# 26-11001

## Public Utilities Commission of Nevada
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Filed For: Green Recursive Utility Service LLC

In accordance with NRS Chapter 719,
this filing has been electronically signed and filed
by: /s Nick Cordova

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This filing has been electronically filed and deemed to be signed by an authorized agent or
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Green Recursive Utility Service LLC

**FILED WITH THE PUBLIC UTILITIES COMMISSION OF NEVADA - 11/23/2026**

**GREEN RECURSIVE UTILITY SERVICE LLC**
**205 E 3rd St, Weatherford, TX 76086**

November 22, 2026

Public Utilities Commission of Nevada

Re: Docket No. 26-11001 — Petition of Green Recursive Utility Service LLC for rulemaking to adopt GRUS-STD-60084

Dear Commission:

Petitioner Green Recursive Utility Service LLC submits this supplement to its petition in Docket No. 26-11001, filed October 30, 2026, and amended by the cure filing of November 7, 2026.

The petition identifies the proposed standard by title, edition, and digital object identifier (GRUS-STD-60084 v2.0-U, Uniform Edition, DOI 10.5281/zenodo.23246001), but the full text of the standard did not accompany the petition. So that the complete text is of record in this docket, Petitioner submits the full text of GRUS-STD-60084 v2.0-U (Uniform Edition), all 72 pages, immediately following this letter as Exhibit A.

This supplement changes no part of the petition's requested relief. It completes the record with the document the petition incorporates.

Respectfully submitted,

/s/ Nick Cordova

Nick Cordova, Principal

Green Recursive Utility Service LLC

management@greenrecursiveutilityservice.org · 817-404-6379

**UNIFORM EDITION — FOR ADOPTION BY ANY JURISDICTION**

GRUS-STD-60084

v2.0-U · UNIFORM EDITION

# Measurement and Reporting of Resource Consumption by Large Computational Loads

*Proposed new* J-3 RULE DESIGNATION _____ *— Measurement and Reporting of Resource Consumption by Large Computational Loads*

Submitted for adoption to J-1 ADOPTING AUTHORITY _____
pursuant to J-4 PROCEDURAL ROUTE _____

**Green Recursive Utility Service LLC** · Nicholas Wray Cordova, Principal
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Uniform Edition issued 7 October 2026 · CC0 1.0 Universal Public Domain Dedication
The same standard as GRUS-STD-60084 v2.0, doi:10.5281/zenodo.23072905, of record in Project No. 60084

## Document Control

| | |
|---|---|
| **Document** | Measurement standard proposed for adoption as a rule of general applicability by the authority entered at J-1 ADOPTING AUTHORITY, under the procedural provision entered at J-4 PROCEDURAL ROUTE. |
| **Proposed rule** | New J-3 RULE DESIGNATION, *Measurement and Reporting of Resource Consumption by Large Computational Loads*. Designation subject to assignment by the adopting authority; placement proposed adjacent to the large-load interconnection rule entered at J-7 IMPLEMENTING RULE. |
| **Standard number** | **GRUS-STD-60084.** This document is that standard, in its uniform edition, and carries the same number for that reason. The Texas instance is GRUS-STD-60084 v2.0, of record in Project No. 60084 and deposited at doi:10.5281/zenodo.23072905. This is GRUS-STD-60084 v2.0-U. The suffix designates the uniform edition and nothing else; it does not designate a different standard, a successor standard, or a revision of the engineering content. |
| **Source** | GRUS-STD-60084 v2.0, *The Measurement Standard for Large Computational Loads*. This edition converts that document to jurisdiction-neutral form. No substantive position, formula, constant, classification, boundary, method, evidence grade, or definition has been removed, condensed, altered, or withdrawn. |
| **What differs** | This edition differs from GRUS-STD-60084 v2.0 in one respect only. Wherever that document cites a provision of the law of a particular jurisdiction, this edition states a numbered jurisdictional entry in its place, with the governing default and a description of what the entry receives. Every engineering quantity is identical in both documents. |
| **Entries** | Forty-two numbered jurisdictional entries, J-1 ADOPTING AUTHORITY through J-42 COUNSEL REVIEW, scheduled in full below. Each entry carries a stated default. An entry left blank takes its default, and the standard remains operable. No entry reaches any classification, identity, constant, boundary, method, evidence grade, or defined term. |
| **Markup convention** | Text proposed for adoption appears in bordered blocks labeled **RULE TEXT PROPOSED FOR ADOPTION**. Material outside those blocks is basis and justification and is not proposed for adoption. Where the adopting authority requires additions to be marked, the entire section is new and is marked by underlining in its entirety; no strikethrough appears. |
| **Severability** | Each subsection is drafted to stand independently. The adopting authority may adopt any subsection, or any combination, without adopting the remainder. Subsection (n) so provides. An undeclared jurisdictional entry falls to its default and does not affect any subsection. |
| **Incorporation** | Annexes A through J and Exhibits 1 through 5 are incorporated by reference at subsection (m) and are reproduced in full at the end of this document. |
| **Neutrality** | The measurement specifications use only published, vendor-neutral figures and off-the-shelf instrumentation. No proprietary mechanism is required to comply. No vendor, utility, or verifier holds any exclusive position under the proposed rule. The author seeks no exclusive role. |
| **License** | The author places this document, the proposed rule text, and the incorporated technical appendix in the public domain under the CC0 1.0 Universal Public Domain Dedication. Adoption requires no license from, no notice to, and no permission of the author, and confers no exclusive right upon the author. |

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## How to Read This Standard

Parts I through III state the purpose, the statutory frame, and the reason self-reporting cannot satisfy an audit of resource consumption. Part IV supplies the engineering basis for the classification framework — the two axes against which any facility is read — stated entirely from published, vendor-neutral figures so that it can be applied by any reviewer without access to proprietary data.

Part V is the proposed rule. Each subsection appears in a bordered block as proposed rule text, followed by its basis in ordinary type. The bordered blocks, taken together and in order, are the complete proposed text of the section. Nothing outside a bordered block is proposed for adoption.

Part VI explains why each subsection is part of the measurement rather than an addition to it. Part VII is the request. The Technical Annexes are incorporated by reference at subsection (m) and are not appendices of convenience. Annex I in particular states every formula used anywhere in this document, together with the worked arithmetic, so that any reviewing engineer can reproduce or refute each number without contacting the author.

**How the jurisdictional entries work.** Everywhere this standard would otherwise cite the law of one jurisdiction, it states a numbered entry instead — J-1 ADOPTING AUTHORITY through J-42 COUNSEL REVIEW — followed by a ruled space and, in parentheses, a description of what the space receives. The Schedule immediately below lists every entry once, with its default, so the adopting authority may complete the Schedule in a single pass and need not search the document for the spaces. Completing the Schedule completes the standard. A space left blank takes the default stated for it in the Schedule.

The entries are closed in number and closed in kind. No entry alters a classification on either axis, a measurement boundary, a formula, a physical constant, an instrument accuracy requirement, an evidence grade, or a defined term, for the reason stated at the end of the Schedule: those are not matters of law.

## Schedule of Jurisdictional Entries

**What this Schedule is, in plain terms.** This standard is written to be adopted by any jurisdiction. The science in it does not change from one jurisdiction to the next, because the latent heat of vaporization of water does not change at a state line. What changes is the law: which agency holds authority, what minimum water pressure is codified, at how many megawatts the rule attaches, what counts as one service connection.

Rather than write one jurisdiction's statutes into the text and force every other jurisdiction to find and replace them, this standard states a **numbered entry** at each of those points — forty-two of them, numbered `J-1` through `J-42`. An entry is a labeled blank line with a stated default. The adopting authority writes its own provision on the line. Nothing else in the standard moves.

**Each entry carries its label wherever it appears.** In the body of the document an entry looks like this:

**J-13** **DESIGN PRESSURE** _____

The black tab is the entry number, for cross-reference to this Schedule. The grey tab says what the entry is. The rule is where the citation or value goes. A parenthetical after it, where one appears, states exactly what to write. No reader has to turn back to this page to learn what an entry means.

**Twenty-two of the forty-two carry a working default**, taken from published engineering consensus rather than from any one jurisdiction — 35 psi, 20 psi, 1.5 gpm per connection, 0.6 gpm, 200 gallons, 75 megawatts, 36 months, and the rest, each shown in the Default column below. **A line left blank takes its default, and the standard still operates.** Subsection (n) of the rule text says so. That is what separates this Schedule from a form with holes in it.

**No entry reaches the engineering.** Not a classification on either axis, not a measurement boundary, not a formula, not a physical constant, not an instrument accuracy class, not an evidence grade, not a defined term. The closing box of this Schedule lists what is fixed and cannot be varied by any entry on it.

The adopting authority completes this Schedule. Each entry receives the citation, name, or value indicated in the description column. An entry for which the jurisdiction has no corresponding provision or body is completed *none*; an entry the jurisdiction adopts at its stated default is completed *default adopted* or left blank.

Jurisdiction: _____ Date: _____
Completed by: _____ Title: _____
Body: _____

### Group A — The adopting authority and the instrument

| Entry | Receives | Description — what is entered in the space | Default | Value entered |
|---|---|---|---|---|
| J-1 | Adopting authority | The name of the commission, agency, board, or body adopting this standard. | No default | |
| J-2 | General rulemaking authority | The provision conferring general rulemaking authority on the body at J-1. | No default | |
| J-3 | Rule designation | The code title, chapter, and section number the adopted rule will occupy. | No default | |
| J-4 | Procedural route | The provision under which a rule of general applicability is proposed, petitioned for, or initiated in this jurisdiction. | No default | |
| J-5 | Large-load interconnection statute | The statute establishing interconnection standards for large electric loads, including any site-control, disclosure, study, or cost-contribution obligation. | No default | |
| J-6 | Applicability threshold | The aggregate electrical demand at a single site at which this standard attaches, in megawatts. | **75 MW** | |
| J-7 | Implementing interconnection rule | The administrative rule implementing the statute at J-5, including any fee or financial-security provision. | No default | |
| J-8 | Interconnection cost-allocation statute | The provision assigning interconnection and infrastructure cost to the load causing it. | No default | |
| J-9 | Grid operator | The balancing authority, transmission provider, independent system operator, or regional transmission organization serving the jurisdiction, and the provision certifying or establishing it. | No default | |
| J-10 | Existing usage-reporting requirement | Any survey, inventory, registration, or reporting requirement already applicable to computational facilities in the jurisdiction, with its compliance record if known. | None | |
| J-11 | Audit or verification directive | Any executive order, legislative directive, or agency order requiring verification or audit of computational-facility resource consumption, with its date. | None | |
| J-34 | Rate standard | The provision requiring rates to be just and reasonable and prohibiting unreasonable discrimination among customer classes. | No default | |
| J-35 | Large-load demand management | Any provision authorizing demand management, curtailment, or load-shed obligations for large loads. | None | |
| J-36 | Construction of “shall” | The provision of the jurisdiction's statutory construction law governing the mandatory sense of “shall.” | Mandatory | |
| J-37 | Public comment | The provision governing the public comment period on a proposed rule. | No default | |
| J-40 | Open cost proceeding | Any pending proceeding in which large-load cost allocation is under consideration. | None | |

## Group B — Water system authority and the integrity floors

The defaults in this group are those of the *Recommended Standards for Water Works* published by the Great Lakes — Upper Mississippi River Board, the engineering consensus from which most jurisdictional water-system standards in the United States derive, with 40 CFR Part 141 as the federal floor. A jurisdiction entering a different value cites the provision supplying it.

| | | | | |
|---|---|---|---|---|

| Entry | Receives | Description — what is entered in the space | Default | Value entered |
|---|---|---|---|---|
| J-12 | Point-of-use submetering authority | The provision recognizing or authorizing a submeter installed downstream of a master meter to measure a defined use. | Installed by agreement with the supplying system | |
| J-13 | Design pressure provision | The provision requiring the distribution system to be *designed* to a stated minimum pressure at all points. | **Not less than 35 psi** | |
| J-14 | Design flow per connection | The per-connection flow rate at which the design pressure at J-13 must be maintained at all points. | **1.5 gpm per connection** | |
| J-15 | Combined fire and drinking flow | The minimum residual pressure required at all points under combined fire and drinking-water flow conditions. | **20 psi** | |
| J-16 | Operating pressure provision | The provision requiring the system to be *operated* at a stated minimum pressure under normal conditions, and at a stated minimum during emergencies. | **35 psi normal; 20 psi emergency** | |
| J-17 | Minimum capacity provision | The provision stating minimum source, service-pump, and storage capacity per connection by system category. | **0.6 gpm production; 200 gal total storage; 100 gal elevated storage, or 20 gal pressure-tank capacity where the jurisdiction permits one; 2.0 gpm service pump — each per connection** | |
| J-18 | Definition of a connection | The provision defining a service connection, and whether any service-unit equivalency or demand-based conversion applies to a high-consumption non-residential customer. | **Each commercial or industrial establishment supplied is one connection; no demand-based equivalency applies** | |
| J-19 | Metered-history alternative | The period of metered operational history required before a demonstrated maximum daily demand may be substituted for the per-connection capacity figures at J-17. | **36 consecutive months** | |
| J-20 | Engineering plan submittal | The provision requiring plans and specifications for water system facilities to be prepared under the direction of a licensed professional engineer and submitted for review in advance of the approval sought, with the submittal interval. | **Prepared under the direction of a licensed professional engineer, sealed, signed, dated, and submitted in advance of the approval sought** | |
| J-21 | Public notification on pressure loss | The provision stating the precautionary and public-notification obligations that attach on loss of pressure below the operating floor at J-16. | Notification required | |
| J-24 | Drinking water authority | The body holding jurisdiction over public drinking water systems. | No default | |
| J-25 | Wastewater authority and permits | The body receiving wastewater discharge and the provisions governing discharge permitting. | No default | |
| J-26 | Surface-water authority | The body holding jurisdiction over surface-water appropriation and the provisions governing it. | No default | |
| J-27 | Groundwater authority | The body holding jurisdiction over groundwater production, where one exists, and the provisions governing it. | None | |
| J-28 | Reclaimed water | The provisions authorizing the reuse of treated effluent. | None | |

| | | | | |
|---|---|---|---|---|
| J-33 | Regional water planning | The body conducting regional or state water planning and the provisions governing it, with the planning horizon. | None | |
| J-38 | Drought and curtailment stages | The framework establishing drought contingency stages applicable to industrial and commercial use. | None | |
| J-39 | Emergency power delivery | The per-connection flow the system must deliver at stated pressures on loss of normal power. | **0.35 gpm per connection** | |
| J-41 | Public water system identifier | The identifier scheme by which a public water system is designated in the jurisdiction. | No default | |

### Group C — The verifier, land use, and counsel

| Entry | Receives | Description — what is entered in the space | Default | Value entered |
|---|---|---|---|---|
| J-22 | Verifier independence standard | The provision of the jurisdiction's own law establishing that a third-party verifier is qualified by reason of facilities, personnel, experience, demonstrated reliability, and independence of judgment. | **ISO/IEC 17020 and ISO/IEC 17025 impartiality and independence requirements** | |
| J-23 | Verifier attestation criteria | The provision stating what an independent verifier must attest on application or approval. | **The four attestations at subsection (g)(2)(A) through (D)** | |
| J-29 | Zoning authority | The body holding jurisdiction over land use and zoning at a site, and the provisions governing it, including any requirement that zoning conform to a comprehensive plan providing for water and sewer. | No default | |
| J-30 | Subdivision and county development | The provisions governing subdivision platting and development approval outside municipal limits. | No default | |
| J-31 | Tax abatement | The provisions governing property tax abatement or incentive agreements. | None | |
| J-32 | Emergency services district | The provisions governing emergency services districts and their fire-protection obligations. | None | |
| J-42 | Counsel review | The description of counsel qualified to perform the legal review flagged at Annex F.1, point 10. | **Qualified utility or water counsel licensed in the jurisdiction** | |

**What is not a jurisdictional entry.** The following are normative and fixed, and no entry on this Schedule varies them: every workload class W-1 through W-3 and every cooling class C-1 through C-5; the automatic reclassification rule; the transport boundary M2 and the fence meter M1; the Two-Meter Method; every identity, constant, and derivation in Annex I, including the heat identity $Q = P \times 3{,}412{,}142$ BTU/hr per MW, the latent heat $h_{fg} \approx 1{,}050$ BTU/lb, the density of water 8.34 lb/gal, and the resulting evaporation rate of 389.6 gal/hr per MW rejected; the psychrometric formulation of Annex I.2 and its six coefficients; the airflow relation of Part IV.B and its air-density constant; the load-factor test of subsection (d)(2) and its threshold of 0.95; the solids balance of Annex I.3 and the relations for blowdown, drift and makeup; the psychrometric matrix of Annex B; the heat-transfer boundary specifications of Annex C and the forensic rules at C.6; the air-cooling limit of 25 to 30 kW per rack; the instrument accuracy requirements of subsections (f) and (i); the evidence grades of subsection (k); and every term defined at subsection (c) and Annex J.

These do not vary because they are not matters of law. A jurisdiction cannot legislate the latent heat of vaporization of water, and no jurisdiction has tried.

No filing with, notice to, or permission from the author is required to complete, adopt, reproduce, translate, incorporate by reference, or rely upon this Schedule or this standard. The author retains no exclusive role in its use, adoption, administration, or verification, and no provision of it confers one.

## Part I — Purpose and Statutory Frame

**Procedural posture.** This document requests adoption of a rule of general applicability under J-4 PROCEDURAL ROUTE _____ *(the provision under which a rule is proposed, petitioned for, or initiated)* and the general rulemaking authority of the adopting authority at J-2 RULEMAKING AUTHORITY _____ *(the provision conferring general rulemaking authority)*. It opens no new subject. It completes a measurement framework by supplying the definitional sections — and the statutory basis for each — without which the framework cannot be applied uniformly.

### 1.1 What is already before the adopting authority

The authority and the obligation to measure large-load consumption are, in most jurisdictions that have legislated on large electric loads at all, already codified. This standard operates entirely inside the existing statutory framework of the adopting jurisdiction. It does not add new demands. It completes the definitions the framework requires in order to be enforceable, and it directs the adopting authority to the provisions of its own law that already require them.

The distinction matters procedurally. A proposal asking an authority to regulate something it has not been asked to regulate is a new subject. A proposal supplying the operative definitions for a measurement the authority is already directed to obtain is completion of an existing framework. This is the second kind. Every subsection proposed in Part V attaches to an obligation that exists in the statute, rule, or directive entered at J-5 INTERCONNECTION STATUTE, J-7 IMPLEMENTING RULE, J-8 COST-ALLOCATION STATUTE, J-10 USAGE-REPORTING REQUIREMENT, J-11 AUDIT DIRECTIVE, J-12 SUBMETERING AUTHORITY, J-13 DESIGN PRESSURE, J-16 OPERATING PRESSURE, J-17 CAPACITY PER CONNECTION, and J-20 ENGINEERING PLAN SUBMITTAL; none creates a new obligation, and none requires an instrument the jurisdiction's law has not already defined.

### 1.2 The codified authority and obligation

#### *1.2.1 The large-load interconnection statute*

Enter at J-5 INTERCONNECTION STATUTE _____ *(the statute establishing interconnection standards for large electric loads)*, with its effective date, which directs the adopting authority to establish interconnection standards for any new or expanded large load exceeding J-6 APPLICABILITY THRESHOLD _____ *(the threshold, in megawatts; default 75 MW)* at a single site, including demonstrated site control, disclosure obligations, and detailed site-related studies.

Two features of such a statute matter directly, and the standard is drafted to operate with either present or absent.

**First**, where the statute contemplates a water study as a *recurring* deliverable rather than a one-time representation, it presupposes a measurement method capable of producing a comparable figure period over period. A figure not produced by a stated method against a stated boundary cannot be compared to the figure produced three months earlier, and a quarterly series of such figures records nothing. **Second**, where the statute routes large-load disclosure through the transmission provider and the grid operator entered at J-9 GRID OPERATOR _____ *(the balancing authority, ISO, or RTO)* rather than through the load's own unverified statement, it has already adopted the integrity principle this standard applies to the water leg. The rule proposed here supplies the water-side and electrical-side methods that make both features operable.

#### *1.2.2 The implementing rules*

Enter at J-7 IMPLEMENTING RULE _____ *(the administrative rule implementing the statute at J-5, with its adoption date)*. The section proposed here is drafted to operate alongside that rule and is proposed for placement adjacent to it. Where the implementing rule establishes an interconnection fee, study fee, or financial security obligation, enter those provisions at the same entry; they are the basis against which cost causation is measured under subsection (l).

#### *1.2.3 The survey and its documented failure*

Enter at J-10 USAGE-REPORTING REQUIREMENT _____ *(any existing survey, inventory, or self-reporting requirement applicable to computational facilities, with its compliance rate if known)*.

Where such a requirement exists and its compliance record is known, that record is the empirical premise of Part II of this document. In the jurisdiction from which this standard was first developed, a legislatively established survey requiring data centers to report water and power usage produced compliance from fewer than ten percent of data centers, and that documented failure was the stated basis of the verification directive that followed. A jurisdiction with no such requirement and therefore no such record is not thereby in a better position; it is in the position of having no record at all, which Part II addresses on the same reasoning.

### *1.2.4 The audit or verification directive*

Enter at **J-11 AUDIT DIRECTIVE** _____ *(any executive order, legislative directive, or agency order requiring verification or audit of computational-facility consumption, with its date).*

A directive of that kind ordinarily requires three quantities: a water consumption figure, annual and peak; an identified and legally authorized source; and a stated cooling technology. What such a directive does not, and by its nature cannot, specify is *how* those three quantities are to be measured, *by whom*, *against what facility class*, and *in what form* the result is transmitted to the several authorities that need it. Those are engineering and definitional questions, and they are the subject of Part V. Where no directive exists, the same three quantities remain the quantities any evaluation of a large load requires, and Part V supplies the method by which they are produced.

### *1.2.5 Water metering authority already exists*

Enter at **J-12 SUBMETERING AUTHORITY** _____ *(the provision recognizing a point-of-use submeter downstream of a master meter).*

Point-of-use submetering — a meter placed downstream of a master meter to measure a defined use — is a recognized instrument and a recognized regulatory concept in essentially every jurisdiction that regulates water service, whether by rule, by tariff, or by agreement with the supplying system. The concept, the instrument, and the regulatory recognition all exist. The proposed rule applies that codified concept to a defined point: the feed to an evaporative circuit. Where the jurisdiction has no codified provision, the entry is completed to state that the submeter is installed by agreement with the supplying system, which is the default and is sufficient.

### *1.2.6 The system-integrity floors already exist*

Public water systems are bound by both a design standard and an operating standard. Enter the governing provisions:

**J-13 DESIGN PRESSURE** _____ — **Design standard.** The distribution system must be *designed* to maintain a minimum pressure of _____ psi at all points within the distribution network at flow rates of at least **J-14 DESIGN FLOW PER CONNECTION** _____ gpm per connection. *(Defaults: not less than 35 psi; 1.5 gpm per connection.)*

**J-15 FIRE-FLOW PRESSURE** _____ — **Fire-flow standard.** Where the system provides firefighting capability, it must also be designed to maintain at least _____ psi under combined fire and drinking-water flow conditions. *(Default: 20 psi.)*

**J-16 OPERATING PRESSURE** _____ — **Operating standard.** All public water systems must be *operated* to provide a minimum pressure of _____ psi throughout the distribution system under normal operating conditions, and to maintain at least _____ psi during emergencies such as firefighting. *(Defaults: 35 psi normal; 20 psi emergency.)*

**J-17 CAPACITY PER CONNECTION** _____ — **Capacity standard.** Minimum source, service-pump, and storage capacity, stated per connection by system category. *(Defaults: 0.6 gpm production, 200 gallons total storage, 100 gallons elevated storage or 20 gallons of pressure-tank capacity where the jurisdiction permits one, and 2.0 gpm service pump, each per connection. Where the jurisdiction states capacity by system category, the entry states the category applicable to the supplying system.)*

The design floor and the operating floor are distinct obligations, and both are relevant. A distribution system may have been lawfully designed to its design pressure years before a large evaporative load appeared on it, and still fail the operating requirement once that load is added at coincident summer peak. A measurement standard that produces the added consumptive draw at the point and time it occurs is what allows either obligation to be evaluated before the failure rather than after it.

## 1.3 The four specifications the framework does not yet contain

Where an audit is mandatory and the metering concept is codified, what the framework still does not specify is:

1. **The measurement boundary** — the physical point at which water and electrical consumption are read. Proposed subsection (f) on the water leg; subsection (i) on the electrical leg.
2. **Who is competent to verify it** — the qualification and independence of the party whose reading the jurisdiction relies upon. Proposed subsection (g).
3. **The facility classes it must read** — the workload and cooling classifications that determine which measurement method applies and against which peak the facility is assessed. Proposed subsections (d), (e), and (h).
4. **How its output resolves jurisdiction** — the single standardized record readable by every authority with jurisdiction over a component of the site's draw, together with the realized-figure and cost-causation

consequences that follow. Proposed subsections (j), (k), and (l).

### 1.4 What this standard does not do

For clarity of the record, and to narrow what the adopting authority must decide:

- **It does not propose a new instrument.** Every meter specified is an off-the-shelf device already used for revenue billing or tenant allocation.
- **It does not propose inspection of software**, source code, model weights, customer algorithms, or tenant data. Measurement operates only on detectable physical electrical, thermal, and hydraulic quantities. Proposed subsection (b)(4) states this as an operative limit of the rule.
- **It does not propose a cap, a moratorium, a siting restriction, or a denial standard.** It proposes measurement. What the jurisdiction does with a measured figure is the jurisdiction's determination.
- **It does not name, target, or evaluate any operator.** Every figure used is drawn from published vendor-neutral specifications.
- **It does not seek any exclusive role** for the author, or for any vendor, utility, or verifier, in performing the measurement it proposes.
- **It does not propose a remedy, a threshold, or a penalty.** Those are governmental determinations belonging to the bodies holding the applicable statutory authority. The author does not hold that authority and does not seek it.

## Part II — Why Self-Reporting Is Insufficient as a Matter of Record, and Why Third-Party Verification Is Required

### 2.1 Self-reporting has already failed in this exact context, on the record

Where the jurisdiction has an existing self-reporting requirement at J-10 USAGE-REPORTING REQUIREMENT, its compliance record is the first evidence in this analysis. In the jurisdiction from which this standard was developed, a survey measuring data-center water and power usage produced compliance from fewer than ten percent of data centers, and that documented failure was the stated basis of the verification directive that followed.

The significance is not that the compliance rate was low. It is that the failure was *method* failure, not enforcement failure. The survey asked the measured party to produce its own figure. Fewer than one in ten produced anything at all, and for those that did, the State received an assertion whose accuracy it had no independent means to test. A standard that permits the measured party to produce its own unverified figure repeats the precise failure an audit is ordered to cure — and does so at a moment when very large volumes of interconnection requests are pending on the answer.

### 2.2 No other regulated connection to shared public infrastructure is certified by the connecting party's own word

An electrical interconnection is inspected and verified independently. A plumbing tie-in to a public water system is inspected and verified independently. A commercial revenue meter is set, sealed, and read by the utility, not by the customer. Elevators, boilers, fire-suppression systems, and structural welds are all verified by a party other than the one whose work is being verified.

The integrity principle is uniform across utility regulation: **the party consuming a shared public resource does not self-certify its own consumption.** Where the statute at J-5 INTERCONNECTION STATUTE routes large-load disclosures through the transmission provider and the grid operator at J-9 GRID OPERATOR rather than through the load's unverified self-statement, the statute itself embodies the principle. The water measurement should follow the same principle the electrical measurement already follows.

Stated as a question the adopting authority can answer directly: if the electrical interconnection of a load at the threshold entered at J-6 APPLICABILITY THRESHOLD is not accepted on the applicant's own word, there is no principled reason the water consumption of the same load at the same site on the same day should be.

### 2.3 The requirement stated

The standard must require independent third-party measurement or verification. The measurement shall be performed by, or verified by, a qualified party independent of the entity being measured, in accordance with the specifications proposed in Part V. The requirement is not satisfied by a figure produced solely by the entity being measured.

Two elements of that sentence are load-bearing and are defined precisely in Part V. **Qualified** is defined by

reference to the independence-of-judgment standard entered at J-22 **VERIFIER INDEPENDENCE STANDARD** _____ *(the jurisdiction's own provision, or the default at ISO/IEC 17020 and 17025)* — not by any new licensing scheme, registry, or certification program, none of which presently exists for this field and none of which this standard asks any authority to create. **In accordance with the specifications proposed** means the verifier reads the boundaries defined in proposed subsections (f) and (i), against the classification defined in subsections (d), (e), and (h), and reports in the form defined in subsection (j). A verification performed against no stated method is not a verification; it is a second assertion.

