

ICS 35.020
CCS L 97



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 37947.4-2024

**Information technology - Energy consumption monitoring
system of energy user - Part 4: Collection of energy varieties**

信息技术 用能单位能耗在线监测系统 第4部分:能源品种采集

Issued on: July 24, 2024

Implemented on: February 1, 2025

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

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1 Scope

The document lays down the energy varieties and collection items of the energy consumption on-line monitoring system of the energy user, and the requirements for collecting energy data.

It applies to the design, the development, the operation and the acceptance of such systems and to the collection of the data related to each category of energy.

The normative references are GB 17167 on the provision and management of energy metering instruments at the energy user, GB/T 19582 in all its parts on industrial automation networks based on the Modbus protocol, GB/T 29871 on the general data interface protocol for energy metering instruments, GB/T 30094 on industrial Ethernet switches, GB/T 37947.3-2024 on basic information and format, and DL/T 645 on the communication protocol for multi-function watt-hour meters.

3 Terms and definitions

3.1 industrial control system: a system made up of industrial process control components and of process control components for real-time data acquisition and supervision, with the same note on core components as in Part 3.

3.2 production monitoring management system: a real-time system that links the production control system and the related auxiliary systems into one whole through a communication network and that, on the basis of real-time data acquisition from the production process,

combines real-time process monitoring and analysis, optimizing control and management of the production process.

3.3 management information system: an information software system that embodies most of the management functions of the energy user and supplies real-time, relevant, accurate and complete data as a basis for management decisions.

3.4 data acquisition: the process of obtaining the data held in sensors, energy metering instruments, industrial control systems, production monitoring management systems and management information systems.

3.5 device: the end device deployed at the energy user that collects, analyses and aggregates the user's data and uploads them to the system platform.

4 Energy varieties and collection items

4.1 Energy varieties. By physical form and by way of metering, the energy the system deals with falls into five groups: electricity, heat, solid energy, gaseous energy and liquid energy. Electricity and heat are single varieties; the other three groups each contain several. Table 1 then names seventy-one individual varieties and gives a short definition for each.

The coal varieties run from mixed raw coal, entered where the coal fed to the furnace is a blend of two or more raw coals that cannot be monitored separately, through raw coal, anthracite, coking bituminous coal, general bituminous coal and lignite, then washed coal with its coking and power-use grades, other washed coal with middlings and slime, coal products with briquette, pulverized coal and coal water slurry, coke and semi-coke, and the other coking products, coal tar and crude benzene among them.

The manufactured and natural gases follow: coke oven gas, blast furnace gas, converter gas, producer gas, semi-coke oven gas, calcium carbide furnace gas, pyrolysis gas and other coal gases; then natural gas, gas field gas, associated gas and liquefied natural gas, defined as gaseous natural gas turned liquid on cooling at atmospheric pressure to about minus 162 degrees C; then coal bed methane, hydrogen and other fuel gases.

The petroleum varieties run from crude oil through gasoline, kerosene, diesel oil, fuel oil, liquefied petroleum gas, refinery dry gas, naphtha, lubricating oil, paraffin wax, solvent oil, petroleum coke, petroleum asphalt, coal tar pitch, asphalt and other petroleum products.

The remaining varieties are heat, defined as the hot water and the superheated or saturated steam that can serve as a heat source; electricity, with the subclasses thermal, hydro, nuclear, other renewable, waste incineration and waste heat and waste pressure generation; then coal gangue used as fuel, municipal solid waste used as fuel, biomass residues used as fuel with straw, firewood, biogas and other residues, waste heat and waste pressure, other industrial residues used as fuel, and other fuels.

4.2 Energy collection items. Data are collected so as to obtain the consumption, output and

external supply of each category of energy at the user. Steam of every kind has to be converted and aggregated into heat data by the monitoring end device before upload. Where the coefficient for converting an energy variety to standard coal differs from the national standard value and the user is equipped to test it, the actual coefficient has to be uploaded. The codes of the collected data items have to conform to Clause 8 of GB/T 37947.3-2024.

5 Energy data collection

5.1 Ways of collecting energy data. Collection has to be accurate, complete and truthful. The routes are ranked from highest to lowest priority as management information system, production monitoring management system, industrial control system, field instrument and manual entry. The monitoring end device obtains data through a communication interface with the user's own systems, may read field metering instruments automatically at the interval set by the collection task, and falls back on manual entry for data that cannot be obtained automatically.

5.2.1 Metering instruments. A field energy metering instrument that has to carry a communication interface has to meet at least one of GB/T 19582 in all its parts, GB/T 29871 and DL/T 645, or else provide an analogue or pulse output. Table 2 pairs each form of energy with the instruments used: electricity with watt-hour meters, wattmeters, voltmeters, ammeters, instrument transformers and timers; heat with heat meters, steam flowmeters and pressure and temperature instruments; gaseous energy with gas flowmeters of the velocity, differential pressure, positive displacement, mass, laser Doppler and variable area kinds together with pressure and temperature instruments; liquid energy with liquid flowmeters, level gauges, water meters and pressure and temperature instruments; and solid energy with truck scales, track scales, belt weighers, rotary weighers, nuclear scales, hopper scales and pressure-resistant coal feeders. The last three rows carry a remark that the same instruments serve for the energy-carrying media in the matching physical state.

5.2.2 Requirements for collection. Electricity data on purchase, consumption, output and external supply may be collected from smart watt-hour meters with a communication interface and sent to the end device by wire or wirelessly. Heat, gaseous, liquid and solid energy follow the same pattern at the inlet or outlet of the pipe or at the weighing point: where the instrument gives only an analogue or pulse output, an integrator has to be added to obtain the accumulated value, and where neither is available the user has to replace the instrument with a smart one before collection. As to the coefficients for conversion to standard coal, the principle is to keep as close to the actual situation as possible: a user equipped to test reports its own value or draws it from its management information system, and a user not so equipped may report the value from the assay report of a qualified third party. Where no coefficient is uploaded, the system analyses and calculates with the value

laid down in GB/T 37947.3-2024.

5.3 Requirements for system interfacing. Where the management information system or the resource planning system of the user holds energy consumption data, the data should be obtained through the matching interface; the same holds for the production monitoring management system; and where an industrial control system is installed and already holds the energy data, the data may be obtained from it by the matching means.

5.4 Requirements for data quality. Quality control has to reach four effects: completeness, the data collected covering the elements the data rules require, so that what has to be collected is collected; accuracy, the data being the user's true data and reflecting its true energy consumption; consistency, the data not conflicting with the data used in other given contexts, and, where collection passes through a security gateway, the internal and external databases staying consistent after any resumption from a break point; and timeliness, updates being completed within the prescribed cycle.

Errors are governed as follows: the provision, accuracy and management of energy metering instruments have to conform to GB 17167; the delay and packet loss rate of automatically collected and transmitted data have to conform to GB/T 30094; and the significant figures of the collected data have to meet Clause 9 of GB/T 37947.3-2024.

As to the collection cycle, the cycle may be set according to the actual application; data collected from the user's energy metering instruments are required at a cycle of 15 min; data collected from the user's information systems should be collected as close as possible to the rate at which those systems generate the data, with a cycle of 15 min at the shortest and 1 d at the longest; and data not collected automatically on line are collected and uploaded according to the specific requirements of their use, under the corresponding standards or the rules of the competent authorities.