7.20 Energy resources

Definition:

(INSPIRE, 2007) Energy resources including hydrocarbons, hydropower, bio-energy, solar, wind, etc., where relevant including depth/height information on the extent of the resource.

Description:

Pan-European, national or local initiatives on mapping occur, resulting from governmental initiatives or private interests. There is a main distinction between fossil fuels and renewable energy resources. The concept of energy resources provides focus to the resource aspect and the extent/distribution of the resources. Thus, the technical constructions for abstraction, transport and treatment are not covered by this theme. However they are to a large extent covered in other themes, such as production and industrial facilities. Energy use, e.g. petrol consumption, is not covered by this theme. Licence areas, permission areas or planning areas linked to energy resource exploitation is covered by the theme "Area management/restriction/regulation zones and reporting areas".

The term resource can be problematic to define, the quantification and thus location of a resource is depending on the technical and economic situation. Resource aspects should not only be restricted to the resources under utilisation, but should also include un-utilised resources.

Fossil fuel resources include

- Oil accumulation: hydrocarbot fields, petroleum volumes
- Natural gas accumulations, including solid methane clathrates
- Coal, lignite or peat deposits
- Uranium ore deposits

For these resources the nature, location and 3D geometry of the deposit (= geological resource) of the deposit, the nature of the economic energy carrier and the size of the reserves at a point in time are key attributes.

The different kinds of renewable energy resources may include:

- **Hydropower:** Water resources especially mapped according to energy potential. Commonly undertaken in the MS, carried out by governmental bodies or private firms.
- **Bio-energy resources:** Forest resources, “scrap” forest, cereals or agricultural residues can be used for energy purposes, e.g. in the form of firewood or biodiesel. The resources or supply is sometimes being estimated and mapped.
- **Wind energy:** Country inventories of wind energy is being done in areas where wind is being utilised or planned utilised. Estimated by wind measurement together with topographical information. Example: http://www.nve.no/vindatlas/
- **Geothermal energy:** The Earth's natural heat flow is of high interest as a renewable and clean energy source. Mapping of the resource can be available or relevant at local, regional or national levels. A Pan-European Atlas was published in 2002 by the EC (see reference materials). Geothermal energy systems use the natural heat of the subsoil by utilising warm groundwater from surficial deposits for direct heating or electricity generation (open system). Alternatively, shallow geothermal flows are exploited by ground source heat pumps (closed system). Common heat sources in bedrock or subsoil may be utilized - a circulation of an antifreeze solution in collector hoses which are lowered into relatively shallow boreholes bedrock or circulation of ground water from deep boreholes in bedrock. Heat pumps are suitable, too, for example for extraction of heat from air, rivers, seas and artificial components**.**

- **Solar power and resources:** In order to reduce the need for extra heating solar conditions at local sites are important to bring into account in local planning. National, regional and local inventories on solar energy conditions is needed, relating to heating needs. Systems for storing solar heat is found at some locations. Solar resources may also be used in electricity production, through the use of solar cell technology (silicium cells). Air-based heat pumps can use solar energy stored in the air.
- **Other energy resources such as waves, currents etc.:** The different kinds of renewable energy resources is long. The list above is only giving some examples.

The quantification of the resources may be aggregated or detailed. The detailed information is to a large extent private business information. This includes for instance data about the internal structure of geological structures within oil fields. Within the INSPIRE context the data in question will mainly be aggregation and overview data. However, for public planning purposes at the local level detailed information about some of the renewable energy resources may be relevant.

The geographical representation of the resources (objects) may be different in different scales. In the mapping and exploitation of the resources 2-d (ordinary maps) and 3-d geographical data are being used. Resources may be mapped by natural boundaries. Aggregated or overview information can be referring to grid cells in a geographical grid system, administrative units/areas, statistical units/areas or points.

