DATA BASE DESCRIPTION AND RESEARCH METHODOLOGY
UDI WORLD ELECTRIC POWER PLANTS DATA BASE

The UDI World Electric Power Plants Data Base (WEPP) is a global inventory of electric generating units. It contains design data for power plants of all sizes and technologies operated by regulated utilities, private power companies, and industrial autoproducers in every country in the world.

The first WEPP precursor was a U.S. utility-owned power plant data set started in 1978 at the Atomic Industrial Forum with joint funding from the U.S. Department of Energy and the Utility Water Act Group (UWAG). Overseas power plant data base development began at UDI in 1984 and the first international plant directory was published in 1990.

The WEPP is re-issued on a quarterly basis by the UDI Products Group of Platts, the energy information division of The McGraw-Hill Companies, Inc.

FORMAT

The WEPP is sold in flat-file DBF format. The file can imported into Access or other data-management software by specifying "dBase" as the file type. Due to the size of the file, it does not completely load in Excel spreadsheet software. Separate regional subsets with identical field structures have been created: these can be used directly in Excel.

The WEPP data file directory including field names, types, lengths, and a brief content description is maintained as a separate document.

DATA BASE ORGANIZATION

Information in the WEPP data base is included at the company, plant, and unit levels. Company data include the company name, electric type, and business type (see next section). There are three electric types:

U = regulated utility, also includes most capacity owned by government ministries, agencies, and departments

A = autoproducer, typically an industrial or commercial enterprise generating its own electricity without off-site energy sales

P = private or independent power plant (IPP) developer, also includes utility-built capacity sold to third parties and so-called merchant plants

Plant data include the city, state or province, country, geographic area, and subregion. For plants in North America, the North American Electric Reliability Council (NERC)

region is identified.

Most territories and other dependencies are treated in the data base as separate countries. In some instances, the country names contain an area designator to assist in sorting, for example, UK/SCOTLAND.

Unit data include unit name, operating status, capacity (MWe), year-on-line, primary and alternate fuels, equipment vendors for the boiler (or reactor), turbine and/or engine, and generator/alternator, steam conditions, pollution control equipment, and cooling system data. Turbine type or model number is given where known.

Two types of electric power plants are excluded from the data base: most reciprocating (IC) engines or gas turbines identified in primary sources as "emergency," "standby," or "backup," and all power generating equipment on offshore oil and gas production platforms.

The file includes all other known electric power plants. Due to the difficulty of data collection and compilation, coverage for wind turbines, IC engines, solar systems, fuel cells, and mini- and micro-hydro units is considered representative, but is not comprehensive in many countries. Data for deactivated and retired units are included if available, but data for cancelled units are not included in the commercial data table.

Mechanical-drive steam or gas turbines and reciprocating engines are not included in the WEPP, nor are district heating plants without electricity output.

BUSINESS TYPES AND CLASSIFICATIONS

The field BUSTYPE includes a primary business classification plus a secondary descriptor. The primary business classifications include COMM, ENERGY, FUELS, GOVT, MFG, SVCS, UTIL OTHER, and UTIL.

The secondary or functional descriptor provides additional details for the power plant operating companies. Under COMM (commercial), for example, are such establishments as greenhouses and hospitals, while MFG (manufacturing) companies include cement and building materials, pulp and paper, metals plants, textiles, and other manufacturing enterprises, ENERGY has coal, oil and gas, and so on. There are approximately 70 different primary + secondary business combinations represented in the data base.

UNIT CONFIGURATION AND CODING CONVENTIONS

With the exceptions noted below, the WEPP data base includes information on a generating unit basis whenever possible. A unit is usually the prime mover and may be termed a set, block, or section in other sources.

- ✓ For typical steam-electric plants, a unit is comprised of a steam generator (boiler or reactor), a steam turbine, and a generator. In a few instances, a single boiler or reactor drives two identical T/G sets. These are treated as single units in the data base.

- ✓ For simple-cycle gas turbines, a unit consists of the gas turbine (GT) and generator. Two turbines sharing a single generator are treated as one record. Note that *gas turbine* and *combustion turbine* are considered synonymous in the data base.

- ✓ Combined-cycle units, cogeneration units, and combined heat-and-power (CHP) units typically add a fired or unfired waste heat recovery steam generator (HRSG) behind a gas turbine. The HRSG may in turn drive a steam turbine or may only generate process steam or heat for heating or industrial applications. HRSG supplier is generally not listed unless there is steam production for a steam-electric turbine-generator set (also see below under “Repowering”).

