



SYNC 2.2 — Outer-Book Audit Suite

Board / Investor Version, Final Version, and Municipal Policy Version

Version	2.2 Final Suite
Date	2026-06-25
Prepared For	SYNC Protocol Review
Document Use	Executive, capital, utility, and municipal policy review

This audit suite reorganizes the core engineering conclusions of the current SYNC 2.2 outer-book audit into three audience-specific versions without changing the underlying determinations. It preserves the technically defensible findings that near-zero-water cooling and conditional heat reuse are viable; that the original neuromorphic inference claim must be rewritten into a pragmatic edge-efficiency mandate; that zero-knowledge telemetry is optional rather than foundational; and that municipal collapse prevention depends not on efficiency

alone, but on hard demand caps, interconnection governance, and flexible-load obligations.

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Lead Architect & IP Holder: Yuna A. Moon (yuna@symbioticlxi.org 3107765359)
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Contents and Reader Guide

This document is structured as a single audit suite serving three decision audiences. Each version uses the same underlying technical conclusions, but shifts emphasis to the concerns most relevant to its readers.

Section	Primary Audience	What It Emphasizes
Board / Investor Version	Boards, investment committees, capital partners, infrastructure finance teams	Permitting durability, interconnection viability, risk-adjusted deployment, capital discipline, and what is approved versus conditional.
Final Version	Cross-functional executive, technical, utility, and legal review	Full balanced determination, pillar summary, preserved quantitative thresholds, and risk register.
Municipal Policy Version	Municipal planners, utilities, water authorities, regulators, and public-interest counsel	Public-system protection, enforceability, transparent capacity governance, demand caps, and basin legitimacy.
Closing Page	All audiences	Unified recommendation and final implementation posture.

Reader note: The decisive conclusion is unchanged across all versions: Pillars 1 and 2 can reduce per-site burden, Pillar 3 must be rewritten, Pillar 4 should remain optional, and Pillars 5 through 7 are what make the framework municipally credible rather than merely efficient.

The preserved seven-pillar posture is as follows: Pillar 1 deploy in new builds in water-stressed jurisdictions; Pillar 2 deploy conditionally where there is real heat demand within 2–3 km; Pillar 3 rewrite into an edge inference efficiency mandate using quantized, distilled, and pruned models on inference ASICs or SoCs; Pillar 4 retain as an optional enhanced privacy/compliance tier; Pillar 5 make mandatory as the demand cap and interconnection ledger layer; Pillar 6 make mandatory as the load-

flexibility and curtailment layer; and Pillar 7 retain as an emerging aquifer recharge opportunity rather than a universal requirement.

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Board / Investor Version

Board conclusion: SYNC 2.2 is not a speculative sustainability narrative. It is a selective infrastructure standard that improves buildability, sharpens permitting posture, and lowers denial risk in constrained markets. Invest only where the project accepts the full governance stack. If a developer wants the efficiency upside of Pillars 1 through 4 without the legal and operational obligations of Pillars 5 through 7, the answer should be no.

Decision Posture

Item	Capital View	Final Position
Pillar 1 — ZLD / Waterless Compute	Strong investability in stressed basins where permitting risk is real	Approve for new builds only
Pillar 2 — Thermal Symbiosis	Attractive only when offtake is proximate and bankable	Approve conditionally
Pillar 3 — Edge Inference Efficiency	Operational upside exists, but only after rewrite	Rewrite and then deploy
Pillar 4 — ZKP Telemetry	Limited direct return; niche strategic use	Optional enhanced tier
Pillars 5–6 — Governance Layer	Economically decisive because they govern project buildability	Non-negotiable
Pillar 7 — Aquifer Recharge Credits	Supplementary upside; not core underwriting	Selective opportunity

Board Takeaways

- **Do not underwrite narrative; underwrite permission.** Pillar 1 matters because it improves the odds of approval in stressed basins where conventional cooling is politically and regulatorily exposed.
- **Do not model generic heat upside.** Pillar 2 is monetizable only when anchor demand is real, proximate, contracted, and supported by storage.
- **Do not repeat the neuromorphic overclaim.** Pillar 3 survives only as a disciplined edge efficiency mandate built on quantization, distillation, pruning, and inference ASICs.
- **Do not treat governance as friction.** Pillars 5 and 6 are the gating mechanism for interconnection credibility, public defensibility, and

project finance resilience.

Board call: Back SYNC 2.2 where it improves entitlement probability and interconnection survivability. Do not back any commercial rollout that strips out the collapse-prevention layer. The real return is not a marketing-grade efficiency claim; it is a financeable path to approval, energization, and continued operation.

