

THE FOUNDING WHITE PAPER



POWERING A SUSTAINABLE FUTURE

FTG CURRENCY

Currency Backed by Electricity

The Patented Architecture for Energy-Denominated Money

THE CONSTITUTIONAL UNIT

1 FTG = 10 kWh = 36 MJ

Conceived, invented, and developed by

Nicholas VandenBrekel

Named inventor — U.S. Patent Nos. 11,962,710 B2 and 12,647,288 B2

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ELECTRICITY FIRST · FTG SECOND · BLOCKCHAIN THIRD

Edition Record

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This edition incorporates patent and institutional developments verified through June 19, 2026. The edition note preserves the required founding date while ensuring that no later grant, event, market figure, or institutional development is backdated.

Inventor attribution

Nicholas VandenBrekel is the named inventor on U.S. Patent Nos. 11,962,710 B2 and 12,647,288 B2. Patent ownership, assignment, and enforceable scope are distinct legal questions determined by current records, issued claims, and counsel review.

Publication status

This document states the FTG monetary constitution and target institutional architecture. Verified public-record facts, FTG-reported operations, patent facts, target architecture, illustrations, founder testimony, future theses, and legal conclusions are expressly distinguished throughout.

Core principle

The physical denomination is fixed. Fiat price, purchasing power, liquidity, reserve coverage, redemption terms, and legal classification are separate variables governed by evidence, contracts, and applicable law.

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Attribution

FTG Currency begins with a human act of invention.

Nicholas VandenBrekkel conceived the foundational proposition that measured electrical energy could be authenticated, represented digitally, and organized as the basis of a monetary system. He is the named inventor on U.S. Patent No. 11,962,710 B2, issued April 16, 2024, and U.S. Patent No. 12,647,288 B2, issued June 2, 2026. Both grants are titled *Systems and Methods for Generation of Energy-Backed Digital Units Stored in a Decentralized Ledger*.^{3 4} The second grant postdates the founding-edition date; its inclusion here is part of the transparent consolidation through June 19, 2026.

The order of attribution is permanent:

Nicholas VandenBrekkel → originating insight and intellectual architecture → patented meter-to-ledger inventions → engineering implementation → FTG Energy public platform → FTG Currency monetary architecture → institutional and public adoption.

Corporate entities may own, license, administer, build, operate, verify, distribute, regulate, or adopt parts of the system. Engineers and professional advisers may convert designs into reliable infrastructure. Banks, utilities, custodians, exchanges, assurance providers, governments, and technology companies may become important counterparties. None of those roles changes the identity of the originator.

The patents and the monetary architecture must also remain distinct. The patents establish claim-specific technical inventions at the boundary where measured electricity becomes a traceable digital unit. The FTG monetary constitution—its 10-kWh denomination, holder-rights model, reserve invariant, issuance discipline, settlement law, indices, governance, assurance, and adoption doctrine—is the larger institutional design. Patent rights provide a differentiated technical foundation; they do not, by themselves, establish reserves, legal tender, regulatory approval, market adoption, legal classification, operating scale, or universal exclusivity.

Recommended citation: VandenBrekkel, Nicholas. *FTG Currency: Currency Backed by Electricity—The Patented Architecture for Energy-Denominated Money*. FTG Energy. Founding edition dated October 17, 2006; consolidated definitive edition incorporating developments verified through June 19, 2026.

Inventor's Statement

The following is a first-person statement of purpose based on Nicholas VandenBrekkel's founder testimony supplied for this paper. It records the inventor's account and intent; biographical particulars beyond the public patent record require the separate provenance archive described in Chapter 17.

I created FTG Energy Currency because electricity occupies a singular place in modern life. Every advanced economy depends upon it, every productive system uses it, and every person recognizes its reality. Yet electricity has generally remained something people buy and consume, not a standardized monetary position they can own, transfer, and settle.

My originating question was direct: if electrical energy can be measured, can that measurement be authenticated? If it can be authenticated, can a defined interest in it be represented digitally? If that interest can be governed, reserved, and reconciled, can it be transferred without requiring the physical electricity to travel along the same path as the ownership record? And if it can be transferred and settled, can national and digital currencies receive exchange rates against energy rather than energy always receiving a price only in those currencies?

My working formulation became: "Measure it. Authenticate it. Store it. Establish ownership. Represent that ownership digitally. Transfer it. Settle with it. Give national and digital currencies exchange rates against it." That sequence led to the technology disclosed in the two United States patents on which I am named as inventor and to the wider FTG Currency architecture.

I have deliberately placed electricity first. FTG is the monetary standard built around it. Blockchain is a technology used within that standard. No bank, stablecoin, exchange, government, partner, or blockchain defines FTG. Those institutions may connect to FTG and may greatly accelerate its adoption, but the unit remains defined by energy.

I also intend FTG to be independent without being isolated. It should coexist with national currencies and digital currencies. People should be able to enter and leave through lawful, transparent interfaces. Governments should not be asked to surrender monetary authority as a condition of exploration. Merchants should not be forced to retain exchange risk. Adoption should be voluntary and earned through utility, trust, and evidence.

This project is personal to me. I have spent decades working toward systems that connect electricity, engineering, measurement, and ownership. I have not always placed myself at the center of what I built. Here, the origin matters. I am the named inventor of the patented energy-tokenization technology. FTG Energy Currency is my brainchild, and I intend the record to preserve that fact for my family, for the engineering history of the system, and for the institutions that may carry it forward.

I believe electricity can become currency. I believe that when authenticated measurement, controlled reserves, registered interests, exact accounting, transferable settlement, and independent assurance are joined into one institution, electricity will inevitably assume a monetary role in the global economy. That is my long-term thesis. This paper states the architecture required to turn that thesis into a testable public system.

Nicholas VandenBrekel

Founder testimony consolidated June 19, 2026

Evidence-Status Note

This paper distinguishes constitutional design from evidence of operation. Its declarative voice does not erase that distinction.

Verified fact means a physical, historical, statutory, standards, or public-record fact supported by an authoritative external source. **Patent fact** means a bibliographic, claim, or disclosure fact supported by a published grant or public patent record. **FTG-reported operation** means a present capability represented by FTG through its platform, public materials, contracts, or founder-provided operating record, but not necessarily independently assured. **Proposed architecture** means a required target design that becomes operative only when adopted in governing documents, implemented, tested, and—where stated—independently verified. **Illustration** means a hypothetical example that establishes no fact about current price, reserves, scale, adoption, or legal status. **Founder testimony** means Nicholas VandenBrekel’s account of origin, intention, chronology, or authorship. **Future thesis** means a strategic forecast whose achievement depends on implementation and adoption.

Qualifications are placed beside the claims they constrain. When this paper says that the FTG standard *requires* a control, it describes the constitutional architecture. It does not imply that the global control is presently operating or independently assured. When it describes FTG as *currency*, it identifies the system’s intended monetary function and project name, not a universal legal classification. FTG is not represented here as legal tender, a sovereign-issued currency, a bank deposit, or a stablecoin. Legal treatment will follow the economic substance, agreements, operations, and law of each jurisdiction.

The date discipline is equally explicit. The founding edition is dated October 17, 2006. Patent No. 12,647,288 B2 issued on June 2, 2026, and later institutional evidence appears in this consolidated definitive edition only because the edition note discloses a verification horizon through August 12, 2026. No later development is presented as if known on the founding date.

The System in One Page

FTG Energy — Currency Backed by Electricity.

1 FTG = 10 kWh = 36 MJ.

Electricity first. FTG second. Blockchain third.

FTG is an energy-denominated monetary, ownership, accounting, and settlement architecture. Electricity defines the unit. FTG defines the rules by which measured energy becomes qualifying reserve, a registered holder interest, an accounted liability, and a transferable settlement position. Blockchain is a synchronized, tamper-evident ownership and settlement subsystem. It is not the source of the energy, reserve, legal right, or monetary definition.

The default holder-rights model is a **registered beneficial interest in a commingled, continuously reconciled qualifying reserve pool**, subject to operative governing agreements and jurisdiction-specific legal confirmation. One FTG does not identify particular electrons. It denominates a holder position of 10 kWh under the FTG standard. The physical denomination is invariant; fiat price, purchasing power, liquidity, reserve condition, fees, and the manner of redemption or performance may change.

Only energy that passes the applicable measurement, authentication, custody or control, quality, availability, loss, encumbrance, and policy gates is qualifying reserve. Forecast generation, nameplate capacity, promised future output, unverified telemetry, encumbered inventory, and unavailable energy do not qualify merely because they are associated with a generator or storage asset.

The constitutional Energy Reserve Coverage Ratio is:

$$\text{ERCRCR} = \frac{\text{Verified Qualifying Reserve Energy}}{\text{Recognized Outstanding FTG Energy Liabilities}}$$

ERCRCR must be 1.00 or greater. An operational policy may require an additional disclosed buffer above 1.00. There is no 5% reserve-floor alternative. Coverage must be calculated under a published methodology and may be claimed at a point in time only with the corresponding timestamp, liability population, exceptions, and independent-assurance status.

The **FTG core monetary ledger under FEMS** is the authoritative legal and accounting record. Blockchain synchronizes ownership and settlement evidence with that ledger. The Global Energy Reserve Registry, core ledger, blockchain records, and settlement records must reconcile. Any material mismatch freezes affected issuance or settlement until the discrepancy is investigated, corrected by authorized entries, independently reviewable, and formally cleared for resumption.

Reserve electricity may be discharged only when coverage is preserved through prequalified substitution or concurrent replenishment accepted into qualifying reserve. FTG is burned only when the corresponding holder liability is legally extinguished through redemption, retirement, or another governed event. Physical discharge alone does not erase a holder's liability; a blockchain transfer alone does not create reserve.

Technical finality and legal finality are separate. A transaction may be cryptographically confirmed while remaining pending or held under the governing rulebook because of sanctions screening, fraud review, a court order, a dispute, insolvency law, or another legal condition. Refunds and corrections use compensating entries rather than hidden deletion of history.

FTG reports that a public platform exists with accounts, wallet and ownership records, purchases, transfers, Exchange and Treasury functions, contractual records, compensation records, and administrative controls.

FTG’s public pages describe account opening, a 10-kWh unit, balances, activity, purchase agreements, and enabled transfer or platform functions, while also stating that availability depends on jurisdiction, readiness, and governing terms.^{13 14} These are FTG-reported operations, not independent proof that a global qualifying reserve, GERR, ERCR, FTGX, FEX, GEMS, FEMS, ERTGS, sovereign layer, or institution-wide assurance regime is presently operational.

Monetary independence is compatible with maximum interoperability. National currencies, banks, stablecoins, exchanges, wallets, custodians, blockchains, and public institutions may connect through governed interfaces. They receive exchange rates against FTG; they do not define the unit. **Partners accelerate FTG. They do not define FTG.**



Figure 1: The FTG Proposition. Electricity supplies the physical denomination, FTG governs the monetary unit and reserve institution, and optional external rails provide interoperable access. Status: Proposed architecture.

Executive Summary

Money is a social institution built on correspondence. A monetary record is trusted when the thing recorded, the rights attached to it, the accounting that governs it, and the settlement that transfers it continue to correspond. Physical cash creates that correspondence through possession. Custodial money does it through a claim against an institution. Sovereign fiat does it through law, fiscal capacity, central-bank credibility, and network acceptance. Digital money does not escape the requirement; it makes the quality of the correspondence more consequential.

FTG Currency proposes that authenticated electrical energy become the physical denominator of a new monetary institution. Its constitutional equation is simple:

1 FTG = 10 kWh = 36 MJ. Always.

The word *always* governs denomination, not price. NIST records that one kilowatt-hour equals 3.6 megajoules, so ten kilowatt-hours equal 36 megajoules, or 36 million joules.² This is a physical measure. It does not promise that one FTG will always buy the same quantity of food, command a fixed number of dollars, remain liquid in every market, or be redeemable in one form everywhere. The proper phrase is **physically invariant denomination**, not “inflation proof.”

FTG is not merely tokenizing electricity. Tokenization can create a digital representation of an asset or claim. FTG’s more ambitious purpose is to **monetize standardized ownership or a registered interest in authenticated electricity**: to create a unit that can denominate, account, transfer, settle, and ultimately support contracts as money does. That transformation requires far more than a token. It requires a monetary constitution.

The default constitutional holder right is therefore defined here as a registered beneficial interest in a commingled, continuously reconciled qualifying reserve pool, subject to operative agreements and jurisdiction-specific legal confirmation. This model rejects the fiction that the same electrons remain identifiable forever. Electricity may be stored, discharged, transformed, lost, or replenished. What persists is the governed holder position and the institution’s obligation to maintain qualifying coverage.

“Backed by electricity” has four simultaneous meanings. Physically, eligible energy must be measured, controlled, available, unencumbered, and adjusted for recognized losses and degradation. Mathematically, verified qualifying reserve energy must equal or exceed recognized outstanding FTG energy liabilities.

Contractually, the holder's right, priority, performance options, remedies, and insolvency treatment must be stated in enforceable agreements. Operationally, metering, admission, allocation, issuance, discharge, replenishment, reconciliation, exception handling, and assurance must function as one controlled chain.

The constitutional minimum ERCR is 1.00. If 1,000,000 FTG are recognized as outstanding energy liabilities, the denominator is 10,000,000 kWh. The numerator must contain at least that much verified qualifying reserve energy under the published methodology. A disclosed operating buffer may increase the required numerator, but a buffer is not a substitute for full recognition of liabilities. A proposed percentage of physical reserve below the liability amount is incompatible with this constitution and is rejected.

The monetary ledger under the proposed **FTG Energy Monetary Standard (FEMS)** is authoritative. It is a double-entry, integer-based record of supply, accounts, registered interests, restrictions, and legal-accounting events. Blockchain is synchronized to it as a tamper-evident ownership and settlement subsystem. The reserve registry establishes physical inventory truth; the monetary ledger establishes accounting and legal truth; the blockchain supplies synchronized transaction and provenance evidence. A material discrepancy among them stops the affected process. The system does not continue issuing while humans debate whether the records agree.

The physical reserve is dynamic but cannot become fictional. Discharge is permitted only if prequalified substitution or concurrent replenishment preserves coverage. Replacement electricity counts only after measurement, authentication, qualification, acceptance, allocation, and registry entry. An FTG unit is burned only when the holder liability is legally extinguished—through completed redemption, retirement, or another governed event. Consuming electricity is not the same legal act as extinguishing a monetary obligation.

Transfers also require more than cryptographic confirmation. Technical finality answers whether the system has accepted and durably ordered a transaction. Legal finality answers whether the rights and obligations are irrevocably settled under the governing agreements and applicable law. Screening, disputes, fraud intervention, sanctions, court orders, and insolvency may require pending or held states. Corrections and refunds create explicit compensating entries. History remains visible.

The FTG patent family provides a technical foundation for the meter-to-ledger boundary. Patent No. 11,962,710 B2 identifies Nicholas VandenBrekkel as inventor and describes a meter computing system that authenticates as a ledger node, monitors generated electrical energy, recognizes a predetermined increment, generates a correlated digital unit with unique hashed traceability data, and stores the unit in a decentralized ledger.³ Patent No. 12,647,288 B2, issued June 2, 2026, adds complementary system claims around that physical-to-digital chain.⁴ Together the grants contain 35 issued claims, but their legal reach is determined claim by claim. They do not prove the existence of qualifying reserves, legal-tender status, regulatory approval, a completed monetary system, or market demand.

FTG reports an existing public operating foundation. Its website offers account access and describes balances, transaction activity, purchase agreements, transfers, and enabled platform functions.^{13 14} The broader institutional stack remains an architecture to be adopted, implemented, and independently assured. That stack includes GERR for reserve inventory, ERCR for coverage, FEMS for the monetary constitution, GEMS for global architecture, ERTGS for settlement, FTGX for reference pricing, FEX as a possible future execution venue, and FGEI methodologies for monetary and physical electricity-market reference indices.

FTG is independent by design and interoperable by policy. Energy defines FTG; all fiat and digital currencies receive exchange rates against it. A dollar price of FTG is information about the exchange relationship at a time and under specified terms, not the definition of FTG. Banks, stablecoins, wallets, exchanges, custodians, utilities, data vendors, and blockchains may become interfaces. Every critical provider must be replaceable through data portability, contract termination, migration, and continuity controls. No partner may unilaterally define the unit or issue FTG.

Tether is examined later as a dated case study because it demonstrates the scale digital monetary rails can achieve and the centrality of reserve credibility. Tether's June 30, 2026 report described approximately \$187.75 billion of assets and \$183.64 billion of liabilities, and BDO provided reasonable assurance on the specified point-in-time report under ISAE 3000 (Revised).^{15 16} BDO expressly limited its work to that report and date; it was not a complete audit of financial statements or assurance over activity before or after the reporting instant.¹⁶ The lesson is institutional, not promotional: reserve definition, custody, liabilities, redemption, assurance scope, and public discipline matter at scale. No Tether partnership, listing, approval, financing, or dependency is asserted.

FTG's route to adoption is **Coexistence → Utility → Trust → Adoption → Transition**. It does not ask nations to abandon their currencies. It gives those currencies something new to exchange against: authenticated energy. Users should be able to move fiat to FTG, FTG to fiat, and FTG to FTG. Merchants may convert if they choose and if lawful liquidity exists. Institutions may hold or settle in FTG only after the rights, controls, accounting, and regulatory treatment meet their standards. Native FTG-denominated contracts are a later measure of monetary maturity, not a declaration made at launch.

The same discipline governs sovereign applications. Existing public debt disappears only when the creditor's claim is legally surrendered and extinguished. New FTG is energy-backed only to the independently verified extent of qualifying reserve. Neither event follows automatically from the other. Energy denomination alone creates no wealth; any net improvement must come from creditor concessions, financing terms, productive infrastructure, reduced risks or costs, contributed capital, or other identifiable economics.

The paper's conclusion is therefore both ambitious and bounded. **The architecture shows how electricity can become currency.** It defines the physical unit, legal position, reserve discipline, authoritative record, settlement rules, governance, assurance, and adoption path required to do so. **FTG's long-term thesis is that electricity will inevitably assume a monetary role.** That second statement is a forecast of institutional evolution, not a present fact. FTG must earn it by making every link exact.