- ✓ Combined-cycle units are typically built in configurations abbreviated as 1+1, 2+1, 3+1, or 4+1. The 2+1 configuration, for example, includes two GTs plus two HRSGs plus one steam turbine. Gas turbines and steam turbines in combined-cycle are shown with UTYPE of GT/C and ST/C, respectively. Single-shaft combined-cycle units have a gas turbine and a steam set driving the same generator and are given their own abbreviation in the data base (CCSS).

- ✓ In hydroelectric plants, a unit is considered to be a hydraulic turbine and a generator. If two turbines drive a single generator, this is considered as a single unit.

- ✓ For internal combustion (IC) units (reciprocating gas and diesel engines), a unit is an engine and a generator/alternator. In many cases, waste-heat is taken off IC engines for district heating or other purposes (cogeneration), and, in a few cases, this is used to generate steam and drive steam-turbines in combined-cycle. Both instances are coded separately.

- ✓ For micro-turbine plants, the "unit" record consists of gas turbines of the same model installed at the same time. If known, the number of machines is indicated in the unit name (for example, Microturbine Plant GT 1-12).

- ✓ For wind energy plants, the "unit" record consists of wind turbine generators (WTG) of the same model installed at the same time. If known, the number of machines is indicated in the unit name (for example, Wind Plant WTG 1-8). There are frequently series of WTGs of different size, design, and ownership installed at the same site and these are usually listed separately (also see below under “Power Producer Names.”).

✓ Photovoltaic (PV) plants and fuel cells (FC) are not unitized although installations of different vintage or with different suppliers may be listed separately. PV capacity is peak electric output.

UNIT NAMES

The assignment of unit names often differs from country to country but, in any case, unit numbers in the WEPP are typically those assigned by the plant operator to the prime movers or assigned by UDI to the prime movers on a sequential basis.

Electric utilities use both a unit numbering scheme (1, 2, etc) and an alphabetic scheme (Block A, B, etc). Further complicating the matter is the use of letters to indicate the development of new unit series at existing sites -- Plant "A1" and "A2" followed by Plant "B1" or such schemes as Plant "One", Plant "Two", Plant "New", Plant-1, Plant-2, etc. Some countries use both a letter designation (indicating a fundamental change in design) and a sequential unit numbering scheme.

Where specific unit names are not available, the location or a operator acronym is usually used as the plant and unit. Note too that many power plants have both formal and informal names, the former often being a person's name, for example, and the latter the name of the locality. The WEPP usually uses the formal plant name, but often indicates another name in common usage.

If exact unit names are not known, but a particular number of units are known to be in service, this is shown as, for example, PLANT NAME 1&2. Plant data are unitized whenever possible with the exceptions noted above.

Absence of a unit designation indicates that it is not known whether the generating capacity shown represents one or more than one individual unit. In some cases, research has established the presence of existing capacity of unspecified configuration to which new equipment has been added. In these instances, the original plant record may be shown as PLANT NAME (A) with the plant extension shown in unitized form PLANT NAME B1, PLANT NAME B2, etc.

With very rare exceptions, periods and commas are not used in WEPP company or plant names, nor are foreign letters.

Plant names may be changed when the operator changes the name, to clarify distinctions between similar plants, or to preserve the plant’s unique identification in the data base.

By convention, gas turbine unit names in the data base usually include the designation "GT", steam turbines in combined-cycle show "SC" prefixes, diesels show "IC", fuel cells have "FC", photovoltaic systems show "PV", and wind turbines "WTG".

POWER PRODUCER NAMES

Where possible, the full name of utilities, autoproducers, or private-power companies are used. Otherwise, names are abbreviated to fit data base coding conventions.

Many wind turbines – particularly in Europe – have been installed by individuals or local associations as part of larger installations. In the WEPP data bases, these are often "rolled-up" into plant-level operating entities.

In addition to wind turbines, mini- and micro-hydroelectric plants, and diesel engines are often installed by individuals or small private companies of various kinds. If the specific identity of the owner cannot be established, the operating company may be shown as "XXX Hydro Project," "XYZ Plant," and so on. There are also plants shown with operator "ZZ/Unidentified."

