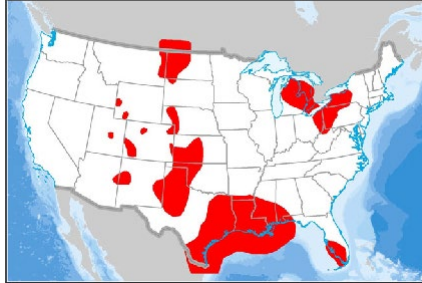


Bedded Salt Formation



Tags

Geology, Bedded Salt, Formation, Compressed Air Energy Storage, CAES, Air, High Pressure, United States, North America

Summary

Bedded salt formations can be used in Compressed Air Energy Storage (CAES) systems. Electricity is used to inject high pressure air into these underground bedded salt formations. CAES uses off-peak generation to compress air adiabatically — using coolers to remove the heat caused by compression — into a reservoir located either below-ground (focus of this effort) or aboveground. When the peak builds, the compressed air is released (much like the water in a pumped hydro system), heated (the exhaust from a standard combustion turbine) and passed through an expansion turbine to drive the generator. When demand for electricity is high, the high pressure air is released from the underground cavern and used to help power natural gas-fired turbines. When demand is low or the generation potential is high, utilities can run compressors and pump air into a cavern or vessel at 750 psi. When the price of electricity goes up - the compressed air is preheated (with a natural gas fired burner) and the air is then used. The pressurized air allows the turbines to generate electricity using significantly less natural gas, in most cases as little as 1/3 the natural gas that would otherwise be required. CAES is also appropriate for load-leveling because it can be constructed in capacities of a few hundred MW and can be discharged over long (4-24 hours) periods of time. The most typical plant size demonstrated to date is around 220 MW with multiple units constructed when greater generation is required.

Description

The geographic location of possible bedded salt formations in the United States.

Credits

Cavern Roof Stability for Natural Gas Storage in Bedded Salt: DeVries, K., Mellegard, K., Callahan, G., and Goodman, W. (2005) DE-FG26-02NT41651. Available at http://204.154.137.14/technologies/oil-gas/publications/Storage/41651_FinalReport.pdf.

Use limitations

Acknowledgment of the Cavern Roof Stability for Natural Gas Storage in Bedded Salt Report and Oak Ridge National Laboratory.

Extent

West -111.413376 **East** -75.692888
North 50.252839 **South** 24.668032

Scale Range

Maximum (zoomed in) 1:5,000
Minimum (zoomed out) 1:50,000,000

ArcGIS Metadata

Topics and Keywords

THEMES OR CATEGORIES OF THE RESOURCE boundaries, location

* CONTENT TYPE Downloadable Data
EXPORT TO FGDC CSDGM XML FORMAT AS RESOURCE DESCRIPTION No

PLACE KEYWORDS United States, North America

THEME KEYWORDS Geology, Bedded Salt, Formation, Compressed Air Energy Storage, CAES, Air, High Pressure

Citation

* TITLE bedded_salt_formation_v2
PUBLICATION DATE 2012-07-05 00:00:00

PRESENTATION FORMATS * digital map

Citation Contacts

RESPONSIBLE PARTY
ORGANIZATION'S NAME Oak Ridge National Laboratory
CONTACT'S ROLE originator

Resource Details

DATASET LANGUAGES * English (UNITED STATES)
DATASET CHARACTER SET utf8 - 8 bit UCS Transfer Format

SPATIAL REPRESENTATION TYPE * vector

* PROCESSING ENVIRONMENT Version 6.2 (Build 9200) ; Esri ArcGIS 10.8.1.14362

CREDITS

Cavern Roof Stability for Natural Gas Storage in Bedded Salt: DeVries, K., Mellegard, K., Callahan, G., and Goodman, W. (2005) DE-FG26-02NT41651. Available at http://204.154.137.14/technologies/oil-gas/publications/Storage/41651_FinalReport.pdf.

