

Energy Consumption

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Discussion

Energy Consumption is [Resource Consumption](#) concerning the amount of energy used by a subject while performing specified activities under specified conditions.

Energy Consumption can apply to:

- A [Candidate Solution](#)
- A [Distributed System](#)
- A [Node](#)
- A Qualified Node
- A [Node Set](#)
- A service
- A software component
- A hardware component
- An [Execution Facility](#)
- An [Operational Resource](#)
- A [Test Environment](#)
- A [Test Run](#)
- Another subject using energy

Energy Consumption can include energy used by:

- Processors
- Memory
- Storage devices
- Network devices
- Cooling systems
- Power-conversion systems
- Physical Deployment Targets
- Supporting Operational Resources
- Another included facility or component

Energy Consumption can identify:

- The evaluated subject
- The specified activity
- The applicable workload
- The applicable [Configuration](#)
- The included components and facilities
- The excluded components and facilities
- The measurement starting event
- The measurement completion event
- The measurement interval

- The applicable energy source
- The measurement method
- The measurement location
- The measurement unit
- The required measurement precision
- The permitted tolerance
- The applicable normalization method
- The applicable DIDO [Baseline](#)
- The applicable [Validation Criteria](#)
- The applicable [Acceptance Criteria](#)
- Its [Evidence](#)
- Its [Provenance](#)
- Its [Traceability](#)

Energy Consumption can be expressed as:

- Total energy used
- Average power over a specified interval
- Maximum power
- Energy used per transaction
- Energy used per request
- Energy used per Test Run
- Energy used per Node
- Energy used per unit of processed data
- Energy used per unit of completed work
- Another value established by the Acceptance Criteria

Definition

[Resource Consumption](#) concerning the amount of energy used by a subject while performing specified activities under specified conditions

Source

Adapted from:

- [ISO/IEC 25010:2023, Systems and software Quality Requirements and Evaluation \(SQuaRE\) — Product quality model](#)
- [ISO/IEC 25023:2016, Systems and software Quality Requirements and Evaluation \(SQuaRE\) — Measurement of system and software product quality](#)
- [Resource Consumption](#)
- [Performance Efficiency](#)
- DIDO Reference Implementation Conceptual Model
- DIDO-TE draft Requirements Register

This definition specializes Resource Consumption for energy used during DIDO and DIDO-TE operations.

Note

Energy Consumption differs from power:

- Energy Consumption identifies energy used over an interval
- Power identifies the rate at which energy is used at a time or over an interval

Energy Consumption differs from Energy Efficiency:

- Energy Consumption identifies the amount of energy used
- Energy Efficiency relates useful work or another outcome to the energy used

Lower Energy Consumption does not necessarily indicate greater [Performance Efficiency](#) when the subject also completes less work or provides lower performance.

Energy Consumption comparisons require equivalent or normalized:

- Workloads
- Completed work
- Test Environments
- Configurations
- Included facilities
- Measurement intervals
- Measurement methods

The applicable Acceptance Criteria should identify whether Energy Consumption includes supporting facilities such as:

- Cooling
- Storage
- Networking
- Power conversion
- Replication
- Backup systems

An Energy Consumption measurement should not combine measured and estimated values without identifying:

- Which values were measured
- Which values were estimated
- The estimation method
- The uncertainty associated with the estimate

Example

DIDO-TE evaluates three Candidate Solutions using the same workload, Test Environment, Configuration, and measurement interval.

For each Candidate Solution, DIDO-TE records:

- Total energy used
- Average power
- Maximum power
- Transactions completed
- Energy used per transaction

The comparative evaluation uses the normalized Energy Consumption measurements to compare the Candidate Solutions.

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