Chapter 1 — Nicholas VandenBrekel: Origin of the FTG Question

In every durable monetary system, the unit eventually becomes more familiar than the person who first framed it. The institution eclipses the moment of invention. That is useful for everyday operation but dangerous for history. FTG Currency must preserve its origin before its architecture becomes distributed among companies, systems, professional advisers, and public institutions.

Nicholas VandenBrekel is the human originator of FTG Energy Currency and the named inventor on its two foundational United States patents.^{3 4} His testimony identifies the project as the culmination of decades devoted to electrical engineering and electric-system design. The public patent record independently establishes named inventorship; the broader career chronology remains founder testimony until the provenance archive collects and verifies credentials, project records, dated designs, correspondence, witnesses, and other contemporaneous evidence.

The originating insight was not that a token could be sold with an energy theme. It was that electricity already possesses three qualities of unusual monetary relevance: it is physically measurable, economically useful, and deeply integrated into productive life. The question was whether engineering and institutional design could turn those qualities into an accountable, transferable position.

VandenBrekel’s formulation proceeds as a chain:

“Measure it. Authenticate it. Store it. Establish ownership. Represent that ownership digitally. Transfer it. Settle with it. Give national and digital currencies exchange rates against it.”

Each verb creates a different proof burden. Measurement requires metrology. Authentication requires device identity, calibration, provenance, and secure data. Storage or other reserve qualification requires custody, availability, losses, safety, and legal control. Ownership requires a legally accurate holder interest. Digital representation requires exact supply accounting. Transfer requires authorization and anti-double-spend controls. Settlement requires finality, remedies, and governing law. Exchange rates require a transparent market or reference methodology. An omission at any link changes the proposition from currency architecture into an unsupported claim.

This leads to the **two-inventions distinction**. The first invention is technical: a patented meter-to-ledger process and system for recognizing measured generation, creating a traceable digital unit, and recording it in a decentralized ledger. The second is institutional: an energy-denominated monetary constitution that defines the unit, qualifying reserve, holder rights, issuance, reconciliation, settlement, governance, assurance, interoperability, and adoption. The patents inform and protect specified technical elements. The monetary architecture combines patent-grounded elements with legal, accounting, market, operational, and policy decisions that are not made patent facts merely by proximity.

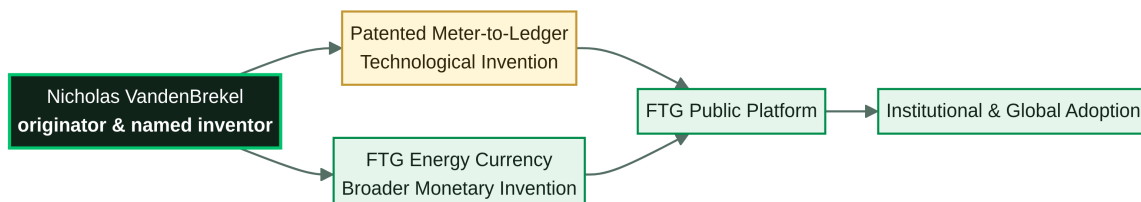


Figure 2: Inventor and Two Inventions. Nicholas VandenBrekel originates both the patented meter-to-ledger foundation and the wider, separately governed FTG monetary architecture. Status: Patent fact.

A proper chronology therefore begins with the person, not the platform. It proceeds from VandenBrekel’s energy-currency insight to patent preparation and filing; from the 2022 applications to the 2024 and 2026 grants; from engineering development to the FTG public platform; and from the public platform to the

monetary and reserve standards proposed here. Later contributors belong in that chronology according to evidenced roles, dates, and deliverables. They do not move ahead of the originating insight.

That attribution is not ceremonial. It protects system integrity. When the original hierarchy is forgotten, later operators can invert the design—making a favored blockchain, bank, exchange, or partner appear to define FTG. VandenBrekel's doctrine prevents that inversion. Electricity is first. FTG is the institution that gives electricity monetary form. Blockchain and counterparties are instrumental.

The strongest historical account is not the most extravagant. It distinguishes named inventorship from patent ownership, current assignment, and broad authorship. It distinguishes patent scope from business ambition. It labels personal recollection as testimony and supports it through a durable archive. In VandenBrekel's own editorial principle, "The strongest position is the precise position."

FTG will maintain a provenance record capable of answering questions decades after current participants have left the project. That record should preserve signed declarations; original notes and diagrams; patent applications, prosecution histories, grants, assignments, and licenses; software and hardware records; unit and reserve designs; publication versions; operating evidence; and contributor statements. Each artifact should carry an archive identifier, creation date, source, author, hash, version, permissions, and chain-of-custody history.

A currency based on verification cannot leave its own invention history unverifiable. The provenance archive is thus not merely a legacy project. It is an application of the same principle that governs the monetary system: the ledger must correspond to the thing it records.

Chapter 2 — The Monetary Problem: From Physical Value to Trusted Ledgers

Money evolves by learning how to move value without moving the underlying object in every transaction. Metal coins joined the payment object and the monetary record in one physical artifact. Deposit and giro banks separated them. Banknotes and deposits widened the distance. Modern payments move claims through ledgers at enormous speed while the reserve, institutional, and legal layers remain largely unseen.

The Bank of Amsterdam, or Wisselbank, offers a useful but bounded precedent. Established in 1609 as a municipal public payments bank, it responded to a world of heterogeneous and debased coin. Customers deposited metal; balances were recorded in a central ledger; and those balances could be transferred among account holders without moving coin for each payment.⁶ The insight can be stated compactly: **the metal stays put; the ledger moves.**

That arrangement did not make metal irrelevant. It made correspondence the institution's central task. Assay, custody, account discipline, withdrawal terms, governance, and confidence connected the ledger position to the reserve practice. The great innovation was not simply a new name for a guilder. It was trustworthy correspondence between the physical layer and the ledger layer.

The analogy must not be romanticized. The Wisselbank did not remain a uniform full-reserve warehouse throughout its history. Scholarship records that it later departed from strict backing, changed redeemability, operated with both earmarked and unencumbered coin, and developed an increasingly elastic balance sheet.⁶ Its history is therefore a warning as well as an inspiration: a monetary institution can begin with a clear physical correspondence and later weaken it through opacity, credit, or governance change.

FTG takes four bounded lessons from Amsterdam. First, heterogeneous physical value can be standardized for accounting. Second, custody can be separated from book-entry transfer. Third, ledger settlement can be faster and more useful than repeatedly moving the reserve object. Fourth, trust depends on the integrity of the correspondence, not the elegance of the ledger alone. FTG does not claim that the Wisselbank validated electricity as money, that an Amsterdam institution invented digital assets, or that seventeenth-century law supplies a modern legal classification.

The later history of money continued the abstraction. Commodity-linked systems gave way to state-centered arrangements in which convertibility, central-bank liabilities, commercial-bank money, law, and fiscal authority defined the structure. The critical twentieth-century transition did not occur in one instant for every nation. In August 1971 the United States suspended official dollar convertibility into gold, beginning the end of the Bretton Woods fixed-exchange-rate system.^{7 8} The Smithsonian Agreement temporarily revised parities; by March 1973 the leading currencies had moved into the floating-rate arrangement that effectively completed the abandonment of Bretton Woods.⁸

This history matters because it shows that monetary foundations are institutional choices, not laws of nature. Gold did not cease to be physically scarce in 1971. The legal and international correspondence changed. Likewise, electricity will not become money merely because it is useful. A new correspondence must be established: between measured energy, qualifying reserve, registered interests, liabilities, ledger records, settlement, and enforceable rules.



Figure 3: Monetary Evolution. Commodity possession, custodial ledger claims, sovereign fiat, digital fiat rails, and energy-denominated value are shown as an interpretive sequence rather than an automatic progression.

Status: Illustration.

Current categories sharpen the distinction. Commercial-bank deposits are liabilities of private banks. A central-bank digital currency would be a digital central-bank liability; the Federal Reserve has emphasized that distinction while taking no position in its 2022 discussion paper on whether the United States should issue one.⁹ The International Monetary Fund’s Special Drawing Right is an international reserve asset, not a currency; its value is calculated from a five-currency basket and it is held by IMF members and approved official institutions, not the public.¹⁰ Fiat-backed stablecoins generally digitize a sovereign unit and seek a predetermined redemption value. None of these categories is the same as FTG.

The category boundary is important:

Bank deposit:	private-bank liability denominated in sovereign currency
CBDC:	central-bank liability in sovereign currency
SDR:	official reserve asset valued by a currency basket
Fiat stablecoin:	digital token intended to track a sovereign unit
FTG:	monetary unit physically denominated as 10 kWh

Digital transformation is nevertheless evidence that monetary infrastructure is changing. A 2025 BIS paper reporting its 2024 survey found that 85 of 93 surveyed central banks were exploring retail CBDCs, wholesale CBDCs, or both, with wholesale work more advanced in aggregate.¹¹ That fact establishes neither endorsement of FTG nor inevitable adoption of private energy money. It does establish that tokenization, digital settlement, and the future role of central-bank money have become mainstream institutional questions.

FTG belongs in this history not because every earlier form points deterministically toward it, but because it asks the next architectural question. Once societies have learned to move claims through ledgers and synchronize settlement digitally, can a standardized physical measure other than a sovereign currency become the denominator? More specifically: can authenticated electrical energy support a registered, reserved, transferable monetary position?

The historical answer is not supplied in advance. It will depend on whether FTG can make physical measurement, legal rights, reserve integrity, ledger discipline, governance, and voluntary adoption correspond better than competing alternatives for defined uses. History grants the question legitimacy. It does not grant the outcome.

Chapter 3 — Why Electricity: The Physical Foundation of an Energy-Age Unit

Electricity is both familiar and technically demanding. People encounter it through a utility bill, a battery indicator, a charging station, a light switch, a data center, a motor, or a factory. The same familiarity can obscure the precision required to make it a monetary denominator.

Energy and power are different. The joule is the SI unit of energy or work. The watt is the SI unit of power, equal to one joule per second.¹ A kilowatt-hour measures energy: the amount associated with one kilowatt of power sustained for one hour. NIST gives the exact conversion used by this paper: 1 kWh equals 3.6 MJ.² Therefore:

$$\begin{aligned} 1 \text{ FTG} &= 10 \text{ kWh} \\ &= 36 \text{ MJ} \\ &= 36,000,000 \text{ J} \end{aligned}$$

This equality is a verified physical conversion. It says nothing by itself about reserve quality, ownership, location, time, delivery, legal status, or exchange value.

Electricity is attractive as a denominator because it is capable of useful work and because modern production depends on controlled energy conversion. It powers computation, communications, refrigeration, manufacturing, transportation, health systems, water treatment, and household life. Unlike a purely arbitrary digital scarcity, electricity has direct productive relevance.

But electricity is not a static, globally homogeneous ingot. It is generated and consumed through networks constrained by time, location, voltage, frequency, capacity, congestion, curtailment, and regulation. Storage changes the temporal relationship but introduces round-trip losses, degradation, self-discharge, thermal and fire risk, maintenance, and availability limits. Ten kilowatt-hours measured at one boundary do not necessarily produce ten usable kilowatt-hours at another after conversion and transmission. The physical quantity remains expressible in the same unit; its economic and deliverable characteristics do not become identical.

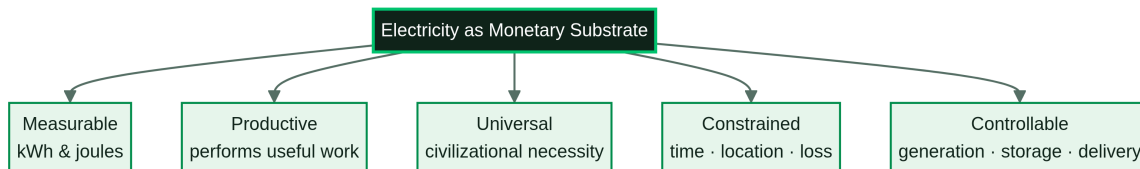


Figure 4: Electricity Substrate. The 10-kWh unit is physically standardized while location, timing, storage, losses, interface, deliverability, and legal control determine reserve qualification. Status: Verified physical fact. This is why FTG does not propose that electrons become coins. The ledger records a governed monetary position associated with qualifying reserve. The reserve institution manages a commingled inventory under rules for measurement, loss, discharge, substitution, and replenishment. Particular electrons may serve a load and cease to remain in storage. The holder's recognized position persists only because the system preserves the qualifying pool and the liability record.

Physical measurability is necessary and insufficient. A generator's output statement is not reserve evidence. A meter reading can be erroneous, stale, manipulated, outside calibration, measured at the wrong boundary, or double-counted. Energy may be legally encumbered, commercially committed, unavailable, impaired, or already allocated. Storage capacity may exist without stored energy. Forecast production is not current inventory. Nameplate capacity describes potential output under stated conditions; it is not an asset that can automatically cover a present monetary liability.

The relevant scarcity is therefore not the total energy described by physics. $E=mc^2$ does not set FTG issuance capacity. The operative constraint is verified, available, qualifying energy under the FTG reserve policy, together with the generation, storage, control, legal, and settlement infrastructure needed to maintain it. Electricity's communication advantage remains significant. People already understand kilowatt-hours as quantities. Businesses budget energy. Utilities meter it. Storage operators monitor states of charge. Data centers and industrial facilities negotiate around power and energy needs. Electric vehicles make stored-energy capacity visible to consumers. A 10-kWh unit can therefore be explained in a physical language that is more concrete than many digital-asset narratives.

Yet familiarity cannot substitute for a legal answer. A consumer who understands 10 kWh still needs to know what the account position permits: transfer, delivery, redemption, services, proceeds, or a beneficial reserve interest. A utility that measures generation still needs to know which data become authoritative. A regulator still needs to classify the actual instrument. An auditor still needs a complete liability population and rights to inspect reserve evidence.

Electricity changes the nature of monetary risk; it does not eliminate it. Fiat systems depend on sovereign, central-bank, banking, fiscal, and political institutions. FTG would depend more directly on metrology, storage, energy infrastructure, custody, reserve policy, software, legal-rights design, and reconciliation. Some risks become observable in physical units. Others—especially operational and legal risks—become more complex.

“This doesn't eliminate risk. It changes the nature of the risk.”

That change is the opportunity. If the new risks are explicitly governed and independently testable, electricity can supply a physically intelligible monetary reference. If they are hidden behind a token interface, the physical narrative adds little. FTG's proposition stands or falls on the institution built between the meter and the holder.

Chapter 4 — The FTG Monetary Standard: One Unit, Four Monetary Functions

The monetary constitution begins with an invariant that every other rule must respect:

1 FTG = 10 kWh = 36 MJ. Always.

This sentence is constitutional design. It fixes the denomination under the FTG standard. It does not mean that 1 FTG is always supported by qualifying reserve unless the coverage test is satisfied at the relevant time. It does not establish the legal nature of the holder's right without governing agreements. It does not fix an issue price, market price, redemption value, or purchasing power. It does not make FTG legal tender. Each of those questions has its own rule and proof.

The distinction is foundational:

“Not ‘\$5.’ Not ‘€4.20.’ Not ‘¥760.’ Those are prices. 10 kWh is the denomination.”

A meter defines energy in kilowatt-hours. A market defines exchange relationships. A reserve system defines coverage. A contract defines rights. Confusing these categories weakens all of them.

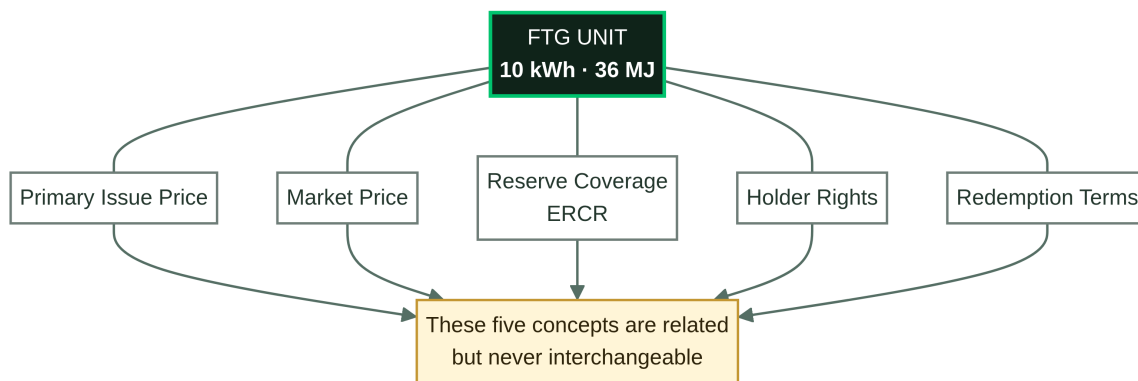


Figure 5: Unit, Price, Coverage, and Rights. One FTG's fixed physical denomination is separated from issue price, market price, reserve coverage, and the holder's legally enforceable interest. Status: Proposed architecture.

4.1 Denomination

Denomination is the name and quantity in which the unit is constituted. For FTG, that quantity is ten kilowatt-hours. The governing standard must state the base-unit precision, permitted subdivisions, display rounding, calculation rules, and change-control process. Monetary accounting must use integers in the smallest governed base unit, not binary floating-point values that can create cumulative rounding errors. Human interfaces may display decimals; the ledger must preserve exact integers.

The constitution should make redenomination extraordinarily difficult. A routine board vote cannot change one FTG from 10 kWh to another quantity. Any amendment would require heightened approval, public notice, impact analysis, compatibility rules, holder protection, and a new standard version. Otherwise the physical invariant would be political language rather than monetary discipline.

4.2 Price

Price is what another asset or currency will exchange for one FTG under stated conditions. A primary issue price may be established by an authorized issuer or Treasury. A reference exchange value may be calculated from non-executable data. An executable market price may emerge from lawful bids and offers on a venue. A redemption value may follow a contract and need not equal any of the foregoing. These values can diverge.