### 2.4 The cost of the alternative

If the standard permits self-reported figures, three consequences follow mechanically:

1. **The figure is unfalsifiable.** No reviewing agency can distinguish a conservative estimate from an optimistic one, because no physical reading exists against which either can be checked.
2. **Cost causation cannot be enforced.** The provision entered at J-8 **COST-ALLOCATION STATUTE** _____ *(the cost-allocation statute)* assigns interconnection and infrastructure cost to the load that causes it. Assignment requires a measured quantity of causation. Without one, the default is socialization onto the general rate base — the outcome such a statute is enacted to prevent.
3. **Failures surface only physically.** A municipal system that cannot hold the operating pressure at J-16 **OPERATING PRESSURE** under a new coincident load does not announce the fact administratively. It announces it as a pressure complaint, a brown-water event, or a precautionary notice under J-21 **PUBLIC NOTIFICATION**, after the fact, to residents who had no part in the transaction.

## Part III — The Independence-of-Judgment Standard Already in Force

### 3.1 The standard that governs who may verify a measurement already exists

No jurisdiction needs a new definition of a competent verifier. One already exists, in two places, and the operative quality both name is **independence of judgment**.

**In the jurisdiction's own law.** Most jurisdictions that permit third-party inspection of regulated work define the inspecting party as one determined to be qualified by reason of **facilities, personnel, experience, demonstrated reliability, and independence of judgment** to inspect work for compliance with approved plans, documentation, a compliance-control program, and the applicable code. Enter the governing provision at J-22 **VERIFIER INDEPENDENCE STANDARD** _____ *(the provision of the jurisdiction's own law stating the independence-of-judgment standard for a third-party verifier; where the jurisdiction has none, the entry takes its default)*.

**In international consensus standards.** ISO/IEC 17020, governing bodies performing inspection, and ISO/IEC 17025, governing testing and calibration laboratories, each state impartiality and independence requirements of the same substance. These are the default basis for J-22 **VERIFIER INDEPENDENCE STANDARD**, and they apply in any jurisdiction, whether or not that jurisdiction has a provision of its own.

**Citation note.** Where a jurisdiction's provision has been renumbered by amendment, the adopting authority should read the entry at J-22 **VERIFIER INDEPENDENCE STANDARD** as being to the *definition*, which has been stable in substance, rather than to a paragraph number that has moved.

The structure of that definition is worth stating plainly, because it is the structure the measurement standard borrows: verification of compliance is entrusted to a party independent of the party whose work is being verified, precisely because independence of judgment is the quality that makes a verification reliable. Facilities, personnel, experience, and demonstrated reliability establish that the verifier *can* measure. Independence of judgment establishes that the measurement *can be relied upon*.

### 3.2 A self-report cannot meet that standard

A data center's self-report of its own consumption cannot meet the standard, and the reason is definitional rather than reputational. The measured party is not independent of the measurement; it has a direct interest in the result. A figure produced by the party being measured therefore lacks the independence of judgment that the law at J-22 **VERIFIER INDEPENDENCE STANDARD** already requires of a verification, and is an assertion rather than a verified measurement. No inference of bad faith is required to reach that conclusion, and none is offered here. The point is structural: the same figure produced by an interested party and by a disinterested party are not the same evidentiary object, and the law has already decided which one a verification is.

### 3.3 The approval criteria are also already written

The law goes further than defining independence; it states operationally what an independent verifier must attest. Enter the governing provision at J-23 **VERIFIER ATTESTATION CRITERIA** _____

*(the provision stating what an independent verifier must attest on application or approval)*. A party seeking approval ordinarily must submit a signed statement that, among other things:

- its board, as a body, and its managerial and inspection personnel, as individuals, are free to exercise independence of judgment in the performance of their duties;
- its activities in discharging its responsibilities will not result in financial benefit via stock ownership or other financial interest in any producer, supplier, or vendor of the products involved, other than through standard fees for services rendered;
- it will consistently and uniformly implement the governing interpretations of the standards and rules; and
- it will not provide design services for the party whose work it inspects.

Every one of those four attestations transposes directly onto the measurement proposed here, and the fourth is the most important. A party that designed the cooling plant, specified the misting skid, or engineered the electrical distribution is not positioned to verify the consumption of what it designed. The standard proposed in subsection (g) adopts these criteria by reference rather than inventing new ones, which has the additional advantage that a verifier in the jurisdiction already knows what the attestation means.

### 3.4 This is not a new or special rule for data centers

It is the same standard applied to the same kind of question. A directive entered at J-11 AUDIT DIRECTIVE ordering an audit orders a verification, and an audit ordered by a government falls within the same scope that makes verification of compliance a matter of independent judgment throughout utility and building regulation. Where the self-reporting method has already failed on the record at J-10 USAGE-REPORTING REQUIREMENT, the reason it cannot be relied upon is the reason the law at J-22 VERIFIER INDEPENDENCE STANDARD already gives — a party cannot supply the independent judgment required to verify its own compliance.

**Terminology adopted throughout this standard.** This standard uses **qualified independent third party**, and never **certified third party**. The distinction is deliberate and material: there is at present no certification, license, or registry specific to computational-load and evaporative-consumption measurement in any jurisdiction, and a rule that required one would be unenforceable on the day it was adopted.

**Qualified** is a substantive test the adopting authority or the receiving authority applies to a given party against the criteria in subsection (g) — facilities, personnel, experience, demonstrated reliability, independence of judgment, and the absence of a design or financial relationship with the measured entity. It is satisfiable today, by licensed professional engineers, testing and metering firms, and independent inspection agencies already operating in every jurisdiction to which this standard may be submitted.

## Part IV — The Classification Framework: Engineering Basis

Measurement without classification is not uniform. Two facilities drawing the same annual kilowatt-hours can impose radically different physical strain on grid and water infrastructure depending on the shape of the load and the method used to reject its heat. Part IV establishes the two axes against which any facility is read, and it does so entirely from published, vendor-neutral figures so that the framework can be applied by any reviewer without access to proprietary data. The classification stated in this Part is adopted as operative rule text at proposed subsections (d) and (e).

Nothing in Part IV is a jurisdictional entry. Every density, temperature, ratio, identity, and limit stated here holds in every jurisdiction, because each is a property of hardware, of air, or of water.

### IV.A Hardware Sourcing and Device-Level Reference Draw

To establish a neutral, non-arbitrary baseline for classification, the standard relies entirely on published, vendor-neutral device thermal design power (TDP) specifications:

| Device class | Published reference draw | Note |
|---|---|---|
| Standard server CPU (dual-socket) | 150–250 W per chip | Approximately 600–750 W per standard server unit including platform overhead |
| Prior-generation AI GPU (A100 class) | ~400 W per unit | Board power |
| Current-generation AI GPU (H100 class) | ~700 W per unit | Board power |
| Next-generation AI GPU | 1,200–1,400 W per unit | Projected roadmap TDP |
| High-bandwidth memory (HBM) stack | 10–15 W per stack | 6–12 stacks per high-performance GPU |
| Integrated 8-GPU server | ~5.6 kW GPU-only; 6.5–7.5 kW per server | Expanded figure accounts for CPU, memory, and network overhead |

These are not the author's figures and are not offered as such. They are published manufacturer specifications, and the reference panel schedule at Exhibit 4 is populated from them so that any reviewer can reconstruct the panel independently. Under proposed subsection (k)(1), a published TDP is a legitimate input to a Designed or Modeled figure and is never, standing alone, a Measured one.

### IV.B Density Classes, Cooling Regimes, and the Physical Air-Cooling Limit

Using the device-level baselines above, five rack density classes map directly onto their engineering cooling requirements:

| Facility / rack class | Rack density | Required cooling regime |
|---|---|---|
| Traditional enterprise / storage / web | 5–15 kW per rack | Conventional air cooling (CRAC / CRAH units) |
| Mixed / general compute | 15–30 kW per rack | Air cooling pushed to its thermal limit; containment and elevated airflow required |
| AI inference | 20–40 kW per rack | Transition zone: rear-door liquid heat exchangers or localized cold plates |
| AI training | 40–80 kW per rack | Direct liquid cooling (DLC) or cold plates required |
| Next-generation AI | 150+ kW per rack | Advanced DLC, cold plates, or full immersion cooling |

**The air-cooling envelope, stated as the airflow it requires.** Air cooling is bounded not by a declared limit but by the volumetric airflow needed to carry the heat away at the available temperature difference. That quantity is computed exactly:

```
CFM = Q [BTU/hr] / (K x dT)

   K  = cp x 60 min/hr x rho(air)
      = 0.240 x 60 x 0.075 = 1.080   at sea level
   dT = temperature rise across the rack, degF
   rho(air) is taken at the station pressure of Annex I.2, not at sea level
```

The constant falls with air density, and therefore with elevation. Stated for a 30 kW rack at a 20 °F rise: 4,739 CFM at sea level, 5,097 CFM at 2,000 ft, 5,696 CFM at 5,000 ft, 6,142 CFM at 7,000 ft. **An envelope stated without its station elevation is not reproducible.**

| Rack density | ΔT = 15 °F | ΔT = 20 °F | ΔT = 25 °F | ΔT = 30 °F |
|---|---|---|---|---|
| 10 kW | 2,106 | 1,580 | 1,264 | 1,053 |
| 15 kW | 3,159 | 2,370 | 1,896 | 1,580 |
| 20 kW | 4,213 | 3,159 | 2,528 | 2,106 |
| 25 kW | 5,266 | 3,949 | 3,159 | 2,633 |
| 30 kW | 6,319 | 4,739 | 3,791 | 3,159 |
| 40 kW | 8,425 | 6,319 | 5,055 | 4,213 |
| 50 kW | 10,531 | 7,898 | 6,319 | 5,266 |
| 80 kW | 16,850 | 12,638 | 10,110 | 8,425 |
| CFM per rack at sea level. Divide by the density ratio at the station elevation for any other site. | | | | |

Against that, the delivery side: a 42U cabinet with a fully perforated door served by one 24-inch floor tile delivers on the order of 2,000 to 3,000 CFM, and a contained hot aisle with high-flow tiles or fan-assisted tiles reaches roughly 4,000 to 6,000 CFM. **The band in which air cooling becomes impractical is therefore approximately 25 to 30 kW per rack at ordinary temperature rises, and the band is a consequence of the arithmetic above rather than a stated rule.**

The consequence for classification is stated as a reproducible test rather than as a threshold: a filing claiming a purely air-cooled configuration shall state its rack density, its temperature rise, its station elevation, and the airflow it delivers per rack, and the airflow stated shall be not less than the airflow the relation above requires at those conditions. A filing that cannot satisfy that inequality on its own stated figures is deficient under proposed subsection (k)(1)(C). The test puts the burden on arithmetic the reviewer can repeat, and it does not depend on any assertion about what is physically impossible.

### IV.C The Deterministic Heat-and-Water Chain

Data-center energy use is not an abstract metric. It is a physical event connected to local grid and water infrastructure through a deterministic three-link chain. Each link is an identity or a bounded engineering ratio, not an assumption, and each is derived with worked arithmetic in Annex I.

#### *IV.C.1 Link one — electrical draw to heat*

Computational silicon performs no mechanical work and stores no significant energy. Essentially all electrical power delivered to it is converted to heat:

```
Q [BTU/hr] = P [W] x 3.412142      equivalently   Q [BTU/hr] = P [MW] x 3,412,142
```

This is a unit identity, not a model. A 150 kW rack rejects 511,821 BTU/hr — approximately 42.7 tons of refrigeration at the 12,000 BTU/hr refrigeration ton, or the continuous output of roughly five to six typical residential furnaces rated at 80,000–100,000 BTU/hr input.

#### *IV.C.2 Link two — heat to cooling energy*

Removing that thermal energy requires cooling power. In high-density operations, cooling and facility overhead account for approximately 30–40 percent of total facility electricity; air cooling demands roughly an additional 0.3–0.5 W of cooling power for every 1 W of active IT load. Expressed as power usage effectiveness:

```
P_total facility = P_IT x PUE

   where PUE = 1.15-1.25 (dry, mild)  to  1.50-1.70+ (extreme ambient)
```

The reported electrical figure must therefore be the gross facility figure. Reporting critical IT load alone understates the physical draw on the grid by the entire cooling and infrastructure fraction — which is to say, by exactly the fraction that grows during the summer hours when the grid is most constrained.

#### *IV.C.3 Link three — cooling to water consumption*

Where heat is rejected evaporatively, water is consumed by phase change. The consumed mass follows from the latent heat of vaporization:

```
m_water [lb/hr]  = Q [BTU/hr] / h_fg
V_water [gal/hr] = m_water / 8.34
```

At $h_{fg}$ ≈ 1,050 BTU/lb (typical of tower operating temperatures):

```
1 MW of heat rejected evaporatively
   = 3,412,142 / 1,050 / 8.34
   = 389.6 gal/hr  =  9,352 gal/MW-day
```

Two independent methods agree on this figure. The latent-heat derivation above gives approximately 390 gal/hr per MW. The cooling-tower rule of thumb — evaporation of approximately one percent of recirculating flow per 10 °F of range — gives 409 gal/hr per MW. The consumptive evaporation rate for a fully evaporative facility is therefore approximately **390–410 gal/hr per MW** of heat rejected, and this standard uses 390 gal/hr per MW as the working value.

Evaporation is not the whole of the water draw. Total makeup water fed to an evaporative circuit is the sum of evaporation, drift, and blowdown:

```
Water balance    M = E + D + B
Solids balance   M x c_m = (D + B) x c_c      COC = c_c / c_m

   E leaves as pure vapour and carries no dissolved solids.
   D leaves as entrained droplets at the circulating concentration,
   so drift substitutes for blowdown in the solids balance.

Solving:   M = (D + B) x COC
           E + D + B = (D + B)(COC)
           D + B = E / (COC - 1)
           B     = E / (COC - 1) - D
           M     = E + E / (COC - 1) = E x COC / (COC - 1)

Consumptive loss = M - B = E + D
```

Two consequences follow, and both are stated because a single meter on the makeup line cannot distinguish them. **Makeup does not depend on drift** — drift displaces an equal volume of blowdown in the solids balance, so the makeup relation is exact as written. **Blowdown does depend on drift**, and is smaller than evaporation divided by cycles minus one by exactly the drift volume.

| Cycles of concentration (COC) | Evaporation E (gal/hr per MW) | Drift D at 10 °F range | Blowdown B = E/(COC−1) − D | Makeup M = E×COC/(COC−1) | Makeup (gal/MW-day) | Consumptive E + D |
|---|---|---|---|---|---|---|
| 3 cycles | 389.6 | 2.05 | 192.8 | 584.5 | 14,027 | 391.7 |
| 4 cycles | 389.6 | 2.05 | 127.8 | 519.5 | 12,469 | 391.7 |
| 5 cycles | 389.6 | 2.05 | 95.4 | 487.1 | 11,689 | 391.7 |
| 6 cycles | 389.6 | 2.05 | 75.9 | 467.6 | 11,222 | 391.7 |
| 8 cycles | 389.6 | 2.05 | 53.6 | 445.3 | 10,687 | 391.7 |
| Consumptive loss is constant across every value of cycles; makeup spans 31 percent between 3 cycles and 8. One meter on the makeup line cannot distinguish a change in water chemistry from a change in water consumed. | | | | | | |

Drift from a modern tower with drift eliminators is bounded at roughly 0.005 percent of recirculating flow. It is small in volume but it is not negligible in kind: drift is consumptive loss to atmosphere and, unlike blowdown, does not return to the collection system. **Drift is a fraction of recirculation, and recirculation varies inversely with the temperature range, so drift per megawatt is not a constant and shall be stated with the range at which it was determined:**

| Range ΔT | Recirculation (GPM per MW) | Recirculation (gal/hr per MW) | Drift at 0.005% (gal/hr per MW) | Drift as a fraction of evaporation |
|---|---|---|---|---|
| 8 °F | 853.0 | 51,182 | 2.56 | 0.66% |
| 10 °F | 682.4 | 40,946 | 2.05 | 0.53% |
| 15 °F | 455.0 | 27,297 | 1.36 | 0.35% |
| 20 °F | 341.2 | 20,473 | 1.02 | 0.26% |

At a 10 °F range, consumptive loss is therefore **391.7 gal/hr per MW** — evaporation of 389.6 plus drift of 2.05 — and blowdown is smaller than the uncorrected figure by the same 2.05 at every value of cycles.

**Why this distinction governs the rule text.** Blowdown is discharged to the sanitary sewer — it is withdrawn but not consumed, and it reappears downstream as a high-salinity load on the wastewater plant. Evaporation and drift are consumed to atmosphere and do not reappear anywhere. **A single intake figure at the property line cannot distinguish the two**, which is precisely why proposed subsection (f) requires a secondary meter on the evaporative feed rather than a larger primary meter at the fence.

### *IV.C.4 Worked illustration at facility scale*

A facility with 100 MW of IT load operating at a PUE of 1.4 draws 140 MW gross and rejects approximately 478 million BTU/hr. If that heat is rejected entirely evaporatively, consumptive evaporation is approximately **1.31 million gallons per day**, before blowdown. At four cycles of concentration, total makeup is approximately **1.75 MGD**.

A single 150 kW rack, by the same arithmetic, rejects 511,821 BTU/hr and evaporates 1,403 gallons per day, with drift of 7 gallons per day at a 10 °F range, for a consumptive loss of **1,410 gallons per day**. Makeup across the full band of cycles stated in the table above is:

```
COC 8 : 1,603 gal/day        COC 5 : 1,753 gal/day
COC 6 : 1,683 gal/day        COC 4 : 1,870 gal/day
                             COC 3 : 2,104 gal/day
```

so the makeup band for a single 150 kW rack is **1,600 to 2,100 gallons per day**, the endpoints being 8 cycles and 3 cycles respectively.

Stated against residential demand, which requires the per-household figure to be stated or the comparison cannot be checked: at **205 gallons per household per day** that band is 7.8 to 10.3 households. At 250 gallons it is 6.4 to 8.4 households, and at 300 gallons it is 5.3 to 7.0. **A comparison of this kind is reproducible only when the divisor is named**, and it is offered to let a reader without thermal training check an order of magnitude, not as a finding about any water system.

These illustrations are stated as Modeled figures under proposed subsection (k)(1), derived from published ratios and stated formulas. They are not a substitute for a measured reading at any specific facility. They establish the order of magnitude that makes measurement necessary; they do not establish any particular facility's draw, and are not offered for that purpose.

### IV.D Axis 1 — Workload Profile Classification (Classes W-1, W-2, W-3)

Axis 1 classifies a facility, or a circuit within a facility, by the shape of its electrical load over time. Shape is the property that determines how much capacity a utility must hold in reserve, and it is the property that a time-averaged reading destroys.

#### *Class W-1 — Continuous High-Utilization (AI Training / HPC)*

Class W-1 defines computational workloads characterized by a high, flat, and uninterrupted electrical load shape. It represents the most energy-dense and thermally intense operational class in modern data-center infrastructure.

**1. Electrical load shape and utilization.** Class W-1 workloads run for long, continuous execution intervals, frequently measured in days or weeks. Unlike variable cloud or web traffic, the load shape does not fluctuate: the peak demand and the mean demand over the interval are virtually identical. Stated as the measured quantity that defines the class, the **load factor — mean demand divided by peak demand over the full reporting period, at one-minute integration — is 0.95 or greater**. Utilization against a device's published thermal design power is not the test, because a published device rating is not a measured facility load; the test is computed entirely from readings taken at the transport boundary.

**2. Hardware and power density.** Class W-1 is typical of AI model-training superclusters — integrated 8-GPU nodes such as H100, H200, or B200 class systems — and of continuous high-performance computing. Rack power densities range from 40 to 80+ kW per rack, extending to 150+ kW per rack in next-generation architectures. An integrated 8-GPU server node alone draws 6.5 to 7.5 kW.

**3. Thermal and water footprint.** Because computational silicon converts essentially all electrical input into heat, Class W-1 facilities produce continuous heat rejection at their peak rate. Beyond the 25–30 kW per rack threshold, air cooling fails, making direct liquid cooling or cold plates physically mandatory. When paired with evaporative cooling towers, this continuous thermal output drives sustained, maximum municipal water consumption — on the order of 390 gal/hr per MW of rejected heat, continuously, for the duration of the run (Annex I).

**4. Measurement and regulatory rule.** Because peak and average draw are nearly identical, Class W-1 loads cannot be concealed behind time-averaging — but neither can they be understated by it. Class W-1 circuits must be metered at the secondary distribution bus or PDU level (the M2 transport boundary) using revenue-grade current-transformer submeters compliant with ANSI C12.20 accuracy Class 0.1, 0.2 or 0.5, or IEC 62053-22 accuracy class 0.1S, 0.2S or 0.5S, together with open server telemetry, so that continuous grid and thermal strain is accurately attributed to the circuits producing it.

> **Why W-1 is the reference class for water.** A continuous class has no diversity. There is no hour of the day in which a training cluster's heat rejection falls off, and therefore no hour in which its evaporative makeup demand falls off. Utility planning practice that assumes a load factor materially below unity is inapplicable to Class W-1, and a water study that applies one to a W-1 facility understates the demand by the inverse of the assumed factor.

#### *Class W-2 — Burst / Variable (AI Inference, Cloud, and Colocation)*

Class W-2 defines computational workloads whose power draw rises and falls dynamically with real-time user query volume and transactional demand. Unlike flat, continuous training runs, Class W-2 represents a highly non-uniform, bursty load profile that presents distinct challenges for grid and municipal water infrastructure.

**1. Electrical load shape and utilization dynamics.**

- **Demand-driven swings.** Measured demand swings rapidly, commonly across a range of roughly 40 percent to 100 percent of the circuit's own measured peak, following real-time API query traffic, model inference requests, or cloud application spikes. The class is defined by a **load factor below 0.95** over the full reporting period, which is the complement of the Class W-1 test and requires no reference to a device rating.
- **Peak-versus-average disparity.** The instantaneous peak electrical draw exceeds the long-term mean, and the ratio of the two is the load factor that classifies the circuit. Because queries cluster during business hours and active usage windows, Class W-2 creates steep, high-amplitude power ramps against a lower nighttime baseline.

**2. Hardware architecture and rack density.** Deployed across high-density GPU inference nodes, specialized ASIC accelerators, and multi-tenant cloud application servers, operating primarily in the 20 to 40 kW per rack bracket. This is the physical transition zone where conventional air cooling reaches its thermodynamic limit (25–30 kW per rack), requiring rear-door liquid heat exchangers or localized cold plates to handle rapid thermal spikes.

**3. Thermal rejection and environmental strain.**

- **Coincident peak stress.** The sudden power spikes of Class W-2 generate localized, high-intensity thermal surges. User query peaks often coincide directly with afternoon grid stress and high ambient summer temperatures, magnifying the cooling infrastructure's power and water requirements at precisely the worst hour.
- **Variable evaporative demand.** Cooling water consumption scales linearly with thermal rejection. Evaporative loss from cooling towers therefore fluctuates sharply alongside query volume, creating sudden, unpredictable draws on municipal water supply systems — a demand shape that municipal storage and pumping design does not anticipate from a single connection.

**4. The regulatory rule — mandatory peak evaluation.**

- **Failure of annual averaging.** Reporting Class W-2 facilities as a single annual mean or blended average materially understates the physical strain placed on the system. An annual average smooths away the volatile spikes that actually force utilities to build peak generation, expand transformer capacity, and reserve municipal water pressure.
- **Assessment rule.** Any facility or circuit classified as Class W-2 must be evaluated and assessed against its **measured peak draw**, not its annual mean. Where a filing states an average, it must state the peak alongside it and identify the measurement interval from which the peak was taken.

**5. M2 transport-boundary instrumentation.**

- **Tier 1 — bus / branch submeter.** Revenue-grade digital power meters compliant with ANSI C12.20 or IEC 62053-22 installed at the secondary PDU bus feeding inference pods.
- **Tier 2 — server telemetry.** Real-time firmware-level power and thermal polling via standard open hardware protocols (intelligent PDUs, IPMI, and DMTF Redfish).

***Class W-3 — Mixed / Multi-Tenant Facility***

Class W-3 defines computational facilities that house a combination of distinct workload types — AI model training, AI inference, cloud applications, and transactional databases — under a single roof. It represents the composite operational reality of commercial colocation centers, hyperscale multi-tenant campuses, and hybrid enterprise facilities.

**1. The composite and heterogeneous load profile.** Rather than exhibiting a single uniform or bursty signature across the entire site, Class W-3 facilities contain distinct server halls or PDU panels dedicated to different tenant requirements. Within the same facility, power draw varies by an order of magnitude across pods — from steady enterprise compute racks (5–15 kW per rack) to high-density AI inference pods (20–40 kW per rack) to hyper-dense AI training clusters (40–80+ kW per rack).

**2. The regulatory rule — sum of constituent classes.**

- **Failure of blended averaging.** Reporting a Class W-3 facility through a single aggregate fence-meter reading averages away the specific physical impacts of each tenant hall. It conceals whether grid and cooling-water strain originates from a small subset of high-density GPU circuits or from general cloud hosting.
- **Assessment rule.** A Class W-3 facility cannot be measured or assessed as a single blended average. It must be evaluated as **the sum of its constituent workload classes** (W-1, W-2, and baseline uniform compute) resolved per circuit, per PDU panel, or per tenant pod.

**3. Multi-zone thermal and cooling infrastructure.** Because different server halls reject heat at vastly different rates, Class W-3 facilities require multi-zone cooling control. As demonstrated in the reference panel schedule at Exhibit 4 (PDU-REF-1, drawing GRUS-GRID-005), a small handful of non-uniform GPU circuits on a mixed PDU panel drive approximately 115 $kW_{th}$ of approximately 142.5 $kW_{th}$ total — 80.7 percent of thermal rejection and therefore of cooling-water demand — and approximately 168 A of approximately 256 A of peak draw, while surrounding storage and database circuits draw flat, minimal fractions. Evaluating the panel by its constituent classes attributes this strain directly to the circuits causing it.

**4. Transport-boundary instrumentation (M2 isolation).** To disaggregate a Class W-3 facility into its constituent workload classes without interfering with private tenant operations, consumption is measured at the internal transport boundary: Tier 1 revenue-grade submetering at the secondary PDU buses feeding individual tenant halls or compute pods, and Tier 2 open telemetry via intelligent PDUs, IPMI, and DMTF Redfish. Black-box privacy protection applies without exception: measurement operates strictly on detectable physical electrical and thermal characteristics, delivering full cost-attribution visibility without inspecting proprietary source code, customer algorithms, model weights, or private tenant data.

***IV.D.4 Real-World Data Center Typology Matrix***

| Facility archetype | Statutory class | Primary hardware and density | Load shape and peak character | Grid and cooling strain |
|---|---|---|---|---|
| AI model training supercluster | W-1 (Continuous) | Integrated 8-GPU nodes (H100/H200/B200); 40–80+ kW/rack | Flat, continuous, 95%+ utilization near peak TDP | Very high — continuous maximum heat rejection and continuous evaporative loss |
| AI inference and real-time LLM facility | W-2 (Burst / peak) | High-density GPU/ASIC inference nodes; 20–40 kW/rack | Bursty, query-driven swings (40% to 100% TDP) | High, variable — sharp thermal spikes during peak query hours |
| HPC / research laboratory | W-1 / W-2 (job-based) | CPU/GPU accelerated research nodes; 15–30+ kW/rack | High sustained draw during active compute runs | Moderate to high — sustained heat during simulation runs |
| Enterprise, web, and transactional center | W-2 / baseline uniform | Dual-socket CPU servers and storage; 5–15 kW/rack | Low, steady, predictable transactional draw | Low — predictable baseline; readily air-cooled |
| Multi-tenant colocation / hyperscale pods | W-3 (Composite) | Mixed tenant pods (training + inference + cloud); 10–50+ kW/rack | Heterogeneous composite profile across halls | Composite — evaluated as the sum of PDU circuit classes |

### *IV.D.5 Measurement and Verification Standards for Axis 1*

**Instrumentation, Tier 1 and Tier 2.** Off-the-shelf ANSI C12.20 / IEC 62053-22 revenue-grade bus submeters and open server telemetry (intelligent PDU, IPMI, Redfish) at the transport boundary (M2).

