined

RANGE OF VALUES
MINIMUM VALUE 26.7
MAXIMUM VALUE 198.1
UNITS OF MEASURE meter

FIELD t_conf_atr
* ALIAS t_conf_atr
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0
FIELD DESCRIPTION
Level of confidence in the turbine's attributes, from low to high

DESCRIPTION SOURCE
Producer defined

LIST OF VALUES
VALUE 1
DESCRIPTION no confidence: no information found
ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

VALUE 2
DESCRIPTION partial confidence: incomplete information or discrepancies across data sources or other issues found
ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

VALUE 3
DESCRIPTION full confidence: consistent information across multiple data sources
ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

FIELD t_conf_loc
* ALIAS t_conf_loc
* DATA TYPE Double
* WIDTH 8
* PRECISION 0
* SCALE 0
FIELD DESCRIPTION
Level of confidence in turbine location, from low to high

DESCRIPTION SOURCE
Producer defined

LIST OF VALUES
VALUE 1
DESCRIPTION no confidence: nothing on image, image has clouds, never built, previously removed, needs newer imagery
ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

VALUE 2
DESCRIPTION partial confidence: image shows developed pad with base and/or turbine parts on ground
ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

VALUE 3
DESCRIPTION full confidence: image shows an installed turbine or tower being constructed, the tower is least partially present with neighboring turbine constructed
ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

FIELD t_img_date
   * ALIAS t_img_date
   * DATA TYPE Date
   * WIDTH 8
   * PRECISION 0
   * SCALE 0
   FIELD DESCRIPTION
      date of image used to visually verify turbine location (note if NAIP is the image source the
      month and day were set to 01/01)
   DESCRIPTION SOURCE
      Producer defined

   RANGE OF VALUES
      MINIMUM VALUE 1/1/2006
      MAXIMUM VALUE 8/27/2019
      UNITS OF MEASURE date

FIELD t_img_srce
   * ALIAS t_img_srce
   * DATA TYPE String
   * WIDTH 254
   * PRECISION 0
   * SCALE 0

   FIELD DESCRIPTION
      source of image used to visually verify turbine location

   DESCRIPTION SOURCE
      Producer defined

   LIST OF VALUES
      VALUE Bing Maps Aerial
      DESCRIPTION ESRI ArcMap Base maps, available from ESRI ArcMap
      ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

      VALUE Digital Globe
      DESCRIPTION Digital Globe EV WebHosting Imagery from evwhs.digitalglobe.com
      ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

      VALUE Google Earth
      DESCRIPTION Google Earth
      ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

      VALUE NAIP
      DESCRIPTION National Agriculture Imagery Program County Mosaics from
      https://datagateway.nrcs.usda.gov/
      ENUMERATED DOMAIN VALUE DEFINITION SOURCE Producer defined

FIELD xlong
   * ALIAS xlong
   * DATA TYPE Double
   * WIDTH 8
   * PRECISION 0
   * SCALE 0
   FIELD DESCRIPTION
      current longitude of the turbine point, in decimal degrees calculated in Arc Map using GCS:
      North American 1983 (NAD 83)
   DESCRIPTION SOURCE
      Producer defined

   RANGE OF VALUES
      MINIMUM VALUE -171.713074
      MAXIMUM VALUE 144.722656
      UNITS OF MEASURE decimal degrees

FIELD ylat
  * ALIAS ylat
  * DATA TYPE Double
  * WIDTH 8
  * PRECISION 0
  * SCALE 0
  FIELD DESCRIPTION
  current latitude of the turbine point, in decimal degrees calculated in Arc Map using GCS: North American 1983 (NAD 83)

  DESCRIPTION SOURCE
  Producer defined

  RANGE OF VALUES
    MINIMUM VALUE 13.389381
    MAXIMUM VALUE 66.839905
    UNITS OF MEASURE decimal degrees

OVERVIEW DESCRIPTION
  ENTITY AND ATTRIBUTE OVERVIEW
  None

  ENTITY AND ATTRIBUTE DETAIL CITATION
  The entity and attribute information was generated by the individual and/or agency identified as the originator of the data set. Please review the rest of the metadata record for additional details and information.

Metadata Details

  * METADATA LANGUAGE English (UNITED STATES)
  SCOPE OF THE DATA DESCRIBED BY THE METADATA   * dataset
  SCOPE NAME   * dataset
  * LAST UPDATE 2019-10-25
  ARCGIS METADATA PROPERTIES
    METADATA FORMAT ArcGIS 1.0
    METADATA STYLE FGDC CSDGM Metadata
    STANDARD OR PROFILE USED TO EDIT METADATA FGDC
    CREATED IN ARCGIS FOR THE ITEM 2019-10-25
    LAST MODIFIED IN ARCGIS FOR THE ITEM 2019-10-25
    AUTOMATIC UPDATES
      HAVE BEEN PERFORMED Yes
      LAST UPDATE 2019-10-25
    ITEM LOCATION HISTORY
      ITEM COPIED OR MOVED 2019-10-03
        FROM D:\TURBINE\2019q3\uswtdb_v2_2_20191004_FGDC
        TO \\gs.doi.net\DenverCO-g_gecsc\gecsc\ProjectWorkspace\WindEnergy\TurbineMapping\uswtdb_v2_2_20191004\uswtdb_v2_2_20191004_FGDC