The quote convention must be explicit. FTG/USD means U.S. dollars per FTG; USD/FTG means FTG units per U.S. dollar. A statement that one FTG has a particular dollar value is incomplete unless it identifies the direction, price type, source, timestamp, eligibility, amount, spread, fees, and whether execution was actually available. Because FTG is defined in energy rather than dollars, its fiat exchange rate may float. That is why this paper does not call FTG a stablecoin. Under the design stated here, it is not promised to redeem at a predetermined fixed dollar amount. Its denomination is physically invariant while exchange value may change.

4.3 Coverage

Coverage asks whether the qualifying reserve numerator equals or exceeds the energy liability recognized for outstanding FTG. The constitutional minimum is $ERCR \geq 1.00$. Coverage is a condition of the system at a stated time under a methodology; it is not part of the unit equation.

An FTG account can display 100 units while the system has a reserve exception. The accounting balance does not make the exception disappear. Conversely, a facility can hold abundant energy that has not been legally controlled, authenticated, allocated, or admitted as reserve. Its physical presence does not create authorized FTG. The system must prove both sides and reconcile them.

4.4 Holder right

The holder right answers what the ledger balance means under law and contract. The default model in this constitution is a registered beneficial interest in a commingled, continuously reconciled qualifying reserve pool, with transfer and any redemption or service rights defined in the operative agreements. The exact legal form may vary by jurisdiction and may be expressed as beneficial ownership, a contractual entitlement, a custody interest, or another recognized arrangement. The governing agreements—not a user-interface label—control.

The 10-kWh denomination indicates the size of the energy position used for reserve accounting. It does not necessarily give every holder an unconditional right to demand ten kilowatt-hours at any outlet, time, or location. If physical delivery is offered, the agreement must define location, connection, scheduling, losses, taxes, capacity, safety, minimum quantity, and cost. If proceeds or platform services are offered instead, those rights must be separately stated.

4.5 Physical invariance and economic variability

A kilogram does not change mass when its commodity price changes. Likewise, ten kilowatt-hours remain 36 megajoules when dollars strengthen or weaken. This makes FTG a physically invariant denomination. It does not make it invariant in purchasing power. Electricity prices differ by market and hour. Storage and delivery costs change. Regulation, demand, liquidity, and trust affect exchange value. Reserve impairment and legal risk can affect value even while the nominal energy denomination remains unchanged.

“I’d describe the concept as physically invariant, rather than ‘inflation proof.’” That formulation is exact. Inflation is a change in the price level of goods and services in a given monetary context. A fixed energy measure may offer a different long-run reference, but it cannot guarantee protection from every form of price change, scarcity, regulation, technological substitution, or market dislocation.

4.6 Four monetary functions

FTG’s name states an intended monetary role. Performance must be tested through four distinct functions.

Denomination and prospective unit of account. FTG can serve as a unit of account when parties quote goods, services, wages, energy, financing, or contracts directly in FTG rather than converting from fiat at the last moment. Native pricing requires accounting systems, tax treatment, contract practice, and price stability sufficient for the use case. A wallet balance alone does not establish a unit-of-account function.

Medium of exchange and settlement. FTG can act as a medium of exchange when users can lawfully authorize transfers, recipients accept them, the system supplies technical and legal finality, and conversion or retention choices are practical. Transaction count, repeat merchant use, completion rates, costs, and disputes matter more than theoretical transferability.

Store of value and reserve position. FTG can serve this function only to the extent that holder rights are clear, reserve coverage is credible, operations are resilient, liquidity is available, and risks are understood. Energy denomination does not eliminate loss. A holder remains exposed to reserve impairment, legal uncertainty, liquidity, governance, cyber, custody, and market risks.

Reference asset. FTG can provide a reference against which fiat and digital currencies are quoted if transparent, governed methodologies and sufficiently reliable markets exist. An index can describe exchange behavior; it cannot manufacture liquidity or establish reserve coverage.

These functions need not mature simultaneously. FTG may begin as a held energy position with limited transfer, become useful in settlement corridors, later acquire native contracts, and only then develop broader reference relevance. Architecture permits monetary function. Adoption establishes it.

The controlling doctrine is therefore:

Energy defines FTG. All fiat and digital currencies receive exchange rates against it.

That statement asserts the direction of FTG's monetary identity, not the present existence of deep markets in every currency. FTG does not borrow its definition from the dollar, the euro, bitcoin, a stablecoin, an exchange, or a benchmark. Those systems can price or connect to FTG. They do not constitute it.

Chapter 5 — What “Currency Backed by Electricity” Means

What exactly does ownership of 1 FTG legally and physically entitle its owner to demand?

A serious white paper cannot leave this question to metaphor. Under the constitutional design adopted here, an FTG holder has a **registered beneficial interest in a commingled, continuously reconciled qualifying reserve pool**, together with the transfer, redemption, retirement, service, information, and remedy rights stated in the operative governing agreements. The legal characterization must be confirmed for each jurisdiction. Where local law does not recognize the intended beneficial-interest form, the implementation must use the nearest enforceable structure and disclose the difference before issuance.

The holder does not own identifiable electrons. The holder does not necessarily own a particular battery cell, generator, or reserve lot. The holder’s account is not equity in FTG Energy, does not confer dividends or voting rights, and does not create a guaranteed return unless a separate lawful contract expressly does so. The energy position is pooled so that units can be fungible while reserve sources remain traceable and auditable.

“A claimant owns a defined claim on a commingled reserve pool—not the same identifiable electrons forever.”

This model is comparable in limited respects to a warehouse receipt against controlled inventory. The analogy illustrates pooled custody and transferable interests. Electricity, however, is not grain in a static silo. It is subject to conversion, discharge, degradation, network constraints, and replenishment. The analogy must yield whenever the engineering or legal facts differ.

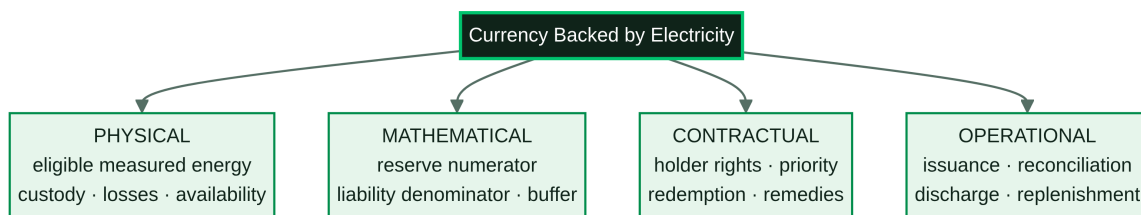


Figure 6: Four Dimensions of Backing. Physical eligibility, mathematical coverage, contractual rights, and operational controls jointly define what “Currency Backed by Electricity” means. Status: Proposed architecture.

5.1 Physical backing

Physical backing begins at a defined measurement boundary. The reserve policy must identify the facility, source, meter, storage or control system, jurisdiction, custody arrangement, and point at which energy becomes eligible for evaluation. Gross generation is reduced by applicable conversion, transmission, storage, auxiliary-load, degradation, and availability adjustments to produce the qualifying amount.

Eligible energy must be real, measured, authenticated, controlled, available under policy, and free of undisclosed encumbrances. It must not be counted simultaneously for another incompatible claim. The registry must state whether environmental attributes, renewable certificates, capacity rights, or other attributes are included, excluded, or separately allocated. A carbon credit does not become part of FTG merely because a patent embodiment mentions one.

Physical backing is portfolio-based. Reserve lots may differ by source, geography, storage technology, age, efficiency, availability, or regulatory constraints. The reserve policy must determine eligibility and haircuts without pretending that every lot has the same delivery economics. Fungibility exists at the monetary level only because the policy standardizes and conservatively adjusts the physical inputs.

5.2 Mathematical backing

Mathematical backing is the coverage invariant. Let:

- QRE be verified qualifying reserve energy after applicable exclusions and adjustments;
- REL be the energy liability recognized for outstanding FTG under the governing policy; and
- B be any additional operational buffer required above the constitutional minimum.

Then:

$$\text{ERCR} = \text{QRE} / \text{REL}$$

Constitutional requirement: $\text{ERCR} \geq 1.00$

Operational requirement, if adopted: $\text{QRE} \geq \text{REL} + B$

The denominator must include every FTG state that creates a recognized holder or settlement liability. It cannot omit units because they are frozen, lost, held by an inactive account, or difficult to redeem unless the legal obligation has actually been extinguished. Treasury inventory that has been authorized but not issued requires a separately defined treatment and must not be confused with outstanding liability. Pending issuance cannot enter circulation before reserve allocation is final.

The numerator excludes forecasts, nameplate capacity, future purchase commitments, disputed title, stale telemetry beyond tolerance, unavailable storage, impaired energy, and reserve already pledged to an incompatible obligation. Haircuts must be transparent. A coverage ratio has meaning only when the population, cutoff, methodology version, exceptions, and assurance scope accompany the number.

The constitution rejects any inconsistent proposal that only five percent of recognized FTG liabilities be physically reserved. A policy may require a five-percent *surplus above* 100 percent, but it may not relabel five-percent backing as satisfaction of an energy-backed liability. The minimum is 1.00; a buffer is additive.

5.3 Contractual and legal backing

The governing agreement must identify the issuer or obligor, reserve owner or trustee, registry operator, custodian or controller, account operator, and holder. It must say whether the beneficial interest is proprietary, contractual, trust-based, custodial, or mixed. It must define segregation, priority, liens, insolvency, governing law, dispute resolution, remedies, and the consequences of a shortfall.

Redemption cannot remain an evocative word. The agreement must specify what a holder may request: physical electricity delivery, a transfer to another holder, application to an FTG service, sale for fiat proceeds through an available counterparty, retirement, or another performance. It must identify minimums, location, scheduling, interfaces, costs, taxes, losses, eligibility, delays, and force-majeure treatment. Different jurisdictions or account classes may lawfully offer different options, but the distinction must be visible.

A token holder's private key is evidence of transaction authority within the applicable system; it is not, by itself, the complete legal title instrument. Identity, account registration, succession, court orders, sanctions, lost credentials, and insolvency can alter who may exercise a right. That is why the authoritative monetary ledger and governing agreements matter.

5.4 Operational backing

Operational backing is the continuous chain that keeps the other three dimensions true. It includes authenticated metering; reserve admission; lot allocation; issuance authorization; account credit; transfer controls; reserve and liability reconciliation; discharge, substitution, and replenishment; impairment; audit; exception handling; and public reporting.

No single dashboard proves the chain. Telemetry can prove what a device reported. A custodian can confirm control of an asset. The ledger can establish supply. Legal review can define rights. An assurance provider

can test selected assertions. Institutional credibility comes from joining these proofs without overstating any one of them.

The reserve system must prevent three forms of duplication: counting the same energy twice in the reserve; issuing two liabilities against the same allocation; and treating a discharged lot as available before replacement has qualified. These are not mere software bugs. They strike at the meaning of the currency.

5.5 Rights during discharge and substitution

Electricity may serve productive loads. That usefulness is part of the economic case, but it cannot reduce coverage invisibly. Reserve electricity may be discharged only under rules that preserve ERCR through prequalified substitution or concurrent replenishment. “Prequalified” means the replacement has already passed the necessary physical, legal, and policy gates and can be allocated without creating a gap. “Concurrent” means the reserve and accounting records recognize the substitution within the controlled settlement sequence, not as an expectation that future generation will eventually catch up.

Physical discharge and legal extinguishment are separate. If a reserve lot is discharged while a holder’s FTG remains outstanding, the liability continues and must be supported by replacement qualifying reserve. FTG is burned only when the holder liability is legally extinguished through completed redemption, retirement, or another governed event. The patent’s disclosed ability to record consumption or delete a correlated digital unit does not, by itself, determine the monetary treatment of a pooled holder liability.

5.6 Shortfall and remedies

If ERCR falls below 1.00, new issuance stops immediately. Affected redemption or settlement may also be held if continuing would worsen unequal treatment or violate law. The operator must publish the exception within the required disclosure window, identify its cause and magnitude, activate the impairment waterfall, and notify the governing and assurance bodies.

The waterfall should apply, in order, available surplus; the disclosed operational buffer; prequalified replacement reserve; authorized Treasury resources that do not create unreserved FTG; insurance or contractual recoveries; and, if still necessary, a formally governed impairment and holder-remedy process. No step may conceal the shortfall by changing the denominator or moving liabilities off the main record.

The exact remedies must be contractual. They may include cure periods, pro rata treatment, transfer restrictions, substitution, cash or other performance where lawful, claims against responsible parties, and wind-down rights. The promise of backing becomes credible not because failure is said to be impossible, but because failure has rules.

Chapter 6 — Patent Foundation: From Metered Electricity to a Traceable Digital Unit

The FTG patent record supplies a concrete technical answer to a central question: how can a physical electrical event become a traceable digital record?

U.S. Patent No. 11,962,710 B2, *Systems and Methods for Generation of Energy-Backed Digital Units Stored in a Decentralized Ledger*, issued April 16, 2024. Its public record identifies Nicholas VandenBrekkel as inventor, application No. 17/871,588, and a July 22, 2022 filing date.³ The grant contains fifteen claims. Its public assignment history records a March 2024 assignment event to Nicholas VandenBrekkel, but any statement of current ownership or enforcement authority should remain subject to a current counsel-reviewed chain-of-title report.³

U.S. Patent No. 12,647,288 B2 bears the same title and issued June 2, 2026 from application No. 17/863,165, filed July 12, 2022. It identifies Nicholas VandenBrekkel as inventor and contains twenty claims.^{4 5} Because this grant postdates October 17, 2006, it is included only under the consolidated-edition note. The two grants together contain 35 issued claims, but number alone does not define scope.

The patents describe a “digital medium of exchange blockchain that is based on a metered amount of generated electrical energy.”^{3 4} In the disclosed chain, a meter computing system authenticates as a node, a sensor monitors generated electrical energy over time, the system recognizes a predetermined increment, a correlated digital unit receives unique hashed signature and traceability data, and the unit is stored in a decentralized ledger. The specifications also describe implementations involving storage, predicted and actual degradation, consumption records, source information, location, timestamps, and exchange-related functions.^{3 4}

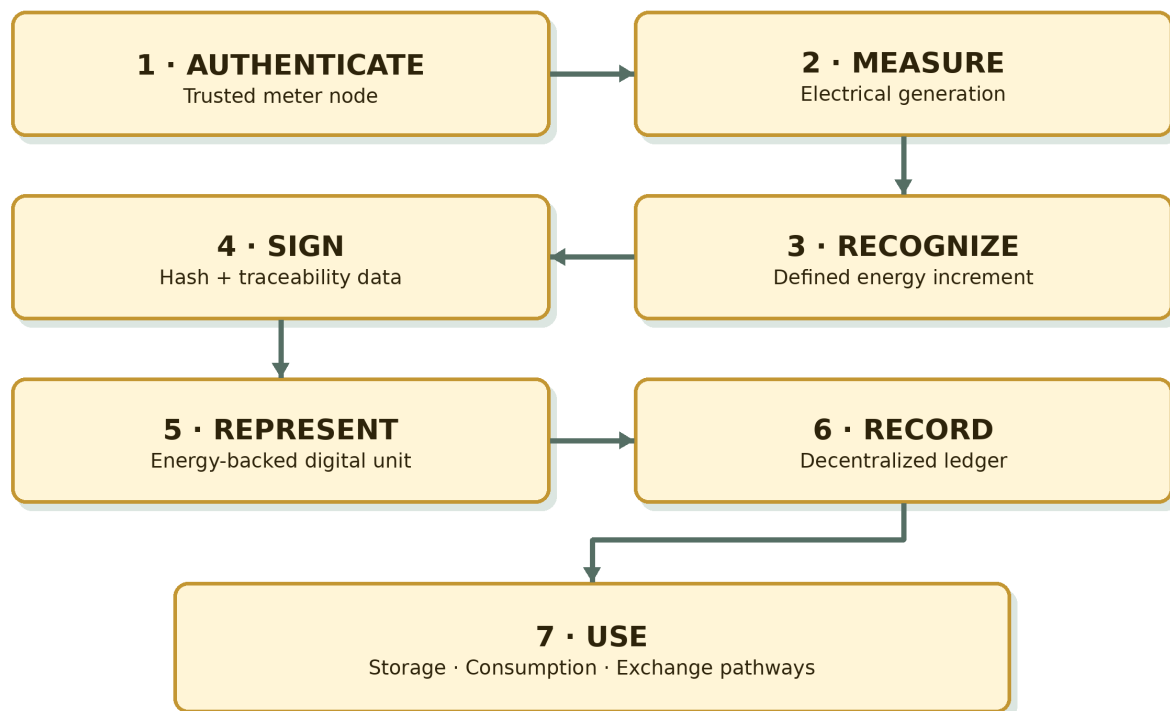


Figure 7: Patent Meter-to-Ledger Chain. Authenticated meter node measures generation, recognizes a defined increment, signs traceability data, and records the digital unit in a decentralized ledger. Status: Patent fact. The legal scope lies in the claims, not in a slogan or high-level diagram. Different independent claims use different statutory forms and limitations. Some claimed or disclosed pathways include renewable-generation

and carbon-credit elements; others emphasize current transformers, meter computing systems, or machine-readable instructions. The definitive claim chart must identify, for every architecture element, whether it is required by a claim, described as an embodiment, selected as an FTG implementation, or created by the separate monetary constitution.

That classification protects both the patents and the white paper. It prevents a broad statement—such as “the patents cover electricity currency”—from obscuring the actual invention. It also prevents the technical grant from being burdened with conclusions it never needed to establish.

The patents do not establish:

- that any particular electricity is presently held as qualifying FTG reserve;
- that ERCR is at or above 1.00;
- that a holder has a legally perfected beneficial interest;
- that an FTG unit is redeemable in a particular manner;
- that FTG is legal tender or regulator-approved;
- that the full global architecture is implemented;
- that a market is liquid or adopted;
- that every energy-related token or monetary system infringes; or
- that the patent claims are valid and enforceable against every challenged implementation.

Those matters require separate evidence and legal analysis.

The patents nevertheless matter profoundly. A monetary proposal based on electricity must prevent the digital record from becoming detached from the physical event at inception. VandenBrekel’s invention places authenticated measurement at the creation boundary. It does not begin with an arbitrary token and add an energy narrative afterward. It begins with generated electricity, a meter, an increment, traceability, a signature, and a ledger.