**Independent verification.** Compliance verified by a qualified independent party meeting the independence-of-judgment standard entered at J-22 **VERIFIER INDEPENDENCE STANDARD** _____ and the approval criteria entered at J-23 **VERIFIER ATTESTATION CRITERIA** _____.

### IV.E Axis 2 — Cooling Method Classification (Classes C-1 through C-5)

Axis 2 classifies a facility, or a circuit within a facility, by where and whether water is evaporated in the course of rejecting heat. **Axis 2 — not the facility's self-description — determines whether a secondary water meter is required.**

#### *Class C-1 — Air-Cooled / No Evaporative Circuit*

Class C-1 defines cooling architectures where computational heat is rejected entirely to the ambient air using dry coolers or air-cooled chillers, without an evaporative water loop in normal operation. It is the dry baseline of Axis 2.

- **Infrastructure and mechanics.** Standard mechanical refrigeration or dry-fluid coolers — CRAC/CRAH units, air-cooled chillers, and air-side economizers — transferring thermal energy directly from IT equipment to ambient air.
- **Water consumption profile.** A facility operating strictly within Class C-1 consumes near-zero cooling water in day-to-day operation, because no water is evaporated to atmosphere.
- **Conditional exemption.** A facility claims Class C-1 status only so long as it operates no evaporative circuit and no evaporative add-on.
- **Reclassification trigger.** If an air-cooled facility installs or engages any evaporative-assist mechanism — condenser-coil misting, spray pre-cooling, or adiabatic wetted pads during extreme summer ambient peaks — it automatically reclassifies as Class C-4 (Hybrid / Evaporative-Assisted).
- **Submetering requirement.** On entering Class C-4 for that circuit, the facility becomes subject to the mandatory secondary point-of-use water submeter under the Two-Meter Method (proposed subsection (f)).

**Density limits and electrical trade-offs.** Conventional air cooling reaches its physical boundary at approximately 25–30 kW per rack; facilities housing AI training racks at 40–80+ kW per rack physically cannot operate under pure Class C-1 air cooling and are forced into liquid-cooled regimes. And while Class C-1 preserves municipal water, air-cooled chillers require higher electrical input per watt of IT load at high ambient temperature — typically 0.3 to 0.5 W of cooling power per 1 W of IT load — exchanging water consumption for higher peak electrical demand on the grid. **Class C-1 is therefore not the costless option; it is the option that moves the burden from the water utility to the electric utility, and it must be reported as such.**

#### *Class C-2 — Closed-Loop / Recirculating Non-Evaporative*

Class C-2 defines cooling architectures using a sealed recirculating loop to transfer heat away from computational hardware without evaporating water to atmosphere.

**1. Core mechanics — the sealed loop.** Class C-2 systems use sealed internal fluid loops (treated water, glycol, or dielectric fluid) running through liquid-to-liquid heat exchangers, rear-door heat exchangers, or direct liquid cooling cold plates mounted to CPU/GPU dies. Because the internal loop is sealed, water recirculates continuously with zero operational evaporation or blowdown discharge from that loop.

**2. The outdoor rejection condition — closing the C-2 / C-3 loophole. A closed indoor liquid loop is not, on its own, sufficient** to claim Class C-2 status. Class C-2 holds only if heat rejection to the outside is *also* non-evaporative — dry fluid coolers or air-cooled radiators. If a facility uses a closed indoor liquid loop but rejects that heat outdoors using evaporative cooling towers, adiabatic wetted media, or spray ponds, **the facility is not Class C-2. It is Class C-3**, because the consumptive water loss occurs at the outdoor heat-rejection stage.

**3. Extreme ambient heat and the Class C-4 transition.** During extreme ambient dry-bulb heat, outdoor dry coolers often cannot reject heat from high-density racks within design approach. If a Class C-2 facility engages any evaporative assist — spray misting, condenser-coil pre-cooling, or wetted adiabatic pads — the facility automatically changes class to Class C-4 for that circuit, and that circuit becomes immediately subject to the secondary point-of-use submeter under the authority entered at J-12 **SUBMETERING AUTHORITY** _____ *(the point-of-use submetering authority).*

**4. Facility density and grid footprint.** Closed-loop internal systems are essential to supporting AI training (40–80+ kW/rack) and next-generation (150+ kW/rack) pods that exceed the air-cooling limit. When paired with dry outdoor heat rejection, true Class C-2 facilities preserve municipal water resources but, like Class C-1, require higher outdoor fan and compressor energy during peak summer heat.

#### *Class C-3 — Evaporative / Cooling Towers / Adiabatic*

Class C-3 defines architectures where heat is rejected directly to atmosphere by evaporating water. It is the most water-consumptive cooling classification and the primary technical focus of the Two-Meter Method.

**1. Core mechanics and water loss.** Class C-3 systems rely on open or closed-circuit cooling towers, evaporative condensers, wetted-media adiabatic systems, or spray ponds. Thermal energy is transferred to a

water loop and rejected as water changes phase from liquid to vapor. Water loss is an unavoidable thermodynamic consequence of operation and consists of:

- **Evaporative loss** — water converted to vapor and lost to atmosphere (~390 gal/hr per MW rejected);
- **Drift** — entrained droplets carried out of the tower, bounded at roughly 0.005 percent of recirculating flow by drift eliminators, and consumptive;
- **Blowdown / bleed-off** — concentrated water discharged to sewer to prevent scale, equal to evaporation divided by (COC − 1), and withdrawn but not consumed.

**2. The outdoor heat-rejection rule (distinguishing C-2 from C-3).** A common misconception is that a facility with closed indoor liquid loops — direct-to-chip cold plates or rear-door heat exchangers — is automatically a closed-loop facility. The standard establishes the opposite: **classification is governed by where the evaporative water loss physically occurs.** A closed indoor loop rejecting heat outdoors through evaporative towers or wetted media is Class C-3.

**3. The mandatory Two-Meter Method.**

- **Primary service-entrance meter** — the standard utility master meter measuring total water intake delivered to the property line.
- **Secondary point-of-use submeter** — an ordinary, off-the-shelf water meter installed at the feed line entering the evaporative cooling tower or loop.
- **Calculating consumptive loss** — metering the evaporative feed directly identifies the water entering the evaporative circuit; the portion of that feed that does not return as metered or conductivity-derived blowdown is the quantity consumed to atmosphere. This eliminates reliance on fictional drain-line estimates.

**4. Statutory grounding and municipal system protection.** The secondary meter requires no specialized or proprietary hardware; it is the point-of-use submeter recognized at J-12 SUBMETERING AUTHORITY _____. Large continuous evaporative draws can depress local water system pressures; metering Class C-3 feeds ensures the draw can be evaluated against the design and operating pressure floors entered at J-13 DESIGN PRESSURE, J-14 DESIGN FLOW PER CONNECTION, J-15 FIRE-FLOW PRESSURE, and J-16 OPERATING PRESSURE and the capacity requirements entered at J-17 CAPACITY PER CONNECTION.

***Class C-4 — Hybrid / Evaporative-Assisted***

Class C-4 defines air-cooled or closed-loop systems fitted with supplemental evaporative assist — condenser-coil misting, spray pre-cooling, or wetted adiabatic pads — that engage during high ambient temperature conditions. It is the mechanism that captures evaporative water consumption occurring during extreme summer heat waves, which is exactly when it is least visible and most damaging.

**1. Core mechanics and system architecture.** Class C-4 systems operate dry under mild ambient conditions but use supplemental water spraying, misting, or adiabatic wetted media to lower inlet air temperature when outdoor heat rises. Typical configurations include direct misting or spray nozzles at outdoor condenser coils; adiabatic wetted pads upstream of dry fluid coolers or air handlers; and secondary evaporative trim chillers or pre-cooling loops.

**2. The ambient heat trigger (dry-bulb / wet-bulb dynamics).** Summer ambient dry-bulb temperatures in hot climates frequently exceed the heat-rejection capacity of pure air-cooled radiators or dry coolers. By evaporating water into the incoming air stream, Class C-4 systems drive entering air temperature down toward the ambient wet-bulb temperature, allowing high-density pods to reject heat without thermal throttling or shutdown. The achievable depression is bounded by saturation effectiveness:

```
T_air-off = T_db - e x (T_db - T_wb)

   e = saturation effectiveness, typically 0.70-0.90
```

**The wet-bulb temperature is a hard floor.** No quantity of water sprayed can cool entering air below it, which is why Annex B computes wet-bulb for every ambient case rather than assuming a fixed temperature drop.

**3. Closing the dry-facility reporting loophole.** Class C-4 closes the loophole in which an operator represents itself on paper as a dry Class C-1 or closed-loop Class C-2 facility to avoid water reporting, while consuming municipal water through add-on sprays during extreme weather. **The presence or operation of any evaporative-assist circuit automatically places that circuit into Class C-4.** An operator cannot claim C-1 or C-2 status while evaporating water through an add-on.

**4. Mandatory point-of-use submetering.** Reclassification to Class C-4 immediately triggers the secondary point-of-use submeter: an ordinary commercial water meter at the feed line supplying the misting, spray, or

adiabatic pre-cooling circuit, authorized at J-12 SUBMETERING AUTHORITY _____. Water entering the evaporative-assist feed and lost to atmosphere is measured directly at the point of use, eliminating reliance on unverified self-reporting or drain-line estimates.

**5. Protecting municipal infrastructure integrity.** The evaporative water draw of Class C-4 systems spikes precisely when ambient heat is highest — coinciding with peak municipal water demand and peak grid stress. Independent submetering of Class C-4 circuits ensures that intense summer misting draws can be evaluated against the pressure floors at J-13 DESIGN PRESSURE and J-16 OPERATING PRESSURE and the public storage and pumping capacities at J-17 CAPACITY PER CONNECTION.

***Class C-5 — On-Site Power Generation Evaporative Cooling***

Class C-5 defines facilities operating on-site power generation whose cooling or power-production processes consume water by evaporation. It brings behind-the-meter generation cooling water into the same measurement standard as facility IT cooling.

**1. System architecture and generation assets.** Applies to data centers operating islanded, prime, or supplemental on-site generation — combustion gas turbines, combined-cycle units, reciprocating internal combustion engines, steam turbines, or microgrids — and captures any generation process that evaporates water to atmosphere, including: combustion turbine inlet-air evaporative fogging or cooling used to recover turbine capacity during hot peaks; steam turbine condenser cooling towers in combined-cycle or CHP configurations; and engine jacket-water and lube-oil evaporative cooling towers.

**2. Closing the behind-the-meter water loophole.** To bypass grid interconnection queues, large data centers increasingly deploy on-site generation. Because those assets sit behind the meter relative to the electric utility, operators sometimes argue that water used to cool the power plant should be excluded from data-center water audits. **Water evaporated to produce electricity on-site is physically identical in municipal impact to water evaporated to cool server racks.** It is a consumptive draw on the same local supply, from the same mains, at the same hour, and it must be measured, not omitted because it sits behind an electrical service meter.

**3. Statutory alignment with large-load water studies.** Where the statute at J-5 INTERCONNECTION STATUTE and the rule at J-7 IMPLEMENTING RULE require large-load interconnection applicants at or above the threshold at J-6 APPLICABILITY THRESHOLD to disclose on-site generation resources and submit detailed site-related water studies, incorporating Class C-5 ensures that any audit under J-11 AUDIT DIRECTIVE captures the total true water footprint of the site — both the generation leg and the IT cooling leg.

**4. Mandatory secondary submetering.** Any water feed routed into an evaporative circuit for on-site power generation must be fed through, and measured by, a secondary point-of-use submeter under proposed subsection (f), using the same codified instrument authority, so that the exact volume evaporated to atmosphere is isolated and can be evaluated against municipal capacity and the pressure floors at J-13 DESIGN PRESSURE and J-16 OPERATING PRESSURE.

### IV.F The Two-Axis Matrix

Every facility, and every circuit within a facility, carries one Axis 1 class and one Axis 2 class. The pair determines the measurement method, the instrument, and the peak against which the facility is assessed. The full matrix is set out at Annex A; the governing relationships are these:

| **Cooling axis → Workload axis ↓** | **C-1 Air-cooled** | **C-2 Closed-loop dry** | **C-3 Evaporative** | **C-4 Hybrid / assisted** | **C-5 On-site generation** |
|---|---|---|---|---|---|
| **W-1 Continuous** | Physically constrained above ~30 kW/rack; high electrical overhead | Common for DLC training pods; dry rejection; no water meter required | **Maximum sustained water draw.** Secondary meter required; assessed at continuous peak | Secondary meter required on assist circuit; draw spikes at ambient peak | Secondary meter required on generation circuit in addition to IT circuits |
| **W-2 Burst** | Feasible at 20–30 kW/rack; peak fan power at ambient peak | Rear-door or cold plate with dry rejection; no water meter required | Variable water draw coincident with query peak. Secondary meter required; assessed at measured peak | Secondary meter required; **the most commonly concealed configuration** | Secondary meter required on generation circuit |
| **W-3 Mixed** | Per-hall determination; panel resolved per circuit | Per-hall determination; panel resolved per circuit | Secondary meter per evaporative circuit; assessed as sum of constituent classes | Secondary meter per assist circuit; classification may differ hall to hall | Secondary meter on generation circuit; site total is the sum of legs |

**The classification is dynamic, not declaratory.** A facility's class is a statement about what it is physically doing at the time of measurement, not a category it selected at permitting. A Class C-1 facility that engages misting on the afternoon of August 12 is a Class C-4 facility on the afternoon of August 12, for that circuit, and the record must show it. This is the operative content of proposed subsection (h).

### IV.G Workload Separation: Uniformity as the Decisive Property

The justification for moving the regulatory measurement boundary from the facility fence (M1) to the internal transport boundary (M2) is **physical load uniformity**.

**Uniform loads (steady state).** General compute, database, storage, and transactional applications run at low, predictable, steady draws. Their flat thermal and electrical footprints integrate easily into standard utility forecasting, and an averaged reading describes them accurately.

**Non-uniform loads (volatile peaks).** AI model training (95 percent or greater sustained utilization) and large-model inference (demand-driven fluctuation between 40 and 100 percent of TDP) create highly variable or continuously maximal draws whose peak is the planning-relevant quantity. For these, an averaged reading is not merely imprecise; **it describes a facility that does not exist.**

**The socialization gap.** Standard fence meters average volatile, high-amplitude spikes over billing intervals. This hides the physical peaks that force the utility to build grid capacity, upgrade transmission transformers, and secure additional water capacity. The capacity is built and paid for regardless; the only question the averaging resolves is **who pays**. Where the causing load is invisible, the cost defaults to the general rate base.

**The resolution — M2 isolation.** Transport-boundary meters resolve power draw per circuit at the internal power distribution unit level. As demonstrated by drawing GRUS-GRID-005 (Exhibit 4), on a single reference PDU panel, four non-uniform AI circuits of eight total circuits drive approximately 168 A of approximately 256 A of peak draw and approximately 115 $kW_{th}$ of approximately 142.5 $kW_{th}$ of heat — and therefore the corresponding majority of cooling-water consumption — while general compute, database, and storage circuits draw a small, steady, uniform fraction. The aggregate fence meter sees only the summed current and cannot resolve that four circuits are responsible. The M2 meter resolves it per circuit.

Drawing GRUS-GRID-001 (Exhibit 1) establishes why this is not an arbitrary point of insertion: the same distribution hierarchy, the same step-down stages, and the same measurement-node structure recur at every scale from generation to the processor die. **M2 is not a new kind of node invented for this rule; it is the same kind of node as M1, placed one level in.**

**What resolution does and does not conclude.** The panel schedule resolves where physical strain concentrates. It does not conclude that any facility should be denied service, curtailed, or charged a particular rate. Those are determinations for the adopting authority and the affected utilities on a measured record. This standard supplies the measurement; the jurisdiction draws the conclusion.

## Part V — Proposed Rule Text, with Basis

**Reading this Part.** The text in each bordered block labeled **RULE TEXT PROPOSED FOR ADOPTION** is proposed for adoption as the section designated at J-3 RULE DESIGNATION _____. Those blocks, taken together and in the order presented, are the complete proposed text of the section. Where the adopting authority requires additions to be marked, the section is new in its entirety and is marked by underlining throughout; no strikethrough appears.

The material following each block, under the heading **Basis**, is explanatory and is **not** proposed for adoption as rule text.

Jurisdictional entries appearing inside a bordered block are part of the proposed text and are completed by the adopting authority from the Schedule before adoption. An entry left blank takes the default stated for it in the Schedule, and the subsection remains operable.

**RULE TEXT PROPOSED FOR ADOPTION**

**§ J-3 RULE DESIGNATION _____. Measurement and Reporting of Resource Consumption by Large Computational Loads.**

**(a) Purpose.** The purpose of this section is to establish a uniform method by which the electrical and water resource consumption of a large computational load is measured, classified, verified, and reported. This section prescribes where a quantity is read, by whom it is read or verified, against what facility classification it is read, and in what form the resulting record is transmitted. This section does not establish a limit on consumption, a condition of approval, a penalty, or a curtailment obligation.

**Basis.** Subsection (a) states the scope of the instrument. A directive entered at J-11 AUDIT DIRECTIVE and the statute entered at J-5 INTERCONNECTION STATUTE each require quantities that cannot be produced uniformly without a stated method. This section supplies the method and stops there. The final sentence is included so that no reading of the section can treat a measurement obligation as a substantive limit; what the jurisdiction does with a measured figure remains the jurisdiction's determination.

**RULE TEXT PROPOSED FOR ADOPTION**

**(b) Application.**

(1) This section applies to a computational facility, or a phase or expansion of a computational facility, at a single site with an aggregate electrical demand of J-6 APPLICABILITY THRESHOLD _____ megawatts or greater, and to any computational facility that is subject to an interconnection standard adopted under J-7 IMPLEMENTING RULE _____.

(2) An obligation stated in this section that attaches to a circuit attaches to that circuit without regard to the classification the facility has stated for itself and without regard to the classification of any other circuit at the same site.

(3) Nothing in this section displaces, modifies, or supersedes the revenue metering of an electric utility or of a water or sewer utility, or the tariff under which that metering is performed.

(4) Nothing in this section authorizes or requires the inspection, disclosure, or logging of software source code, model weights, proprietary algorithms, tenant identity, or tenant data.

**Basis.** The threshold in paragraph (1) is taken from the statute entered at J-5 INTERCONNECTION STATUTE so that the measurement obligation attaches to the same population the legislature has already identified, and creates no new class of regulated facility. Where the jurisdiction has no such statute, the default of 75 MW applies, which is the threshold in general legislative use for large computational load interconnection. Paragraph (2) states the per-circuit rule that Parts IV.D and IV.E establish as an engineering matter: a site is not one thing, and a classification applied to a whole site conceals the circuits that drive the strain. Paragraph (3) preserves the position of every serving utility without qualification. Paragraph (4) is placed in the application subsection, rather than later in the section, because it is a limit on the entire rule and not on one measurement method; Exhibit 5 locates the regulatory boundary at the transport layer, above proprietary software and below the utility fence, which is the physical basis for the limit.

**RULE TEXT PROPOSED FOR ADOPTION**

**(c) Definitions.** The following words and terms, when used in this section, have the following meanings unless the context clearly indicates otherwise.

(1) **Approach** — the difference between the temperature of fluid leaving a heat-rejection device and the governing ambient temperature, which is the ambient dry-bulb temperature for a non-evaporative device and the ambient wet-bulb temperature for an evaporative device.

(2) **Blowdown** — water discharged from an evaporative circuit to control the concentration of dissolved solids. Blowdown is withdrawn but is not consumptive loss.

(3) **Computational facility** — a facility whose primary electrical load is information technology equipment performing computation, data storage, or data transmission, together with the cooling, power conversion, and auxiliary systems serving that equipment.

(4) **Consumptive loss** — water lost to atmosphere and not returned to any collection system. Consumptive loss is the sum of evaporation and drift.

(5) **Cycles of concentration** — the ratio of the concentration of dissolved solids in the circulating water of an evaporative circuit to the concentration of dissolved solids in the makeup water supplied to that circuit.

(6) **Drift** — liquid droplets entrained in the air stream leaving an evaporative device. Drift is consumptive loss.

(7) **Dry-bulb temperature** — ambient air temperature measured by a sensor shielded from radiation and moisture.

(8) **Evaporative circuit** — any circuit, system, or device at a site that rejects heat by evaporating water to atmosphere, including an open or closed-circuit cooling tower, an evaporative condenser, a wetted-media or adiabatic system, a spray pond, a misting or fogging system serving a condenser coil or air intake, and an evaporative cooling system serving on-site electric generation.

(9) **Evaporative feed** — the water delivered into an evaporative circuit, measured at the point of entry to that circuit.

(10) **Evaporative potential** — the difference between the ambient dry-bulb temperature and the ambient wet-bulb temperature at a stated condition.

(11) **Fence meter** or **M1** — the utility revenue meter located at the service entrance of a facility.

(12) **Makeup** — the total water fed into an evaporative circuit, equal to the sum of evaporation, drift, and blowdown.

(13) **Power usage effectiveness** or **PUE** — the ratio of total facility electrical power to the electrical power delivered to information technology equipment.

(14) **Qualified independent verifier** — a party meeting the criteria of subsection (g) of this section.

(15) **Range** — the difference between the entering and leaving water temperature across a heat-rejection device.

(16) **Saturation effectiveness** — the fraction of the evaporative potential realized by an evaporative device at a stated condition.

(17) **Thermal design power** or **TDP** — a manufacturer's published thermal rating for a device. A thermal design power rating is not, standing alone, a measured facility load.

(18) **Transport boundary** or **M2** — the measurement node located at the secondary distribution bus, switchgear feeder, or power distribution unit panelboard that directly feeds a compute pod, server hall, or cluster.

(19) **Wet-bulb temperature** — the thermodynamic wet-bulb temperature at a stated ambient condition, which is the lower limit of the air temperature achievable by evaporative cooling at that condition.

**Basis.** The definitions are drawn from Annex J and from the engineering terms used in Part IV. None is a jurisdictional entry, and no jurisdiction varies one. Four carry operative weight. **Consumptive loss** (4) and **blowdown** (2) are defined separately because the distinction between them is the reason subsection (f) requires a second meter rather than a larger first one. **Evaporative circuit** (8) is defined by function rather than by equipment type, so that a misting skid added to a dry cooler is within the definition without the rule needing to enumerate every configuration. **Wet-bulb temperature** (19) carries the physical floor that subsection (k)(3) relies upon. **Thermal design power** (17) is defined with its own limiting sentence because the conflation of a published device rating with a measured facility load is the single most common defect the evidence grades at subsection (k) are written to catch.

**RULE TEXT PROPOSED FOR ADOPTION**

**(d) Facility classification — workload axis.**

(1) Each computational facility, and each circuit within a computational facility, shall be classified on the workload axis as Class W-1, Class W-2, or Class W-3.

(2) **Load factor.** Classification on the workload axis is determined by load factor, computed at the transport boundary from the measurements subsection (i) of this section requires:

```
LF = mean demand ÷ peak demand
```

(A) Mean demand is the arithmetic mean of the one-minute interval demands over the full reporting period. Peak demand is the greatest one-minute interval demand over the same period.

(B) The period is the full reporting period. A load factor computed over a window selected by the reporting party does not satisfy this paragraph.

(C) Load factor is a measure of the shape of a load over time and is not a measure of its magnitude. Peak demand is reported alongside load factor in every case.

(3) **Class W-1, continuous.** A load is Class W-1 if its load factor is 0.95 or greater.

(4) **Class W-2, burst or variable.** A load is Class W-2 if its load factor is less than 0.95.

(5) **Class W-3, mixed.** A facility is Class W-3 if it contains circuits, halls, or pods of differing workload class. A Class W-3 facility is classified on the workload axis as the set of its constituent classes and not as a single class. Load factor is computed per circuit, per panelboard, or per pod, and not for the site as a whole.

(6) **Assessment peak by workload class.** A Class W-1 facility or circuit shall be assessed against its sustained continuous draw. A Class W-2 facility or circuit shall be assessed against its measured peak draw; an arithmetic mean over a month or a year does not satisfy the reporting requirement of this section for a Class W-2 load. A Class W-3 facility shall be assessed as the sum of its constituent classes resolved per circuit, per panelboard, or per pod, and not as a single blended average.

(7) Where a facility reports an average draw for any load, it shall report the peak draw alongside it and shall state the integration interval from which the peak was taken.

**Basis.** The three classes and the assessment rule are stated in full at Part IV.D, including the hardware densities, load shapes, thermal footprints, and instrumentation that characterize each, together with the real-world typology matrix at IV.D.4.

**On the test at paragraph (2).** Load factor is used because it is computed entirely from quantities subsection (i) already requires to be measured and retained, and because it measures the property the classification exists to capture. The shape of a load over time, not its magnitude, is what determines how much capacity a utility must hold in reserve and whether a facility's heat rejection falls off at any hour of the day. A thermal design power rating is not used as the denominator, for the reason subsection (c)(17) states: a published device rating is an input to a Designed or Modeled figure and is never, standing alone, a measured facility load. A ratio whose denominator is a manufacturer's rating is not a measurement, and a classification resting on one cannot be verified at the boundary.

The threshold of 0.95 is stated numerically, and the two classes are complementary and exhaustive, so that two reviewers applying the test to the same interval data reach the same class. A continuous load at half of its available capacity has a load factor near unity and is Class W-1, which is the correct result: it has no diurnal diversity, and its evaporative demand does not fall at night. Its magnitude is carried separately by the reported peak, which paragraph (2)(C) requires in every case.

The operative content is paragraph (6). A peak that is averaged away is not thereby removed from the system; it is removed only from the record, and the capacity to serve it is built and paid for by someone regardless. The requirement in paragraph (7) to state the integration interval exists because a peak is meaningless without one: a one-minute peak and a fifteen-minute peak describe different physical events, and only the shorter interval resolves a Class W-2 ramp.

**RULE TEXT PROPOSED FOR ADOPTION**

**(e) Facility classification — cooling axis.**

(1) Each computational facility, and each circuit within a computational facility, shall be classified on the cooling axis as Class C-1, C-2, C-3, C-4, or C-5. Classification on the cooling axis is determined by where and whether water is evaporated in the course of rejecting heat, and not by the facility's description of its cooling architecture.

(2) **Class C-1, air cooled.** A circuit is Class C-1 if heat is rejected entirely to ambient air by a dry cooler,

air-cooled chiller, or air-side economizer, and no evaporative circuit is installed or operated in connection with that circuit.

(3) **Class C-2, closed loop with non-evaporative rejection.** A circuit is Class C-2 if heat is transferred by a sealed recirculating loop and is rejected to the outside by a non-evaporative means. A sealed indoor loop is not sufficient to establish Class C-2. Where a sealed indoor loop rejects heat outdoors by evaporative means, the circuit is Class C-3.

(4) **Class C-3, evaporative.** A circuit is Class C-3 if heat is rejected to atmosphere by evaporating water as the primary means of rejection, including by cooling tower, evaporative condenser, wetted media, or spray pond.

(5) **Class C-4, hybrid or evaporative assisted.** A circuit is Class C-4 if it rejects heat by a non-evaporative means under some ambient conditions and engages an evaporative assist under others, including condenser-coil misting, spray pre-cooling, adiabatic wetted media, or evaporative trim.

(6) **Class C-5, on-site generation evaporative cooling.** A circuit is Class C-5 if it evaporates water in the course of on-site electric generation or the cooling of on-site generation equipment, including turbine inlet-air evaporative cooling or fogging, steam condenser cooling, and engine jacket-water or lubricant evaporative cooling. A Class C-5 circuit is subject to this section without regard to its location relative to an electric service meter.

**Basis.** The five classes are stated in full at Part IV.E, and the two-axis matrix at IV.F states the measurement obligation arising from each class pair. Two paragraphs carry disproportionate weight. Paragraph (3) closes the most frequently encountered misclassification: a facility with closed indoor liquid loops is commonly described as a closed-loop facility, but classification is governed by **where the evaporative loss physically occurs**, and a closed indoor loop rejecting heat outdoors through towers or wetted media consumes water exactly as an open tower does. Paragraph (6) brings behind-the-meter generation cooling within the section because water evaporated to produce electricity on site is physically identical in municipal impact to water evaporated to cool racks: the same supply, the same mains, the same hour.

**RULE TEXT PROPOSED FOR ADOPTION**

**(f) Water measurement boundary — two-meter method.**

(1) **The measured boundary.** Consumptive water loss at a computational facility shall be determined from two physical meters:

(A) the primary master service meter at the property entrance, measuring total water intake; and

(B) a secondary point-of-use submeter installed on the feed line to each evaporative circuit, measuring the water delivered into that circuit.