Scope, use examples:

Digital energy resource data can be used in different settings

- in management of resources and exploitation activities
- in EU policy development and regional policies
- in strategic work and resources planning
- in land use and urban planning
- in environmental impact assessments
- as input-data in assessments of state of the environment, e.g. modelling of future emissions, pressure and sustainability

Important feature types and attributes:

Some energy resources, such as oil or hydropower can be localised quite distinctly, while other resources, such as solar resources or wind resources based on point measurements are modelled/interpolated into "continuous" area and 3D-objects,

Energy resource object (2D or 3D-volumes)

- resource type (oil, gas, wind,..)
- name (place/location name)
- id
- quantifitation
    - volume
    - date of quantification

Water catchment area
- id
- average runoff

Administrative/ statistical unit
- resource type (oil, gas, wind…)
- quantification
    - amount
    - date of quantification

Grid cell
- resource type (oil, gas..)
- name
- id
- quantifitation
    - volume
    - date of quantification

Links and overlaps with other themes:

- Grids
- Administrative units
- Geology
- Statistical units
- Hydrography
- Soil (e.g. coal, peat)
- Land use
- Production and industrial facilities, area management/ restriction/regulation and reporting units
- Oceanographical geographical features
- Mineral resources

Reference documents:

Energistics , Formerly, the Petrotechnical Open Standards Consortium (POSC), The mission of Energistics is to deliver to the upstream oil and gas industry the means to produce, deploy and maintain common information and data standards. http://www.energistics.org/posc/Overview.asp?SnID=912544453 (formerly http://www.posc.org and http://w3.posc.org/xxxx)

Geowissenschaftliche Karten der Bundesrepublik Deutschland, 1 : 2 000 000 – Kohlereviere, Hannover 2006 / Geoscientific MAps of te hFEderal Republic of Germany, 1 : 2 000 000 – Coal Mining Districts

http://www.esa.int/esaEO/SEM9BL3VQUD_economy_0.html

http://www.esa.int/esaEO/SEMM8L3VQUD_economy_0.html

http://gis2.rrc.state.tx.us/public/

http://www.ppdm.org/standards/model/

http://www.etpsmr.org/ to the reference documents

Hurter, S. & Haenel, R. (2002): Atlas of Geothermal Resources in Europe. - 93pp, 88 plates, ISBN 92-828-0999-4, CG-NA-17-811-EN-C; Luxemburg (Office for Official Publications of the European Communities)

INSPIRE IMS: Implementation Strategy Issues - Data requirements. 2003.

INSPIRE position paper: Environmental and thematic data. 2002.

INSPIRE scoping paper, 2004.

Norwegian feature catalogue, specification and data model on oil/gas: URL:
http://www.statkart.no/sosi/UMLfullmodell/Petroleum/Petroleum.htm

PRODML (Production XML) Standards for Production Optimization: This standard is currently used by over 60 E&P companies, service industries and governmental agencies. http://www.prodml.org/ http://www.energistics.org/posc/Production_Stds.asp?SnID=1369808806

The Dutch Mining Act, Mining Decree and Mining Regulations. May be of use for the EU community of Energy Regulating authorities. Operators must obtain a variety of permits for oil and gas exploration and production. Summary of the permitting procedures, including an overview of pertinent legislative articles and different reports standards required:
http://dinolks01.nitg.tno.nl/dinoLks/NLOGPortal.jsp
http://dinolks01.nitg.tno.nl/dinoLks/delfstoffen/index.html

Wagner H, Tiess G, Nielsen K, Solar S, Hamor T, Ike P, Vervoort A, Espi JA, Agiountantis Z, Koziol W, Bauer V, 2005: Minerals planning policies and supply practices in Europe. Montanuniversität Leoben (At)

Wellsite Information Transfer Standard Markup Language WITSML: Developed by the WITSML project, an oil industry initiative sponsored by BP and Statoil, and later by Shell, as a new standard for drilling information transfer This standard is currently used by over 60 E&P companies, service industries and governmental agencies. http://www.witsml.org/