That sequence embodies the project’s hierarchy. Electricity comes first as physical fact. FTG then determines whether the event qualifies for reserve and monetary treatment. Blockchain records the approved digital representation. The order cannot be reversed.

The second invention—the wider monetary architecture—starts where the patent chain leaves off. A traceable digital unit is not yet an institution. FEMS must determine reserve eligibility, holder rights, liability recognition, issuance authority, settlement, burn, impairment, governance, and assurance. GERR must connect the energy evidence to reserve inventory. The core ledger must account for every monetary state. These are deliberate institutional extensions, not conclusions automatically granted by a patent office.

For that reason, patent attribution remains central throughout the system’s history while patent scope remains disciplined. Nicholas VandenBrekel originated and patented the meter-to-ledger foundation underlying FTG’s energy-tokenization architecture. FTG’s claim to be a functioning currency must be earned through the legal, reserve, operational, and adoption systems built upon it.

Chapter 7 — Physical Reserve Infrastructure: Generation, Storage, Load, and Replenishment

A reserve of electricity is a managed system, not a static pile. Its credibility depends on the lifecycle by which energy enters, remains, leaves, and is replaced.

Generate → measure → store or otherwise qualify → represent → consume or discharge → regenerate → restore reserve.



Figure 8: Reserve Lifecycle. Energy moves from generation through metering and qualification into a pooled reserve, then through governed discharge, substitution, replenishment, and reconciliation. Status: Proposed architecture.

7.1 Admission begins after generation

A power source produces a physical event. The first authoritative meter captures the event at a defined boundary. Additional measurement paths test the reading. The system identifies source, facility, device, time, jurisdiction, and applicable quality attributes. It applies losses between gross generation and the reserve boundary. It then determines whether the resulting energy is under the legally required control and is available for allocation.

“No energy may enter the monetary reserve merely because a generator reported output. It must pass measurement, custody, quality, and policy gates.”

Approved source types may include renewable and conventional generation if the operative reserve policy permits them. The constitution does not silently make environmental attributes part of the monetary unit. If renewable origin, carbon intensity, or certificates are represented, those attributes require separate provenance and no-double-sale controls.

7.2 Storage and control

The default reserve model contemplates stored or otherwise strictly controlled usable energy. The exact eligible technologies must be enumerated in the Reserve Qualification Policy. Batteries, pumped storage, thermal conversion arrangements, or other systems have different measurement boundaries and loss profiles. A promise to generate later is not stored energy. A capacity payment is not energy inventory. A fuel stock is not electricity unless a separately disclosed reserve standard intentionally recognizes a conversion right—and doing so would change the risk and backing claim.

For stored electricity, the registry must distinguish gross input, conversion losses, state of charge, reserved allocation, operational minimums, unavailable portions, degradation, and net qualifying energy. It must record the time and confidence interval of each measurement. If the technology cannot support sufficiently reliable, timely, and independently testable measurement, it cannot support issuance merely because it stores energy in an engineering sense.

7.3 Availability and quality

Qualifying reserve is usable under the governing policy. Energy behind a failed inverter, an inaccessible connection, an expired permit, an unresolved safety event, or a legal seizure may be physically present but unavailable. The policy must specify when availability is impaired and what haircut applies.

Location and interface matter. An energy position in one country cannot be represented as though it were physically deliverable without constraint in another. The pooled monetary unit can abstract source location

for transfer purposes, but redemption terms, reserve concentration, and valuation disclosures must preserve the underlying geography. Pooling is not permission to hide basis risk.

7.4 Allocation and no double pledge

Each reserve lot receives a unique identifier and state. Available qualifying energy becomes allocated only through the issuance state machine. Once allocated, it cannot support another FTG issuance, a contradictory third-party lien, or another reserve claim. The registry must preserve lot history even when energy is commingled operationally.

Commingling serves fungibility. Traceability serves accountability. The design requires both. A holder need not receive a source-specific unit, but assurance providers must be able to reconstruct the portfolio and prove that every recognized liability maps to sufficient unencumbered qualifying reserve.

7.5 Discharge

Electricity is valuable because it can perform work. A reserve architecture that never permits useful discharge could become economically inefficient. A system that permits discharge without replacement would become unbacked. FTG resolves the tension through the coverage-preserving rule.

Reserve electricity may be discharged only if one of two conditions is met. First, prequalified substitute reserve may be allocated before the original lot loses qualifying status. Second, concurrent replenishment may qualify and be recorded within the same controlled process so that coverage never drops below the constitutional requirement. The policy may define a technically precise transition window, but it cannot use ordinary expected future generation as present coverage.

“The physical energy and ownership of energy therefore don’t need to follow identical paths.” The registered interest can transfer among holders while reserve facilities continue to operate. But path separation requires stronger accounting, not weaker physical discipline.

7.6 Replenishment

Replacement energy follows the same admission path as initial energy. It does not count when scheduled, generated, invoiced, or transmitted. It counts after the relevant event is measured, authenticated, adjusted, controlled, accepted, entered into GERR, and allocated. The system must retain the lineage from discharged lot to substitute lot and the time at which the transition occurred.

Replenishment rules should prefer conservative timing. Where telemetry latency or settlement uncertainty exists, the operator should maintain an operating buffer sufficient to absorb it. The buffer must be disclosed and cannot be used to excuse systematic undercoverage.

7.7 Capacity and concentration

Physical infrastructure places hard limits on supply. Nameplate capacity can bound potential production but cannot justify immediate issuance. Current usable reserve places the operative bound. Concentration in a technology, facility, geography, operator, grid, insurer, or jurisdiction can create correlated impairment. The Treasury and reserve authority must set limits and disclose material concentrations.

Facility dossiers should include ownership and control records, licenses, meter and storage specifications, calibration, maintenance, telemetry, cyber controls, safety systems, insurance, liens, emergency procedures, historical performance, and independent inspection. Strategic Energy Vaults or named technologies should be treated as operating facts only when these dossiers establish them. Otherwise they remain proposed facility categories.

7.8 Casualty and impairment

Fire, flood, component failure, cyberattack, seizure, curtailment, or grid isolation can make energy unavailable. The reserve registry must shift affected lots into an impaired state automatically or on authorized determination. ERCR recalculates using the reduced qualifying numerator. Insurance proceeds may support financial recovery but do not remain electricity reserve unless converted into qualifying energy through the governed process.

The physical reserve is credible when it can be counted conservatively during ordinary operation and reclassified quickly during stress. The reserve institution must be designed for the instant when a favorable assumption stops being true.

Chapter 8 — Energy Authentication, GERR, and ERCR

At monetary scale, reserves become the institution. For FTG, continuously verified energy reserves must become part of the monetary architecture itself.

The physical layer must answer a narrow question repeatedly: **How can the system prove that a ledger unit corresponds to the physical-energy event or reserve obligation it claims to represent?** No single device, oracle, custodian, or blockchain can answer alone.

8.1 Multiple paths to energy truth

The target architecture uses multiple measurement and evidence paths. A primary meter records the relevant boundary. Secondary sensors or facility systems provide comparison. Storage-management systems report state and health. Grid or operator records may corroborate flows. Calibration status determines whether a reading is eligible. Secure device identity and signed messages bind the event to the originating equipment. Differences between sources must be evaluated against defined tolerances. An unexplained material difference moves the event into an exception state. The system does not average conflicting readings merely to produce a convenient number. Authentication establishes provenance; it does not guarantee physical truth if the underlying sensor is compromised. Independent metrology and periodic inspection remain necessary.

8.2 The ENERGY_EVENT

Each candidate energy event should produce a signed, time-bound record containing at least:

- unique event, source, facility, meter, storage, and reserve-lot identifiers;
- start and end timestamps and time zone;
- gross measured energy and measurement boundary;
- recognized losses and net candidate energy;
- calibration certificate, status, uncertainty, and expiry;
- source and technology attributes used by policy;
- jurisdiction and control entity;
- storage state, availability, degradation, and health where applicable;
- signatures, hashes, sequence numbers, and prior-event linkage;
- exception status and reviewer actions; and
- resulting qualifying energy, if accepted.

The proposed **Energy Proof Engine (EPE)** validates signatures, device status, temporal consistency, source consensus, replay protection, policy eligibility, and other technical rules. EPE output is evidence for reserve admission. It is not a legal title opinion or an independent audit.

8.3 Global Energy Reserve Registry

The proposed **Global Energy Reserve Registry (GERR)** is the authoritative inventory record for the physical reserve layer. It records facilities, sources, meters, lots, storage systems, gross and net quantities, reserve status, allocations, liens, control, degradation, availability, geographic concentration, inflows, discharges, substitutions, and impairments.

GERR must distinguish at least these states:

OBSERVED
AUTHENTICATED
CANDIDATE
QUALIFIED-AVAILABLE
ALLOCATED

RESERVED
DISCHARGE - PENDING
SUBSTITUTED
IMPAIRED
UNAVAILABLE
RETIRED
REJECTED

Only amounts in policy-authorized qualifying states enter the ERCR numerator. Historical state transitions are immutable. Corrections create new records linked to the original entry.

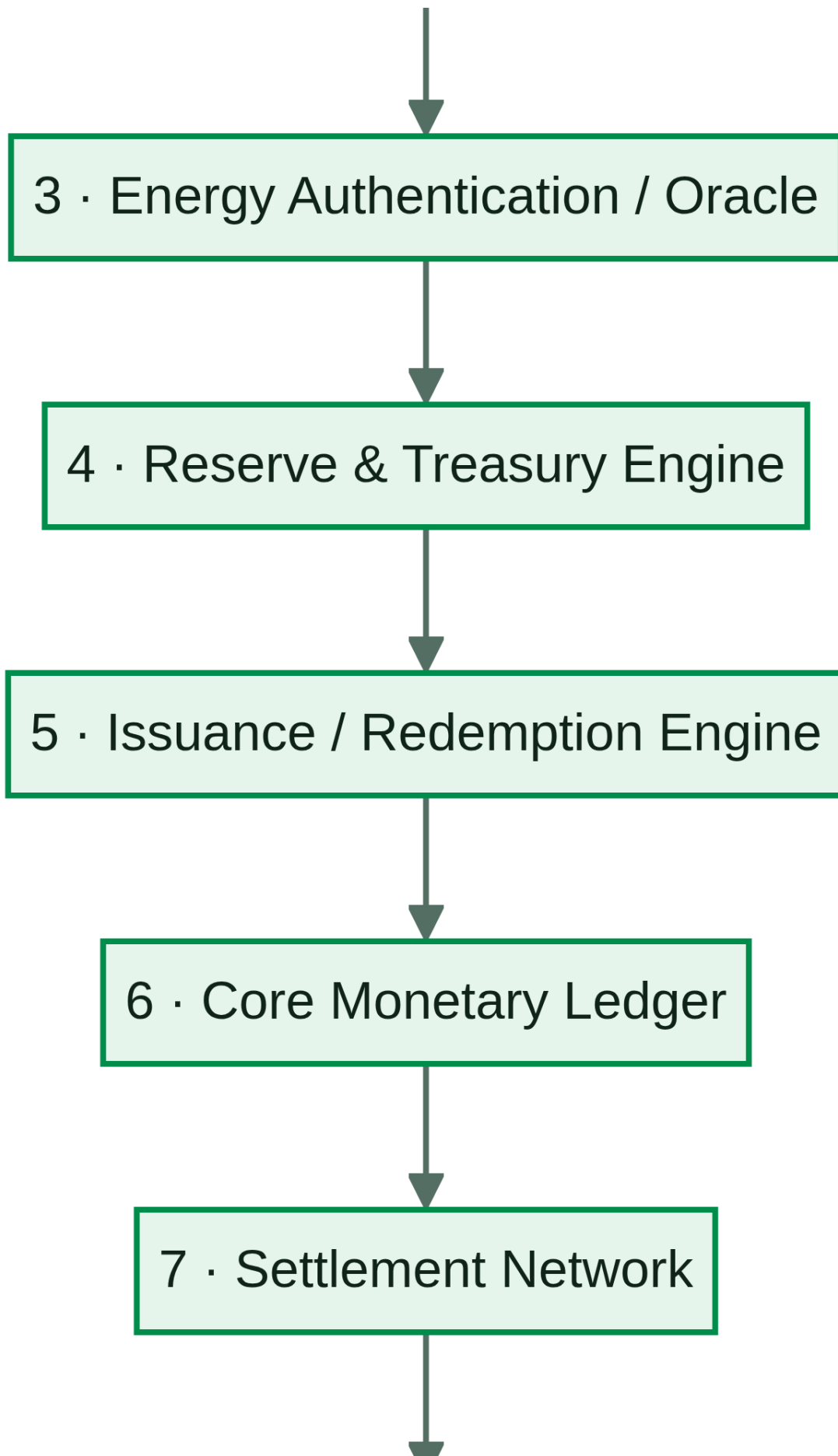


Figure 9: GEMS Layers. Physical infrastructure, energy proof, reserve registry, issuance, authoritative ledger, settlement, markets, and interfaces are governed by cross-cutting security and assurance. Status: Proposed architecture.

8.4 Energy Reserve Coverage Ratio

The primary public coverage measure is:

$$\text{ERCR} = \frac{\text{Verified Qualifying Reserve Energy}}{\text{Recognized Outstanding FTG Energy Liabilities}}$$

The numerator is not “all energy associated with FTG.” It is energy admitted under the current reserve-policy version, within freshness limits, after losses, degradation, availability reductions, encumbrance exclusions, concentration adjustments if used, and unresolved exceptions.

The denominator is not simply a blockchain token count. It is the complete recognized energy liability derived from the authoritative monetary ledger. Each outstanding FTG contributes ten kilowatt-hours unless a legally effective state under the rulebook changes or extinguishes that obligation. Pending, held, frozen, disputed, and lost-access positions remain included when the liability persists. Authorized but unissued units and properly retired units are treated according to the published supply-state rules.

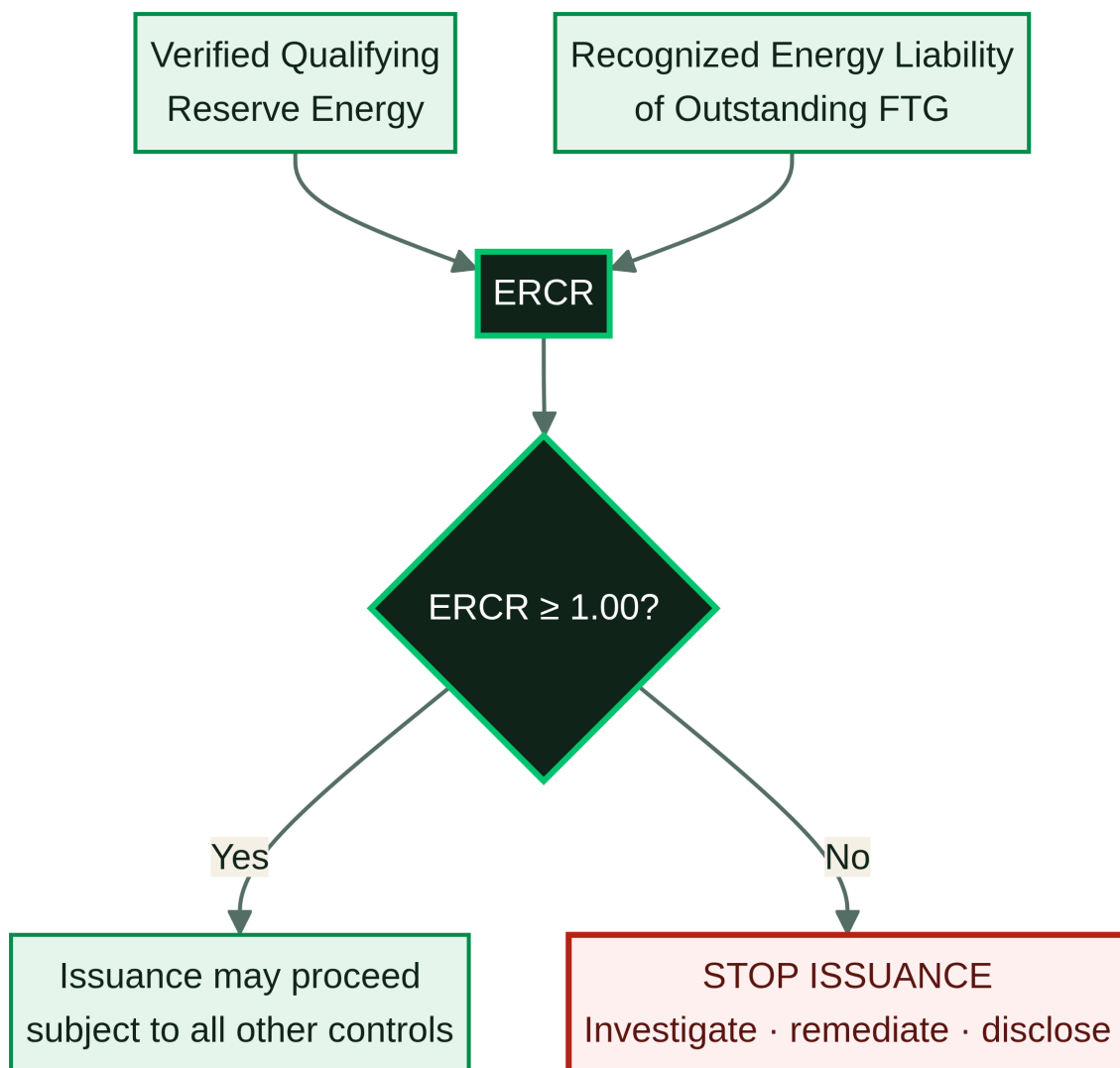


Figure 10: ERCR. Verified qualifying reserve energy forms the numerator; every recognized outstanding FTG energy liability forms the denominator; the constitutional minimum is 1.00. Status: Proposed architecture. The public ERCR report must state:

- the as-of timestamp and reporting time zone;
- methodology and reserve-policy versions;
- numerator and denominator quantities;
- supply-state reconciliation;
- required operating buffer, if any;
- stale, excluded, impaired, disputed, and encumbered amounts;
- material facility and counterparty concentrations;
- known exceptions and remediation status;
- data latency and cutoff rules;
- assurance provider, standard, procedures, coverage period or point in time, and limitations; and
- correction history.