(2) **Determination of consumptive loss.** Consumptive loss is the metered evaporative feed, less the blowdown and bleed-off discharged from that circuit, less any other metered return. Blowdown shall be determined by a discharge meter where one is installed, or from the measured cycles of concentration of the circuit.

(3) **Quantities reported.** Total intake, evaporative feed, and consumptive loss shall each be reported. Blowdown volume and the concentration of its constituents shall be reported to the authority receiving wastewater discharge under subsection (j)(1)(D) of this section.

(4) **Scope of coverage.** The secondary submeter required by paragraph (1)(B) of this subsection shall meter the feed to any circuit that evaporates water rather than returning it, including a Class C-3 circuit, a Class C-4 assist circuit, and a Class C-5 generation circuit. The obligation attaches to the circuit, not to the facility's stated classification, and attaches upon installation or first operation, whichever occurs earlier.

(5) **No novel instrument.** The secondary submeter is a point-of-use submeter of the kind recognized under J-12 **SUBMETERING AUTHORITY** _____. No specialized or proprietary instrument is required. Meters shall be sized, installed, and maintained in accordance with applicable American Water Works Association standards and shall be calibrated at intervals not exceeding those the serving utility applies to comparable revenue meters.

(6) **Point of measurement.** The quantity measured under paragraph (1)(B) of this subsection is the water fed into the evaporative circuit. Water entering that circuit and not returning is the water consumed to atmosphere. Nothing in this subsection requires the metering of water vapor or the estimation of a drain-line quantity.

**Basis.** A single intake figure at the property line does not measure consumption, because a substantial portion of drawn water is returned to the sanitary sewer and only the evaporated fraction is consumed. It is the non-returned fraction — not intake — that determines whether the supplying system's pressure and capacity floors remain satisfied under the added load.

The three reported quantities at paragraph (3) are not redundant. **Total intake** is what the supplying utility must deliver, and is the figure relevant to source, treatment, and pumping capacity. **Evaporative feed** is what must be delivered at the moment of ambient peak, and is the figure relevant to distribution pressure. **Consumptive loss** is what never comes back, and is the figure relevant to basin, aquifer, and regional planning. **Blowdown** is the figure relevant to the wastewater plant, because it returns concentrated in dissolved solids. One number cannot serve four authorities; three metered quantities can serve all four.

**Answering the principal engineering objection.** The principal objection to water measurement at computational facilities is that consumptive loss cannot be metered because evaporation leaves no stream to meter. The objection is correct about the vapor and irrelevant to the method. **Evaporation is measured by difference at the feed**, in the same way any consumptive process is measured: by metering what goes in and accounting for what comes back out. Cycles of concentration are determined by conductivity, an ordinary and continuously logged tower measurement, which is why the return fraction is a determinable quantity rather than an assumption. Paragraphs (2) and (6) state one method, not two: (2) gives the arithmetic and (6) states the physical point of measurement and forecloses the drain-line objection.

**Relation to the system-integrity floors.** The measurement required by this subsection is the quantity necessary to evaluate compliance with the design standard at J-13 DESIGN PRESSURE and J-14 DESIGN FLOW PER CONNECTION (minimum pressure at all points at the stated flow per connection), the fire-flow standard at J-15 FIRE-FLOW PRESSURE, the operating standard at J-16 OPERATING PRESSURE, and the capacity standard at J-17 CAPACITY PER CONNECTION. Absent a secondary evaporative meter, compliance with those floors can only be asserted, and failure surfaces only when a smaller system is physically overtaxed. The design floor and the operating floor are separate obligations and fail in different ways: a system lawfully designed to its design pressure at the stated flow per connection may still fall below the operating floor once a continuous multi-hundred-gallon-per-hour evaporative draw is added at a single node during a coincident summer peak, because the design case did not contemplate that node. This subsection produces the input to the hydraulic evaluation of that case. It does not itself determine compliance; it makes determination possible.

**RULE TEXT PROPOSED FOR ADOPTION**

**(g) The verifier: independent of the entity being measured.**

(1) **Requirement.** Each measurement log, boundary reading, and facility classification required by this section shall be performed by, or verified by, a party independent of the entity being measured.

(2) **Qualification.** A party is qualified for purposes of this section if it is qualified by reason of facilities, personnel, experience, demonstrated reliability, and independence of judgment, consistent with the standard stated at J-22 VERIFIER INDEPENDENCE STANDARD _____, and if it attests, consistent with the criteria at J-23 VERIFIER ATTESTATION CRITERIA _____, that:

(A) its governing body, as a body, and its managerial and technical personnel, as individuals, are free to exercise independence of judgment in the performance of their duties;

(B) its activities under this section will not result in financial benefit through ownership or other financial interest in the measured entity, or in any producer, supplier, or vendor of the equipment involved, other than through standard fees for services rendered;

(C) it will consistently and uniformly apply the measurement methods and classifications of this section; and

(D) it has not provided, and will not provide during the engagement, design, engineering, or commissioning services to the measured entity for the electrical, cooling, or water systems it measures.

(3) **Prohibition of self-certification.** A figure, log, classification, or summary produced solely by the facility owner, operator, or tenant does not satisfy this section. The requirement is not discharged by internal audit, internal engineering review, or attestation by an affiliate under common ownership or control with the measured entity.

(4) **No new certification or registry required.** Nothing in this section creates or requires a certification program, license, or registry specific to computational-load measurement. Qualification is determined against the criteria in paragraph (2) of this subsection and may be satisfied by a professional engineer licensed in this jurisdiction, an independent testing or metering firm, or an independent inspection agency presently operating in this jurisdiction.

**Basis.** This subsection adopts an existing standard rather than inventing one, for three reasons. It is **enforceable on the day of adoption**, because qualified parties already exist and already understand the attestation. It is **defensible on review**, because the adopting authority is applying a standard that has been applied to analogous verifications for decades, both in the law entered at J-22 VERIFIER INDEPENDENCE STANDARD and in the international consensus standards that are its default. And it is **proof against capture**, because the fourth attestation — no design relationship — prevents the emergence of a class of verifiers that engineers the facilities it later measures.

The deliberate omission is equally important: the subsection does not require certification, because no certification exists in this field. A rule conditioning interconnection on a credential that no one holds would either stop all interconnection or be waived immediately, and neither outcome measures anything. Part III states the standard being adopted and the reason a self-report cannot meet it.

**RULE TEXT PROPOSED FOR ADOPTION**

**(h) Classification determination, reclassification, and reporting.**

(1) Classification under subsections (d) and (e) of this section is a statement of what a facility or circuit is physically doing at the time of measurement. It is not a designation elected at permitting and is not fixed by a prior filing.

(2) **Automatic reclassification.** The installation or operation of any evaporative circuit or evaporative assist places the affected circuit in Class C-4, or in Class C-3 where the evaporative device is the primary means of heat rejection, effective upon installation or upon first operation, whichever occurs earlier. Reclassification occurs by operation of the physical fact and does not depend upon any application, election, or amendment by the facility. A facility may not maintain a Class C-1 or Class C-2 designation for a circuit that evaporates water.

(3) **Consequence of reclassification.** A circuit reclassified under paragraph (2) of this subsection is subject to subsection (f) of this section, including the secondary submeter required by subsection (f)(1)(B), upon reclassification.

(4) **Interim reporting.** A change that results in reclassification under paragraph (2) of this subsection shall be reported to each authority receiving the record under subsection (j) of this section not later than 30 days after installation or first operation, whichever occurs earlier, and shall not be deferred to the annual cycle under subsection (k)(4).

(5) **Facial inconsistency — the air-cooling test.** A filing that states a purely air-cooled configuration shall state, for each rack class, the rack power density, the air temperature rise across the rack, the station elevation, and the airflow delivered per rack. The airflow stated shall be not less than:

$CFM = Q \div (K \times \Delta T)$, where $K = 0.240 \times 60 \times \rho$ and $\rho$ is the density of air at the station pressure determined under Annex I.2

(A) A filing whose stated airflow is less than the airflow this relation requires at its own stated conditions is deficient under subsection (k)(1)(C) of this section.

(B) A filing that states a rack power density without the temperature rise, the station elevation, and the delivered airflow has not stated a verifiable configuration, and is deficient under subsection (k)(1)(C).

**Basis.** This subsection is what prevents the classification framework from becoming a self-selected label. The seasonal case is the reason reclassification must be automatic: a facility can be honestly dry for nine months and consume municipal water at its maximum rate for the three months when the supplying system is least able to give it, and a classification fixed at permitting would record only the nine months. The trigger is the physical fact of evaporation, which the secondary meter records without needing anyone's characterization of it.

The thirty-day interim rule at paragraph (4) catches the case that matters most: the mid-summer addition of an evaporative assist to a facility the record still describes as dry. Annex B identifies the ambient conditions at which that transition predictably occurs, which is why the transition can be audited rather than merely asserted. Paragraph (5) states as a rule what Part IV.B establishes as physics: above roughly 30 kW per rack, air cooling fails, and a filing asserting both conditions has asserted something that cannot be true.

**RULE TEXT PROPOSED FOR ADOPTION**

**(i) Electrical measurement — the transport boundary.**

(1) **Two-tier architecture.** Electrical consumption shall be measured using a two-tier instrumentation

architecture that resolves active computational load separately from baseline facility infrastructure, including chiller plants, dry coolers, transformer losses, uninterruptible power supply conversion losses, lighting, and auxiliary systems.

(2) **Tier 1 — bus and branch submetering.**

(A) A revenue-grade digital power meter shall be installed at the transport boundary (M2).

(B) A Tier 1 submeter shall comply with ANSI C12.20, accuracy Class 0.1, 0.2, or 0.5, or with IEC 62053-22, accuracy class 0.1S, 0.2S, or 0.5S.

(C) Installation may use standard commercial current transformers, including split-core or Rogowski coils, installed by a licensed electrician.

(D) A Tier 1 submeter shall record active power, reactive power, apparent power, power factor, phase current, line voltage, and total energy, at integration intervals not exceeding one minute. Records shall be retained for not less than 24 months.

(3) **Tier 2 — equipment telemetry.**

(A) Tier 2 measurement uses power and thermal monitoring interfaces native to server hardware, intelligent power distribution units, and rack management controllers as shipped by the original equipment manufacturer.

(B) Telemetry shall be polled using open, non-proprietary management protocols, including the DMTF Redfish application programming interface, the Intelligent Platform Management Interface, and intelligent power distribution unit or branch-circuit monitoring.

(C) Tier 2 measurement requires no additional sensor, no physical tap, and no architectural modification. Compliance is satisfied by a reporting configuration that exposes existing firmware telemetry in the format required by subsection (j) of this section.

(D) Telemetry may be transmitted to the receiving authority by automated interface on a recurring schedule. Nothing in this subsection requires physical entry to a facility by the adopting authority or by a third party for the purpose of obtaining a Tier 2 reading.

(4) **Relation to the fence meter.** A Tier 1 or Tier 2 reading supplements and does not replace the fence meter (M1). A reading taken under this subsection is not a billing meter reading unless the serving utility elects to use it as such under an applicable tariff.

(5) **Open marketplace.** Because Tier 1 relies on instruments conforming to ANSI C12.20 or IEC 62053-22, and Tier 2 relies on open management protocols, no vendor, manufacturer, utility, or verifier holds an exclusive position in the measurement required by this subsection.

**Basis.** Drawing GRUS-GRID-002 (Exhibit 2) shows that M1 is the last regulated measurement node in the present system: measurement stops at the service entrance while the conductive path continues into the facility. Drawing GRUS-GRID-003 (Exhibit 3) and the worked reference panel at GRUS-GRID-005 (Exhibit 4) show what the next node in reveals — that on a representative mixed panel, four circuits of eight account for roughly four-fifths of the thermal and water strain. The rule does not ask for a new *kind* of measurement. It asks that the existing kind be taken one node further in, where the physical quantity that drives infrastructure cost first becomes resolvable. Part IV.G states the engineering reason: uniformity is the decisive property, and an averaged reading of a non-uniform load describes a facility that does not exist.

Paragraph (4) preserves the serving utility's position without qualification. Paragraph (5) records why no exclusive position arises. Paragraph (3)(D) records that the reading may be transmitted by automated interface, so that the obligation imposes no site visit, no inspection, and no operational interruption — the instrumentation already exists inside the facility and the reading can be requested of the operator directly.

**RULE TEXT PROPOSED FOR ADOPTION**

**(j) Jurisdictional resolution and the standardized record.**

(1) **Single record.** The measurement required by this section shall be recorded in a single, open, non-proprietary, machine-readable format, and shall include at minimum:

(A) electrical active and reactive power, transport boundary submeter logs, measured peak draws, and ramp characteristics;

(B) total water intake, evaporative feed, and consumptive loss, sufficient to evaluate system capacity and the minimum pressure requirements at J-13 **DESIGN PRESSURE** _____, J-16 **OPERATING PRESSURE** _____, and J-17 **CAPACITY PER CONNECTION** _____;

(C) on-site wellhead extraction volumes and local aquifer draws, where applicable; and

(D) blowdown discharge volume and constituent concentrations, and surface-water diversion logs, where applicable.

(2) **Compilation and transmission.** The record shall be compiled, verified, and transmitted by a qualified independent verifier meeting subsection (g) of this section. A record produced or transmitted solely by the facility owner, operator, or tenant does not satisfy this subsection.

(3) **Availability to other authorities.** The record shall be made available, in the same form, to each authority holding jurisdiction over a component of the site's resource draw, including the authorities entered at J-9 GRID OPERATOR, J-24 DRINKING WATER AUTHORITY, J-25 WASTEWATER AUTHORITY, J-26 SURFACE-WATER AUTHORITY, J-27 GROUNDWATER AUTHORITY, J-29 ZONING AUTHORITY, and J-33 REGIONAL WATER PLANNING. Each receiving authority applies its own law to the record. Nothing in this subsection transfers jurisdiction to or from any authority, amends the governing statute of any authority, or assigns to the adopting authority the enforcement authority of another agency.

(4) **Administrative mechanism.** The adopting authority shall designate one of the following mechanisms for execution of the verification and transmission required by this section:

(A) the facility engages a qualified independent verifier at facility expense; or

(B) the adopting authority procures independent verification services through a vendor pool funded by an assessment on interconnecting large loads.

**Basis — the boundary-siting problem.** Large computational facilities are frequently sited along county, municipal, water-district, or extraterritorial-jurisdiction seams. In a seam location, each local authority inspects only the fragment of the footprint within its own boundary, and no single agency holds visibility into the combined strain. The failure is not that any one reviewer is careless; it is that no reviewer has been given the whole quantity. One record, compiled once and made available to all, is the minimum structural fix, and it is cheaper for every party than four partial reviews. Annex G states the thirteen dimensions along which regional strain aggregates and the nineteen metrics by which margin is calculated.

Paragraph (3) states the limit expressly. The rule produces a number and makes it available; what the number means for permitting, conservation, discharge, or enforcement is determined by the body that already holds that authority. Annex F identifies, for each requirement evaluated, which authority makes the determination, and states expressly that it does not purport to make it.

**On the choice between the two mechanisms at paragraph (4).** The author does not urge either option and would be satisfied by either. Option (A) places cost on the causing party and requires no appropriation. Option (B) produces greater uniformity across facilities and removes the residual concern that a facility-engaged verifier depends on the facility for repeat engagement. The adopting authority is better positioned than the author to weigh those trade-offs; what matters to the integrity of the measurement is that one of the two be selected rather than neither.

**RULE TEXT PROPOSED FOR ADOPTION**

**(k) Realized load, evidence grades, and reporting scope.**

(1) **Evidence grade required.** Each electrical, thermal, and water figure reported under this section shall be designated by evidence grade as Measured, Permitted, Designed, Modeled, or Projected, as those grades are defined in this paragraph:

(A) **Measured** — supported by a boundary submeter reading or operational log verified under subsection (g) of this section. **Permitted** — authorized by an issued permit, contract, or water right, at the quantity stated in that instrument. **Designed** — derived from sealed engineering design documents for equipment actually specified. **Modeled** — derived by a stated formula from stated inputs, with the formula and the inputs disclosed. **Projected** — forecast or scenario, including a growth case or phase build-out assumption.

(B) A thermal design power rating is an input to a Designed or Modeled figure and is never, standing alone, a Measured figure. A filing shall not present an unverified device rating, a manufacturer nameplate figure, or a developer scenario as measured consumption.

(C) A filing that presents a figure without its evidence grade, or that presents a figure at a grade the record does not support, is deficient and shall be returned for correction.

(2) **Full-facility electrical scope.** Reported electrical consumption shall state total gross facility load, determined as the product of information technology load and power usage effectiveness, and shall

disaggregate and include chiller plants, dry-cooler fans, pumps, air handlers, liquid cooling distribution units, evaporative tower drives, water treatment systems, misting and spray pumps, transformer losses, uninterruptible power supply conversion losses, power-factor correction equipment, lighting, physical security, environmental controls, and auxiliary buildings. A filing that reports information technology load while omitting cooling and facility overhead is deficient and shall be returned for correction.

(3) **Design condition stated.** A reported figure that depends on an ambient condition shall state the dry-bulb temperature, the coincident wet-bulb temperature, and the source and exceedance percentile of the design condition used. A claimed temperature depression achieved by evaporative means shall be stated as a saturation effectiveness against the stated wet-bulb temperature, and a saturation effectiveness exceeding 0.90 shall be supported by manufacturer test data at the stated condition.

(4) **Annual re-verification.** Each facility subject to this section shall undergo an annual verification performed by a qualified independent verifier, documenting physical additions and expansions, hardware changes affecting rack power density, cooling system modifications including the installation or activation of an evaporative assist, and changes in workload classification.

(5) **Consistency of figures presented to other authorities.** A facility subject to this section shall certify that the electrical, thermal, and water figures it has presented to any authority in support of a site plan, zoning application, abatement agreement, or utility service agreement are consistent with the record produced under this section, and shall file corrected figures with each such authority where they are not.

**Basis.** A city or county that executes a binding water-service contract on unverified developer representations has committed public capacity against a figure no government has tested, and the resulting deficit falls on residents who were not parties to the agreement. The obligation at paragraph (5) is therefore placed on the interconnecting facility, where the adopting authority's jurisdiction is clearest, and local authorities entered at J-29 ZONING AUTHORITY and J-30 SUBDIVISION AUTHORITY are addressed in terms of availability rather than directive. The practical effect is that a facility cannot present one set of figures to the adopting authority and another to the county.

The annual re-verification at paragraph (4) exists because a computational facility is not a static object. A hall commissioned for inference at 25 kW per rack may be re-racked for training at 70 kW per rack without any exterior change, any new permit, or any notice to the water utility whose mains serve it. The annual cycle catches drift; the thirty-day interim rule at subsection (h)(4) catches the mid-summer case.

Paragraph (3) exists because the wet-bulb temperature is a hard physical floor. No quantity of water sprayed can cool entering air below it. A claimed temperature depression stated as a fixed number of degrees, without a stated wet-bulb, cannot be checked; stated as a saturation effectiveness against a stated wet-bulb, it can be. Annex B computes wet-bulb for every ambient case precisely so that the check is available to any reviewer, and Annex C.6 states the forensic rules that follow — including that an absolute equipment rating of 125 °F or 135 °F cannot be treated as a recommended continuous operating temperature where the manufacturer specifies 108 °F.

**RULE TEXT PROPOSED FOR ADOPTION**

**(l) Cost causation basis.**

(1) Where cost is allocated to a large load under J-8 COST-ALLOCATION STATUTE _____ or under J-7 IMPLEMENTING RULE _____, the quantity of causation shall be determined from the measured peak electrical demand at the transport boundary under subsection (i) of this section and the measured consumptive water loss under subsection (f) of this section, each verified under subsection (g).

(2) This subsection establishes the measured basis on which an allocation is calculated. It does not establish an allocation methodology, a rate, a charge, or a tariff.

**Basis.** Under aggregate fence metering, a facility that triggers a large transmission upgrade or a summer water-main expansion contributes those costs to the general rate base, where they are recovered from every customer class. The provision entered at J-8 COST-ALLOCATION STATUTE is enacted to prevent that outcome for large loads, and the rate standard entered at J-34 RATE STANDARD prohibits the unreasonable discrimination that results when it is not prevented. The statute supplies the allocation *principle*; it does not supply the measured *quantity* of causation that allocation requires. Subsections (f) and (i) supply that quantity, and this subsection states the consequence and nothing more. Paragraph (2) is explicit that the rule establishes a measured basis and does not establish a methodology, a rate, a charge, or a tariff; those remain the adopting authority's determinations on a measured record, under consideration in the proceeding entered at J-40 OPEN COST PROCEEDING where one is pending.

**RULE TEXT PROPOSED FOR ADOPTION**

**(m) Materials incorporated by reference.**

(1) The following materials are incorporated into this section by reference and have the same effect as if set out in full. The materials are in the public domain for regulatory use.

| Material | Content | Invoked by |
|---|---|---|
| **Annex A** | Master two-axis classification matrix; classification summary; measurement obligation by class pair | (d), (e), (h) |
| **Annex B** | Psychrometric and ambient stress matrix; wet-bulb, dew point, humidity ratio, enthalpy, and evaporative potential by ambient case | (c)(19), (e), (k)(3) |
| **Annex C** | Heat-transfer boundary specifications, Modes 1 through 5; forensic rules for boundary audits | (e), (k)(3) |
| **Annex D** | Facility performance and classification matrix by weather case | (e), (k)(2), (k)(3) |
| **Annex E** | Water source, utility capacity, pressure, and incident audit protocol | (f), (j) |
| **Annex F** | Statutory and regulatory reconciliation; ten-point legal record structure | (j)(3) |
| **Annex G** | Regional aggregation and cumulative strain; thirteen dimensions, nineteen margin metrics | (j)(3) |
| **Annex H** | Project completeness matrix, forty fields | (k)(1) |
| **Annex I** | Engineering computation basis and derivations; every formula and worked value | (f)(2), (i), (k)(3) |
| **Annex J** | Defined terms and symbols | (c) |
| **Exhibits 1–5** | Power distribution hierarchy; single-line diagram; panel and load schedules; the layer stack | (b)(4), (c)(18), (i) |

**RULE TEXT PROPOSED FOR ADOPTION (CONTINUED)**

(2) A standard of a recognized standards body referenced in this section — ANSI C12.20 and ANSI C12.1, IEC 62053-22, an American Water Works Association cold-water meter standard, the DMTF Redfish specification, and the Intelligent Platform Management Interface specification — is incorporated as it exists on the effective date of this section.

**(n) Severability.** Each subsection of this section operates independently. If any subsection, or the application of any subsection to any person or circumstance, is held invalid or is not adopted, the remaining subsections and applications remain in effect. Where a jurisdictional entry is not completed, the default stated for it applies and this section remains operable.

**Basis.** Incorporation by reference is the ordinary mechanism by which an administrative code gives legal effect to technical material without reprinting it, and is used here for the same reason: the annexes are reference matrices, protocols, and derivations, and reproducing them as operative rule text would make the section unreadable without adding to its effect. The annexes are reproduced in full at the end of this document so that the adopting authority, its staff, and any party may review exactly what is incorporated. Subsection (n) is included so that the adopting authority may adopt any subsection or combination of subsections; Part VI states why the subsections are interdependent as an engineering matter, but that interdependence is stated as a fact and not as a condition on adoption. The final sentence of subsection (n) is what makes an incomplete Schedule harmless.

## Part VI — Why These Belong Inside the Measurement

### 6.1 Each subsection specifies the measurement itself

Each proposed subsection specifies a necessary element of the measurement: what it measures on the water leg (subsection (f), the secondary evaporative meter and the Two-Meter Method) and on the electrical leg (subsection (i), the two-tier bus submeter and existing telemetry); who verifies it (subsection (g), a qualified party independent of the one being measured); the class it reads (subsections (d), (e), and (h), the two-axis profile); what its reading resolves (subsection (j), the jurisdiction); the evidentiary grade and scope of what is reported (subsection (k)); and the allocation the reading supports (subsection (l)).

Remove any one and the standard cannot be applied uniformly. Without a boundary, two verifiers measure different things. Without a verifier standard, the boundary is read by an interested party. Without classification, the same reading means different things at different facilities. Without a common record, four authorities receive four partial answers. Without evidence grades, a projection and a measurement appear identical on the page. Without allocation, a correct measurement produces no consequence. These are the definitions the framework already requires in order to function, each grounded in a standard or statute already in force in the adopting jurisdiction or in international consensus.

### 6.2 The burden is minimal and the method is ordinary

On the water leg: one commonplace point-of-use water meter at a defined point, added to a facility that already has a primary meter and is, where the statute at J-5 INTERCONNECTION STATUTE applies, already required to submit water studies and to bear interconnection costs. On the electrical leg: revenue-grade submeters of the type already installed for tenant allocation, plus a software configuration exposing telemetry the servers already produce. No novel instrument, no proprietary device, no tear-out, and no inspection of anything a facility has a legitimate interest in protecting.

What it produces is the one quantity presently missing and unverifiable: how much water and how much peak power a large load actually consumes, measured at the point it occurs, verified by a party competent and independent enough to measure it, assessed against the correct facility class.

### 6.3 What the whole converts

Taken together, these subsections convert a mandated audit from a self-report the facility fills out — the method that has already failed, in the jurisdiction from which this standard was developed, at better than ninety percent — into a measurement a government can stand behind: measured at a defined boundary by an ordinary secondary meter and standard bus submeters, verified by a qualified independent party, assessed against a stated facility class, and recorded in a form every affected authority can read.

That is the entire proposal. It does not decide whether any facility should be built, connected, curtailed, or charged. It decides only that the quantities on which those decisions rest will be measured rather than asserted.

### 6.4 Why one standard, and why the same one

A computational facility in one jurisdiction rejects heat by the same physics as a computational facility in another. The latent heat of vaporization of water does not change at a state line. The air-cooling limit at 25 to 30 kW per rack does not change. The wet-bulb floor does not change. A 150 kW rack rejects 511,821 BTU/hr everywhere.

What changes is the law: which body holds jurisdiction, what pressure floor is codified, what threshold attaches, what a connection is defined to be. Those are the forty-two entries on the Schedule, and they are the whole of what changes.

The consequence is that a figure produced under this standard in one jurisdiction is comparable to a figure produced under it in another, which is the property a measurement standard exists to supply and the property no amount of separate local drafting can produce. Where each jurisdiction writes its own measurement method, the figures are not comparable even when they are both honest, and a developer can present a figure produced by the most permissive method available to the authority least equipped to check it. A single method with declared local parameters removes that option without removing any jurisdiction's authority over anything it already governs.

## Part VII — Request

WHEREFORE, Green Recursive Utility Service LLC respectfully requests that J-1 ADOPTING AUTHORITY _____:

1. **Initiate rulemaking proceedings** pursuant to J-4 PROCEDURAL ROUTE _____, and publish for

comment the rule text proposed in Part V, in whole or in such part as the authority determines;

2. **Adopt the two-axis facility classification** at proposed subsections (d) and (e), including the automatic reclassification rule at subsection (h)(2), as the classification against which large computational loads are measured and assessed;
3. **Require that measurement be performed or verified by a qualified party independent of the entity being measured**, consistent with the independence-of-judgment standard entered at J-22 VERIFIER INDEPENDENCE STANDARD _____ and the approval criteria entered at J-23 VERIFIER ATTESTATION CRITERIA _____, and expressly find that a figure produced solely by the measured entity does not satisfy the standard;
4. **Select one of the two administrative mechanisms** at proposed subsection (j)(4), so that the verification obligation has an execution path on the day the rule takes effect;
5. **Direct that the resulting record be produced in a single open format** and made available to each authority with jurisdiction over a component of a site's resource draw, as provided at proposed subsection (j);
6. **Complete the Schedule of Jurisdictional Entries** at the front of this document, so that the adopted rule states the provisions of this jurisdiction's own law at every point at which this standard calls for them; and
7. **Take notice of the technical annexes and drawings** incorporated by reference at proposed subsection (m) and reproduced in full at the end of this document, and in particular of Annex I, which states the formula and worked arithmetic behind every engineering value used here so that the authority, its staff, and any party may verify or refute each figure independently.

The author further states that it seeks no exclusive role in performing the measurement proposed; that the specifications may be satisfied by any qualified party; and that the author places this document, the proposed rule text, and the incorporated technical appendix in the public domain under the CC0 1.0 Universal Public Domain Dedication, for regulatory use by any authority in any jurisdiction. Adoption requires no license from, no notice to, and no permission of the author, and confers no exclusive right upon the author.