GENERATING CAPACITY AND RATINGS

The WEPP capacity value is preferentially gross megawatts electrical (MWe). In many cases, no defined value is available so the data base includes whatever value is included in the primary source documentation. If re-rating data are available after a unit is modernized or otherwise modified, new capacity values are entered in the data base without making any changes to service year or suppliers.

REPOWERING

Existing generating equipment and ancillary equipment are often reused as part of the power plant development process. This activity is difficult to track in the data base and the unit coding scheme has evolved over time.

For thermal plants, existing steam-electric turbine generator sets may be partially or completely repowered. In partial repowering, one or more new boilers or one or more new gas turbines are installed with one or more HRSGs and the resulting steam flow is added to steam from an existing conventional boiler to drive the steam set. In this case, the steam turbine/generator (T/G) set is essentially unchanged and the WEPP data base record for this machine is left with the existing data for year-on-line and steam conditions.

In full repowering, the existing boiler is removed or disconnected from the rest of the steam-cycle equipment and is replaced by one or more new boilers (such as fluidized-bed equipment) or HRSGs. There are then two possibilities for the existing steam T/G set -- it either remains generally as it was before or the machine is substantially modified during the repowering development. In the former case, the data for the steam set is left as-is and the new boiler data is added to the data base record. If, on the other hand, there has been a substantial modification, for example, steam T/G set power output is substantially less than before, the existing T/G data record is shown as

“retired” and a new record is added.

The names of repowered plants may include the phrase "REPOWER."

For hydroelectric plant repowering, the same general approach is used. In cases where new mechanical and/or electrical equipment is used in existing civil works, the old unit records are retired and replaced by new records. The names of the new records typically include the phrases "NEW" or "REBUILD". If existing machinery is refurbished but otherwise left largely unchanged, the existing data is maintained as-is.

N/A AND NOT APPLICABLE

Throughout the data base, "N/A" is used to indicate "not applicable" in alphanumeric fields. Blanks in alphanumeric fields indicate data are "not available". Blanks in numeric fields may indicate missing data or not applicable.

SERVICE DATES

Unit-specific data obtained from power companies or other industry sources are used as the primary determinant of the year of commercial operation.

In cases where only main equipment order dates are available for larger steam-electric and hydraulic units, the data base has a year-in-service date of three years after the order date. For gas turbines, the data base uses a two-year construction duration estimate. For engines and small hydro units, service year is assumed to be order or delivery year. Such estimates are always replaced by the results of direct survey or by the use of data from other primary sources.

GEOGRAPHIC INFORMATION

To the extent possible, the formal names for states, provinces, counties, etc., are used according to data published by the Universal Postal Union. City and country names are those in common usage. The geographic information fields are being retroactively populated as research time permits.

FUEL DESCRIPTORS, EQUIPMENT VENDORS, AND OTHER DATA

Data base coding and abbreviating conventions are reflected in an extensive List of Abbreviations. This is included with the data base documentation.

ID NUMBERS

The ID numbers on a company, location, and unit basis are data base counting fields assigned to uniquely identify each entity and do not link to any other data source or contain any other information. They are fixed once assigned.

DATA SOURCES

Power plant data are obtained from direct surveys, power company financial and statistical reports, vendor reference lists, press releases, and the trade and business press. Primary sources such as surveys and materials directly produced by owners, operators, and suppliers are used preferentially:

- The most reliable information on new power plants is obtained by direct survey. Unit-specific surveys and queries are sent on a continuing basis to utilities, autoproducers, private-power companies, and suppliers around the world.

- Annual reports, statistical supplements, web pages, and public relations materials provided by power plant operators or equipment and service suppliers are also primary documentation.

- Experience lists (also termed reference or installation lists) are a third primary data source. Over 200 equipment and service suppliers have provided their lists to UDI. Data extracted from the lists are manually cross-checked against existing records in the data base and other sources to minimize duplication.

- Trade and business press sources include articles from newspapers and magazines, press releases, papers from professional meetings, yearbooks and directories, and clippings from newsletters and newspapers. Oftentimes, such references provide only one piece of information for a power plant or generating unit, but these references are usually reliable and timely.

ACKNOWLEDGMENTS AND CONTACT

The assistance of the organizations that provided surveys, reports, and other data is gratefully acknowledged. Any data base corrections or updates are welcome and should be directed to Christopher Bergesen, Editorial Director, UDI Products, in Platts' Washington, DC offices (fax: 202-942-8789; email: udi@platts.com).

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