ARCGIS ITEM PROPERTIES

* NAME bedded_salt_formation_v2
* SIZE 0.005
* LOCATION
* ACCESS PROTOCOL Local Area Network

Extents

EXTENT

GEOGRAPHIC EXTENT

BOUNDING RECTANGLE

EXTENT TYPE Extent used for searching
* WEST LONGITUDE -111.413376
* EAST LONGITUDE -75.692888
* NORTH LATITUDE 50.252839
* SOUTH LATITUDE 24.668032
* EXTENT CONTAINS THE RESOURCE Yes

EXTENT IN THE ITEM'S COORDINATE SYSTEM

- * WEST LONGITUDE -12402480.255644
- * EAST LONGITUDE -8426093.703595
- * SOUTH LATITUDE 2835024.644836
- * NORTH LATITUDE 6490178.737019
- * EXTENT CONTAINS THE RESOURCE Yes

Resource Points of Contact

POINT OF CONTACT

INDIVIDUAL'S NAME Olufemi A. Omitaomu
ORGANIZATION'S NAME Oak Ridge National Laboratory
CONTACT'S POSITION Research Scientist, Critical Infrastructure and Climate Change Research
CONTACT'S ROLE resource provider

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CITY Oak Ridge
ADMINISTRATIVE AREA TN
POSTAL CODE 37831-6165
COUNTRY US

Resource Maintenance

RESOURCE MAINTENANCE

UPDATE FREQUENCY not planned

Resource Constraints

CONSTRAINTS

LIMITATIONS OF USE

Acknowledgment of the Cavern Roof Stability for Natural Gas Storage in Bedded Salt Report and Oak Ridge National Laboratory.

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 bedded_salt_formation_v2
- * OBJECT TYPE composite
 - * OBJECT COUNT 13

ARCGIS FEATURE CLASS PROPERTIES

- FEATURE CLASS NAME bedded_salt_formation_v2
- * FEATURE TYPE Simple
 - * GEOMETRY TYPE Polygon
 - * HAS TOPOLOGY FALSE
 - * FEATURE COUNT 13
 - * SPATIAL INDEX TRUE
 - * LINEAR REFERENCING FALSE

Distribution

DISTRIBUTION FORMAT

- * NAME File Geodatabase Feature Class

TRANSFER OPTIONS

- * TRANSFER SIZE 0.005

Fields

DETAILS FOR OBJECT bedded_salt_formation_v2

- * TYPE Feature Class
- * ROW COUNT 13

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 Id

- * ALIAS ID
- * DATA TYPE Integer
- * WIDTH 4
- * PRECISION 0
- * SCALE 0
- * FIELD DESCRIPTION
Attribute ID

FIELD Perimeter

- * ALIAS Perimeter
- * DATA TYPE Double
- * WIDTH 8
- * PRECISION 0
- * SCALE 0
- * FIELD DESCRIPTION
Perimeter

FIELD Area

- * ALIAS Area
- * DATA TYPE Double
- * WIDTH 8
- * PRECISION 0
- * SCALE 0
- * FIELD DESCRIPTION
Area

FIELD Shape_Length

- * ALIAS Shape_Length
- * DATA TYPE Double
- * WIDTH 8
- * PRECISION 0
- * SCALE 0
- * FIELD DESCRIPTION
Length of feature in internal units.

- * DESCRIPTION SOURCE
Esri

- * DESCRIPTION OF VALUES
Positive real numbers that are automatically generated.

FIELD Shape_Area

- * ALIAS Shape_Area
- * DATA TYPE Double
- * WIDTH 8
- * PRECISION 0
- * SCALE 0
- * FIELD DESCRIPTION
Area of feature in internal units squared.

- * DESCRIPTION SOURCE
Esri

- * DESCRIPTION OF VALUES
Positive real numbers that are automatically generated.

OVERVIEW DESCRIPTION

ENTITY AND ATTRIBUTE OVERVIEW

The data was generated by georeferencing image (static) data areas from multiple sources.

Metadata Details

- * METADATA LANGUAGE English (UNITED STATES)
- * METADATA CHARACTER SET utf8 - 8 bit UCS Transfer Format

SCOPE OF THE DATA DESCRIBED BY THE METADATA * dataset

SCOPE NAME * dataset

* LAST UPDATE 2021-10-19

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 2021-10-06 11:06:20
LAST MODIFIED IN ARCGIS FOR THE ITEM 2021-10-19 10:53:21

AUTOMATIC UPDATES

HAVE BEEN PERFORMED Yes
LAST UPDATE 2021-10-19 10:53:07

Metadata Contacts

METADATA CONTACT

INDIVIDUAL'S NAME Kevin Hlava
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CONTACT'S POSITION GIS Assistant/Specialist
CONTACT'S ROLE point of contact

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COUNTRY US

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Metadata Maintenance

MAINTENANCE

UPDATE FREQUENCY not planned