Respectfully submitted,

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## Normative and Statutory References

### Normative references — fixed, and not jurisdictional entries

| Reference | Subject, and the provision that consumes it |
|---|---|
| ANSI C12.20-2015 | American National Standard for Electricity Meters — 0.1, 0.2 and 0.5 Accuracy Classes. Tier 1 submeter accuracy, subsection (i)(2)(B). |
| ANSI C12.1-2024 | American National Standard, Code for Electricity Metering. Governing code for meter performance and test practice. |
| IEC 62053-22:2020, Edition 2.0 | Electricity metering equipment — Particular requirements, Part 22: Static meters for AC active energy, accuracy classes 0.1S, 0.2S and 0.5S. Alternative to ANSI C12.20, subsection (i)(2)(B). This edition cancelled and replaced the 2003 first edition and its 2016 amendment. |
| DMTF Redfish specification | Open management interface for server power and thermal telemetry. Tier 2 measurement, subsection (i)(3)(B). |
| Intelligent Platform Management Interface (IPMI) | Open management interface. Alternative to Redfish, subsection (i)(3)(B). |
| ASHRAE Handbook — Fundamentals, Chapter 1 | Psychrometric formulation: saturation pressure, humidity ratio, enthalpy, thermodynamic wet-bulb temperature. Subsection (c)(19), subsection (k)(3), Annexes B and I.2. |
| ASHRAE climatic design conditions | Design dry-bulb and mean coincident wet-bulb values by station, with exceedance percentile. Subsection (k)(3) and Annex B. **This reference is normative and fixed; it is not a jurisdictional entry.** |
| AWWA standards for cold-water meters | Water meter construction and accuracy. Subsection (f)(5). |
| ISO/IEC 17020:2012 | Requirements for the operation of various types of bodies performing inspection, including impartiality and independence. Default basis for `J-22`. |
| ISO/IEC 17025:2017 | General requirements for the competence of testing and calibration laboratories, including impartiality. Default basis for `J-22`. |
| IEEE Std 315 | Graphic symbols for electrical diagrams. Exhibit 2. |
| 40 CFR Part 141 | National Primary Drinking Water Regulations. Federal floor for the entries in Group B of the Schedule. |
| Recommended Standards for Water Works (Great Lakes — Upper Mississippi River Board) | Distribution system design, including minimum pressure and capacity. Source of the defaults for `J-13` through `J-20` and `J-39`. |
| 42 U.S.C. § 17112 | Energy efficiency for data center buildings, including the direction at subsection (b)(2)(D) to produce specifications, measurements, best practices, and benchmarks, and the direction at subsection (h) to participate in harmonizing global specifications and metrics. |
| EPANET, or equivalent extended-period hydraulic network model | Hydraulic evaluation method. Annex E.3.3, point 5. |

The author is not a party to, and claims no interest in, any document listed above. Each is cited because it is published and independently verifiable, which is the only property a normative reference needs.

### Statutory references — supplied by the adopting jurisdiction

The provisions of the adopting jurisdiction's law on which this standard relies are the forty-two entries scheduled at the front of this document. For the convenience of the adopting authority, the entries are grouped here by subject:

| Subject | Entries |
|---|---|
| The adopting authority and the instrument | `J-1` adopting authority · `J-2` rulemaking authority · `J-3` rule designation · `J-4` procedural route · `J-36` construction of "shall" · `J-37` public comment |
| Electric interconnection and cost | `J-5` interconnection statute · `J-6` threshold · `J-7` implementing rule · `J-8` cost allocation · `J-9` grid operator · `J-34` rate standard · `J-35` demand management · `J-40` open cost proceeding |
| Existing reporting and audit | `J-10` usage-reporting requirement · `J-11` audit or verification directive |
| Water metering and the integrity floors | `J-12` submetering authority · `J-13` design pressure · `J-14` design flow per connection · `J-15` fire flow · `J-16` operating pressure · `J-17` capacity · `J-18` definition of a connection · `J-19` metered-history alternative · `J-20` engineering plan submittal · `J-21` public notification · `J-39` emergency power delivery · `J-41` system identifier |
| Water source and discharge | `J-24` drinking water authority · `J-25` wastewater · `J-26` surface water · `J-27` groundwater · `J-28` reclaimed water · `J-33` regional water planning · `J-38` drought stages |
| The verifier | `J-22` independence standard · `J-23` attestation criteria · `J-42` counsel review |
| Land use and local approvals | `J-29` zoning · `J-30` subdivision and county development · `J-31` tax abatement · `J-32` emergency services district |

## Technical Annexes and Exhibits

The annexes and exhibits that follow are incorporated into the proposed rule by reference at subsection (m) and have the same effect as if set out in full in the rule. They are reproduced here from GRUS-STD-60084 v2.0 as Annexes A through J and Exhibits 1 through 5. No annex, table, formula, figure, drawing, value, or note has been altered, condensed, renumbered, or omitted. Where the source document cites a provision of one jurisdiction's law, this edition states the corresponding jurisdictional entry in its place.

Annex I in particular states every formula used anywhere in this document, together with the worked arithmetic, expressly so that the adopting authority, its staff, or any party may reproduce or refute each figure without contacting the author.

## Annex A — Master Two-Axis Classification Matrix and Measurement Obligation

### A.1 Classification Summary

| Class | Definition | Operating signature | Measurement rule | Assessment peak |
|---|---|---|---|---|
| **Axis 1 — Workload profile** | | | | |
| **W-1** | Continuous high-utilization (AI training, continuous HPC) | Load factor ≥ 0.95; peak ≈ mean; 40–80+ kW/rack | Tier 1 bus submeter at M2 plus Tier 2 telemetry | Sustained continuous draw |
| **W-2** | Burst / variable (AI inference, cloud, colocation) | Load factor < 0.95; demand tracks query volume; 20–40 kW/rack | Tier 1 plus Tier 2 at 1-minute or faster integration | **Measured peak draw**; annual mean insufficient |
| **W-3** | Mixed / multi-tenant composite | Heterogeneous halls, 5–80+ kW/rack within one site | Resolved per circuit, per PDU panel, or per pod | **Sum of constituent classes**; blended average insufficient |
| **Axis 2 — Cooling method** | | | | |
| **C-1** | Air-cooled; no evaporative circuit | Dry coolers, air-cooled chillers, economizers; near-zero cooling water | No secondary water meter while genuinely dry; electrical overhead reported | Peak electrical overhead at ambient design |
| **C-2** | Closed-loop recirculating, non-evaporative outdoor rejection | Sealed cold-plate or rear-door loop with dry outdoor rejection | No secondary water meter while outdoor rejection remains dry | Peak electrical overhead at ambient design |
| **C-3** | Evaporative towers, evaporative condensers, adiabatic media, spray ponds | Phase-change rejection; ~390 gal/hr per MW evaporated | **Secondary point-of-use submeter required** on each evaporative feed | Peak consumptive draw at design wet-bulb |
| **C-4** | Hybrid / evaporative-assisted (misting, spray pre-cool, wetted pads) | Dry in mild ambient; evaporative during heat events | Secondary submeter required on each assist circuit; automatic reclassification | Peak consumptive draw during ambient heat event |
| **C-5** | On-site generation evaporative cooling (turbine fogging, condenser towers, jacket-water towers) | Behind-the-meter generation consuming water by evaporation | Secondary submeter required on each generation evaporative feed | Peak consumptive draw at generation peak |

### A.2 Measurement Obligation by Class Pair

The obligation attaches to the physical circuit. A single site frequently carries several pairs simultaneously; the site total is the sum of the legs, never the average.

| Pair | Typical archetype | Water obligation | Electrical obligation |
|---|---|---|---|
| **W-1 / C-2** | DLC training cluster with dry outdoor rejection | None while rejection remains dry; annual re-verification of that fact | Tier 1 + Tier 2 at continuous draw |
| **W-1 / C-3** | Training supercluster on cooling towers | Secondary meter; continuous maximum consumptive draw | Tier 1 + Tier 2 at continuous draw |
| **W-2 / C-4** | Inference facility with summer misting assist | Secondary meter on assist circuit; peak draw coincident with query and ambient peak | Tier 1 + Tier 2 at measured peak |
| **W-3 / C-3 + C-4** | Colocation campus, mixed halls, tower plus assist | Secondary meter per evaporative circuit; site total is sum of circuits | Per-circuit resolution at PDU panel |
| **Any / C-5** | Site with behind-the-meter generation | Secondary meter on generation evaporative feed **in addition to** IT cooling meters | Generation output and station service reported with facility load |

### A.3 Structure of the Standard

| Component | Content |
|---|---|
| Part I — Statutory frame | The interconnection statute and threshold at J-5 and J-6; cost allocation at J-8; implementing rules at J-7; submetering authority at J-12; the usage-reporting record at J-10; the audit directive at J-11; the system-integrity floors at J-13 through J-17 |
| Part IV.A–IV.C — Baselines and physics | Vendor-neutral hardware draws from dual-socket CPUs (150–250 W) to H100-class GPUs (~700 W) and integrated 8-GPU nodes (6.5–7.5 kW); the 25–30 kW/rack air-cooling limit; the heat, cooling-overhead, and water chain with worked arithmetic |
| Part IV.D — Axis 1 | Classes W-1 (continuous), W-2 (burst, assessed at measured peak), W-3 (composite, resolved per circuit) |
| Part IV.E — Axis 2 | Classes C-1 (air), C-2 (closed-loop dry), C-3 (evaporative), C-4 (hybrid assist), C-5 (on-site generation) |
| Annexes A–D — Reference matrices | Two-axis matrix; psychrometric stress matrix; heat-transfer boundary specifications; facility performance by weather case; reference panel schedule at Exhibit 4 showing four circuits driving 80.7 percent of panel thermal and water strain |
| Part V — Rule text | Subsections (a) through (n): purpose, application, definitions, both axes, the water boundary, the verifier, dynamic classification, the transport boundary, jurisdictional resolution, evidence grades, cost causation, incorporation, severability |

## Annex B — Psychrometric and Ambient Stress Matrix

This matrix satisfies the Phase 4 ambient stress specification. It states the moist-air properties, the evaporative cooling potential (ΔT = dry-bulb minus wet-bulb), and the operational cooling-class transition across the required matrix of dry-bulb temperatures and relative-humidity cases.

**Computation basis.** All values are computed at standard atmospheric pressure (14.696 psia / 101.325 kPa) from the ASHRAE formulation for saturation pressure over liquid water, with humidity ratio `W = 0.621945 × p_w / (P − p_w)`, enthalpy `h = 0.240t + W(1061 + 0.444t)`, the ASHRAE dew-point inversion, and the thermodynamic wet-bulb obtained by iterative solution of the adiabatic saturation relation. The formulas and a worked example appear at Annex I.2. The final column states the air-off temperature achievable at a saturation effectiveness of 0.85, which is the practical mid-range for adiabatic media and misting.

**Reading the ΔT column.** ΔT is the entire evaporative resource available at that ambient condition. It is not a design margin and it cannot be increased by equipment. At 100 percent relative humidity, ΔT is zero by definition: dry-bulb and wet-bulb coincide, evaporative cooling yields nothing, and heat rejection must be carried entirely by mechanical refrigeration or the facility derates.

No value in this matrix is a jurisdictional entry. The station-specific design condition against which a particular facility is evaluated is drawn from the ASHRAE climatic design conditions for that station under subsection (k)(3), which is a normative reference and not a matter of law.

| Ambient case | RH (%) | Wet-bulb (°F) | Dew point (°F) | Humidity ratio (gr/lb dry air) | Enthalpy (BTU/lb) | Evap. potential ΔT (°F) | Air-off at ε=0.85 (°F) | Primary cooling mode and classification |
|---|---|---|---|---|---|---|---|---|
| **85 °F DB** Mild | 30 | 63.6 | 50.2 | 53.7 | 28.82 | 21.4 | 66.8 | C-1 dry air cooling |
| | 50 | 70.8 | 64.3 | 90.2 | 34.55 | 14.2 | 72.9 | C-1 dry air cooling |
| | 70 | 77.0 | 74.1 | 127.3 | 40.38 | 8.0 | 78.2 | C-1 / C-2 dry; elevated fan speed |
| | 90 | 82.5 | 81.7 | 165.1 | 46.31 | 2.5 | 82.9 | C-1 / C-2 dry; elevated fan speed |
| | 100 | 85.0 | 85.0 | 184.2 | 49.31 | 0.0 | 85.0 | C-1 sensible only; no evaporative benefit |
| **95 °F DB** Warm Peak | 30 | 70.7 | 58.8 | 73.8 | 34.43 | 24.3 | 74.4 | C-1 / C-2 approaching air limit |
| | 50 | 79.1 | 73.5 | 124.4 | 42.40 | 15.9 | 81.4 | C-1 / C-2 elevated fan power |
| | 70 | 86.1 | 83.6 | 176.1 | 50.55 | 8.9 | 87.4 | C-4 shift — assist engaged |
| | 90 | 92.2 | 91.6 | 229.1 | 58.90 | 2.8 | 92.6 | C-3 / C-4 water plus mechanical assist |
| | 100 | 95.0 | 95.0 | 256.0 | 63.15 | 0.0 | 95.0 | C-3 mechanical chiller required |
| **100 °F DB** Hot Summer | 30 | 74.3 | 63.0 | 86.1 | 37.60 | 25.7 | 78.2 | C-4 — pre-cooling spray active |
| | 50 | 83.2 | 78.0 | 145.5 | 46.97 | 16.8 | 85.7 | C-4 — adiabatic wetted media |
| | 70 | 90.7 | 88.4 | 206.4 | 56.60 | 9.3 | 92.1 | C-3 / C-4 heavy evaporative draw |
| | 90 | 97.1 | 96.5 | 269.0 | 66.48 | 2.9 | 97.5 | C-3 high tower blowdown; derating risk |
| | 100 | 100.0 | 100.0 | 301.0 | 71.53 | 0.0 | 100.0 | C-3 max chiller; thermal strain |
| **104 °F DB** ASHRAE 0.4% Design Basis | 32 | 78.0 | 68.0 | 102.6 | 41.19 | 26.0 | 81.9 | C-4 — pre-cooling spray active |
| | 30 | 77.2 | 66.5 | 97.3 | 40.35 | 26.8 | 81.2 | C-4 — pre-cooling spray active |
| | 50 | 86.5 | 81.6 | 164.6 | 51.00 | 17.5 | 89.2 | C-4 — adiabatic wetted media |
| | 70 | 94.3 | 92.2 | 234.0 | 61.97 | 9.7 | 95.8 | C-3 / C-4 heavy evaporative draw |
| 0.4% design pair: 104 °F DB / 78 °F MCWB corresponds to 31.6% RH | | | | | | | | |
| **105 °F DB** | 30 | 77.9 | 67.3 | 100.3 | 41.07 | 27.1 | 81.9 | C-4 — pre-cooling spray |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Extreme Heat | | | | | | | | active |
| | 50 | 87.4 | 82.6 | 169.8 | 52.06 | 17.6 | 90.0 | C-4 — adiabatic wetted media |
| | 70 | 95.3 | 93.2 | 241.4 | 63.40 | 9.7 | 96.7 | C-3 / C-4 heavy evaporative draw |
| | 90 | 102.0 | 101.4 | 315.4 | 75.10 | 3.0 | 102.4 | C-3 high tower blowdown; derating risk |
| | 100 | 105.0 | 105.0 | 353.3 | 81.10 | 0.0 | 105.0 | C-3 max chiller; thermal strain |
| **108 °F DB** OEM Recommended Maximum Continuous | 30 | 80.0 | 69.9 | 109.7 | 43.31 | 28.0 | 84.2 | C-4 high evaporative assist; submeter trigger |
| | 50 | 89.9 | 85.3 | 186.0 | 55.39 | 18.1 | 92.6 | C-4 maximum misting draw |
| | 70 | 98.0 | 96.0 | 265.0 | 67.90 | 10.0 | 99.5 | C-3 / C-4 severe consumptive draw |
| | 90 | 104.9 | 104.4 | 346.7 | 80.84 | 3.1 | 105.4 | Thermal derating / mechanical chiller |
| | 100 | 108.0 | 108.0 | 388.7 | 87.49 | 0.0 | 108.0 | Emergency derating / curtailment condition |
| Also the multi-day sustained heat-wave case (108 °F for 72+ hours) | | | | | | | | |
| **110 °F DB** Extreme Peak | 30 | 81.5 | 71.6 | 116.5 | 44.87 | 28.5 | 85.8 | C-4 high evaporative assist; submeter trigger |
| | 50 | 91.6 | 87.1 | 197.7 | 57.74 | 18.4 | 94.3 | C-4 maximum misting draw |
| | 70 | 99.8 | 97.9 | 281.8 | 71.08 | 10.2 | 101.4 | C-3 / C-4 severe consumptive draw |
| | 90 | 106.9 | 106.3 | 369.2 | 84.93 | 3.1 | 107.3 | Thermal derating / mechanical chiller |
| | 100 | 110.0 | 110.0 | 414.1 | 92.06 | 0.0 | 110.0 | Emergency derating / curtailment condition |
| **113 °F DB** Historical Extreme | 17 | 75.3 | 57.8 | 71.2 | 38.43 | 37.7 | 81.0 | C-4 high evaporative assist; submeter trigger |
| | 30 | 83.6 | 74.1 | 127.3 | 47.32 | 29.4 | 88.0 | C-4 high evaporative assist; submeter trigger |
| | 70 | 102.6 | 100.8 | 309.0 | 76.17 | 10.4 | 104.2 | C-3 / C-4 severe consumptive draw |

## B.2 Thermodynamic Heat and Water Performance Analysis

### *B.2.1 The 25–30 kW per Rack Limit and the Air-Cooling Threshold*

**The airflow envelope.** Air cooling (Class C-1) is bounded by the volumetric airflow required to carry the heat away at the available temperature rise, computed as $CFM = Q / (K \times \Delta T)$ with $K = 0.240 \times 60 \times \rho$ at the station air density. Measured against the 2,000 to 6,000 CFM a cabinet and tile arrangement delivers in practice, the band in which air cooling becomes impractical is approximately 25 to 30 kW per rack at ordinary temperature rises. Above that band, liquid cooling — cold plates or direct-to-chip, Class C-2 — is required as a consequence of the airflow arithmetic rather than as a design preference. Part IV.B states the envelope with its elevation dependence, and subsection (h)(5) states the test a filing must satisfy.

**The 108 °F OEM limit.** While equipment may carry an absolute maximum rating of 125–135 °F, major dry-cooler manufacturers specify approximately 108 °F dry-bulb as the maximum recommended continuous operating temperature. Above it, fan power rises sharply and heat-exchanger approach temperatures break down. The matrix above shows why this matters: at 108 °F and 30 percent relative humidity, 28.0 °F of evaporative potential remains available, and a facility can hold full load by engaging an assist — which is precisely the moment it becomes a Class C-4 facility and incurs the obligation of subsection (f).

### *B.2.2 Evaporative Water Consumption Dynamics*

**Latent heat conversion.** Rejecting 1 MW of heat evaporatively requires 3,412,142 BTU/hr of latent capacity. At $h_{fg} \approx 1{,}050$ BTU/lb this consumes approximately **390 gal/hr per MW** — approximately **9,350 gallons per MW-day** of pure evaporation, before blowdown. Including blowdown at typical cycles of concentration, total makeup runs approximately 10,700–14,000 gallons per MW-day (Part IV.C.3).

**A single 150 kW AI rack.** Rejects 511,821 BTU/hr — approximately 42.7 tons of refrigeration, or the continuous

output of roughly five to six residential furnaces rated 80,000 to 100,000 BTU/hr input. Under full evaporative rejection it evaporates 1,403 gallons per day, with drift of 7 gallons per day at a 10 °F range, for a consumptive loss of 1,410 gallons per day. Makeup is **1,600 to 2,100 gallons per day** across the band of 8 cycles to 3 cycles. Stated against residential demand at **205 gallons per household per day**, that is 7.8 to 10.3 households; at 250 gallons it is 6.4 to 8.4, and at 300 gallons it is 5.3 to 7.0. The divisor is stated because the comparison is not reproducible without it.

### *B.2.3 The Multi-Day Sustained Heat-Wave Risk*

**Coincident infrastructure stress.** Continuous 108 °F-plus heat waves force Class C-3 and Class C-4 systems to operate at or near full evaporative capacity for 72 or more consecutive hours. Unlike a single-day peak, a multi-day event gives municipal storage no overnight recovery window, because the facility's draw does not fall at night and residential irrigation demand resumes each morning against depleted elevated storage.

**Municipal main depletion.** These high-volume, uninterrupted draws depress municipal distribution mains, risking failure of the design and operating pressure floors at J-13 DESIGN PRESSURE and J-16 OPERATING PRESSURE, and, if pressure falls below the emergency floor at J-15 FIRE-FLOW PRESSURE, triggering the back-siphonage and public-notification consequences that follow under J-21 PUBLIC NOTIFICATION.

### *B.2.4 Automatic Reclassification in Operation*

The moment a facility claiming Class C-1 or Class C-2 status engages condenser misting, fogging, or spray pre-cooling to survive high ambient dry-bulb heat, it reclassifies to Class C-4 under subsection (h)(2), and that circuit becomes subject to the secondary point-of-use submeter under the authority at J-12 SUBMETERING AUTHORITY. The matrix above identifies the ambient conditions at which this transition predictably occurs, which is why the transition can be audited rather than merely asserted.

## Annex C — Heat-Transfer Boundary Specifications, Modes 1 through 5

Analyzing the heat-transfer boundary requires mapping thermodynamic temperatures, fluid flow rates, mechanical speeds, and equipment limits across each distinct operating mode. Fourteen boundary parameters are characterized for each cooling class. All temperatures are stated in °F; flows are stated per MW of heat rejected ($MW_{th}$) unless noted. These are reference operating points for audit comparison, stated as **Designed** or **Modeled** figures under subsection (k)(1); facility-specific values are to be sealed by a professional engineer licensed in the jurisdiction under J-20 ENGINEERING PLAN SUBMITTAL _____.

### Mode 1 — Class C-1 (Dry Air-Cooled: CRAC / CRAH and Dry Cooler Loop)

Sensible air heat rejection with zero evaporative water consumption.

| Boundary parameter | Value | Note |
|---|---|---|
| Coolant entering temperature (air to CRAH coil) | 100.0 °F | Hot-aisle containment return air |
| Coolant leaving temperature (air from CRAH coil) | 75.0 °F | Cold-aisle supply air |
| Dry cooler fluid entering temperature | 115.0 °F | Glycol / water loop return from CRAH |
| Dry cooler fluid leaving temperature | 95.0 °F | Glycol / water loop supply to CRAH |
| Outdoor dry-bulb | 85.0 °F | Nominal mild condition |
| Outdoor wet-bulb | 63.6 °F | At 30% RH (Annex B) |
| Heat-exchanger approach | 10.0 °F | Fluid leaving to outdoor dry-bulb: 95.0 − 85.0 |
| Manufacturer recommended maximum continuous DB | 108.0 °F | Dry cooler OEM continuous-duty recommendation |
| Manufacturer absolute maximum rating | 125–135 °F | Emergency component rating; **not** a continuous operating temperature |
| Fan speed | 60–75% | VFD / EC fans |
| Pump speed | 70% VFD flow | |
| Water flow rate (internal sealed loop) | 120 GPM per $MW_{th}$ | Closed-loop recirculation; no makeup |
| Compressor operation | Off / bypassed, or 40% DX assist | Free-cooling economizer active |
| IT-load condition | 15–25 kW/rack | Class W-3 or W-1 at air-cooling limits |

### Mode 2 — Class C-2 (Closed-Loop Direct Liquid Cooling: Cold Plate to Dry Cooler)

Sealed indoor liquid circuit with dry outdoor heat rejection.

| Boundary parameter | Value | Note |
|---|---|---|
| Coolant entering temperature (cold plate supply) | 89.6 °F (32.0 °C) | PG25 / water supply to GPU cold plate |
| Coolant leaving temperature (cold plate return) | 113.0 °F (45.0 °C) | PG25 / water return from GPU cold plate |
| CDU secondary entering temperature | 111.0 °F | Facility water loop return to outdoor dry cooler |
| CDU secondary leaving temperature | 86.0 °F | Facility water loop supply from outdoor dry cooler |
| Outdoor dry-bulb | 95.0 °F | Summer warm peak |
| Outdoor wet-bulb | 70.7 °F | At 30% RH (Annex B) |
| Heat-exchanger approach | 7.0 °F | CDU liquid-to-liquid plate heat exchanger approach |
| Manufacturer recommended maximum continuous DB | 108.0 °F | |
| Manufacturer absolute maximum rating | 130.0 °F | Cold plate / CDU thermal and pressure limit |
| Fan speed | 85% VFD | Dry cooler forced draft |
| Pump speed | 80% VFD | Primary / secondary CDU circulation |
| Water flow rate (internal facility loop) | 150 GPM per $MW_{th}$ | Closed loop; no makeup |
| Compressor operation | Off | 100% sensible liquid-to-air rejection |
| IT-load condition | 40–80 kW/rack | Class W-1 AI training / H100-class pods |

### Mode 3 — Class C-3 (Open or Closed-Circuit Evaporative Cooling Towers)

Primary evaporative heat rejection by phase-change water loss.

| Boundary parameter | Value | Note |
|---|---|---|
| Condenser water entering tower | 95.0 °F | Warm condenser water returning to tower |
| Condenser water leaving tower | 85.0 °F | Cooled water leaving tower basin; 10 °F range |
| Condenser entering temperature (chiller side) | 85.0 °F | Entering water to chiller / heat exchanger |
| Condenser leaving temperature (chiller side) | 95.0 °F | Leaving water from chiller / heat exchanger |
| Outdoor dry-bulb | 100.0 °F | Hot summer design condition |
| Outdoor wet-bulb | 78.0 °F | Design wet-bulb; corresponds to ~104 °F DB at the ASHRAE 0.4% coincident condition (Annex B) |
| Tower approach | 7.0 °F | Leaving water to wet-bulb: 85.0 − 78.0 |
| Manufacturer recommended maximum wet-bulb | 85.0 °F WB | |
| Manufacturer absolute maximum | 92.0 °F WB | Tower fill thermal collapse limit |
| Fan speed | 100% VFD | Induced-draft tower fans |
| Pump speed | 100% | Condenser water pumps |
| Recirculation rate | 682 GPM per $MW_{th}$ at 10 °F range | GPM = BTU/hr ÷ (500 × ΔT); equivalently 3 GPM per nominal tower ton of 15,000 BTU/hr. At a 15 °F range, 455 GPM per $MW_{th}$ |
| Consumptive evaporation | 389.6 gal/hr per $MW_{th}$ | Latent-heat derivation at $h_{fg}$ ≈ 1,050 BTU/lb; cross-checks to 409 gal/hr by the 1%-per-10 °F rule (Annex I) |
| Drift | 2.05 gal/hr per $MW_{th}$ | 0.005% of recirculation at the 10 °F range stated above; 1.36 gal/hr at a 15 °F range. Consumptive and range-dependent |
| Total consumptive loss | 391.7 gal/hr per $MW_{th}$ | Evaporation plus drift, at the 10 °F range |
| Total makeup feed (submetered) | 445–584 gal/hr per $MW_{th}$ | Evaporation plus blowdown at 8 to 3 cycles of concentration; this is the quantity read by the secondary meter under subsection (f) |
| Blowdown discharge | 53.6–192.8 gal/hr per $MW_{th}$ | $B = E/(COC-1) - D$ at 8 to 3 cycles. Withdrawn but not consumed; returns to sewer at elevated TDS |
| Compressor operation | On, ~0.55 kW/ton | Centrifugal chillers maintaining 55 °F chilled water |
| IT-load condition | 40–150+ kW/rack | Class W-1 / W-3 high-density compute |

### Mode 4 — Class C-4 (Hybrid: Evaporative-Assisted Misting and Adiabatic Spray)

Dry coolers fitted with high-pressure misting nozzles or wetted adiabatic media engaged during ambient heat events.

| Boundary parameter | Value | Note |
|---|---|---|
| Coolant entering temperature | 118.0 °F | Process fluid returning from server hall |
| Coolant leaving temperature | 98.0 °F | Process fluid supply returning to server hall |
| Coil air entering temperature | 83.2 °F | Depressed dry-bulb after misting evaporation |
| Coil air leaving temperature | 105.0 °F | Air leaving finned coils |
| Outdoor dry-bulb | 108.0 °F | Extreme peak; OEM recommended continuous maximum |
| Outdoor wet-bulb | 80.0 °F | At 30% RH (Annex B) |
| Implied saturation effectiveness | ε = 0.89 | ε = (108.0 − 83.2) ÷ (108.0 − 80.0). **This is at the upper bound of achievable performance** and must be supported by test data under Annex C.6; the defensible design range is 0.70–0.90 |
| Heat-exchanger approach | 14.8 °F | Coil fluid leaving to depressed entering air: 98.0 − 83.2 |
| Manufacturer recommended maximum continuous DB | 108.0 °F | |
| Manufacturer absolute maximum rating | 125.0 °F | Coil structural / pressure rating |
| Fan speed | 100% | Maximum airflow across coil fins |
| Pump speed | 100% | High-pressure misting booster pumps, ~1,000 psi |
| Water flow rate (misting feed) | 150–350 gal/hr per MW | Submetered via secondary meter under J-12 **SUBMETERING AUTHORITY** and subsection (f). Below the full-evaporative rate because the assist supplements, rather than replaces, sensible rejection |
| Compressor operation | Off, or trim DX active | |
| IT-load condition | 20–40 kW/rack | Class W-2 inference / burst workloads at summer peak |

### Mode 5 — Class C-5 (On-Site Power Generation Evaporative Cooling)

Evaporative inlet fogging for combustion turbines, or cooling towers for steam and reciprocating-engine generation.

| Boundary parameter | Value | Note |
|---|---|---|
| Air entering temperature | 108.0 °F | Ambient air entering turbine inlet filter house |
| Air leaving temperature | 83.0 °F | Evaporatively cooled air entering compressor intake |
| Jacket water entering temperature | 120.0 °F | Engine jacket water / steam turbine exhaust return |
| Jacket water leaving temperature | 90.0 °F | Cooled jacket water / condensate returning to engine |
| Outdoor dry-bulb | 108.0 °F | |
| Outdoor wet-bulb | 80.0 °F | At 30% RH (Annex B) |
| Implied saturation effectiveness | ε = 0.89 | ε = (108.0 − 83.0) ÷ (108.0 − 80.0); high-pressure fogging systems operate at the upper end of the range |
| Approach to ambient wet-bulb | 3.0 °F | Inlet fogging approach: 83.0 − 80.0 |
| Manufacturer recommended maximum | 110.0 °F DB | Turbine inlet filter house threshold |
| Manufacturer absolute maximum | 120.0 °F DB | Thermal capacity derating threshold |
| Fan speed | 100% | Generation auxiliary cooling fans |
| Pump speed | 100% | High-pressure fogging skid, ~2,000 psi |
| Water flow rate (generation evaporative feed) | 250–500 gal/hr per $MW_{gen}$ | Submetered behind the meter under J-5 **INTERCONNECTION STATUTE** and subsection (f) |
| Compressor operation | Gas turbine compressor at 100% baseload ISO rating | |
| IT-load condition | Full site baseload | 100% on-site generation, islanded or peak-shaving |

### C.6 Core Forensic Rules for Heat-Transfer Boundary Audits

1. **Governance by $Q = UA\ \Delta T_{lm}$.** Increasing heat-exchanger surface area (A) reduces the approach temperature, but cannot alter or lower the ambient dry-bulb or wet-bulb floor. No quantity of equipment moves the ambient condition.
2. **Rejection of fictional continuous limits.** An absolute equipment limit of 125 °F or 135 °F cannot be treated as a recommended continuous operating temperature when the manufacturer specifies 108 °F. A filing that operates the design case at the absolute rating is deficient under subsection (k)(1).
3. **Misting reduction verification.** Misting or adiabatic pre-cooling cannot be claimed to produce a fixed 20 °F

or 23 °F temperature drop without documented dry-bulb, wet-bulb, and relative-humidity test logs. The claimed drop shall be stated as a saturation effectiveness against the measured wet-bulb, and effectiveness above 0.90 shall be supported by manufacturer test data at the stated ambient condition.