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Board / Investor Version — Deployment Logic

Capital should follow selectivity, not enthusiasm. The strongest deployment profile remains greenfield projects in water-stressed jurisdictions with visible permitting pressure, credible transmission access, and either proximate thermal offtake or a disciplined heat-ready rationale. Retrofit cases should be presumed weak until proven otherwise, and thermal export should be treated as real only when an offtaker can sign for it.

Deployment Question	Investor-Relevant Test	Audit Answer
Is Pillar 1 capital-rational?	Yes, where water stress, power intensity, and approval risk are material	Deploy in new builds; do not assume retrofit parity
Is Pillar 2 a reliable revenue line?	Only with real offtake and short-distance delivery	Conditional on anchor demand and storage planning
Can Pillar 3 be sold as frontier differentiation?	Only after removing unsupported neuromorphic generality	Rewrite around commercially available edge-efficiency hardware
Are Pillars 5 and 6 optional?	No, not in constrained grids	Mandatory because buildability depends on them

The capital-committee message is direct: fund what can survive scrutiny. Approve efficiency where thermodynamics, siting, and permitting justify it; require governance where public systems are at risk; and reject any commercial implementation that seeks to capture the private benefits of Pillars 1 through 4 without assuming the binding legal obligations of Pillars 5 through 7.

Board summary classification: investable only with full governance attachment; strongest where denial risk, water stress, and interconnection scarcity make conventional models less defensible.

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SYNC 2.2 — Final Version

Final Determination — Executive, Technical, Legal, and Utility
Record

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Final Version

This final version is the controlling record of the SYNC 2.2 audit posture. It preserves the underlying engineering conclusions while stating them in a form suitable for executive action, technical diligence, legal review, utility negotiation, and external reliance.

Pillar	Category	Status	Final Position
Pillar 1 — ZLD / Waterless Compute	Cooling	Deploy	Single-phase immersion for new builds in water-stressed jurisdictions; retrofit not recommended.
Pillar 2 — Thermal Symbiosis	Heat Export	Conditional Deploy	Anchor heat demand within 2–3 km; direct-to-chip preferred for reliable 120–140°F export; storage required.
Pillar 3 — Edge Inference Efficiency Mandate	Compute	Rewrite Required	Quantized, distilled, and pruned models on inference ASICs/SoCs; neuromorphic only for event-driven sensor workloads.
Pillar 4 — ZKP Telemetry	Reporting	Optional Tier	Enhanced privacy and assurance layer; not baseline municipal compliance.
Pillar 5 — Demand Cap & Interconnection Limit Ledger	Grid Governance	Mandatory	Binding subscribed-load caps and transparent allocation control.
Pillar 6 — Load-Flexibility / Curtailment Mandate	Grid Governance	Mandatory	Large loads must maintain flexible IT capacity and accept operational curtailment obligations.
Pillar 7 — Aquifer Recharge Credit System	Water	Emerging Opportunity	Supplementary water-positive mechanism where local recharge-

Pillar	Category	Status	Final Position
			credit frameworks already exist.

Preserved Quantitative Assumption	Value / Threshold	Audit Treatment
Target immersion PUE	1.03–1.08	Retained as a realistic target for well-engineered single-phase immersion deployments.
Cooling water cap	0.01 L/kWh max	Retained as the near-zero-water operating target in stressed basins.
Heat export temperature	120–140°F	Retained as a target band; direct-to-chip is preferred where reliable delivery is required.
Flexible IT load	≥20%	Retained as a target operating rule for large loads, curtailable in 5–15 minutes.
Aquifer drawdown cap	0.5% per 12-month cycle	Retained as a basin protection threshold and drought-stage governance rule.
ZKP system CapEx	\$110k–\$280k per site	Retained as a reasonable range for enhanced telemetry, not default reporting.

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Final Version — Critical Risk Register

Risk	Why It Matters	Mitigation
PFAS / fluid supply-chain exposure	Unsupported or discontinued fluid families create procurement, compliance, and lifecycle risk.	Specify single-phase non-PFAS dielectric fluids and require containment, regeneration, and disposal planning.
Immersion retrofit overreach	Retrofit economics can destroy capital efficiency without corresponding municipal value.	Limit immersion-first deployment to greenfield or capacity-addition builds unless site-specific analysis proves otherwise.
Thermal offtake stranded asset risk	Heat export infrastructure becomes underutilized if demand is seasonal, distant, or weakly committed.	Require anchor customer within 2–3 km, thermal storage, and signed offtake before major thermal CapEx is approved.
Neuromorphic overclaim	Misstating neuromorphic capability undermines technical credibility and distorts procurement strategy.	Rewrite Pillar 3 around quantization, distillation, pruning, and inference ASICs; confine neuromorphic to sensor pilots.
Sensor-attestation weakness in ZKP systems	A cryptographic proof is only as credible as the physical meter and secure signing chain beneath it.	Use calibrated metering, hardware roots of trust, auditable signing paths, and dual-mode regulatory reporting.
Aggregate load growth despite efficiency gains	System collapse is driven by absolute load and queue saturation, not per-site inefficiency alone.	Make Pillars 5 and 6 mandatory; enforce interconnection caps, staged energization, and flexible-load obligations.
Municipal and public acceptance failure	Even efficient facilities can lose political legitimacy if seen as extractive, opaque, or grid-destabilizing.	Use transparent capacity governance, direct reporting, heat-ready design, and basin-sensitive water discipline.