“Verified qualifying stored energy ÷ FTG energy obligations” is a useful summary, but the formal methodology controls. If non-storage reserve forms are ever proposed, they require an explicit amendment and must not be inserted under the label “stored” without explanation.

8.5 Threshold response

The constitutional minimum ERCR is 1.00. A warning threshold above 1.00 should give operators time to replenish the buffer before the minimum is reached. Crossing the warning threshold restricts discretionary reserve discharge and increases monitoring. Reaching 1.00 blocks any action that would reduce coverage. Falling below 1.00 freezes issuance automatically and activates the shortfall process.

Resumption requires verified cure, complete reconciliation, authorized approval, and disclosure. A manual override cannot mint into undercoverage. Emergency powers may freeze more activity; they may not redefine the reserve ratio after the fact.

8.6 Public proof and independent assurance

A target-state public portal should show current and historical ERCR, reserve composition, supply states, methodology versions, reporting latency, exceptions, and assurance reports at a level that protects facility and personal security. Public transparency must be balanced with operational confidentiality through tiered access: aggregated public data, participant-level information, regulator access, and full auditor or verifier access.

Telemetry is not independent assurance. An operator displaying its own readings has improved transparency but has not supplied third-party validation. Assurance should combine calibrated metrology, facility and custody confirmation, legal-control review, complete liability reconciliation, system-control testing, and periodic independent reporting.

The Tether case study later in this paper illustrates why scope language matters. A point-in-time reasonable-assurance engagement is not a continuous audit and not an audit of complete financial statements. FTG must publish the same kind of precision about its own evidence. “Assured” must identify what was tested, under which standard, for which date or period, using what population or sampling, and with which exceptions.

“Transparency is not the absence of exceptions. It is the disciplined disclosure and resolution of them.”

That principle is the bridge from a reserve claim to a reserve institution.

Chapter 9 — The FTG Monetary Kernel: Issuance, Supply, and Reconciliation

The **FTG Monetary Kernel** is the set of functions that no external partner may define or control. It constitutes the unit, determines which energy counts, recognizes liabilities, authorizes issuance, records holder positions, governs extinguishment, and preserves continuity.

Its authority is expressed through the proposed **FTG Energy Monetary Standard (FEMS)**. FEMS is the monetary constitution and rulebook: the binding specification for denomination, precision, reserve, holder rights, issuance, supply states, transfer, finality, redemption, burn, impairment, indices, governance, assurance, emergency control, and change management. The standard becomes operative only through duly adopted governing documents and enforceable agreements.

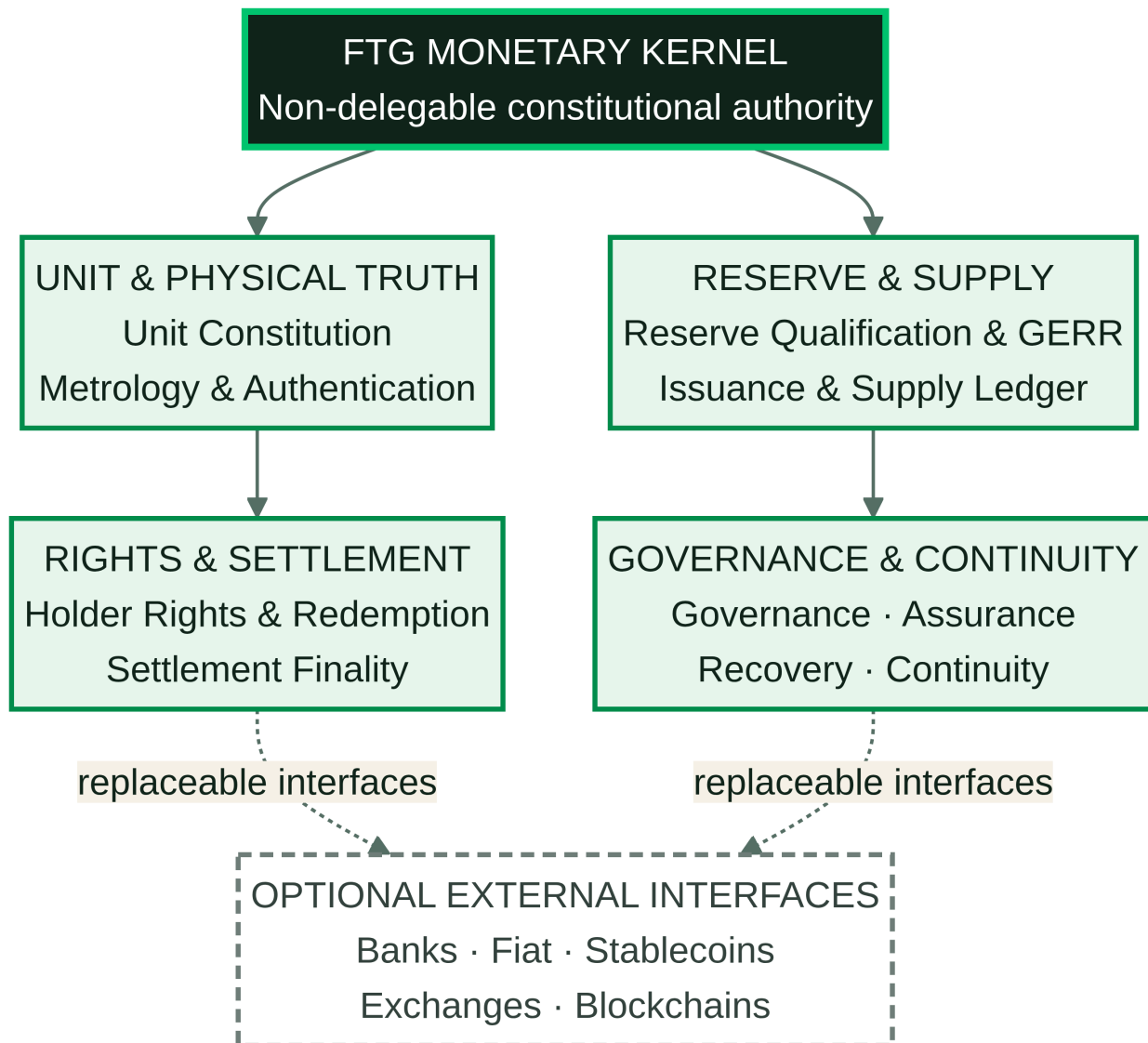


Figure 11: Monetary Kernel. The non-delegable FTG core contains unit, reserve, rights, issuance, ledger, finality, governance, assurance, and continuity functions, surrounded by replaceable interfaces. Status: Proposed architecture.

9.1 The authoritative record

The **FTG core monetary ledger under FEMS is the authoritative legal and accounting record**. It records accounts, holder interests, energy liabilities, Treasury inventory, restrictions, state transitions, and

compensating entries through double-entry accounting. A blockchain network may synchronize transfers and provenance, but if a material inconsistency occurs, the rulebook resolves legal and accounting status through the core ledger after reconciliation and authorized correction.

This hierarchy does not make blockchain cosmetic. A tamper-evident distributed record can improve traceability, reduce unilateral alteration, support participant verification, and extend settlement interfaces. But a blockchain cannot determine whether an external meter was calibrated, whether reserve is encumbered, whether a court order is valid, or whether a holder liability has been legally discharged. Those judgments belong to the wider institution.

The core ledger must use integer base units, deterministic calculations, immutable journals, role-based authorization, idempotent transaction processing, cryptographic event linkage, and complete version history. Idempotency means that replaying the same instruction cannot create a second issuance or payment. Every monetary event receives a unique identifier and a balanced accounting entry.

9.2 Deterministic issuance

Issuance follows a controlled state machine:

```
ENERGY MEASURED
→ EVENT AUTHENTICATED
→ RESERVE QUALIFIED
→ GERR ENTRY ACCEPTED
→ AVAILABLE CAPACITY CALCULATED
→ RESERVE LOCKED OR ALLOCATED
→ ISSUANCE AUTHORIZED
→ FTG ISSUED
→ ACCOUNT CREDITED
→ ACCOUNTING, BLOCKCHAIN, AND AUDIT RECORDS FINALIZED
```

At each transition, the responsible system checks prerequisites, permissions, prior state, policy version, and event uniqueness. Failure moves the request to rejection, hold, or investigation; it does not skip the step.

No valid reserve certificate: No minting.

This is a constitutional control objective. It must be enforced in code and tested through attempts to issue against missing, expired, duplicated, impaired, or insufficient reserve. Administrative status alone cannot substitute for the certificate. No executive, partner, or operator may override the coverage requirement by ordinary discretion.

The issuance formula is bounded by both reserve and system permissions:

```
Maximum additional FTG
≤ floor((Qualifying allocable reserve - recognized existing liability - required
buffer) / 10 kWh)
```

If the result is zero or negative, issuance capacity is zero. The formula must use the same cutoff and loss-adjusted data as ERCR.

9.3 Supply states

A complete supply ledger distinguishes at least authorized capacity, unissued authorization, pending issuance, issued Treasury inventory, outstanding holder liability, held or restricted balances, pending redemption, re-

tired units, burned units, and cancelled erroneous instructions. Each state must specify whether it contributes to recognized energy liability.

Burn is not a convenient token-management operation. Under FEMS, burning FTG is the accounting consequence of legal extinguishment. When a holder completes redemption, voluntary retirement, or another authorized event that terminates the obligation, the ledger debits the holder or pending-redemption account, extinguishes the recognized liability, releases or disposes of reserve according to policy, and synchronizes the blockchain record. An accidental or unauthorized destruction of a blockchain token cannot silently erase the legal obligation.

9.4 Three truths

FTG depends on continuing reconciliation among:

1. **Physical truth** — qualifying reserve recorded in GERR and supported by metrology, custody, availability, and control evidence.
2. **Accounting truth** — recognized assets, liabilities, supply states, account positions, and legal restrictions in the core monetary ledger.
3. **Blockchain truth** — synchronized ownership and settlement records on the selected distributed ledger or ledgers.

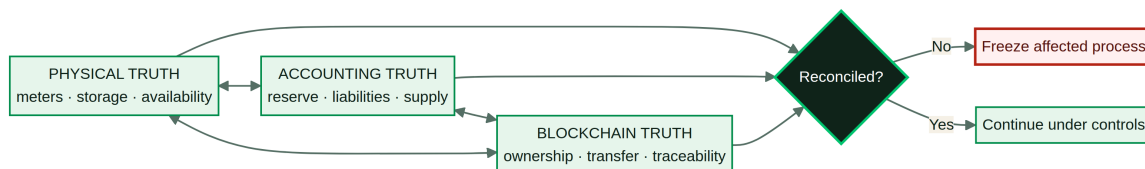


Figure 12: Three-Truth Reconciliation. Physical reserve, authoritative accounting, and blockchain transaction records reconcile continuously; a material difference freezes the affected process. Status: Proposed architecture.

Reconciliation occurs transaction by transaction for issuance, transfer, redemption, burn, and correction, with scheduled full-population checks and independent testing. Differences are classified by amount, age, source, severity, affected holders, and potential coverage impact.

“Any mismatch among the reserve registry, monetary ledger, blockchain, or settlement ledger must stop new issuance automatically until resolved.”

The freeze may be scoped when the discrepancy is demonstrably isolated, but no affected position may continue to create liabilities or final settlement. Investigation must preserve evidence, identify root cause, make authorized compensating entries, restore agreement, and document resumption approval. The system never rewrites an original journal entry invisibly.

9.5 Change control

The Kernel is independent only if its rules cannot be quietly altered by a vendor, administrator, or temporary majority. FEMS changes require versioning, documented rationale, risk and legal review, testing, approval thresholds, public notice where holder rights are affected, backward compatibility or migration plans, and an effective date. Emergency changes require narrow scope, expiry or ratification, and after-action disclosure. The unit, ERCR minimum, authoritative-ledger hierarchy, prohibition on unreserved issuance, and requirement for legal extinguishment before burn should receive constitutional protection above ordinary operating policy. A system that can abandon these rules under commercial pressure does not have an energy monetary constitution; it has revocable branding.

9.6 Independence principles

The Kernel gives operational force to ten principles:

1. The FTG monetary unit is defined by energy, not another currency.
2. One FTG equals 10 kWh, or 36 MJ, under the governing standard.
3. No external currency, stablecoin, bank, exchange, blockchain, or partner defines FTG.
4. External systems interact through governed exchange and settlement interfaces.
5. No external partner has unilateral issuance control.
6. The Kernel must remain operable without any single external institution or technology provider.
7. Interoperability is maximized without sacrificing monetary independence.
8. Physical-energy and reserve rules remain independently verifiable.
9. Patent-governed elements are managed separately from partner integrations.
10. Partners accelerate FTG; they do not define FTG.

These principles must be tested. Architecture diagrams and contracts should name the control owner, evidence artifact, failure test, and disclosure requirement for each. Independence is not declared by refusing partners. It is established by preventing any partner from becoming the unreplaceable source of monetary truth.

Chapter 10 — Transfers, Settlement, Treasury, Redemption, and Holder Protection

A monetary unit becomes socially useful when people can transfer it with confidence and understand how they may exit. FTG settlement must therefore connect transaction speed to legal certainty, reserve preservation, and remedies.

The reserve infrastructure stays put. The ledger moves.

When one account sends FTG to another, the physical reserve need not travel between facilities. The authoritative ledger transfers the registered position; the blockchain subsystem records synchronized settlement evidence. The reserve remains pooled and continuously reconciled. If the recipient later exercises a redemption or service right, the applicable performance rules determine which reserve or Treasury action follows.

10.1 Transfer types

The architecture supports, when legally and operationally enabled, peer-to-peer transfers, merchant payments, institutional settlement, Treasury operations, and cross-border transfers. Each use case can have different eligibility, identity, screening, limits, fees, disclosure, and finality conditions. A platform's ability to update balances does not establish that all transaction types are available in every jurisdiction.

FTG reports current platform functions involving accounts, wallet or ownership records, purchases, transfers, Exchange and Treasury functions, agreements, compensation records, and administrative controls. Its public token page describes balances, activity, purchase agreements, and enabled transfer functions while warning that availability depends on jurisdiction, readiness, and terms.¹⁴ This is first-party evidence of a public operating foundation. It is not independent verification of ERTGS, global market liquidity, energy redemption capacity, or the reserve architecture specified in this paper.

10.2 Technical and legal finality

The target transfer sequence is:

INITIATED → AUTHORIZED → RESERVED → SUBMITTED → CONFIRMED → FINAL

Technical finality occurs when the governing system rules regard a transaction as durably recorded and no longer subject to ordinary technical reordering. **Legal finality** occurs when the transfer of rights and discharge of obligations is irrevocable and enforceable under the governing agreements and applicable law, subject to defined legal exceptions.

The two moments may coincide in routine cases but need not. Sanctions screening, fraud detection, a legal hold, court order, insolvency stay, account compromise, or conflict of laws may prevent legal completion even after a technical record exists. The state machine therefore includes PENDING, HELD, REJECTED, DISPUTED, and REMEDIATION states where appropriate.

A system must not advertise an “irreversible” transaction while maintaining undisclosed administrative powers to change balances. Nor should it make error correction impossible in the name of immutability. The correct design preserves original events and uses explicit compensating entries.

10.3 Compensating entries

A refund creates a new transfer from recipient to sender or merchant to customer. A correction creates a new authorized accounting entry linked to the mistaken one. A fraud remedy, court-ordered transfer, or administrative recovery follows a documented authority path and remains auditable. The original transaction is never erased from history.

This design separates record integrity from economic remedy. The ledger can remain append-only while the legal institution corrects outcomes. Every compensating entry must carry reason code, authority, evidence, affected accounts, approvals, timestamps, and links to the original event.

10.4 ERTGS

The proposed **Energy Real-Time Gross Settlement system (ERTGS)** is the target mechanism for individually final institutional transfers in FTG, subject to liquidity, identity, compliance, and legal-finality rules. “Real-time” is an objective, not an unqualified performance claim. The operating specification must define service levels, queuing, liquidity reservation, downtime, recovery, participant defaults, cutoffs, and the moment at which obligations discharge.

ERTGS does not replace the core ledger. It is a settlement service governed by FEMS and posting to the authoritative record. It may connect through ISO-compatible messages or other accepted standards, but compatibility should not be claimed until interfaces are implemented and tested.

10.5 Treasury

The FTG Treasury manages issuance inventory, reserve allocation, operating buffers, conversion liquidity, fiat settlement resources, redemption queues, concentration limits, counterparty exposures, and contingency funding. Treasury may facilitate transactions but cannot create reserve truth or override issuance controls. Treasury assets that are not qualifying electricity must remain economically and visibly distinct from the energy reserve. Cash held for fees, conversion, operations, or redemption liquidity may improve resilience without increasing the ERCR numerator. The financial statements and reserve reports must prevent readers from mistaking total corporate assets for qualifying energy reserve.

10.6 Redemption and performance

The default holder interest must be paired with a clear performance matrix. Possible channels include transfer to another eligible account; application to an FTG product or service; physical electricity delivery at a qualifying interface; sale or conversion through an available counterparty; receipt of proceeds under specified terms; and voluntary retirement.

No channel is presumed universal. Physical delivery can require interconnection, scheduling, local permissions, minimum quantities, network and conversion losses, and fees. Fiat conversion requires liquidity, pricing, a lawful counterparty, and settlement banking. Service use requires an available product. The terms must identify what FTG itself promises and what an independent counterparty may offer.

When redemption legally extinguishes the holder liability, the monetary ledger records that event and authorizes burn. The corresponding reserve allocation is released, delivered, sold, reallocated, or retired according to policy. If performance fails, the agreement must supply a complaint path, cure period, escalation, dispute resolution, and remedies.

10.7 Holder protection and wind-down

Holder protection includes clear statements of rights; custody and segregation; conflict controls; fee disclosure; privacy; complaint handling; fraud response; account recovery; succession; unclaimed-property treatment; and insolvency priority. A lost private key should not force the legal institution to pretend that the underlying liability vanished. Recovery must use strong identity and authorization controls without enabling administrative theft.