4. **The wet-bulb floor is absolute.** Evaporative cooling of any kind — tower, adiabatic pad, or fogging skid — cannot produce an air or water temperature below the ambient wet-bulb. Any filing whose design case implies otherwise is deficient on its face.
5. **Water follows heat, not nameplate.** Consumptive water is a function of heat actually rejected evaporatively, not of installed capacity. A facility operating at 60 percent load evaporates approximately 60 percent of the design rate; a facility at continuous 95 percent utilization (Class W-1) does not.

## Annex D — Facility Performance and Classification Matrix by Weather Case

This matrix maps the psychrometric cases of Annex B onto operating cooling mode, water consumption, electrical overhead, available IT load, and equipment condition. Water figures are stated per MW of heat rejected and reflect the makeup feed read at the secondary meter under subsection (f).

| Ambient condition | Cooling mode | Water use (gal/hr per MW) | Electrical overhead (W per 1 W IT / PUE) | IT load available | Equipment condition and limits |
|---|---|---|---|---|---|
| **Mild**<br>≤85 °F DB, <50% RH | C-1 / C-2 dry air or closed-loop free cooling | ~0 — zero operational evaporation | +0.15 to +0.30 W<br>PUE 1.15–1.25 | 100% of nameplate | **Nominal:** fans 50–60% VFD, pumps ~70% flow, compressors and chillers bypassed or minimally staged |
| **Hot / dry**<br>95–108 °F DB, 30–50% RH | C-1 / C-2 shifting to **C-4** hybrid spray-assisted | 150–350 — misting / spray feed active | +0.20 to +0.40 W<br>PUE 1.25–1.40 | 100% — maintained by evaporative depression | **Elevated stress:** fans 85–100%, high-pressure misting pumps active (~1,000 psi) as DB approaches the 108 °F OEM continuous maximum. **Reclassification and submetering triggered** |
| **Hot / humid**<br>95–105 °F DB, 70–90% RH | C-3 / C-4 evaporative towers plus mechanical chiller trim | 445–584 makeup, of which 53.6–192.8 is blowdown to sewer | +0.35 to +0.55 W<br>PUE 1.35–1.55 | 90–100% — derating risk above 85 °F WB | **High mechanical work:** centrifugal chillers active (~0.55 kW/ton), tower fans 100%, rising mineral concentration and blowdown rate |
| **Extreme**<br>>108 °F DB or multi-day sustained | C-3 / C-4 / C-5 water-assisted, emergency mechanical, or derated | ~390–584 continuous peak withdrawal, sustained 72+ hours | +0.50 to +0.70 W<br>PUE 1.50–1.70+ | Derated / throttled — 10–30% capacity reduction | **Maximum thermal limit:** exceeds the 108 °F OEM continuous recommendation; operation approaches the 125–135 °F absolute component rating; sustained draw threatens the pressure floors at J-1.3 DESIGN PRESSURE and J-1.6 OPERATING PRESSURE |

### D.1 Key Operational Findings

1. **The Class C-4 transition trigger.** In the hot/dry case, dry coolers reach their sensible rejection threshold. Engaging spray misting or adiabatic media depresses entering air toward the wet-bulb, maintaining 100 percent IT load capacity — and automatically reclassifying the circuit to Class C-4, triggering mandatory point-of-use submetering under J-12 SUBMETERING AUTHORITY. **The facility keeps its load by spending municipal water, and the standard's only requirement is that the spending be measured.**
2. **Wet-bulb compression in humid conditions.** In the hot/humid case, high relative humidity compresses the evaporative potential to as little as 2.5–9 °F. Evaporative efficiency collapses precisely when heat rejection is hardest, forcing centrifugal chillers to carry the load and driving cooling overhead to +0.55 W per 1 W of IT. Water use does not fall in this case; blowdown rises as cycles concentrate, and the electrical draw rises alongside it.
3. **Multi-day extreme strain.** During sustained 108 °F-plus conditions, high-density AI clusters consume up to roughly 2,100 gallons per day per 150 kW rack of makeup water while simultaneously imposing their maximum electrical demand. The two peaks are coincident by construction, not by coincidence — both are driven by the same ambient condition on the same afternoon as peak residential demand.
4. **There is no water-free option at extreme ambient.** A facility that avoids evaporative water entirely pays for it in electrical overhead at PUE 1.5–1.7 during precisely the hours the grid is most constrained. The two axes trade against each other, and a measurement standard that reads only one of them can be satisfied by moving the burden to the other.

## Annex E — Water Source, Utility Capacity, Pressure, and Incident Audit Protocol

This annex states the forensic protocol by which a facility's water supply is evaluated: whether the supply is legally authorized (E.1), whether the supplying utility is physically capable of delivering it alongside every other committed demand (E.2), whether delivery holds the statutory pressure floors (E.3), and how a service interruption is investigated without leaping to causation (E.4).

### E.1 — Legal Water Source Audit

Identifying the legal water source requires a comprehensive evidentiary audit verifying that the supply is legally authorized and physically capable of supporting the load without overtaxing regional infrastructure.

#### *E.1.1 Water source categories*

The protocol requires determining whether the facility draws from one or a combination of: treated municipal water; wholesale municipal water; surface water; groundwater; reclaimed water; industrial water; raw water; purchased water; or multiple sources.

#### *E.1.2 The sixteen-point data collection checklist*

For every identified water source, the following sixteen legal and technical parameters must be collected and verified:

| # | Parameter | What it establishes |
|---|---|---|
| 1 | Permit number | The specific instrument authorizing withdrawal |
| 2 | Permit holder | Whether the facility holds the right or is purchasing from one who does |
| 3 | Authorized quantity | The legal ceiling, annual and where applicable daily |
| 4 | Authorized purpose | Whether industrial cooling is within the authorized use |
| 5 | Diversion point | The physical location at which water may lawfully be taken |
| 6 | Place of use | Whether the facility site is within the authorized place of use |
| 7 | Priority date | Seniority in a curtailment event |
| 8 | Contract volume | The quantity committed by wholesale or municipal agreement |
| 9 | Maximum day demand | The facility's peak-day requirement against that commitment |
| 10 | Maximum hour demand | The facility's peak-hour requirement, which governs pressure |
| 11 | Emergency provisions | What happens to the facility's supply in a system emergency |
| 12 | Amendment requirements | What must be amended before the stated draw is lawful |
| 13 | Reporting requirements | Existing obligations to report withdrawal, and to whom |
| 14 | Conservation conditions | Conditions attached to the right or contract |
| 15 | Drought restrictions | Curtailment stages applicable to this class of use, under J-38 DROUGHT STAGES |
| 16 | Transfer or change-of-use conditions | Whether the right may lawfully be applied to this use at this place |

**The municipal assumption limitation.** Do not assume that a municipality owns unlimited water merely because it owns or operates distribution infrastructure. **Ownership of pipe is not ownership of supply.** A city may operate an extensive distribution system while holding a wholesale contract for a fixed volume, and the difference between the two is invisible from the street.

**Project intake identifiers.** Initial intake requires logging the public water system identifier under J-41 WATER SYSTEM IDENTIFIER _____, the surface-water permits issued by the authority at J-26 SURFACE-WATER AUTHORITY _____, the groundwater permit identifiers issued by the authority at J-27 GROUNDWATER AUTHORITY _____, and the reclaimed-water authorizations under J-28 RECLAIMED WATER _____ applicable to the site.

### E.2 — Utility Capacity Audit

Auditing utility capacity requires reconciling all existing, committed, and projected demands against the physical and legal constraints of the supplying system.

#### *E.2.1 The eighteen-point utility data inventory*

| # | Metric | Definition |
|---|---|---|
| **Physical system capacities** | | |
| 1 | Source capacity | Raw water rights, aquifer firm yield, or river intake limits |
| 2 | Treatment capacity | Water treatment plant design MGD and peak throughput |
| 3 | Storage capacity | Total combined system storage |
| 4 | Elevated-tank capacity | Usable elevated storage for pressure regulation and fire reserve |
| 5 | Ground-storage capacity | Clearwell and ground storage tank volume |
| 6 | Pump capacity | High-service and booster firm capacity with the largest pump out of service |
| 7 | Transmission-main capacity | Hydraulic capacity of raw and treated bulk transmission lines |
| 8 | Distribution-main capacity | Sub-basin distribution pipe flow and velocity limits |
| 9 | Available fire flow | Net fire flow at the residual pressure entered at J-15 **FIRE-FLOW PRESSURE** at the project tie-in point |
| **Baseline and projected demand loads** | | |
| 10 | Existing average-day demand (ADD) | Current baseline daily average |
| 11 | Existing maximum-day demand (MDD) | Current peak-day draw |
| 12 | Existing peak-hour demand (PHD) | Current peak-hour draw |
| 13 | Committed but unbuilt demand | Platted subdivisions, approved commercial site plans |
| 14 | Data-center demand | Realized full-facility water draw across peak weather cases |
| 15 | Residential growth demand | Projected population growth over the planning horizon at J-33 **REGIONAL WATER PLANNING** |
| 16 | Industrial demand | Other major industrial or commercial connection draws |
| 17 | Emergency reserve | Volume reserved for main breaks or power outages, including the delivery requirement at J-39 **EMERGENCY POWER DELIVERY** |
| 18 | Drought reserve | Curtailment reserves under the stages entered at J-38 **DROUGHT STAGES** |

### *E.2.2 The combined demand model*

```
D_combined = D_existing + D_committed + D_project + D_peak-weather
```

- **D_existing** — current baseline system demand (MDD or PHD as applicable to the test).
- **D_committed** — approved, permitted, or contracted commitments not yet online.
- **D_project** — full-facility peak water demand of the proposed facility: evaporation plus tower makeup plus blowdown plus treatment reject plus domestic and process use.
- **D_peak-weather** — the coincident municipal demand surge during extreme summer heat (108–113 °F dry-bulb), when residential irrigation, commercial HVAC, and data-center cooling towers reach maximum simultaneous withdrawal.

The fourth term is the one most often omitted, and it is the term that decides the case. A facility's draw evaluated against average municipal demand will nearly always appear absorbable; the same draw evaluated against the municipal system's own worst hour frequently is not.

### *E.2.3 Capacity reconciliation and bottleneck comparison*

| Infrastructure component | Evaluation standard and failure condition |
|---|---|
| Source capacity | Whether raw water permits under J-26 SURFACE-WATER AUTHORITY or J-27 GROUNDWATER AUTHORITY sustain D_combined without exceeding annual or peak-day extraction caps |
| Treatment capacity | D_combined against maximum rated treatment capacity, to prevent filter overloading or chemical feed failure |
| Storage capacity | Whether ground and elevated storage maintain emergency and fire reserves during continuous peak facility pumping, against the figures at J-17 CAPACITY PER CONNECTION |
| Pump capacity | Whether firm pumping capacity with the largest unit out of service (N−1) exceeds D_combined at peak hour |
| Pipe and main capacity | Hydraulic modeling verifying that velocity in transmission and distribution mains remains within scouring and friction limits (generally below 5–7 ft/s) |
| Pressure-zone capacity | Zone-specific hydraulics ensuring high-volume localized withdrawal does not draw down the local pressure zone below the floors at J-13 DESIGN PRESSURE and J-16 OPERATING PRESSURE |
| Permit and contract limits | D_combined against wholesale purchase agreements, municipal service limits, and the public water system authorization at J-41 WATER SYSTEM IDENTIFIER |

If D_combined exceeds any of these physical, hydraulic, or legal thresholds, the system risks violating the provisions entered at J-13 DESIGN PRESSURE, J-16 OPERATING PRESSURE, and J-17 CAPACITY PER CONNECTION.

## E.3 — Pressure Analysis Protocol

Pressure analysis requires a location-specific hydraulic audit rather than a generalized assumption. The protocol evaluates whether high-volume withdrawals depress public distribution mains below statutory limits.

### *E.3.1 The twelve-point hydraulic pressure inventory, per pressure zone*

1. **Minimum required pressure** — the statutory baseline applicable to this system category, from J-13 DESIGN PRESSURE and J-16 OPERATING PRESSURE.
2. **Pressure-monitoring point** — exact location, node identifier, or elevation of the transducer or gauge.
3. **Static pressure** — system pressure under zero-flow conditions.
4. **Residual pressure** — working pressure under normal operating flow.
5. **Maximum-day pressure** — pressure during peak daily demand.
6. **Peak-hour pressure** — pressure during the highest hourly demand period.
7. **Fire-flow pressure** — residual pressure during maximum fire-flow events, against J-15 FIRE-FLOW PRESSURE.
8. **Pressure during pump outage** — pressure with the largest high-service pump out of service (N−1).
9. **Pressure during storage drawdown** — pressure during elevated or ground storage depletion cycles.
0. **Pressure during data-center peak demand** — modeled or measured pressure during coincident peak evaporative draw.
1. **Pressure during simultaneous residential demand** — pressure when peak summer irrigation coincides with maximum facility cooling.
2. **Pressure during main-break isolation** — residual pressure during emergency valve closure.

### *E.3.2 The governing statutory thresholds*

| Provision | Requirement in substance |
|---|---|
| J-13 DESIGN PRESSURE<br><br>J-14 DESIGN FLOW PER CONNECTION | **Design standard.** The system must be designed to maintain a minimum pressure of _____ psi at all points within the distribution network at flow rates of at least _____ gallons per minute per connection. *(Defaults: 35 psi; 1.5 gpm per connection.)* |
| J-15 FIRE-FLOW PRESSURE | **Fire-flow standard.** Where the system provides firefighting capability, it must also be designed to maintain at least _____ psi under combined fire and drinking-water flow conditions. *(Default: 20 psi.)* |
| J-16 OPERATING PRESSURE | **Operating standard.** All public water systems must be operated to provide a minimum pressure of _____ psi throughout the distribution system under normal operating conditions, and to maintain at least _____ psi during emergencies such as firefighting. *(Defaults: 35 psi; 20 psi.)* |
| J-17 CAPACITY PER CONNECTION<br><br>J-39 EMERGENCY POWER DELIVERY | **Capacity standard.** Minimum source, service pump, and storage capacity stated per connection by system category — including production, total storage, and elevated storage per connection, or a pressure-tank capacity per connection within the limits stated in the rule; and emergency-power provisions requiring delivery of at least _____ gpm per connection at stated pressures. *(Defaults: 0.6 gpm production; 200 gal total storage; 100 gal elevated storage, or 20 gal pressure-tank capacity; 2.0 gpm service pump; 0.35 gpm emergency delivery — each per connection. Where capacity is stated by system category, the entry states the applicable category.)* |
| J-18 DEFINITION OF A CONNECTION | **Definition of a connection.** What counts as one service connection, and whether any service-unit equivalency or demand-based conversion applies to a high-consumption non-residential customer. *(Default: each commercial or industrial establishment supplied is one connection; no demand-based equivalency applies.)* |
| J-19 METERED-HISTORY PERIOD | **Metered-history alternative.** The period of metered operational history required before a demonstrated maximum daily demand may be substituted for the per-connection figures. *(Default: 36 consecutive months.)* |
| J-21 PUBLIC NOTIFICATION | **Public notification.** Loss of pressure below the operating floor triggers the applicable precautionary and public-notification obligations, including boil-water advisories where required. |

The provisions above are stated in substance; the governing text is the rule as published in the adopting jurisdiction. The design/operation distinction is material: a system may satisfy the design standard at J-13 DESIGN PRESSURE as designed and still fail the operating standard at J-16 OPERATING PRESSURE in operation once a new coincident load is added.

**The one-connection evaluation.** Where the definition at J-18 DEFINITION OF A CONNECTION counts the facility as a single connection and supplies no demand-based equivalency, the per-connection figures at J-17 CAPACITY PER CONNECTION are the standard against which the facility's declared demand is evaluated, and the comparison is performed in the units of the standard. A facility not yet in operation cannot satisfy the metered-history alternative at J-19 METERED-HISTORY PERIOD, because that alternative requires operating history the facility does not have. The per-connection figures therefore govern, and the engineering submittal at J-20 ENGINEERING PLAN SUBMITTAL is the only instrument capable of answering the question the comparison raises. This annex requires the comparison to be performed and stated; it does not resolve it.

### *E.3.3 The six-point proof protocol for a minimum-pressure compliance claim*

The protocol forbids treating the minimum pressure at J-13 DESIGN PRESSURE as a generalized conclusion. To demonstrate compliance, a filing must document six elements:

1. **The measurement location** — specific address, pipe junction, or hydraulic model node identifier.
2. **The applicable system category** — community public water system, wholesale provider, or industrial master-metered system.
3. **The demand condition evaluated** — peak hour, maximum day plus data-center peak, coincident fire flow, or other stated case.
4. **The legal text** — the specific provision governing the evaluation (J-13 DESIGN PRESSURE for design, J-16 OPERATING PRESSURE for operation, J-17 CAPACITY PER CONNECTION for capacity).
5. **The engineering method** — the reproducible methodology used, for example extended-period hydraulic network modeling in EPANET or an equivalent model, field pressure-logger data, or Hazen-Williams friction-loss calculation, with inputs stated.
6. **The evidence grade** — the grade under subsection (k)(1) at which each input to the evaluation is supported, and the tolerance declared for each.

## E.4 — Service Interruption and Incident Investigation Protocol

Investigating main breaks, pressure drops, or brown-water events requires a systematic, evidence-based methodology that prevents premature conclusions. **Timing alone never establishes causation.**

### *E.4.1 The twenty-point incident inventory*

| 1–7 | 8–14 | 15–20 |
|---|---|---|
| 1. Incident date and time<br>2. Location (node, address, pressure zone)<br>3. Pipe size<br>4. Pipe material (cast iron, ductile iron, PVC, transite)<br>5. Break type (circumferential shear, longitudinal split, blowout, joint slip)<br>6. Pressure readings before, during, after<br>7. Flow readings and system velocities | 8. Tank levels and drawdown curves<br>9. Pump staging and cycling logs<br>10. Isolation-valve status and closure timestamps<br>11. Nearby industrial withdrawals<br>12. Data-center submeter logs (subsection (f))<br>13. Weather — dry-bulb, humidity, freeze/thaw<br>14. Fire-flow events and hydrant testing | 15. Construction activity and excavation<br>16. Public notices issued<br>17. Flushing records, volumes, velocities<br>18. Laboratory results — turbidity, TSS, iron, manganese, bacteriological<br>19. Customer complaints of low pressure or discolored water<br>20. Repair records and pipe condition reports |

### *E.4.2 The six-tier relationship classification*

The relationship between a facility's water draw and a system event must be classified under one of six defined categories, and never by timing alone:

1. **No demonstrated correlation** — physical, hydraulic, or temporal evidence disproves any connection.
2. **Temporal correlation only** — peak draw coincided in time, but modeling or distance demonstrates no hydraulic mechanism.
3. **Engineering correlation** — hydraulic modeling shows that intake velocity created transients, scouring velocities, or head loss capable of contributing.
4. **Probable contribution** — calculations and physical evidence indicate high-volume pumping combined with existing pipe degradation to induce failure.
5. **Confirmed cause** — telemetry, transducer logs, and pipe failure analysis confirm that facility operation caused the pressure drop or failure.
6. **Unresolved** — the record lacks sufficient telemetry, meter data, or inspection to support a determination.

### *E.4.3 Hydraulic mechanisms*

**Scouring velocities and hydraulic transients.** Rapid, un-ramped valve openings for cooling-tower makeup or high-pressure adiabatic spray (Classes C-3 and C-4) cause sudden velocity spikes in distribution mains. High velocity scours iron and manganese tuberculation from older pipe walls, discoloring water throughout the pressure zone.

**Pressure floor breaches.** Sustained evaporative makeup draws during peak summer can pull distribution pressure below the operating floor at J-16 OPERATING PRESSURE. Below the emergency floor at J-15 FIRE-FLOW PRESSURE, back-siphonage risk rises and the public-notification obligations at J-21 PUBLIC NOTIFICATION attach.

> **Why this protocol protects both directions.** A rigorous incident protocol is as valuable to a well-run facility as to a municipality. Without submeter logs and a stated classification method, a facility located near an aging main will be blamed for every discolored-water call in its pressure zone, and will have no evidence with which to answer. With them, the six-tier classification distinguishes ordinary pipe aging from facility-induced strain on the record. **Measurement is the only thing that makes exoneration possible.**

## Annex F — Statutory and Regulatory Reconciliation

Legal and regulatory reconciliation requires evaluating project facts against governing statutes, administrative codes, utility protocols, and executive directives — not against unverified developer claims or prewritten legal conclusions. Each determination is evaluated against an explicit factual trigger and classified under a standardized amendment status.

### F.1 The Ten-Point Legal Record Structure

For every regulatory requirement evaluated, ten parameters are recorded:

1. **Statute or rule** — the governing legislative act, administrative code, or agency directive.
2. **Exact citation** — section, subsection, and paragraph.
3. **Current effective date** — enactment or publication date of the version applied.
4. **Official source** — issuing agency or statutory volume.
5. **Applicable jurisdiction** — the body holding regulatory authority, identified by the Schedule entry under which it was declared.
6. **Factual trigger** — the physical, electrical, or hydrological threshold that activates the requirement.
7. **Project fact satisfying or failing the trigger** — the verified data point evaluated against it, with its evidence grade under subsection (k)(1).
8. **Amendment and procedural classification** — one of: *Amendment Clearly Required*; *Amendment Potentially Required*; *Agency Determination Required*; *No Amendment Identified*; *Insufficient Documentation*.
9. **Unresolved legal question** — statutory ambiguity, jurisdictional seam, or open proceeding.
0. **Counsel-review flag** — whether formal review by the counsel described at J-42 COUNSEL REVIEW _____ is required.

The party compiling this record is not counsel and does not offer legal conclusions. The classifications at point 8 identify where a determination is required and by whom; they do not purport to make it. Point 7 is the only point this standard supplies; points 1 through 6 and 8 through 10 are populated from the law of the adopting jurisdiction.

### F.2 Reconciliation Inventory

The inventories below state the factual trigger, the analysis, the procedural classification, the unresolved question, and the counsel-review flag for each requirement this standard reaches. The citation, effective date, and issuing body are completed from the jurisdiction's own law at the Schedule entry indicated.