Final determination: SYNC 2.2 is technically credible, commercially usable, and publicly defensible only when site-level efficiency measures are joined to legally enforceable aggregate protections. Efficiency without caps is not resilience; it is growth without limits.

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Municipal Policy Version

For municipalities, utilities, water authorities, and public-interest regulators, the controlling finding is that efficiency claims do not by themselves protect public systems. Institutional adequacy requires enforceable limits on aggregate demand, transparent allocation of interconnection rights, regulator-readable reporting, and binding operational obligations that compel large loads to respond to grid and basin stress.

Public-Interest Position by Pillar

- **Pillar 1:** Appropriate in water-stressed jurisdictions because it materially reduces cooling water draw; require single-phase immersion or equivalent near-zero-water performance and do not assume retrofit feasibility.
- **Pillar 2:** Encourage only where local heat demand exists and where heat-ready design serves a real community thermal use.
- **Pillar 3:** Permit as an efficiency requirement after rewrite, but do not treat speculative neuromorphic claims as a basis for public planning.
- **Pillar 4:** Keep optional; baseline compliance should remain direct, auditable, and regulator-readable.

Mandatory Governance Expectations

Pillar 5 and Pillar 6 should be treated as the minimum institutional protection layer and incorporated as binding conditions of approval, interconnection, and continued operation. Each facility should operate under a binding subscribed-load cap and be entered into a transparent capacity ledger or regulator-held register. Large loads should also maintain a meaningful flexible-load capability, with a target of **≥20% flexible IT load** and curtailable response in the **5–15 minute** range depending on event class, reliability condition, and operating agreement.

Municipal Concern	Policy Requirement	SYNC 2.2 Position
Grid saturation	Hard subscribed-load caps and transparent queue governance	Pillar 5 mandatory
Peak reliability risk	Curtailable and dispatchable large-load capability	Pillar 6 mandatory

Municipal Concern	Policy Requirement	SYNC 2.2 Position
Aquifer legitimacy	Near-zero-water cooling in stressed basins and basin-sensitive monitoring	Pillar 1 required where stress is material
Opaque reporting	Direct metering, auditable reporting, optional privacy-enhanced tier	Pillar 4 optional, not baseline
Public benefit from thermal output	Heat-ready design where real local demand exists	Pillar 2 conditional

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Municipal Policy Version — Implementation Posture

A municipality or utility evaluating SYNC 2.2 should treat it as a conditional approval framework rather than a blanket development endorsement. The controlling public-law question is not whether a facility is more efficient than a worse alternative; it is whether the facility remains within legally defensible limits for power, water, interconnection occupancy, and operational flexibility.

1. **Approve Pillar 1 where basin stress justifies it**, using a near-zero-water operating target of 0.01 L/kWh maximum for cooling in stressed basins.
2. **Require heat-use feasibility screening for Pillar 2**, but only compel deployment where local demand is physically near and technically real.
3. **Require the rewritten Pillar 3**, but do not permit unsupported neuromorphic generality claims to substitute for measurable efficiency criteria.
4. **Keep Pillar 4 available but optional**, with direct metering and regulator-readable reporting as the default path.
5. **Make Pillars 5 and 6 binding conditions of interconnection**, because they are the true collapse-prevention layer.
6. **Allow Pillar 7 selectively**, where recharge-credit frameworks can convert basin stewardship into measured public value.

Municipal legal posture: No commercial deployment should be permitted to claim the legitimacy of SYNC 2.2 if it seeks cooling or compute benefits without accepting hard demand caps, interconnection transparency, auditable capacity allocation, and enforceable flexible-load obligations.

Unified Recommendation and Authorship

Across all three versions, the unified recommendation is unchanged: authorize SYNC 2.2 as a **conditional deployment standard** and final operating posture. Approve site-level efficiency where thermodynamics and siting justify it, require legally enforceable governance where public systems are at risk, and reject any selective implementation that takes the

private benefits of Pillars 1 through 4 without the municipal responsibilities and binding conditions embedded in Pillars 5 through 7.

Final Audit Position: Approved with mandatory governance conditions.

Document Classification: Final Executive Technical and Institutional Review — board-, investor-, utility-, and municipality-ready.

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Contact: yuna@symbioticlxi.org | 3107765359 | <https://silxi.pages.dev>

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