Wind-down rules must define suspension of new issuance, reserve preservation, claim submission, redemption or distribution order, costs, data retention, system access, dispute resolution, and final accounting. The status of each holder’s beneficial interest must be addressed under the relevant insolvency regime. Bankruptcy remoteness, if intended, requires a legal structure and opinion; it cannot be created by white-paper language.

10.8 Compensation is separate

Account-holder compensation, if offered, is a separate contractual business-model feature funded from disclosed operating economics. It is not inherent in electricity, not an attribute of the 10-kWh denomination, not guaranteed, and not evidence of reserve growth.

“The 10% isn’t something inherent in electricity. It’s a contractual payment from the commercial economics of FTG’s system.”

No percentage is promised by this paper. Any program must identify the payer, source of funds, conditions, variability, priority, tax treatment, regulatory characterization, stress performance, and termination rights. Compensation paid in FTG must come from already issued Treasury inventory or pass the same reserve-allocation and issuance gate as any other unit. It must never create unreserved FTG.

Chapter 11 — Reference Values, FTGX, FEX, and the FGEI Family

Energy defines FTG. Markets describe what other currencies and assets will exchange for it.

“The exchange rate can change. The market value can change. Fiat currencies can rise or fall. Electricity prices can rise or fall. But the physical denomination does not change.”

This principle allows FTG to participate in markets without permitting markets to rewrite the unit.

11.1 Quote discipline

FTG/USD is the number of U.S. dollars per one FTG. USD/FTG is the number of FTG units per one U.S. dollar. Similar conventions apply to EUR, JPY, GBP, digital assets, and other quote currencies. Interfaces must display the direction prominently.

Every quote must identify whether it is a primary-issue price, redemption term, reference exchange value, indicative mid, executable bid or offer, last trade, close, or another measure. It must also state source, time-stamp, size, eligibility, spread, fees, market status, and data latency. A derived reference is not an executable foreign-exchange market.

A source-stated \$5 example may illustrate arithmetic, but it does not appear as FTG’s definition, a guaranteed floor, a current universal price, or a redemption promise. If used in a governed document, it must be dated and tied to the actor and terms that established it.

11.2 FTGX and FEX

FTGX is the proposed reference-pricing and oracle engine. It gathers permitted data, scores sources, rejects outliers, detects stale feeds, applies fallback rules, calculates reference values, and publishes methodology and corrections. It may support wallets, Treasury, merchants, accounting, and risk systems.

FEX is a proposed future execution venue. It would match or otherwise execute permitted transactions, subject to licensing, participant rules, surveillance, custody, liquidity, market integrity, and settlement arrangements. FTGX may inform FEX, but a pricing engine and a trading venue are not the same institution. A robust oracle uses multiple independent sources and avoids concentration in a single exchange or vendor. Source scoring should consider executability, volume, spreads, resilience, governance, manipulation risk, jurisdiction, and data rights. During disruption it may widen tolerances, drop sources, use a documented fallback, or suspend publication. It must not fabricate continuity.

11.3 FGEI-M

The proposed **FTG Global Energy Monetary Index (FGEI-M)** measures changes in FTG’s exchange value against a disclosed basket of selected currencies. The methodology must specify constituents, fixed quantities or weights, base date, normalization, data times, rebalancing, missing-data rules, calculation agent, conflicts, corrections, and history.

The IMF’s SDR offers a useful category comparison but should not be copied loosely. The SDR is an official reserve asset, not a currency, and its daily value is based on fixed amounts of five currencies during the valuation period, while effective weights move with exchange rates.¹⁰ FGEI-M requires its own rationale and governance. It cannot borrow IMF legitimacy by analogy.

FGEI-M is a reference measure, not a guarantee of return or a universal value of FTG. Before deep executable markets exist, any series derived from a primary reference price should say so. The transition from administered or reference inputs to market inputs must be governed and disclosed.

11.4 FGEI-P

The proposed **FTG Global Physical Electricity-Market Price Index (FGEI-P)** observes a selected basket of wholesale electricity-market benchmarks normalized to ten kilowatt-hours. It measures prices, not physical quantity. It does not establish reserve coverage, retail electricity cost, deliverability, or a universal global electricity price.

The methodology must identify hubs, products, delivery intervals, currencies, time zones, negative-price treatment, conversion rules, weights, liquidity thresholds, outage handling, and data licenses. Because electricity markets are local and temporal, a basket necessarily makes choices. Those choices must remain visible.

11.5 ERCR remains separate

ERCR measures coverage. FGEI-M measures selected monetary exchange relationships. FGEI-P measures selected wholesale electricity-market prices. Their units, inputs, purposes, and governance differ.

“Don’t make one opaque index containing currencies, electricity prices, inflation, storage and everything else.”

A composite resilience score may be developed later, but it must not be called collateral coverage or blended into the reserve ratio. Users should be able to see each signal and its limitations.

11.6 Market integrity

Reference and execution layers require controls for manipulation, wash trading, conflicts, front-running, stale data, concentration, outages, erroneous trades, and benchmark changes. Administrators and market operators need separation of duties and disclosed interests. Price corrections must be versioned rather than overwritten.

FTG can be independently defined while still requiring liquid markets to be useful. Poor liquidity may produce wide spreads and unstable price discovery. Energy backing does not automatically create buyers, merchants, or market makers. Market maturity must be demonstrated through transparent volumes, depth, concentration, realized settlement, redemption behavior, and participant diversity.

“My identity comes from energy. These currencies merely tell you what they currently exchange for against my energy.”

That is FTG’s orientation. It is not a claim that the desired markets already exist.

Chapter 12 — GEMS: Global Architecture and Optional Interfaces

The proposed **Global Energy Monetary System (GEMS)** organizes the components required to scale FTG without surrendering the Monetary Kernel.

Its nine layers are:

1. security, identity, governance, compliance, audit, and resilience as cross-cutting controls;
2. physical generation, storage, control, and delivery infrastructure;
3. energy measurement, authentication, and EPE;
4. reserve registry and Treasury functions;
5. deterministic issuance, redemption, burn, and impairment;
6. the authoritative core monetary ledger and synchronized blockchain subsystem;
7. transfer, clearing, ERTGS, and legal settlement;
8. reference data, market, liquidity, and financial-product interfaces; and
9. public, merchant, institutional, sovereign, auditor, and regulator interfaces.

Physical energy is the asset foundation. Security and governance are not simply “Layer 1” beneath it; they cut across every layer. A compromised meter, administrator, custodian, key, API, or legal process can break the chain.

The architecture’s principal flow is:

```

PHYSICAL GENERATION
→ SIGNED MEASUREMENT AND AUTHENTICATION
→ QUALIFYING RESERVE AND GERR
→ DETERMINISTIC ISSUANCE AUTHORITY
→ FEMS CORE MONETARY LEDGER
⇌ SYNCHRONIZED BLOCKCHAIN RECORD
→ SETTLEMENT, TREASURY, MARKET, AND USER INTERFACES
  
```

No exchange, website, or blockchain is the source of reserve truth. No meter directly mints spendable FTG without the reserve and issuance gates.

12.1 Independent core, open interfaces

Banks may provide fiat accounts and payments. Utilities may supply generation, metering, grid access, and delivery. Custodians may control reserve assets or keys. Assurance firms may test particular assertions. Wallets may provide access. Exchanges and market makers may support conversion. Governments may regulate, procure, hold, or adopt. Stablecoins may provide digital settlement bridges. Blockchains may provide transaction and provenance rails.

Each is an interface to FTG. The Monetary Kernel remains authoritative over denomination, reserve eligibility, liability recognition, issuance, holder rights, and finality. No external provider may unilaterally mint FTG, change 10 kWh, alter ERCR, or become the sole copy of the ownership and reserve history.

Provider abstraction requires standardized interfaces, data export, contractual exit, substitute-provider testing, cryptographic portability, record escrow where appropriate, and recovery objectives. Multi-chain or multi-provider capability is not mandatory on day one, but a credible migration path is.

Independent core. Open interfaces. Global exchange. No external master.

12.2 A dated Tether case study

Tether is included because it demonstrates that blockchain-based private monetary instruments can reach extraordinary scale and because its reserve practices illuminate the institutional questions FTG must answer. It is not included as a partner, endorser, regulator, or definitional foundation.

The distinction is elemental:

USDT: U.S. dollar denomination → blockchain representation

FTG: authenticated electricity → qualifying reserve → energy-denominated ledger position

Tether changed the rail while preserving the denomination. FTG proposes a new denomination.

As part of this consolidated edition's later evidence, Tether reported approximately \$184.6 billion of tokens issued at June 30, 2026 and assets exceeding liabilities by approximately \$4.11 billion.¹⁵ Its report showed \$187.751 billion of assets and \$183.642 billion of liabilities, including \$114.961 billion of U.S. Treasury bills and \$25.619 billion of overnight and term reverse-repurchase agreements.¹⁶ These are dated issuer and assurance-report figures, not permanent facts.

BDO described its work as a reasonable-assurance engagement under ISAE 3000 (Revised) on Tether International's specified Financial Figures and Reserves Report as of June 30, 2026.¹⁶ It obtained confirmations, tested valuations and reconciliations, and expressed a conclusion on that report. It also stated that the reporting date was a single point in time, that no assurance covered other dates, that the report was not a complete set of financial statements, and that the accompanying notes were outside the assurance scope.¹⁶ The lesson for FTG is not that one assurance form should be copied. It is that words such as *audit*, *attestation*, *assurance*, *reserves*, and *backed* carry scope. At scale, users and institutions need exact assets, liabilities, rights, valuation, custody, redemption, and assurance boundaries.

The U.S. GENIUS Act offers another dated comparison. A Congressional Research Service summary states that the 2025 law defines a payment stablecoin as a payment or settlement digital asset redeemable at a predetermined fixed amount and requires at least one dollar of permitted reserves per dollar issued, along with redemption procedures, periodic reports, and other supervisory requirements.¹⁷ That framework does not make FTG a payment stablecoin. FTG's unit is fixed to energy, while its fiat exchange value may float. The comparison demonstrates that lawmakers treat reserve composition, reporting, custody, bankruptcy priority, AML, and redemption as core design questions.

Potential Tether capabilities—digital-dollar conversion, wallets, compliance tooling, token infrastructure, liquidity, or distribution—could in principle become interfaces after diligence and agreement. No such FTG partnership, listing, market-making commitment, financing, wallet support, regulatory approval, or sovereign endorsement is asserted here.

“Tether could be the bridge. FTG must remain the foundation.”

A permanent peg of one FTG to a fixed number of USDT would subordinate FTG's energy denomination to the dollar and contradict this constitution. A floating FTG/USDT market, by contrast, could be one optional exchange relationship if lawful and supported.

12.3 Partners and continuity

Every partner relationship must define role, data, authority, service level, audit rights, incident obligations, intellectual property, confidentiality, termination, portability, substitution, and public-description permissions. Partnerships can add capability but also create concentration and dependency.

The independence test is practical: if a bank, stablecoin, exchange, custodian, data provider, blockchain, or wallet disappears, can FTG reconstruct supply, ownership, reserve relationships, restrictions, and transaction

history from FTG-controlled evidence and resume through another interface? Until that test is exercised, partner replaceability remains a design goal.

Partners accelerate FTG. They do not define FTG.

Chapter 13 — Governance, Security, Independent Assurance, and Legal Architecture

A monetary standard becomes an institution when its rules survive conflicts of interest, operational stress, and changes of leadership. Governance, law, security, and assurance are therefore components of the unit's credibility, not administrative overlays.

13.1 FEMS governance

FEMS should be governed by a charter that identifies the constitutional provisions, ordinary policies, committees, decision rights, voting thresholds, conflicts procedures, emergency powers, appeals, and disclosure requirements. Functions that should be separated include rulemaking, reserve operation, metrology approval, issuance authorization, Treasury, key custody, compliance, assurance, and internal audit.

No single person should be able to approve reserve admission, authorize issuance, and reconcile the resulting liability. Critical actions should require multi-party approval and produce immutable evidence. Holders and public-interest expertise should have defined representation where the legal form permits.

Policy versions must be public. Material changes to reserve eligibility, rights, fees, finality, index methodology, or impairment rules require notice and, where appropriate, holder consent or exit rights. Emergency authority can pause activity to protect the system. It cannot issue unreserved FTG or rewrite liabilities.

13.2 Security and identity

Security begins with physical devices and extends through people, software, keys, networks, facilities, vendors, and legal process. Meter and storage systems require secure identity, signed firmware, tamper detection, patch governance, calibration protection, and authenticated communications. The monetary systems require least privilege, segmented access, hardware security modules, multisignature control, monitored administration, secure development, dependency review, penetration testing, and protected backups.

Identity and compliance controls must be proportionate to the activity and law. Account onboarding may require know-your-customer or know-your-business verification. Transactions may require sanctions screening, anti-money-laundering monitoring, source-of-funds controls, travel-rule or reporting obligations, and restrictions by jurisdiction. Privacy, data localization, and retention requirements must be reconciled with auditability. Public blockchain transparency does not eliminate the need to protect personal information.

13.3 Layered assurance

“Reserve verification is not a later compliance appendix. It is core monetary infrastructure.”

No single assurance engagement can prove the entire FTG chain. The target program therefore has distinct layers:

- **metrology assurance** tests devices, calibration, uncertainty, boundaries, and event integrity;
- **engineering assurance** tests storage, losses, availability, safety, and facility performance;
- **custody and legal-control assurance** confirms ownership, liens, segregation, access, and enforceability;
- **reserve assurance** tests qualifying inventory under the policy;
- **liability and supply assurance** reconciles every outstanding state in the authoritative ledger and blockchain;
- **financial assurance** addresses accounts, valuations, revenues, expenses, liquidity, and going concern as applicable;
- **cybersecurity assurance** tests identity, keys, applications, infrastructure, monitoring, and recovery;
- **operational-resilience assurance** tests incidents, continuity, migration, and reconstruction; and
- **legal-rights review** tests whether documents create the disclosed holder position and remedies.

Each report must state the responsible party's assertion, criteria, standard, period or point in time, procedures, population and sampling, materiality, limitations, exceptions, and practitioner independence. "Proof of reserve" should not be used as a catch-all badge.

13.4 Legal architecture

The label *currency* does not settle legal classification. Depending on rights, marketing, compensation, transfer, redemption, custody, and jurisdiction, an FTG instrument could be analyzed under payment, money-transmission, stored-value, electronic-money, commodity, securities, derivatives, banking, custody, consumer-protection, tax, energy, insolvency, data, or sanctions law. Different activities within the system may receive different classifications.

FTG is therefore described as an **independent energy-denominated monetary system**. It is not claimed to be legal tender, sovereign-issued money, a state guarantee, or a stablecoin. "Monetary independence" means that another currency or partner does not define the unit. It does not mean governmental sovereignty.

The holder-rights structure requires counsel to determine whether the beneficial interest is perfected, how it transfers, whether reserve assets are segregated or bankruptcy-remote, what claims have priority, and how cross-border conflicts are resolved. Energy delivery may trigger utility, market, licensing, or grid obligations. Exchange functions may trigger additional permissions. Compensation may materially change regulatory treatment and must be analyzed separately.

13.5 PFMI-informed discipline

The CPMI-IOSCO Principles for Financial Market Infrastructures are international standards for payment systems, central securities depositories, securities settlement systems, central counterparties, and trade repositories.¹² They emphasize a clear and enforceable legal basis, transparent governance, comprehensive risk management, settlement finality, operational resilience, communication standards, and public disclosure.¹² FTG can use those principles as design guidance for institution-grade infrastructure. It does not thereby claim to be a designated financial market infrastructure or compliant with PFMI. Such a claim would require a formal assessment against applicable principles and jurisdictional oversight.

13.6 Patent governance is separate

Inventorship, assignment, licensing, maintenance, enforcement, and freedom to operate belong to intellectual-property governance. They must be kept separate from reserve custody, monetary governance, and regulatory approval. A current counsel-reviewed register should identify the patent family, claims, ownership or license rights, encumbrances, maintenance, and approved public wording. Neither a governance board nor a patent assignee can expand claim scope by policy.

The institution is complete only when authority and accountability match. The operator who can stop issuance must be named. The verifier who can challenge reserve must be independent. The holder who bears a risk must receive the relevant disclosure. The public claim must be no broader than the evidence.

Chapter 14 — Failure Modes, Recovery, and Independence Tests

The strength of FTG is defined not only by ordinary operation but by what happens when a fact, system, institution, or assumption fails.

STOP THE AFFECTED PROCESS.

This is the first rule of material discrepancy. A monetary system should prefer a visible pause to invisible corruption. The scope of the pause should be proportionate, but preservation of reserve, records, and holder equality takes priority over throughput.

14.1 Measurement and oracle failure

A meter can fail, drift, exceed calibration, be tampered with, or disagree with another measurement path. Telemetry can become stale or unavailable. An oracle can replay an event, accept a forged signature, or be corrupted by a data provider.

Detection uses calibration status, heartbeat monitoring, redundant measurements, sequence checks, signature validation, physical plausibility, source consensus, and anomaly analysis. Affected energy events move to HELD or REJECTED; reserve admission and issuance stop. Previously admitted lots are reassessed if the fault may be retrospective. Resumption requires corrected measurement, bounded impact analysis, reconciliation, and authorized evidence.

14.2 Storage and facility failure

Storage can degrade faster than modeled. Fire, flood, equipment failure, grid disconnection, curtailment, cyberattack, or maintenance can reduce availability. GERR must reclassify the affected energy, recompute ERCR, and prevent discharge or issuance that assumes the unavailable amount.

The response sequence is detection, isolation, independent engineering assessment, reserve substitution if available, ERCR disclosure, insurance or recovery action, and revised qualification. Facility operators cannot keep a lot “qualifying” merely because removal would create a shortfall.

14.3 Legal-control and custody failure

A lien, seizure, title dispute, unauthorized pledge, custodian insolvency, or governing-law conflict may impair energy that remains physically present. Legal-control monitoring must include registry searches, contractual covenants, custodian confirmations, and event-driven notice.