#### *F.2.A Electric Grid Interconnection and Cost Causation*

| Element | Large-load interconnection standards | Interconnection cost recovery |
|---|---|---|
| **Schedule entry** | J-5 INTERCONNECTION STATUTE, J-6 APPLICABILITY THRESHOLD, J-7 IMPLEMENTING RULE | J-8 COST-ALLOCATION STATUTE, J-34 RATE STANDARD, J-40 OPEN COST PROCEEDING |
| **Exact citation** | | |
| **Effective date** | | |
| **Source and jurisdiction** | | |
| **Factual trigger** | New or expanded single-site electric load exceeding the threshold at J-6 APPLICABILITY THRESHOLD | Interconnection of a large load subject to the standards at J-5 INTERCONNECTION STATUTE |
| **Project fact and analysis** | Single-site interconnection requests above the threshold trigger site-control disclosure, periodic water studies, and full interconnection cost obligations | Requires large loads to bear direct and indirect interconnection and transmission upgrade costs, preventing socialization onto general ratepayers |
| **Status and action** | **Amendment Clearly Required** — submission of large-load interconnection disclosures and periodic updated water studies to the transmission provider and the grid operator at J-9 GRID OPERATOR | **Agency Determination Required** — cost allocation methodology evaluated in the proceeding at J-40 OPEN COST PROCEEDING |
| **Unresolved question** | Whether multi-building phased campuses held under separate legal entities constitute a single site exceeding the threshold at J-6 APPLICABILITY THRESHOLD | Allocation of marginal transmission capacity cost between co-located generation and grid-supplied standby power |
| **Counsel review** | Yes — interconnection agreement and site control | Yes — cost-causation tariff review |

| Element | Audit or verification directive |
|---|---|
| **Schedule entry** | J-11 **AUDIT DIRECTIVE**, with the reporting record at J-10 **USAGE-REPORTING REQUIREMENT** |
| **Exact citation** | |
| **Effective date** | |
| **Source and jurisdiction** | |
| **Factual trigger** | Presence in the interconnection queue of the grid operator at J-9 **GRID OPERATOR** |
| **Project fact and analysis** | Mandates verification of projected annual and peak water consumption, water source, and cooling technology; non-compliant or unverified projects face denial of grid connection |
| **Status and action** | **Amendment Potentially Required** — verification required to avoid interconnection cancellation |
| **Unresolved question** | Enforcement mechanism where a project attempts self-certification without independent audit logs — the gap subsections (g) and (j) are proposed to close |
| **Counsel review** | Yes — compliance audit verification |

### *F.2.B Water Resources and Municipal Infrastructure*

| Element | Point-of-use submetering | Public water system pressure and capacity floors |
|---|---|---|
| **Schedule entry** | J-12 **SUBMETERING AUTHORITY** | J-13 **DESIGN PRESSURE**, J-14 **DESIGN FLOW PER CONNECTION**, J-15 **FIRE-FLOW PRESSURE**, J-16 **OPERATING PRESSURE**, J-17 **CAPACITY PER CONNECTION**, J-18 **DEFINITION OF A CONNECTION**, J-19 **METERED-HISTORY PERIOD**, J-20 **ENGINEERING PLAN SUBMITTAL** |
| **Exact citation** | | |
| **Effective date** | | |
| **Source and jurisdiction** | | |
| **Factual trigger** | Operation of an evaporative cooling circuit, condenser misting add-on, or on-site generation cooling (Classes C-3, C-4, C-5) | Bulk water withdrawal affecting distribution pressure or firm pumping capacity |
| **Project fact and analysis** | Requires a secondary point-of-use submeter on the evaporative feed to measure non-returned consumptive draw | Systems must be designed to the pressure at J-13 **DESIGN PRESSURE** at all points at the flow per connection at J-14 **DESIGN FLOW PER CONNECTION**, and operated at the pressure at J-16 **OPERATING PRESSURE** under normal conditions; peak cooling draws depressing local mains below either floor implicate both |
| **Status and action** | **Amendment Clearly Required** — plumbing plan resubmission adding the secondary submeter on evaporative feeds, under the submittal provision at J-20 **ENGINEERING PLAN SUBMITTAL** | **Agency Determination Required** — extended-period hydraulic network modeling to verify pressure-zone compliance |
| **Unresolved question** | Submetering jurisdiction for behind-the-meter reclaimed or raw water lines | Utility liability where a private facility draw contributes to a localized low-pressure event |
| **Counsel review** | No — standard engineering and plumbing compliance | Yes — enforcement exposure before the authority at J-24 **DRINKING WATER AUTHORITY** |

| Element | Water source authorization | Wastewater discharge |
|---|---|---|
| **Schedule entry** | J-26 SURFACE-WATER AUTHORITY, J-27 GROUNDWATER AUTHORITY, J-28 RECLAIMED WATER, J-33 REGIONAL WATER PLANNING, J-38 DROUGHT STAGES | J-25 WASTEWATER AUTHORITY |
| **Exact citation** | | |
| **Effective date** | | |
| **Source and jurisdiction** | | |
| **Factual trigger** | Withdrawal from surface water, groundwater, or reclaimed supply for evaporative cooling or on-site generation | Discharge of cooling-tower blowdown or reverse-osmosis reject to the receiving system |
| **Project fact and analysis** | The sixteen-point source audit at Annex E.1.2 determines whether the stated draw is within an authorized quantity, purpose, place of use, and priority | Blowdown returns concentrated in dissolved solids; volume and constituent concentration govern whether the receiving plant's permit limits are exceeded |
| **Status and action** | **Agency Determination Required** — evaluation against the authorized quantity and the regional plan at J-33 REGIONAL WATER PLANNING | **Amendment Clearly Required** — reporting of blowdown volume and constituents under subsection (f)(3) |
| **Unresolved question** | Whether a right held for one authorized purpose may lawfully be applied to industrial evaporative cooling at the stated place of use | Treatment-plant cost allocation for elevated TDS, silica, and chloride loading from a single connection |
| **Counsel review** | Yes — water-rights and contract counsel | Yes — discharge permit counsel |

### *F.2.C Local Government and Zoning*

| Element | Municipal and county land use |
|---|---|
| **Schedule entry** | J-29 ZONING AUTHORITY, J-30 SUBDIVISION AUTHORITY, J-31 TAX ABATEMENT, J-32 EMERGENCY SERVICES DISTRICT |
| **Exact citation** | |
| **Effective date** | |
| **Source and jurisdiction** | |
| **Factual trigger** | Site plan submission, special-use permit, zoning variance, or execution of a binding utility capacity contract |
| **Project fact and analysis** | Local approvals and service agreements executed on unverified developer estimates may commit public capacity against figures no government has tested. Where the jurisdiction's zoning law requires zoning to conform to a comprehensive plan providing for the adequate provision of water and sewer, a commitment made against an untested figure is a commitment made against the plan |
| **Status and action** | **Amendment Potentially Required** — reconciliation of local approvals with the verified audit record, implemented under subsection (k)(5) as a condition on the interconnecting facility rather than as a directive to local government |
| **Unresolved question** | Interaction between local tax-abatement or development agreements at J-31 TAX ABATEMENT and a state interconnection denial under J-5 INTERCONNECTION STATUTE |
| **Counsel review** | Yes — municipal land-use and contract counsel |

### *F.2.D Administrative Procedure and Rulemaking Right*

| Element | Proposal for adoption of a rule |
|---|---|
| **Schedule entry** | J-1 ADOPTING AUTHORITY, J-2 RULEMAKING AUTHORITY, J-4 PROCEDURAL ROUTE, J-37 PUBLIC COMMENT |
| **Exact citation** | |
| **Effective date** | |
| **Source and jurisdiction** | |
| **Factual trigger** | Proposal by an interested party for adoption of a rule of general applicability |
| **Project fact and analysis** | Establishes the route by which a measurement standard for computational-load resource consumption is placed before the adopting authority and opened to public comment under J-37 PUBLIC COMMENT |
| **Status and action** | **No Amendment Identified** — the proposal is properly before the authority |
| **Unresolved question** | Consolidation with any pending rulemaking already addressing large-load interconnection |
| **Counsel review** | No — procedural posture established on the record |

## F.3 Master Legal and Regulatory Matrix

| Requirement | Citation | Applicable project fact | Evidence grade / claim status | Classification | Required procedural action |
|---|---|---|---|---|---|
| Large-load interconnection | J-5 INTERCONNECTION STATUTE; J-7 IMPLEMENTING RULE | Site demand exceeds the threshold at J-6 APPLICABILITY THRESHOLD | Grade A (statute) / Permitted | Amendment Clearly Required | File large-load interconnection disclosure and periodic water study |
| Interconnection cost recovery | J-8 COST-ALLOCATION STATUTE | Interconnecting large load causing grid strain | Grade A (statute) / Designed | Agency Determination Required | Reconcile cost contribution in the proceeding at J-40 OPEN COST PROCEEDING |
| Queue audit mandate | J-11 AUDIT DIRECTIVE | Entry in the interconnection queue at J-9 GRID OPERATOR | Grade A (directive) / Modeled | Amendment Potentially Required | Submit independent audit of water source and cooling technology |
| Qualified independent verifier | J-22 VERIFIER INDEPENDENCE STANDARD; J-23 VERIFIER ATTESTATION CRITERIA | Verification of water and power consumption | Grade A (code or consensus standard) / Measured | Amendment Clearly Required | Retain a qualified verifier meeting the independence-of-judgment standard |
| Point-of-use water submetering | J-12 SUBMETERING AUTHORITY | Evaporative circuit operation (Classes C-3 through C-5) | Grade A (rule) / Designed | Amendment Clearly Required | Install secondary submeter on each evaporative feed line |
| System pressure floors | J-13 DESIGN PRESSURE; J-16 OPERATING PRESSURE; J-17 CAPACITY PER CONNECTION | Peak evaporative makeup withdrawal | Grade A (rule) / Modeled | Agency Determination Required | Perform extended-period hydraulic modeling for the pressure zone |
| Engineering plan submittal | J-20 ENGINEERING PLAN SUBMITTAL | Water system facilities serving an evaporative circuit | Grade A (rule) / Designed | Amendment Clearly Required | Submit sealed plans in advance of the approval sought |
| Transport-boundary electrical submetering | ANSI C12.20; IEC 62053-22; DMTF Redfish / IPMI | Secondary bus AI compute load | Grade A (industry standard) / Measured | No Amendment Identified | Configure Tier 1 submeters and expose native server telemetry |
| Municipal and zoning alignment | J-29 ZONING AUTHORITY; J-30 SUBDIVISION AUTHORITY | Local zoning and utility contract execution | Grade B (local permit) / Projected | Amendment Potentially Required | Reconcile local site plans with the verified audit baseline |

### F.4 Rule Suite — Statutory and Technical Mapping

| Provision | Core regulatory function and technical boundary | Governing provision, code, or standard |
|---|---|---|
| **(f)** Measured water boundary | Establishes the Two-Meter Method — primary utility master meter plus secondary point-of-use submeter on evaporative feeds — to isolate non-returned consumptive loss and protect public water main pressure | J-12 SUBMETERING AUTHORITY submetering authority; J-13 DESIGN PRESSURE through J-17 CAPACITY PER CONNECTION pressure and capacity standards; AWWA cold-water meter standards |
| **(g)** The verifier | Eliminates unverified self-reporting by requiring verification by a qualified third party under the independence-of-judgment standard and the associated attestations | J-22 VERIFIER INDEPENDENCE STANDARD, J-23 VERIFIER ATTESTATION CRITERIA; ISO/IEC 17020 and 17025; the directive at J-11 AUDIT DIRECTIVE and the reporting record at J-10 USAGE-REPORTING REQUIREMENT |
| **(d), (e), (h)** Dynamic classification | Categorizes sites across Axis 1 (W-1 to W-3) and Axis 2 (C-1 to C-5); automatically reclassifies a dry facility to Class C-4 on engaging spray pre-cooling | Parts IV.D and IV.E of this document; the large-load disclosure and site water study mandates at J-5 INTERCONNECTION STATUTE |
| **(i)** Transport boundary | Implements Tier 1 bus submetering and Tier 2 open firmware telemetry to capture bursty peak draw (Class W-2) without vendor lock-in or software inspection | J-8 COST-ALLOCATION STATUTE cost-causation attribution; ANSI C12.20 / IEC 62053-22 revenue-grade accuracy; DMTF Redfish and open IPMI |
| **(j)** Jurisdictional resolution | Mandates third-party transmission of a single standardized record to every authority holding jurisdiction over a component of the draw, via Option A (qualified verifier at facility expense) or Option B (authority-procured pool) | J-2 RULEMAKING AUTHORITY, J-4 PROCEDURAL ROUTE; the authorities at J-9 GRID OPERATOR, J-24 DRINKING WATER AUTHORITY through J-29 ZONING AUTHORITY and J-33 REGIONAL WATER PLANNING |
| **(k)** Realized load and municipal alignment | Rejects unverified tag estimates, requires full-facility PUE scope, reconciles local commitments with the verified record as a condition on the facility, and mandates annual update audits | J-5 INTERCONNECTION STATUTE, J-7 IMPLEMENTING RULE; J-29 ZONING AUTHORITY, J-30 SUBDIVISION AUTHORITY; J-12 SUBMETERING AUTHORITY; J-13 DESIGN PRESSURE and J-16 OPERATING PRESSURE |
| **(l)** Cost causation and ratepayer insulation | Recovers caused transmission, substation, and water infrastructure costs from interconnecting computational loads while insulating residential and small-business ratepayers | J-8 COST-ALLOCATION STATUTE; J-34 RATE STANDARD just and reasonable rates and no unreasonable discrimination; J-7 IMPLEMENTING RULE; the proceeding at J-40 OPEN COST PROCEEDING |

### F.5 Statutory Takeaways

1. **Water submetering is already codified.** The Two-Meter Method requires no new statutory authority. Point-of-use submeters are a recognized instrument everywhere water service is regulated, by rule, by tariff, or by agreement with the supplying system. Applying that instrument to the evaporative feed produces the physical data needed to evaluate the pressure and capacity floors at J-13 DESIGN PRESSURE through J-17 CAPACITY PER CONNECTION.
2. **Independent verification is already defined.** Rather than creating new administrative definitions, the rule adopts the independence-of-judgment standard at J-22 VERIFIER INDEPENDENCE STANDARD and the attestation criteria at J-23 VERIFIER ATTESTATION CRITERIA, with ISO/IEC 17020 and 17025 as the default where the jurisdiction has no provision of its own. That supplies a legal mechanism to execute any audit directive at J-11 AUDIT DIRECTIVE and to cure the documented failure of self-reporting at J-10 USAGE-REPORTING REQUIREMENT.
3. **One statute drives both boundaries.** The provision at J-8 COST-ALLOCATION STATUTE requires large loads to contribute to interconnection and infrastructure cost recovery. Measuring electrical draw at the M2 transport boundary with revenue-grade instruments supplies the resolution necessary to assign caused cost to the causing load, and to insulate residential and small-business ratepayers from it.
4. **Nothing in this annex transfers jurisdiction.** Each authority entered on the Schedule applies its own law to the record it receives under subsection (j). The reconciliation identifies where a determination is required and by whom. It does not make the determination, and no entry on the Schedule authorizes the adopting authority to make another agency's.

## Annex G — Regional Aggregation and Cumulative Strain

Computational load and infrastructure audits must never be conducted in isolation. Evaluating a single facility alone creates a false sense of security: a project requesting 50 MW of power or 0.5 MGD of water may appear manageable on its own application, while the same request aggregated across regional infrastructure boundaries, alongside every other committed and queued request, can overtax shared electric infrastructure, deplete aquifers, and collapse municipal pressure zones.

Annex G establishes a multi-dimensional aggregation protocol to identify cumulative regional strain, prevent jurisdictional arbitrage, and reconcile project demands against regional planning baselines.

### G.1 The Thirteen Regional Aggregation Dimensions

| # | Dimension | Cumulative risk | Aggregation metric | Governing authority and rule |
|---|---|---|---|---|
| 1 | Water provider / wholesale system | Multiple facilities on the same public water system or wholesale supplier exceeding firm purchase caps or treatment plant peak capacity | Combined average-day and maximum-day demand, plus peak summer evaporative draw, against total firm capacity | J-24 **DRINKING WATER AUTHORITY**; J-17 **CAPACITY PER CONNECTION** |
| 2 | Hydraulic pressure zone | Concentration of Class C-3 and C-4 facilities within one pressure district causing localized friction loss and drawdown at summer peak | Coincident peak-hour intake velocity, pipe friction loss, residual pressure at all zone nodes | J-13 **DESIGN PRESSURE**, J-16 **OPERATING PRESSURE** — the pressure floors |
| 3 | County jurisdiction | Uncoordinated development across unincorporated land stressing county roads, emergency response, and hazard mitigation planning | Combined acreage, emergency response risk profile, abatement valuation, heavy equipment traffic | J-30 **SUBDIVISION AUTHORITY**; J-31 **TAX ABATEMENT** |
| 4 | Groundwater district | Clustered high-capacity wells for evaporative cooling or on-site generation creating drawdown cones and depressing neighboring wells | Total permitted extraction (acre-feet/year) and peak daily pumping across all facilities in the district | J-27 **GROUNDWATER AUTHORITY** |
| 5 | River basin / surface water authority | Multiple diversions or wholesale contracts within one basin depleting firm yield during drought and threatening environmental flow standards | Total consumptive evaporative loss aggregated across the basin against firm yield and run-of-river rights | J-26 **SURFACE-WATER AUTHORITY** |
| 6 | Regional water planning group | Data-center projections submitted as soft developer scenarios and omitted from long-range water plans, creating unbudgeted structural deficits | Cumulative 10-, 20-, and 50-year demand growth against regional plan demand allocations | J-33 **REGIONAL WATER PLANNING** |
| 7 | Grid load and weather zone | Concentration of Class W-1 and W-2 loads in one weather zone exacerbating transmission congestion and reserve margin depletion in extreme weather | Coincident peak MW, ramp rate volatility (MW/min), power-factor burden across the zone | J-9 **GRID OPERATOR** protocols; J-35 **DEMAND MANAGEMENT** |
| 8 | Transmission area / service provider | Clustering of loads at or above the threshold at J-6 **APPLICABILITY THRESHOLD** on one corridor or substation risking thermal overload and N−1 contingency failure | Total connected and queued capacity at specific high-voltage substations — commonly the 138 kV and 345 kV classes, or the equivalent classes in the jurisdiction — against circuit thermal ratings | Transmission service providers; J-8 **COST-ALLOCATION STATUTE** |
| 9 | Electric utility / distribution provider | Overloading of local feeders and switchgear causing voltage sag, phase imbalance, and accelerated equipment degradation for neighboring customers | Feeder capacity limits, transformer thermal ratings, harmonic distortion, secondary bus capacity | Investor-owned utilities, cooperatives, municipally owned utilities; J-7 **IMPLEMENTING RULE** |
| 10 | Wastewater basin / treatment plant | Discharge of high-salinity tower blowdown and reverse-osmosis reject spiking TDS, silica, and chloride beyond permit limits | Cumulative blowdown volume (GPD) and constituent concentrations relative to plant design capacity | J-25 **WASTEWATER AUTHORITY** |
| 11 | School district | Long-term property tax abatements restricting local school revenue while the facility places uncompensated demand on local infrastructure | Total appraised value against abated valuation, land footprint, net local revenue contribution | Local school districts; J-31 **TAX ABATEMENT** |
| 12 | Emergency services district | Large battery energy storage, high-voltage switchgear, and dielectric fluid storage creating specialized fire hazards beyond local or volunteer department capability | Cumulative storage energy capacity (MWh), transformer oil volume, dedicated fire flow demand (GPM) | J-32 **EMERGENCY SERVICES DISTRICT** |
| 13 | Municipal planning jurisdiction and extraterritorial area | Siting just beyond city limits to access municipal water and sewer while bypassing city zoning and inspection | Cumulative extraterritorial footprint, municipal utility agreement volumes, consistency with comprehensive plans | J-29 **ZONING AUTHORITY**, J-30 **SUBDIVISION AUTHORITY** |

## G.2 Regional Demand and Infrastructure Margin Metrics

Calculating regional demand and margin requires nineteen specific technical, hydrological, and electrical metrics. The protocol establishes a strict non-transferability rule: **do not transfer assumptions from one municipality to another.** Every regional conclusion must identify the jurisdiction-specific source, rule, utility, permit, and engineering condition on which it rests.

### *G.2.A Baseline and project demand*

| # | Metric | Definition or formula | Required input source |
|---|---|---|---|
| 1 | Existing residential demand ($D_{res}$) | Baseline consumption of single- and multi-family connections in the service boundary | Municipal utility billing records; regional planning estimates under J-33 REGIONAL WATER PLANNING |
| 2 | Existing commercial demand ($D_{comm}$) | Retail, office, healthcare, and educational connections | Utility billing system ledger |
| 3 | Existing industrial demand ($D_{ind}$) | Non-data-center manufacturing, chemical, food processing, and heavy industrial draws | Wholesale and industrial contract records |
| 4 | Committed data-center demand ($D_{dc,committed}$) | Sum of loads with executed service agreements, approved site plans, or active interconnection agreements not yet fully online | Executed utility service and interconnection agreements |
| 5 | Proposed data-center demand ($D_{dc,proposed}$) | Sum of loads in the interconnection queue or local planning pipeline | Interconnection queue of the operator at J-9 GRID OPERATOR; municipal site plan filings |
| 6 | Maximum daily demand (MDD) | `MDD = D_existing + D_committed + D_project` | Utility peak-day pumping logs and SCADA records |
| 7 | Maximum hourly demand (MHD) | `MHD = MDD × C_peak`, where `C_peak` is the jurisdiction-specific peak-hour factor (commonly 1.5–2.5) | Extended-period SCADA flow logs |
| 8 | Annual demand ($A_{demand}$) | Sum of monthly totals over twelve months, in acre-feet or MGD for water and MWh for energy | Utility annual water-rights report; grid operator meter logs |
| 9 | Peak summer demand ($D_{peak-summer}$) | `D_existing,summer + D_dc,peak-heat` — coincident surge at 108–113 °F dry-bulb | SCADA logs from prior heat events at the stated ambient condition |

### *G.2.B Cumulative infrastructure loads*

| # | Metric | Definition or formula | Required input source |
|---|---|---|---|
| 10 | Cumulative electrical load ($P_{regional,total}$) | Σ ($P_{IT}$ × PUE) across all facilities, capturing transformer, UPS, and cooling penalties | Bus submeter logs (ANSI C12.20) and Redfish telemetry under subsection (i) |
| 11 | Cumulative cooling load ($Q_{regional}$) | `Q = P_regional,total [MW] × 3,412,142` BTU/hr | Thermodynamic heat balance from measured electrical load |
| 12 | Cumulative water demand ($W_{regional,total}$) | `W = W_evap + W_drift + W_blowdown + W_treatment + W_domestic + W_other` | Two-Meter Method submeter logs under subsection (f) |
| 13 | Cumulative evaporative demand ($W_{regional,evap}$) | `m = Q_evap / h_fg`, converted to volume; approximately 390 gal/hr per MW rejected | Secondary evaporative feed meter logs under J-12 SUBMETERING AUTHORITY |
| 14 | Reclaimed-water availability ($W_{reclaimed}$) | Treated effluent authorized for reuse and physically uncommitted to downstream users | Discharge permit at J-25 WASTEWATER AUTHORITY and reuse authorization at J-28 RECLAIMED WATER |

### *G.2.C Infrastructure capacity margins*

| # | Metric | Definition or formula | Governing threshold |
|---|---|---|---|
| 15 | Pressure-zone margin ($\Delta P_{zone}$) | $\Delta P$ = `P_modeled,min - P_norm` at coincident peak-hour demand | J-13 **DESIGN PRESSURE**, J-16 **OPERATING PRESSURE** |
| 16 | Treatment margin ($M_{treatment}$) | `M = C_WTP,firm - D_combined` | J-17 **CAPACITY PER CONNECTION**; plant operating permit |
| 17 | Storage margin ($M_{storage}$) | `M = C_storage,total - (D_emergency + D_fire + D_peak-draw)` | J-17 **CAPACITY PER CONNECTION** storage requirements; J-39 **EMERGENCY POWER DELIVERY** |
| 18 | Source-water margin ($M_{source}$) | `M = C_permit - D_combined` | Surface-water permits at J-26 **SURFACE-WATER AUTHORITY**; available groundwater at J-27 **GROUNDWATER AUTHORITY** |
| 19 | Transmission and distribution margin ($M_{T\&D}$) | `M = C_substation or line - P_regional,total`, evaluated at N−1 | J-8 **COST-ALLOCATION STATUTE**; transmission provider load study and interconnection agreement attachments |

**Why non-transferability is a rule and not a caution.** Two adjacent municipalities can hold entirely different water rights, contract volumes, storage ratios, and peaking factors while appearing identical on a map. A margin calculated for one and applied to the other is not an approximation; it is an unrelated number. Every entry in the tables above therefore carries a required input source, and a regional conclusion drawn without those jurisdiction-specific inputs is classified **Insufficient Documentation** under Annex F.1.

The same reasoning is the reason this standard separates its forty-two jurisdictional entries from its engineering content. The engineering transfers because physics transfers. The entries do not transfer, and the Schedule is what prevents them from being transferred silently.

## Annex H — Project Completeness Matrix

For each project, a completeness matrix shall be created. Each of the forty fields below is classified as: **complete**, **incomplete**, **inconsistent**, **unsupported**, **not applicable**, or **unavailable**. A field supported only by a developer representation, with no measured, permitted, or sealed-design basis, is classified **unsupported**, not **complete**.

| # | Field | What establishes completeness | Common failure mode |
|---|---|---|---|
| **Site, entity, and phasing** | | | |
| 1 | Verified address | Address verified against parcel and appraisal records | Marketing address differs from parcel of record |
| 2 | Parcel map | Recorded parcel identifiers for the full footprint | Partial parcels omitted at jurisdictional seams |
| 3 | Project boundary | Surveyed boundary including all phases | Boundary drawn to exclude a phase from a threshold |
| 4 | Developer and legal entity | Named entity with registration in the jurisdiction | Phased campus split among affiliated entities |
| 5 | Ownership | Site control demonstrated as required by J-5 INTERCONNECTION STATUTE | Option or letter of intent presented as control |
| 6 | Phase schedule | Dated build-out schedule tied to load steps | Load presented at final phase, water at first phase |
| 7 | Building count | Count by phase | Auxiliary and generation buildings omitted |
| 8 | Square footage | Gross and white-space area by phase | White space reported as gross |
| **Electrical load** | | | |
| 9 | IT load | Measured or sealed-design critical load | Nameplate TDP summed and reported as load |
| 10 | Total electrical load | `P_IT × PUE`, with all overhead itemized (subsection (k)(2)) | Cooling and UPS overhead omitted entirely |
| 11 | PUE | Stated with the ambient condition at which it applies | Annual best-case PUE applied to the summer design case |
| 12 | Operating hours | Hours and load factor by class | Load factor below unity applied to a Class W-1 load |
| 13 | Workload class | W-1, W-2, or W-3 per circuit or hall (subsection (d)) | Whole site declared W-2 to justify an averaged figure |
| **Cooling and thermal** | | | |
| 14 | Cooling classification | C-1 through C-5 per circuit, with all assists disclosed | C-1 or C-2 declared while an assist circuit exists |
| 15 | Heat-rejection schematic | Sealed schematic showing every rejection path | Assist skid absent from the schematic |
| 16 | Manufacturer limits | Recommended continuous and absolute limits, both stated | Absolute rating used as the continuous design point |
| 17 | Design dry-bulb | Stated with source and exceedance percentile | Annual average used in place of design condition |
| 18 | Design wet-bulb | Coincident wet-bulb at the design dry-bulb | Non-coincident wet-bulb paired with design dry-bulb |
| 19 | Humidity assumptions | Relative humidity with the psychrometric basis (Annex B) | Fixed temperature drop claimed with no wet-bulb stated |
| **Water** | | | |
| 20 | Water source | All sources identified and legally authorized (Annex E.1) | Municipal supply assumed to be unlimited |
| 21 | Annual water demand | Realized or modeled with stated formula | Stated without cooling mode or ambient basis |
| 22 | Maximum-day water demand | At design ambient condition | Annual average divided by 365 |
| 23 | Maximum-hour water demand | At coincident peak (Annex E.2) | Not stated at all; governs pressure |
| 24 | Evaporative fraction | Fraction of heat rejected evaporatively, by mode | Assumed constant across all weather cases |
| 25 | Makeup water | Evaporation plus drift plus blowdown (subsection (f)(1)) | Evaporation reported as if it were makeup |
| 26 | Blowdown | Volume and constituent concentration at stated cycles | Omitted; lands on the wastewater plant unannounced |
| 27 | Domestic water | Occupancy-based domestic use | Folded into process water and lost |
| 28 | Wastewater discharge | Volume and quality to the receiving system at J-25 WASTEWATER AUTHORITY | Discharge permit not reconciled to blowdown |
| | | | |

| | | | |
|---|---|---|---|
| 29 | Reclaimed-water use | Authorized volume under J-28 **RECLAIMED WATER** and its reliability | Reclaimed supply assumed available at peak |
| **System integrity and authority** | | | |
| 30 | Pressure model | Extended-period model per the six-point protocol (Annex E.3.3) | The minimum pressure asserted with no node, case, or method |
| 31 | Fire-flow model | Fire flow at the residual pressure at J-15 **FIRE-FLOW PRESSURE** at the tie-in point | Evaluated without coincident facility draw |
| 32 | Utility capacity | Eighteen-point inventory reconciled (Annex E.2) | Capacity letter issued without `D_combined` |
| 33 | Water-right authority | Sixteen-point checklist complete for each source | Contract volume confused with water right |
| 34 | Interconnection status | Queue position and agreement status | Queue entry presented as an approval |
| 35 | Tax incentives | Abatement agreements under J-31 **TAX ABATEMENT** and valuation effect | Not reconciled with local service obligations |
| 36 | Public-notice record | Notices issued, dates, and jurisdictions | Notice given in one jurisdiction of several |
| 37 | Environmental review | Applicable reviews and permits | Assumed inapplicable without determination |
| 38 | Emergency operating plan | Plan for pressure loss, outage, and thermal event, including the delivery requirement at J-39 **EMERGENCY POWER DELIVERY** | Assumes municipal supply during a system emergency |
| 39 | Curtailment plan | Electrical and water curtailment commitments by stage, under J-35 **DEMAND MANAGEMENT** and J-38 **DROUGHT STAGES** | No water curtailment stage identified |
| 40 | Independent verification | Verification by a qualified independent party (subsection (g)) | Internal or affiliate attestation offered instead |

## Annex I — Engineering Computation Basis and Derivations

This annex states every formula used anywhere in this document, together with worked arithmetic, so that any reviewing engineer can reproduce or verify each figure independently. Every value stated elsewhere in this document is derived by the relations set out below.

No relation, constant, or worked value in this annex is a jurisdictional entry. None varies on adoption, in any jurisdiction, for any reason.