Affected reserve is excluded or conservatively impaired until enforceability is restored. The Treasury activates substitute reserve and contingency resources. Holders receive disclosure according to the incident threshold. Litigation prospects are not qualifying energy.

14.4 Coverage failure

An ERCR below 1.00 is a constitutional breach. Issuance stops automatically. Discretionary discharge stops. The governing body determines whether redemptions or transfers can continue without worsening unequal treatment. Public notice states the amount, cause, time, affected components, assurance status, and remediation plan.

The impairment waterfall applies surplus, operating buffer, prequalified replacement, authorized non-dilutive Treasury resources, insurance or recoveries, and then the contractual shortfall process. The system must not mint replacement FTG without reserve, change the ratio, or omit liabilities.

14.5 Ledger and blockchain failure

Failures include duplicate issuance, unbalanced accounting, a blockchain fork, an invalid bridge message, corrupted partner data, sequence divergence, or an inability to reconcile supply. The authoritative core ledger preserves legal and accounting status, but that hierarchy is not permission to ignore the blockchain. Affected transfer or issuance is frozen while records are reconstructed.

A blockchain reorganization may require re-submission or a compensating entry. A false on-chain transfer cannot create a valid holder interest if it failed the authorization and core-ledger rules. Conversely, an operational failure to synchronize a valid core-ledger event requires correction and holder communication. Recovery follows the versioned rulebook rather than ad hoc preference.

14.6 Key, cyber, and insider failure

Key compromise, credential theft, malicious administration, ransomware, software-supply-chain compromise, or insider collusion can affect monetary and physical systems simultaneously. Controls include hardware-protected keys, multisignature approval, geographic and organizational separation, behavior monitoring, transaction limits, privileged-session recording, immutable logs, and tested revocation.

An incident response team preserves evidence, isolates systems, invokes secondary keys or recovery environments, reconciles every affected event, and communicates according to legal and operational requirements. Restoration from backup is insufficient without proving the recovered state against reserve, ledger, blockchain, and independent evidence.

14.7 Partner failure

A bank can fail. A stablecoin can lose convertibility. An exchange can delist FTG. A custodian can interrupt service. A data vendor can corrupt prices. A wallet can stop supporting an interface. A blockchain can become unsafe, expensive, censored, or technically obsolete.

Because these are optional interfaces, their failure must not redefine FTG. The response is to isolate the interface, freeze affected flows, export or reconstruct data, activate substitute arrangements, and preserve the core record. Holders may lose temporary access, liquidity, or convenience; the system should not lose the ability to establish who owns what and which reserve supports it.

A partner-failure exercise must demonstrate that FTG can reconstruct supply, account positions, restrictions, reserve allocations, transaction history, and pending states from FTG-controlled evidence. The recovery report should state dependencies that remained and the achieved recovery time.

14.8 Market and redemption stress

Illiquidity, price dislocation, manipulation, a run on redemption, or failure of conversion counterparties can occur even while ERCR remains above 1.00. Energy reserve is not the same as immediate fiat liquidity. The Treasury must maintain scenario-based liquidity resources, transparent queues, fair allocation rules, market-disruption procedures, and communication.

The system must not promise instant fiat redemption solely because physical energy exists. Converting energy positions to fiat can require sale, delivery, financing, or market making. The applicable agreement must define timing and risk.

14.9 Legal holds, insolvency, and wind-down

Sanctions, court orders, law-enforcement requests, estate disputes, or insolvency can override ordinary transaction paths. Explicit held states protect record integrity. A hold does not remove the liability from ERCR unless the obligation is legally extinguished. A wind-down follows the adopted plan, preserves records, protects reserve, and treats holders according to enforceable priority.

14.10 Recovery and resumption

Every runbook should identify detection, automatic action, incident owner, decision authority, required experts, holder communication, evidence preservation, compensating entries, reserve remediation, independent review, resumption criteria, and post-incident disclosure. Recovery-point and recovery-time objectives must be tested rather than merely stated.

“Blockchain is one subsystem. Energy is the monetary foundation.”

That formulation is most important during failure. The system must be able to change a blockchain, replace a partner, and repair a data path without changing the unit. It cannot lose reserve truth, holder rights, or authoritative accounting merely because one technical rail fails.

Chapter 15 — Adoption, Institutions, and the Natural Evolution of Money

FTG's adoption doctrine is cooperative rather than confrontational:

Coexistence → Utility → Trust → Adoption → Transition



Figure 13: Adoption Path. FTG advances from coexistence through demonstrated utility and verifiable trust toward voluntary adoption and possible monetary transition. Status: Proposed architecture.

This sequence resists two errors. One is to assume that declaring a currency creates adoption. The other is to assume that coexistence weakens monetary independence. In reality, users adopt new monetary systems through bridges to familiar systems. Independence concerns who defines the unit; coexistence concerns how people access and use it.

15.1 Coexistence

FTG does not ask nations to abandon their currencies. It gives those currencies something new to exchange against: authenticated energy. Early users will likely evaluate FTG through familiar fiat references, purchase through conventional payment channels, and convert when necessary. That is not surrender to fiat; it is an access path.

The system should support fiat → FTG, FTG → fiat, and FTG → FTG where lawful and liquid. Users should not be trapped. Merchants should be able to retain FTG or convert through a disclosed counterparty. Conversion terms and risks should be visible.

15.2 Utility

A backed asset without use may remain inert. Utility can include holding a transparent energy position, transferring value, paying for qualifying products or services, settling among energy-market participants, supporting infrastructure finance, or using FTG as an accounting unit. Each use must solve a real problem better than available alternatives after costs and regulation.

The failure of physically backed products in other markets shows that backing alone does not ensure product-market fit. FTG must be comprehensible, available, reliable, liquid enough for its uses, and connected to actual demand.

15.3 Trust

Trust is earned through rights, reserves, performance, governance, and response to exceptions. A public ERCR history, independent assurance, transparent incident reports, predictable redemption, and accurate statements matter more than claims of inevitability. Users must see that the system stops when truth is uncertain and resumes only with evidence.

Institutional trust also requires legal workability, accounting treatment, cyber resilience, qualified custody, and responsible governance. A bank or government does not gain comfort merely because a patent exists. It needs an operable rulebook and auditable controls.

15.4 Adoption

Adoption is observable behavior. Relevant measures include active holders, concentration, repeat merchant use, FTG-to-FTG settlement share, transaction completion, velocity, geographic distribution, duration of holdings, energy purchases or redemptions, and institutional participation.

Two metrics deserve special care:

Retention Ratio

= FTG remaining after a defined period / FTG received during that period

Native Denomination Ratio

= value originally priced in FTG / total value settled in FTG

High retention may indicate confidence or hoarding. It must be read alongside activity and velocity. A high native-denomination ratio is stronger evidence that FTG functions as a unit of account, but only if prices are genuinely originated in FTG rather than converted mechanically from fiat.

15.5 Transition

A six-stage maturity path provides a disciplined sequence:

1. **Fiat-referenced energy asset** — users understand FTG through familiar exchange values.
2. **Parallel transactional unit** — transfers and selected merchant or institutional payments become practical.
3. **Treasury and reserve allocation** — organizations hold FTG as a defined energy position.
4. **Cross-border bridge settlement** — FTG supports corridors where its energy denomination and settlement design add value.
5. **Native FTG-denominated contracts** — parties price obligations directly in FTG.
6. **Independent energy monetary ecosystem** — the unit supports broad accounting, saving, exchange, settlement, and capital-market functions without dependence on one external currency.

These stages are not guaranteed and need not occur uniformly. Different jurisdictions and sectors may stop at different points. The architecture should allow useful partial adoption rather than making value contingent on universal replacement.

15.6 Institutional posture

FTG is pro-energy, pro-commerce, pro-infrastructure, pro-choice, pro-interoperability, and pro-verification. It is not anti-dollar, anti-bank, anti-government, anti-central-bank, or anti-fiat. Governments can regulate or use FTG without surrendering their currencies. Banks can provide interfaces without defining the unit. Utilities can participate without becoming monetary policymakers.

The emotional path matters: recognition, familiarity, comprehension, trust, permission, preference, and transition. Institutions adopt only after stakeholders can understand the change and preserve legitimate protections.

“The technology may be disruptive. The relationship must be cooperative. The adoption must be voluntary. The evidence must be verifiable. The transition must feel natural.”

Digital monetary infrastructure is already an active field of central-bank and private-sector development. BIS survey evidence shows broad central-bank exploration of CBDCs.¹¹ Tether shows private blockchain rails at scale.^{15 16} Those facts create familiarity with digital transfer and reserve discussion. They do not guarantee acceptance of an energy denomination. FTG must earn that category.

The long-run strategic case is that an economy increasingly organized around electrification, data, storage, renewable and conventional generation, and energy-intensive computation may find direct energy denomination useful. The conclusion may become powerful through practice. It cannot be declared into existence.

FTG’s path is not conquest. It is earned preference.

Chapter 16 — Sovereign and Infrastructure Applications

Sovereign use is a demanding application of FTG’s architecture, not a shortcut around it.

Sovereign debt is a creditor’s legal claim. It cannot be extinguished by changing labels. An energy-denominated instrument may refinance, exchange, or restructure that claim only through lawful authority, creditor consent, valuation, settlement, and cancellation.

Three structures are conceptually available.

Direct Sovereign Debt-for-Energy Conversion. Eligible creditors voluntarily exchange existing claims for FTG or another defined energy-linked position. The old instrument is delivered and legally cancelled. Qualifying reserve is independently verified and allocated to the new obligation.

Energy-Denominated Sovereign Refinancing. A sovereign issues a new obligation denominated or settled in FTG and uses proceeds to repay existing debt. Debt is retired through payment or legal cancellation; the new instrument remains a continuing liability with its own terms.

Debt-for-Infrastructure and Energy Conversion. Creditors, development institutions, or investors exchange or finance claims in connection with productive generation, storage, grid, or energy infrastructure. Any fiscal benefit depends on asset economics, transaction terms, and actual cancellation of the old claim.

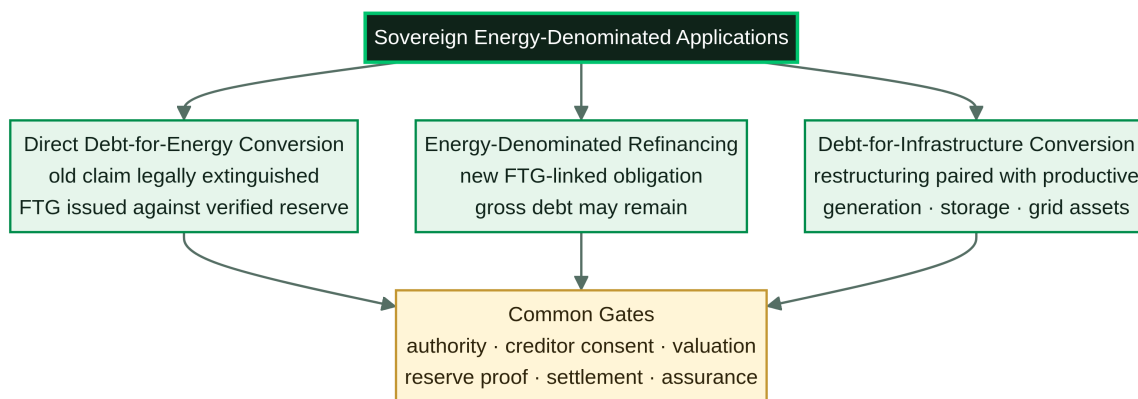


Figure 14: Sovereign Structures. Direct conversion, energy-denominated refinancing, and debt-for-infrastructure conversion are shown as separate legal and balance-sheet transactions. Status: Proposed architecture. Potential facilities such as a sovereign energy fund, National Strategic Energy Reserve Account, GERR connection, FTGX references, FGEI indices, or ERTGS corridor remain proposed until established under law and independently evidenced.

16.1 The dual rule

The governing rule is non-negotiable:

No sovereign debt is deemed retired until the existing creditor’s legal claim has actually been extinguished. No FTG is deemed energy-backed except to the extent that the required qualifying energy has been independently verified under the applicable reserve standard. Neither event may be presumed merely because the other occurred.

A government announcement does not cancel a bond. Issuing FTG does not itself create reserve. Building a power plant does not prove current stored or controlled qualifying energy. Conversely, verifying energy does not force a creditor to surrender a legal claim.

16.2 Delivery versus proof

A controlled transaction follows this sequence:

1. identify eligible debt and lawful governmental authority;
2. obtain voluntary creditor tender or consent;

3. establish valuation, exchange ratio, cutoff, and timing;
4. confirm unencumbered qualifying reserve under the applicable standard;
5. obtain independent verification;
6. deliver the old claim to the authorized cancellation agent;
7. establish legal extinguishment under the governing law;
8. issue or release FTG under the reserve gate;
9. record reserve allocation and the holder's beneficial interest; and
10. maintain ongoing reconciliation, disclosure, and assurance.

The settlement design should make steps six through nine conditional and as close to delivery-versus-payment as law and infrastructure permit. Neither side should perform irrevocably while the other remains discretionary.

16.3 Sources of economic improvement

Denomination creates no wealth. A sovereign improves its position only through identifiable economics: creditor discount or maturity extension; lower financing cost; improved duration or currency matching; productive energy cash flow; reduced import expense; fiscal activity; contributed assets; private or development capital; better risk sharing; or reduced transaction and settlement costs.

A conversion can also worsen the position. New guarantees, operating costs, reserve funding, subsidies, contingent liabilities, or expensive redemption rights may offset relief. The analysis must track gross extinguished debt, new liabilities, assets contributed, reserve costs, guarantees, ongoing cash flows, and risk-adjusted net position.

A useful discipline is:

Net Liability Improvement

= legally extinguished old liabilities

– newly incurred liabilities and guarantees

– reserve-funding and transaction obligations

+ realizable value of contributed or productive assets

The formula is conceptual; public-sector accounting and economic valuation require jurisdiction-specific treatment.

16.4 Scale

“The arithmetic is simple. The architecture is not.”

If an illustrative \$1,000 claim were exchanged at an assumed \$5 per FTG, the transaction would require 200 FTG and a recognized energy liability of 2,000 kWh. This is arithmetic only; \$5 is not a current or guaranteed FTG price.

At larger scale, the physical requirement dominates. A hypothetical \$1 trillion conversion at the same assumed reference would require 200 billion FTG and 2 trillion kWh, or 2,000 TWh, before any operating buffer. That example establishes no feasibility. It shows that **scale becomes the governing constraint**. Generation, storage, control, reserve law, losses, financing, grid capacity, assurance, and settlement must all support the amount.

A credible sovereign pilot should therefore be bounded. It should involve a limited creditor group, a clearly identified debt tranche, proven authority, a verified reserve, transparent valuation, a complete settlement path, and independent reporting. Success is measured by legal finality, reserve integrity, operational performance, and net economics—not announcement size.

16.5 Sovereign participation short of conversion

Governments can participate without restructuring debt. They may establish regulatory sandboxes, procure energy services, permit reserve facilities, use FTG in a limited settlement corridor, hold a disclosed Treasury allocation, accept specified payments, or sponsor infrastructure pilots. Each path has different authority and risk.

FTG's cooperative posture is essential. Sovereign adoption should preserve policy choice and financial stability. It should not be framed as a campaign to displace national currencies. Energy denomination may become a useful complement precisely because it supplies a different reference and reserve structure.

The sovereign proposition is therefore rigorous rather than magical. A creditor can voluntarily exchange a claim against future public revenue for a defined energy-linked position if the law, economics, reserve, and settlement support it. Whether that improves the parties' positions is a transaction-specific conclusion.

Chapter 17 — Evidence, Deployment, Provenance, and the Conditional Conclusion

FTG has two tasks. It must state the monetary constitution with clarity, and it must prove which parts of that constitution operate. The first without the second is aspiration. The second without the first is a collection of features without a monetary institution.

17.1 Present operating foundation

As of this consolidated edition, FTG reports that a public platform exists with accounts, wallet and ownership records, purchases, transfers, Exchange and Treasury functions, contractual records, compensation records, and administrative controls. Public pages permit account registration and describe a ten-kWh token, account balances and activity, purchase agreements, transfer functions, and jurisdiction/readiness limitations.^{13 14} That evidence supports a scoped statement about a public digital platform. It does not independently establish the number or value of transactions, production jurisdictions, qualifying physical reserve, ERCR, GERR, EPE, FTGX, FEX, FGEI, ERTGS, GEMS, FEMS adoption, sovereign use, or institution-wide independent assurance. Those layers remain standards and target architecture unless and until evidence packages establish otherwise. The operating register for each function should state the operator, legal entity, jurisdiction, environment, release date, feature scope, supported assets, balances or volumes where publishable, terms, dependencies, control owner, evidence identifier, and independent-assurance status. “Live” should never be the only description.

The consolidated status is therefore:

System element	Status through June 19, 2026	Evidence boundary
Patented meter-to-ledger technology	Patent fact	Two issued U.S. grants establish claim-specific technical subject matter; they do not prove implementation, reserve, or adoption.
Public accounts and wallet/ownership records	FTG-reported operation	Public platform and terms evidence; production scale and controls are not independently assured here.
Purchases, transfers, Exchange/Treasury functions, agreements, compensation records, and administration	FTG-reported operation	Reported by FTG; jurisdiction, volume, reserve linkage, and assurance require the Existing-System Evidence Register.
FEMS core monetary ledger and constitutional controls	Proposed standard / target architecture	This paper defines the required authority and behavior; formal adoption, implementation, and control testing remain required.
Qualifying global reserve, EPE, GERR, and ERCR	Proposed standard / target architecture	No current reserve quantity or coverage percentage is asserted.
FTGX, FEX, FGEI-M, and FGEI-P	Proposed standard / future market layer	Methodology, permissions, data, liquidity, and operating evidence are required before live claims.

ERTGS, full GEMS stack, and independent assurance regime	Proposed target architecture	Requires legal basis, production implementation, testing, and scoped third-party reports.
Institutional, capital-market, and sovereign applications	Future application	No partnership, approval, issuance, or sovereign transaction is implied.