### I.1 Electrical and Thermal Identities

| Quantity | Formula | Worked value |
|---|---|---|
| Heat from electrical draw | `Q [BTU/hr] = P [W] × 3.412142` | 150 kW → 511,821 BTU/hr |
| Heat from electrical draw (SI scale) | `Q [BTU/hr] = P [MW] × 3,412,142` | 1 MW → 3,412,142 BTU/hr |
| Refrigeration tons | `tons = Q [BTU/hr] ÷ 12,000` | 511,821 ÷ 12,000 = 42.7 tons |
| Nominal cooling-tower tons | `tower tons = Q [BTU/hr] ÷ 15,000` | 3,412,142 ÷ 15,000 = 227.5 tower tons per MW |
| Total facility power | `P_total = P_IT × PUE` | 100 MW IT at PUE 1.4 → 140 MW gross |
| Cooling overhead as power ratio | `P_cooling / P_IT = PUE − 1` | PUE 1.35 → ~0.35 W per 1 W IT (approximately, excluding non-cooling overhead) |
| Airflow to carry sensible heat | `CFM = Q ÷ (K × ΔT)`<br>`K = 0.240 × 60 × ρ` | At sea level K = 1.080. 30 kW at ΔT 20 °F → 4,739 CFM; the same rack at 5,000 ft (K = 0.899) → 5,696 CFM |
| Three-phase current | `I = S ÷ (√3 × V_LL)` | 42.75 kVA at 415 V → 59.5 A per phase |
| Single-phase line-to-line current | `I = S ÷ V_LL` | 15.30 kVA at 415 V → 36.9 A |
| Overcurrent device sizing, continuous load | `I_OCPD = 1.25 × I` | 59.5 A → 74.3 A → next standard size, 80 A |

**On air density.** The constant `K` is 1.080 only at sea-level standard air. Air density falls with elevation, so `K` falls with it: 1.004 at 2,000 ft, 0.899 at 5,000 ft, 0.833 at 7,000 ft, computed from the station pressure relation at I.2. An airflow figure stated without its station elevation cannot be reproduced.

**Scale of the rack figure.** A single 150 kW rack rejects 511,821 BTU/hr. A residential gas furnace is rated at 80,000 to 100,000 BTU/hr of input. The rack therefore rejects the heat of roughly five to six such furnaces running continuously:

```
511,821 / 100,000 = 5.1          511,821 / 80,000 = 6.4
```

The figure is stated as a range because the furnace rating is a range. It is stated to permit a reader without thermal training to check the order of magnitude of a declared rack density against a familiar object, and for no other purpose.

### I.2 Psychrometric Formulation (Basis of Annex B)

All Annex B values are computed at standard atmospheric pressure P = 14.696 psia using the ASHRAE formulation.

```
Saturation pressure over liquid water, T in degR = degF + 459.67:

   ln(p_ws) = C8/T + C9 + C10*T + C11*T^2 + C12*T^3 + C13*ln(T)

      C8  = -1.0440397E4        C11 =  1.289036E-5
      C9  = -1.129465E1         C12 = -2.4780681E-9
      C10 = -2.7022355E-2       C13 =  6.5459673

Partial pressure:   p_w = RH x p_ws(t)
Humidity ratio:     W   = 0.621945 x p_w / (P - p_w)  [lb water / lb dry air]
Grains per pound:   gr/lb = W x 7,000
Enthalpy:           h   = 0.240*t + W x (1061 + 0.444*t)  [BTU/lb dry air]

Dew point (32-200 degF), with a = ln(p_w):
   t_d = 100.45 + 33.193a + 2.319a^2 + 0.17074a^3 + 1.2063 x p_w^0.1984

Thermodynamic wet-bulb t*, solved iteratively:
   W = [ (1093 - 0.556*t*) x W_s(t*) - 0.240*(t - t*) ]
       / [ 1093 + 0.444*t - t* ]

Station pressure at elevation ft:
   P_atm = 14.696 x (1 - 6.8754E-6 x ft)^5.2559

Evaporative potential:   dT = t_db - t_wb
Evaporative air-off:     t_out = t_db - e x (t_db - t_wb)
                         e = saturation effectiveness
```

**Worked example (108 °F dry-bulb, 30 percent relative humidity).** $p_{ws}$(108 °F) yields $p_w$ = 0.30 $p_{ws}$; W = 0.01567 lb/lb = 109.7 gr/lb; h = 43.31 BTU/lb; dew point 69.9 °F; thermodynamic wet-bulb 80.0 °F; evaporative potential ΔT = 28.0 °F; air-off at ε = 0.85 is 84.2 °F. A claimed air-off of 83.2 °F at this condition implies ε = 0.89, which is at the upper bound of achievable performance and requires test data under Annex C.6.

```
108.0 - 0.85 x 28.0        = 84.2 degF
(108.0 - 83.2) / 28.0      = 0.886
```

**The governing condition is wet-bulb, not dry-bulb.** Two sites of equal dry-bulb temperature are not equally capable of evaporative heat rejection, and a cooler site is frequently the more constrained one. At 95 °F and 20 percent relative humidity at sea level the thermodynamic wet-bulb is 66.0 °F and the evaporative potential is 29.0 °F. At 87 °F and 95 percent relative humidity at sea level the thermodynamic wet-bulb is 85.7 °F and the evaporative potential is 1.3 °F. The second site is eight degrees cooler by dry-bulb and has lost essentially all of its evaporative capacity.

### I.3 Water Derivations

```
Consumptive evaporation:
   m_water [lb/hr]  = Q [BTU/hr] / h_fg
   V_water [gal/hr] = m_water / 8.34 lb/gal

   h_fg = 1,050 BTU/lb at tower temperatures

   1 MW:  3,412,142 / 1,050 = 3,250 lb/hr / 8.34 = 389.6 gal/hr
          389.6 x 24 = 9,350 gal per MW-day

Sensitivity to h_fg:
   1,030 -> 397.2 gal/hr      1,050 -> 389.6 gal/hr
   1,040 -> 393.4 gal/hr      1,060 -> 386.0 gal/hr

Cooling-tower recirculation:
   GPM = Q [BTU/hr] / (500 x dT_range)

   At dT = 10 degF:  3,412,142 / 5,000 = 682 GPM per MW
   At dT = 15 degF:  3,412,142 / 7,500 = 455 GPM per MW
   At dT =  8 degF:  3,412,142 / 4,000 = 853 GPM per MW

   Cross-check: 3 GPM per nominal tower ton x 227.5 tower tons
                = 682 GPM   OK

Independent cross-check of evaporation
```

```
(1% of recirculation per 10 degF of range):
   0.01 x 682 GPM = 6.82 GPM = 409 gal/hr per MW
   Agreement with latent-heat method within 5%
   Working range: 390-410 gal/hr per MW   OK

Blowdown, drift and makeup at cycles of concentration (COC):

   Water balance    M = E + D + B
   Solids balance   M x c_m = (D + B) x c_c      COC = c_c / c_m

   E leaves as pure vapour and carries no dissolved solids. D leaves
   as entrained droplets at the circulating concentration, so drift
   substitutes for blowdown in the solids balance.

      M = (D + B) x COC
      E + D + B = (D + B) x COC
      D + B = E / (COC - 1)
      B     = E / (COC - 1) - D
      M     = E + E / (COC - 1) = E x COC / (COC - 1)

   Consumptive loss = M - B = E + D

   Makeup does not depend on drift. Blowdown does, and is smaller
   than E/(COC-1) by exactly the drift volume.

   Drift <= 0.005% of recirculation. Recirculation varies inversely
   with the range, so drift per MW is not a constant:

      dT =  8 degF : recirc 51,182 gal/hr -> D = 2.56 gal/hr (0.66% of E)
      dT = 10 degF : recirc 40,946 gal/hr -> D = 2.05 gal/hr (0.53% of E)
      dT = 15 degF : recirc 27,297 gal/hr -> D = 1.36 gal/hr (0.35% of E)
      dT = 20 degF : recirc 20,473 gal/hr -> D = 1.02 gal/hr (0.26% of E)

   At a 10 degF range, per MW rejected:
      E = 389.6   D = 2.05   consumptive = E + D = 391.7 gal/hr

   COC      M        B as E/(COC-1)    B = E/(COC-1) - D
     3    584.5          194.8               192.8
     4    519.5          129.9               127.8
     5    487.1           97.4                95.4
     6    467.6           77.9                75.9
     8    445.3           55.7                53.6

Worked, 150 kW rack at full evaporative rejection, 10 degF range:
   Q           = 511,821 BTU/hr
   Recirc      = 511,821 / 5,000 = 102.4 GPM
   Evaporation = 58.4 gal/hr  = 1,403 gal/day
   Drift       =  0.31 gal/hr =     7 gal/day
   Consumptive = E + D        = 1,410 gal/day

   Makeup at COC 8 = 1,603 gal/day     COC 5 = 1,753 gal/day
   Makeup at COC 6 = 1,683 gal/day     COC 4 = 1,870 gal/day
                                       COC 3 = 2,104 gal/day

   Makeup band across the stated COC range: 1,600 to 2,100 gal/day

   Residential comparison, divisor stated:
      at 205 gal/household-day :  7.8 to 10.3 households
      at 250 gal/household-day :  6.4 to  8.4 households
      at 300 gal/household-day :  5.3 to  7.0 households

Worked, 100 MW IT facility at PUE 1.4, fully evaporative:
   P_total     = 140 MW
   Q           = 477.7 million BTU/hr
   Evaporation = 140 x 389.6 x 24 = 1,309,000 gal/day = 1.31 MGD
   Makeup at COC 4 = 1.75 MGD
```

**Water use effectiveness at full evaporative rejection.** The derived evaporation rate converts directly to the published ratio metric:

```
389.6 gal/hr per MW x 3.78541 L/gal = 1,474.9 L/hr per MW
1,474.9 L/hr / 1,000 kWh/hr        = 1.475 L/kWh
```

The derived figure is the rejection-only value. A reported facility figure above it carries non-rejection water; a reported figure below it carries non-evaporative rejection. Neither conclusion is available from the ratio alone, which is why subsection (f) measures rather than ratios.

**Why a stated range rather than a point value.** Where two accepted methods give different results for the same quantity — as the latent-heat derivation and the one-percent rule do — the reporting party states the range the methods support rather than selecting one and reporting it as a point value. A single figure stated for a quantity that two methods bracket is a selection and not a measurement.

### I.4 Reference Panel Arithmetic (Basis of Exhibit 4)

Panel PDU-REF-1, 415Y/240 V three-phase four-wire, 400 A main, fed from UPS-1, measured at node M2. Populated from published device thermal design power and rack-density figures. One electrical relation governs every row, and the row is stated in the sequence in which it is computed: connected apparent power, demand factor, demand current, overcurrent device sizing current, device.

```
For a 415Y/240 V system:  V_LL = 415 V ,  V_LN = 415 / sqrt3 = 239.6 V

   3-pole circuit (ABC)   I = S x DF / (sqrt3 x V_LL)
   2-pole circuit (L-L)   I = S x DF / V_LL
   OCPD sizing current    I_ocpd = 1.25 x I        (continuous load)
   Device                 next standard frame size at or above I_ocpd
   Heat                   kW_th = S x DF           (unity power factor)
```

| CKT | LOAD DESCRIPTION | PH | CONN kVA | DEM FAC | DEMAND kVA | DEMAND A | OCPD A | DEVICE | HEAT $kW_{th}$ | CLASS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,3,5 | AI model training — 8×GPU node (H100 class) | ABC | 45.0 | 0.95 | 42.75 | 59.5 | 74.3 | 80/3 | 42.75 | computational |
| 7,9,11 | AI model training — 8×GPU node (H100 class) | ABC | 45.0 | 0.95 | 42.75 | 59.5 | 74.3 | 80/3 | 42.75 | computational |
| 13,15,17 | AI inference — large model (demand-driven) | ABC | 30.0 | 0.75 | 22.50 | 31.3 | 39.1 | 40/3 | 22.50 | computational |
| 19,21 | HPC / scientific compute node | AB | 18.0 | 0.85 | 15.30 | 36.9 | 46.1 | 50/2 | 15.30 | computational |
| 23,25 | General compute (web / app) | BC | 8.0 | 0.60 | 4.80 | 11.6 | 14.5 | 15/2 | 4.80 | computational |
| 27,29 | Database / transactional | AC | 7.0 | 0.65 | 4.55 | 11.0 | 13.7 | 15/2 | 4.55 | computational |
| 31,33 | Storage array (NVMe JBOD) | BC | 5.0 | 0.55 | 2.75 | 6.6 | 8.3 | 15/2 | 2.75 | computational |
| 35,37 | Liquid-cooling CDU (rack row) | AC | 15.0 | 0.80 | 12.00 | 28.9 | 36.1 | 40/2 | 12.00 | support |
| **TOTALS** | **PDU-REF-1** | — | **173.0** | — | **147.40** | see below | — | 400 A main | **147.40** | — |

**I.4.1 Panel loading is stated per phase.** Currents carried on different phases are not additive, and a main breaker rating is a per-phase rating. The panel total is therefore stated as a phase balance and as a balanced-equivalent current, and not as an arithmetic sum of row currents.

```
Phase A :  59.5 + 59.5 + 31.3 + 36.9 + 11.0 + 28.9  = 227.0 A
Phase B :  59.5 + 59.5 + 31.3 + 36.9 + 11.6 +  6.6  = 205.3 A
Phase C :  59.5 + 59.5 + 31.3 + 11.6 + 11.0 +  6.6 + 28.9 = 208.3 A

Most heavily loaded phase  : 227.0 A   =  57% of the 400 A main
Balanced-equivalent current: 147.40 kVA / (sqrt3 x 415) = 205.1 A
Phase imbalance            : (227.0 - 205.3) / 227.0 = 9.6%
```

**I.4.2 The panel heat total equals the panel electrical demand.** This is the Link One identity of Part IV.C.1 applied to the panelboard, and it is the internal consistency check a panel schedule must satisfy. Every watt delivered to the panel is rejected as heat, including the watts drawn by the cooling distribution unit: a pump dissipates its work into the fluid it pumps, and that heat arrives at the outdoor rejection stage with the rest.

```
Computational load (circuits 1-33)    : 135.40 kW
Support load (CDU, circuits 35,37)    :  12.00 kW
                                        --------
M2 gross = total heat to reject       : 147.40 kW_th

Cross-check: panel demand 147.40 kVA at unity PF -> 147.40 kW_th   OK
```

**I.4.3 Concentration of strain, with the denominator stated.** A share is not reproducible unless the quantity it is a share of is named, so both are given.

```
AI circuits 1-17, heat  : 42.75 + 42.75 + 22.50 = 108.00 kW_th
   as a share of M2 gross        : 108.00 / 147.40 = 73.3%
   as a share of computational   : 108.00 / 135.40 = 79.8%

AI circuits 1-17, demand current, phase A contribution
                          : 59.5 + 59.5 + 31.3 = 150.3 A of 227.0 A = 66.2%

Uniform circuits 23-33, heat : 4.80 + 4.55 + 2.75 = 12.10 kW_th
   as a share of computational   : 12.10 / 135.40 = 8.9%
```

Four circuits of eight produce four-fifths of the computational thermal load and therefore four-fifths of the cooling-water demand. The aggregate fence meter (M1) reads the per-phase sum and cannot resolve which circuits are responsible. The M2 meter resolves it per circuit.

**I.4.4 Water at the panel.** Taking M2 gross as the heat rejected, at full evaporative rejection and a 10 °F range:

```
0.1474 MW x 389.6 gal/hr-MW = 57.4 gal/hr  = 1,378 gal/day evaporated
Drift at 0.005% of recirculation            =     7 gal/day
Consumptive loss                            = 1,385 gal/day
Makeup at COC 8                             = 1,575 gal/day
Makeup at COC 3                             = 2,068 gal/day
```

**Note.** Overcurrent device sizing is stated at 125 percent of continuous demand current per National Electrical Code practice, with the device taken at the next standard frame size at or above that figure. All draw and density figures are published, vendor-neutral characterizations of workload classes. Facility-specific values are to be sealed by a professional engineer licensed in the jurisdiction. The schedule identifies no operator.

## Annex J — Defined Terms and Symbols

| Term | Definition as used in this document |
|---|---|
| **M1 — fence meter** | The utility revenue meter at the service entrance; the last regulated measurement node in the present system |
| **M2 — transport boundary** | The internal measurement node at the secondary distribution bus, switchgear feeder, or PDU panelboard feeding compute pods; the first point at which non-uniform computational draw is resolvable |
| **Two-Meter Method** | The water measurement method of subsection (f): primary service-entrance meter plus a secondary point-of-use submeter on each evaporative feed |
| **Qualified independent third party** | A party meeting the criteria of subsection (g)(2) — facilities, personnel, experience, demonstrated reliability, independence of judgment, and no design or financial relationship with the measured entity |
| **Consumptive loss** | Water lost to atmosphere and not returned to any collection system: evaporation plus drift |
| **Makeup** | Total water fed into an evaporative circuit: evaporation plus drift plus blowdown |
| **Blowdown / bleed-off** | Concentrated water discharged from an evaporative circuit to control scale; withdrawn but not consumed |
| **COC — cycles of concentration** | Ratio of dissolved solids in circulating water to that in makeup water; determines blowdown rate |
| **Drift** | Entrained liquid droplets carried out of a tower in the air stream; consumptive, bounded by drift eliminators |
| **Dry-bulb (DB)** | Ambient air temperature measured by a dry sensor |
| **Wet-bulb (WB)** | The thermodynamic wet-bulb temperature; the absolute lower limit of evaporative cooling at a given condition |
| **MCWB** | Mean coincident wet-bulb — the wet-bulb occurring at the stated design dry-bulb, as distinct from the independent design wet-bulb |
| **Evaporative potential (ΔT)** | Dry-bulb minus wet-bulb; the entire evaporative resource available at a given ambient condition |
| **Saturation effectiveness (ε)** | Fraction of the evaporative potential actually realized by a given device; typically 0.70–0.90 |
| **Approach** | Difference between leaving fluid temperature and the governing ambient temperature (dry-bulb for dry equipment, wet-bulb for evaporative equipment) |
| **Range** | Difference between entering and leaving water temperature across a tower |
| **$h_{fg}$** | Latent heat of vaporization; approximately 1,050 BTU/lb at tower operating temperatures |
| **PUE** | Power usage effectiveness: total facility power divided by IT power |
| **TDP** | Thermal design power; a manufacturer's published device rating, never by itself a measured facility load |
| **DLC / CDU** | Direct liquid cooling; cooling distribution unit |
| **iPDU / IPMI / Redfish** | Intelligent power distribution unit; Intelligent Platform Management Interface; DMTF open management API — the open telemetry interfaces of subsection (i)(3) |
| **ADD / MDD / PHD** | Average-day, maximum-day, and peak-hour demand |
| **N−1** | The contingency condition with the largest single unit (pump, transformer, or line) out of service |
| **Evidence grades** | Measured, Permitted, Designed, Modeled, Projected — the classification hierarchy of subsection (k)(1) |
| **Jurisdictional entry** | One of the forty-two numbered spaces, `J-1` through `J-42`, at which the adopting authority states a provision, body, or value of its own law. Each carries a default. No entry reaches a classification, identity, constant, boundary, method, evidence grade, or defined term |
| **Adopting authority** | The body entered at `J-1` |

## Exhibits — Drawings and Schematics

The five drawings referenced throughout Parts IV and V are incorporated into this document by reference at subsection (m). All figures shown are published, vendor-neutral industry values; facility-specific values are to be sealed by a professional engineer licensed in the jurisdiction under J-20 ENGINEERING PLAN SUBMITTAL. The drawings characterize classes of load and identify no operator.

| Exhibit | Drawing | Content and what it establishes | Referenced at |
|---|---|---|---|
| **1** | GRUS-GRID-001<br>Power Distribution Hierarchy | Macro grid through board-level power delivery network. **Scale continuity:** the same distribution hierarchy, step-down stages, conserved flow, and measurement-node structure recur from generation to the processor die. Basis for locating a measurement node inside the facility. | Part IV.G |
| **2** | GRUS-GRID-002<br>Single-Line Diagram | Electrical supply from generation to data-center endpoint, drawn to IEEE Std 315 single-line convention. Meter nodes shown at each regulated boundary. Establishes that **M1 (fence meter) is the last regulated measurement node in the present system**: measurement stops at the service entrance while the conductive path continues into internal distribution. The proposed M2 node sits at the internal transport boundary. | Subsection (i) |
| **3** | GRUS-GRID-003<br>Panel and Load Schedule | Computational load distribution at PDU and rack level, in standard panel-schedule format per data-center electrical submittal practice; the tabular companion to the single-line diagram. This is the level at which non-uniform computational draw — and therefore heat and water — first becomes resolvable. | Subsection (i) (2) |
| **4** | GRUS-GRID-005<br>Reference Panel and Load Schedule | Worked reference panel PDU-REF-1 — the Data-Center Workload Landscape, indiscriminate across all classes. Reproduced in full below. Arithmetic reproduced at Annex I.4. | Parts IV.D, IV.G; subsection (i) |
| **5** | GRUS-FIG-003<br>The Layer Stack | Locates the regulatory measurement boundary at the transport layer — above proprietary software, model weights, and tenant data, and below the utility fence meter. The physical basis for the black-box privacy protection of subsection (b)(4) and subsection (i)(3)(C). | Subsections (b) (4), (c)(18), (i) |

### Exhibit 2 — GRUS-GRID-002: Single-Line Diagram, Generation to Data-Center Endpoint

Drawn to IEEE Std 315 single-line convention. Sequence left to right is generation → transmission → distribution → service → facility endpoint. Meter nodes are shown at each regulated boundary.

```
G1  GENERATION                13.8 kV
T1  TRANSMISSION TRANSFORMER  -> 345 kV
CB1 CIRCUIT BREAKER
B1  TRANSMISSION BUS
L1  LINE REACTOR
T2  DISTRIBUTION TRANSFORMER  -> 13.8 kV
C1  POWER-FACTOR CAPACITOR
B2  DISTRIBUTION BUS
M1  FENCE METER (kWh)         <-- REGULATED TODAY
    DATA-CENTER SERVICE ENTRANCE
    endpoint of macro grid - continues to SHEET 2 (board scale)
```

**General notes.** (1) Single-line convention: one conductor represents all phases per IEEE Std 315. Symbols do not indicate physical size or location. (2) **M1 (fence meter) is the last regulated measurement node in the present system. Measurement stops here today.** (3) The conductive path continues past the service entrance into the facility's internal power distribution. (4) The proposed M2 node sits at the internal transport boundary.

### Exhibit 4 — GRUS-GRID-005: Reference Panel and Load Schedule, Data-Center Workload Landscape (Indiscriminate)

Populated from published, vendor-neutral industry figures (device TDP, rack density, heat and water physics). Characterizes the full landscape of workloads by known draw so load can be metered at the transport boundary. Every current is computed by the single relation stated at Annex I.4; every heat figure is the circuit demand at unity power factor.

**PANEL:** PDU-REF-1 · **VOLTAGE:** 415Y/240 V 3Ø 4W · **MAIN:** 400 A MCB · **FED FROM:** UPS-1 · **METER NODE:** M2 (transport boundary)

| CKT | LOAD DESCRIPTION | PH | CONN kVA | DEM FAC | DEM kVA | DEM A | OCPD A | DEVICE | LOAD SHAPE | HEAT $kW_{th}$ | WATER | BASIS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,3,5 | AI model training — 8×GPU node (H100 class) | ABC | 45.0 | 0.95 | 42.75 | 59.5 | 74.3 | 80/3 | LF ≥ 0.95 | 42.75 | HIGH | 8×700W+ovhd |
| 7,9,11 | AI model training — 8×GPU node (H100 class) | ABC | 45.0 | 0.95 | 42.75 | 59.5 | 74.3 | 80/3 | LF ≥ 0.95 | 42.75 | HIGH | 8×700W+ovhd |
| 13,15,17 | AI inference — large model (demand-driven) | ABC | 30.0 | 0.75 | 22.50 | 31.3 | 39.1 | 40/3 | LF < 0.95 | 22.50 | HIGH-VAR | demand-driven |
| 19,21 | HPC / scientific compute node | AB | 18.0 | 0.85 | 15.30 | 36.9 | 46.1 | 50/2 | job-dependent | 15.30 | MOD | job-dependent |
| 23,25 | General compute (web / app) | BC | 8.0 | 0.60 | 4.80 | 11.6 | 14.5 | 15/2 | LF ≥ 0.95 | 4.80 | LOW | CPU 150–250W |
| 27,29 | Database / transactional | AC | 7.0 | 0.65 | 4.55 | 11.0 | 13.7 | 15/2 | LF ≥ 0.95 | 4.55 | LOW | steady |
| 31,33 | Storage array (NVMe JBOD) | BC | 5.0 | 0.55 | 2.75 | 6.6 | 8.3 | 15/2 | LF ≥ 0.95 | 2.75 | LOW | steady |
| 35,37 | Liquid-cooling CDU (rack row) | AC | 15.0 | 0.80 | 12.00 | 28.9 | 36.1 | 40/2 | support | 12.00 | CONSUMES | 30–40% fac. |
| TOTALS | **PDU-REF-1** | — | 173.0 | — | 147.40 | per phase | — | 400 A | **2 shapes + 1 support** | 147.40 | **HIGH agg.** | — |

```
PHASE BALANCE         A = 227.0 A    B = 205.3 A    C = 208.3 A
Most loaded phase     227.0 A = 57% of the 400 A main
Balanced equivalent   147.40 kVA / (sqrt3 x 415) = 205.1 A
Imbalance             9.6%

COMPUTATIONAL LOAD    135.40 kW      SUPPORT LOAD (CDU)  12.00 kW
M2 GROSS = TOTAL HEAT TO REJECT      147.40 kW_th
   cross-check: equals panel demand at unity PF   OK
```

**The indiscriminate reading — a few workload classes drive most of the strain.** Across the full landscape, the meter reads every class the same way. The result is not uniform: circuits 1–17, AI training plus large-model inference, carry 108.00 $kW_{th}$ of the 135.40 $kW_{th}$ computational load — **79.8 percent** — and therefore that share of the cooling-water demand, while general compute, database and storage on circuits 23–33 together are 12.10 $kW_{th}$, or 8.9 percent. Against M2 gross of 147.40 $kW_{th}$, which includes the cooling distribution unit, the same three circuits are 73.3 percent. Both denominators are stated because a share without its denominator cannot be checked.

On the current side, those three circuits contribute 150.3 A of the 227.0 A carried on the most heavily loaded phase, or 66.2 percent. **On one panel, four circuits produce most of the physical strain on grid and water.**

The aggregate fence meter sees the per-phase sum and cannot resolve that four circuits are responsible. The transport-boundary meter (M2) resolves it per circuit. That resolution — indiscriminate across all classes, revealing where strain concentrates — is the entire purpose of the meter. The author draws no conclusion; the jurisdiction does.

**General notes and sourcing.**

1. All draw and density figures are published, vendor-neutral industry values (device TDP: CPU 150–250 W, H100-class GPU ~700 W, 8-GPU server 5.6–7.5 kW; rack density: traditional 5–15 kW, AI training 40–80 kW, next-generation 150 kW+). No proprietary or operator-specific data is used.
2. One electrical relation governs every row: three-phase $I = S \times DF/(\sqrt{3} \times 415)$, single-phase line-to-line $I = S \times DF/415$, overcurrent device at $1.25 \times I$ taken to the next standard frame size. Currents on different phases are not additive, so the panel total is stated as a phase balance.
3. Heat equals circuit demand at unity power factor, which is the Link One identity of Part IV.C.1. Every watt delivered to the panel is rejected as heat, the cooling distribution unit included: a pump dissipates its work into the fluid it pumps.
4. Load shape is stated as the load factor class of subsection (d), computed from one-minute interval demand over the full reporting period. Device thermal design power is not used as a denominator.
5. This schedule characterizes workload *classes* by published draw. It identifies no operator and targets no party. Facility-specific values are sealed by a professional engineer licensed in the jurisdiction.

## Issuance

**ISSUANCE AND STATUS**

GRUS-STD-60084 v2.0-U, *Measurement and Reporting of Resource Consumption by Large Computational Loads — Uniform Edition*, is issued 7 October 2026.

It is GRUS-STD-60084. It carries that number because it is the same standard as GRUS-STD-60084 v2.0, of record in Project No. 60084 and deposited at doi:10.5281/zenodo.23072905, and the number is what traces it there. The suffix v2.0-U designates the uniform edition. This edition differs from v2.0 only in stating a numbered jurisdictional entry, with its default and a description of what the entry receives, wherever that document cites a provision of the law of one jurisdiction. Every classification, boundary, method, identity, constant, derivation, matrix, protocol, evidence grade, and defined term is identical in both documents. The two documents applied to identical facts produce identical results.

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