Figure 15: Evidence-Gated Roadmap. FTG-reported platform functions are separated from the proposed reserve, monetary, settlement, market, assurance, and sovereign layers required for institutional completion.

Status: Proposed architecture.

17.2 Evidence-gated deployment

The deployment sequence follows the dependency chain.

Phase 1: Constitution and rights. Adopt FEMS, the 10-kWh unit, precision, holder-rights agreements, governing entities, legal classifications, change control, and dispute framework.

Phase 2: Reserve and metrology standard. Adopt eligible-energy rules, measurement boundaries, device and calibration standards, storage and control requirements, loss methods, lien policy, and facility dossiers.

Phase 3: GERR, ERCR, and issuance. Implement signed events, registry states, liability reconciliation, deterministic certificates, automatic freeze, and public coverage methodology.

Phase 4: Ledger, settlement, redemption, and assurance. Harden the authoritative ledger, blockchain synchronization, technical and legal finality, compensation entries, Treasury, redemption channels, independent tests, and public reporting.

Phase 5: Bounded pilot. Operate with limited energy, users, jurisdictions, and transaction types under independent observation. Publish performance, exceptions, ERCR, and incident results.

Phase 6: Lawful market and merchant use. Add transparent reference quotes, conversion, liquidity, merchant options, and surveillance only where permissions and counterparties exist.

Phase 7: Multi-jurisdiction interoperability. Add banks, wallets, utilities, custodians, blockchains, and settlement corridors with migration and failure testing.

Phase 8: Capital-market and sovereign applications. Proceed only after the foundational layers are proven at appropriate scale and professional standards.

Promotion from proposed to operating requires implementation and test evidence. Promotion from operating to independently assured requires a report with defined criteria, scope, date or period, and exceptions. Scale claims require scale evidence.



Figure 16: Complete FTG Proof Chain. Authenticated electricity passes through qualification, reserve, rights, issuance, authoritative accounting, blockchain synchronization, settlement, assurance, and voluntary adoption. Status: Proposed architecture.

17.3 Provenance

The permanent provenance archive should preserve the chain from idea to institution:

- originating insight
- contemporaneous notes and diagrams
- patent filings and prosecution

- issued grants and assignments
- engineering development
- platform releases
- monetary constitution
- reserve and settlement implementation
- independent assurance
- institutional and public adoption

Each artifact requires an immutable identifier, original file, author, creation and publication dates, version, cryptographic hash, chain of custody, permission status, and mapping to the claim it supports. Contributor records should identify what each party added without revising the origin history.

The archive must preserve edition integrity. The founding date, later consolidated-edition cutoff, changed claims, added patent grant, updated institutional evidence, reviewer approvals, and archived copies should remain visible. This paper's edition note is the first application of that rule.

17.4 Evidence that can weaken the thesis

A testable system identifies what would falsify or constrain its claims. Persistent inability to reconcile reserve and liabilities would weaken the backing proposition. A holder-rights structure that fails under insolvency would require redesign. Metering that cannot withstand independent testing would invalidate reserve admission. A core ledger that cannot reconstruct the blockchain state would weaken settlement authority. Liquidity and adoption that remain negligible would constrain the monetary thesis even if reserve is sound. Partner dependency that prevents migration would weaken independence.

The response to adverse evidence is correction, not rhetorical escalation. A reserve lot is impaired when it fails the standard. A system module remains proposed when tests are incomplete. A jurisdiction remains unavailable when legal authority is absent. A patent description is narrowed when the claim requires it.

"The most important next step is not to make the claim louder. It is to make every link in the chain exact."

17.5 The architectural conclusion: can become

Electricity can become currency when the word *currency* describes a complete institution rather than a token label. The architecture in this paper supplies the required chain:

- a fixed physical denomination;
- authenticated measurement;
- controlled and qualifying reserve;
- a registered beneficial holder interest;
- coverage of at least 1.00;
- deterministic issuance and legal extinguishment before burn;
- authoritative double-entry accounting;
- synchronized blockchain ownership and settlement evidence;
- distinct technical and legal finality;
- transparent pricing and coverage methodologies;
- governance, law, security, recovery, and independent assurance; and
- voluntary utility and adoption.

Nothing in physics prevents such an institution. Nothing in blockchain creates it automatically. It is an engineering, legal, accounting, monetary, and social construction around a physical fact.

17.6 The strategic thesis: will inevitably

Nicholas VandenBrekel's long-term thesis goes further. As economic life becomes more electrified and digitally settled, a standardized, authenticated energy position will become increasingly intelligible as a monetary reference. FTG was conceived to give that transition a unit and an institution.

"Electricity can become currency. With authenticated measurement, protected digital representation, controlled reserves, transferable ownership, and trusted settlement, electricity will inevitably assume a monetary role in the global economy. FTG Energy has built the intellectual-property and platform foundation for that transition."

The phrase *can become* is the conclusion of the architecture. The phrase *will inevitably* is FTG's forecast about long-run monetary evolution. The distinction matters. The first can be demonstrated through design and implementation. The second will be judged by adoption, history, and the comparative usefulness of the institution.

FTG should not weaken its thesis by pretending the outcome has already arrived. Its confidence should come from the proposition's physical clarity and from the rigor of the path. Electricity supplies a measure recognized everywhere. FTG supplies the constitutional machinery that can turn authenticated energy into a transferable monetary position. Blockchain and external rails extend the reach. Evidence earns trust. Voluntary use earns monetary standing.

The disciplined conclusion is therefore powerful enough:

FTG Currency can become an institution in which electricity serves as monetary reserve, denomination, and reference. FTG's long-term thesis is that, as civilization's dependence on electricity and digital settlement deepens, that monetary role will inevitably emerge. The work now is to make the correspondence exact—and to keep it exact at scale.

Appendix Summaries

The following summaries define the intended scope of the FTG architecture and standards appendices. They are concise constitutional companions to this paper, not substitutes for the standalone, versioned, legally adopted, technically testable documents they describe. Until a referenced document is formally issued, its requirements remain target architecture.

Appendix A — FTG Monetary Constitution (FEMS)

FEMS will establish the hierarchy of authority for the FTG monetary system. It will define 1 FTG as 10 kWh or 36 MJ; specify integer base units, precision, and rounding; establish $ERCR \geq 1.00$; prohibit issuance without a valid reserve certificate; designate the core monetary ledger as authoritative; and define blockchain synchronization. It will also govern transfer states, legal extinguishment before burn, emergency pauses, amendments, public notice, conflicts, and constitutional provisions that cannot be changed through ordinary operating policy.

Appendix B — Reserve Qualification Policy

This policy will enumerate eligible and ineligible energy, approved measurement boundaries, storage or control conditions, legal-control requirements, loss and degradation adjustments, availability tests, concentration limits, safety margins, and encumbrance exclusions. It will distinguish current qualifying energy from nameplate capacity, forecast output, contracted future generation, fuel inventory, environmental attributes, and financial assets. It will specify facility admission, continuing monitoring, suspension, impairment, substitution, and removal.

Appendix C — ERCR Methodology

The ERCR methodology will define the complete reserve numerator and liability denominator; cutoff, time-stamp, data-freshness, and time-zone rules; treatment of every supply state; operating buffer; exceptions; and correction history. It will specify public reporting cadence, warning and breach thresholds, automatic issuance freezes, cure, resumption, and independent assurance. No public coverage percentage should be presented without the applicable methodology version and assurance status.

Appendix D — Energy-Event and GERR Data Dictionary

This dictionary will govern identifiers and schemas for facilities, sources, meters, storage systems, events, reserve lots, allocations, encumbrances, impairments, and liability relationships. It will define signatures, hashes, timestamps, calibration metadata, measurement uncertainty, jurisdiction, data lineage, access control, retention, and privacy classifications. Changes will be versioned so that historical reserve calculations remain reproducible.

Appendix E — Issuance, Redemption, Burn, Impairment, and Reconciliation State Machines

Formal state machines will define every permitted transition, prerequisite, responsible authority, accounting entry, blockchain message, error state, and audit field. Issuance will require accepted reserve allocation. Redemption and retirement will extinguish liability before burn. Corrections will use compensating entries. Material mismatches will freeze affected processes, and resumption will require documented reconciliation and approval.

Appendix F — Holder Rights and Redemption Terms

The operative holder agreement will state the exact legal nature of the registered beneficial interest, the reserve relationship, transfer rights, available performance or redemption channels, priority, fees, taxes,

losses, limits, jurisdiction, governing law, dispute resolution, shortfall remedies, insolvency treatment, and wind-down. It will say expressly that one FTG does not identify particular electrons and that physical denomination does not guarantee purchasing power or fiat liquidity. Jurisdictional schedules will disclose any necessary variation in legal form or available rights.

Appendix G — FTGX Quote and Oracle Methodology

This methodology will define quote direction, source admission, source scoring, consensus, outlier detection, stale-data limits, fallback hierarchy, disruption procedures, timestamps, fees, spreads, corrections, conflicts, and governance. It will distinguish primary issue, reference, indicative, and executable values. FTGX outputs will not be represented as tradable prices where no lawful liquidity and execution exist.

Appendix H — FGEI-M Methodology

The monetary index methodology will identify currency constituents, amounts or weights, base date, normalization, exchange-rate sources, calculation times, rebalancing, holidays, missing data, corrections, administration, and limitations. It will distinguish a reference series based on administered or primary inputs from a later market-price series. The index will not promise performance or define the FTG unit.

Appendix I — FGEI-P Methodology

The selected wholesale electricity-market-price index will identify eligible hubs and products, delivery periods, time zones, currencies, unit conversions, weights, negative-price treatment, liquidity thresholds, missing-market rules, data rights, and governance. It will disclose that it is a selected price basket rather than a measure of physical reserve, retail tariffs, universal energy value, or delivery availability.

Appendix J — Patent Register and Counsel-Reviewed Claim Map

The register will preserve official grant and application records, family relationships, inventorship, filing and issue dates, claim counts, assignment chain, licenses, maintenance, encumbrances, and approved descriptions. The claim map will classify each architecture element as claim-required, specification-disclosed, an FTG implementation decision, or separate monetary policy. It will record the consolidated edition's addition of Patent No. 12,647,288 B2 after its June 2, 2026 issuance and prohibit backdating.

Appendix K — Existing-System Evidence Register

For every claimed platform feature, this register will identify the operator, entity, environment, jurisdiction, first release, current status, evidence artifact, scope, limitations, user terms, dependencies, transaction or capacity measures where available, and independent-assurance status. It will cover accounts, wallet records, purchases, transfers, Exchange, Treasury, compensation records, administration, contracts, reserves, registries, markets, and interfaces. The register will prevent "live" from functioning as an undefined claim.

Appendix L — Governance, Legal, and Regulatory Matrix

This matrix will identify entities, responsibilities, jurisdictions, licenses or registrations, classification memoranda, custody roles, AML and sanctions obligations, tax treatment, consumer rights, privacy, data localization, energy regulation, market rules, and cross-border restrictions. It will distinguish project terminology from legal conclusions and identify open issues requiring counsel or regulatory engagement.

Appendix M — Assurance and Audit Reports

This appendix will index metrology, engineering, facility, custody, reserve, supply, accounting, financial, cybersecurity, operational-resilience, and legal-rights reports. For each it will state the practitioner, independence, criteria, standard, period or point in time, scope, sampling, limitations, exceptions, management

response, and publication status. Audit, attestation, inspection, certification, and reasonable assurance will retain their distinct meanings.

Appendix N — Inventor Provenance Archive Index

The archive index will preserve Nicholas VandenBrekel's signed declarations, contemporaneous notes, diagrams, correspondence, technical development records, patent records, monetary designs, publication history, and evidence of contributor roles. Each artifact will carry a unique identifier, dates, source, authorship, version, hash, chain of custody, permissions, and claim mapping. The archive will distinguish verified public facts from founder testimony while preserving the origin record.

Appendix O — Independence and Continuity Tests

Tests will simulate loss of a bank, stablecoin, exchange, blockchain, custodian, wallet, data provider, facility operator, or other material partner. They will measure FTG's ability to isolate the failure, preserve holder rights, reconstruct supply and reserve relationships, migrate interfaces, restore service, and communicate accurately. Results will include recovery point and time, residual dependencies, exceptions, and remediation.

Appendix P — Risk Factors and Failure-Mode Register

The register will cover metrology, reserve, storage, facility, custody, title, liquidity, market, regulatory, tax, accounting, cyber, software, key, personnel, governance, counterparty, concentration, environmental, safety, force-majeure, and adoption risks. Each risk will have an owner, trigger, likelihood, impact, preventive and detective controls, residual risk, response, and disclosure threshold. It will be updated from incidents and independent reviews.

Appendix Q — Adoption Metrics Methodology

This methodology will define active holders, transaction types, velocity, retention, native denomination, merchant reuse, geographic distribution, concentration, energy use or redemption, and institutional participation. It will address wash activity, related accounts, inactive holdings, bot traffic, data privacy, revisions, and interpretation. No single measure will be presented as proof of monetary adoption.

Appendix R — Sovereign Transaction Framework

The framework will define direct conversion, energy-denominated refinancing, and debt-for-infrastructure structures; authority; creditor eligibility and consent; valuation; reserve proof; delivery-versus-proof settlement; cancellation; continuing obligations; accounting; tax; sanctions; disclosure; and dispute resolution. It will require a complete balance-sheet and cash-flow analysis and prohibit describing debt as retired before legal extinguishment.

Appendix S — Historical Sources and Analogy Limits

This appendix will preserve primary and scholarly sources for the Wisselbank, the 1971–73 monetary transition, SDRs, digital money, and CBDCs. It will state exactly which architectural lessons are drawn and which legal or economic conclusions are not. Unverified family or municipal provenance will be omitted or expressly isolated as testimony until archival evidence exists.

Appendix T — Illustrative Scenarios

Illustrations may demonstrate transfer, quote direction, ERCR, discharge and replenishment, merchant settlement, index calculations, or sovereign scale. Every scenario will state assumptions and display **ILLUSTRATIVE ONLY — NOT CURRENT PRICE, RESERVE, MARKET, OR OPERATING DATA**. No illustration may be reused as evidence of deployment.

Appendix U — Data, API, and Interface Specifications

Specifications will cover account, balance, transfer, reserve, ERCR, settlement, Treasury, merchant, market-data, auditor, and regulator interfaces. They will define authentication, authorization, schemas, signatures, idempotency, rate limits, error codes, privacy, event ordering, versioning, service levels, logging, and depreciation. External interfaces will not receive unilateral authority over the Monetary Kernel.

Appendix V — Release, Revision, and Evidence-Cutoff Log

The release log will preserve the founding-edition date of October 17, 2006; the consolidated-edition evidence horizon of June 19, 2026; the later institutional-evidence horizon of August 12, 2026; review and approval records; added, changed, held, or removed claims; patent-status updates; source archives; and hashes of each published edition. It will ensure that later evidence is never represented as contemporaneous with an earlier edition.

References

1. BIPM, The International System of Units (SI Brochure), 9th edition
2. NIST Guide to the SI, Appendix B.9: Energy conversion factors
3. U.S. Patent No. 11,962,710 B2, Systems and methods for generation of energy-backed digital units stored in a decentralized ledger
4. U.S. Patent No. 12,647,288 B2, Systems and methods for generation of energy-backed digital units stored in a decentralized ledger
5. FTG Energy patent portfolio and official grant copies
6. Bank for International Settlements, The Bank of Amsterdam and the limits of fiat money
7. Federal Reserve History, Nixon Ends Convertibility of U.S. Dollars to Gold
8. U.S. Department of State, Nixon and the End of the Bretton Woods System, 1971–1973
9. Board of Governors of the Federal Reserve System, Money and Payments: The U.S. Dollar in the Age of Digital Transformation
10. International Monetary Fund, Special Drawing Rights (SDR) Factsheet
11. Bank for International Settlements, Advancing in tandem—results of the 2024 BIS survey on central bank digital currencies and crypto
12. CPMI-IOSCO, Principles for Financial Market Infrastructures overview
13. FTG Energy public platform and account-access page
14. FTG Energy, FTG Token public product and account-function description
15. Tether, Q2 2026 financial figures and reserves announcement, July 31, 2026
16. BDO Advisory Services, ISAE 3000 reasonable-assurance report on Tether International financial figures and reserves as of June 30, 2026
17. Congressional Research Service, Stablecoin Legislation: An Overview of the GENIUS Act of 2025

Glossary

assurance: Independent evaluation performed under a defined scope, standard, cadence, evidence base, and level of confidence.

attestation: An independent practitioner engagement addressing specified subject matter under stated criteria; it is not automatically equivalent to a full financial-statement audit.

commingled reserve pool: A fungible reserve inventory against which holders possess defined registered interests rather than permanent claims on identifiable electrons.

compensating entry: A new ledger entry that reverses or adjusts economic effect without erasing an earlier finalized record.

ENERGY_EVENT: A signed, time-bound evidence record containing facility, meter, storage, calibration, quantity, timestamp, jurisdiction, hash, and sequence data.

EPE – Energy Proof Engine: The proposed validation layer for signed energy events, metrology status, reserve admission, and evidentiary completeness.

ERCR – Energy Reserve Coverage Ratio: Verified qualifying reserve energy divided by the recognized energy liability of outstanding FTG.

ERTGS – Energy Real-Time Gross Settlement: A proposed institutional settlement layer for final transfers of FTG under governed technical and legal conditions.

FEMS – FTG Energy Monetary Standard: The proposed monetary constitution governing the FTG unit, reserve, issuance, rights, finality, and institutional controls.

FEX – FTG Energy Exchange: A proposed future lawful execution venue distinct from the FTGX reference-rate engine.

FGEI-M – FTG Global Energy Index — Monetary: A proposed disclosed-basket measure of FTG exchange value against selected sovereign currencies.

FGEI-P – FTG Global Energy Index — Power: A proposed selected wholesale electricity-market-price measure normalized to 10 kWh.

FSEF – FTG Sovereign Energy Facility: A proposed institutional facility for compliant sovereign energy-denominated transactions, reserve accounts, and settlement.

FTG – FTG Energy Currency: An independent energy-denominated monetary and settlement architecture whose constitutional unit is defined as 10 kWh or 36 MJ.

FTGX – FTG Exchange-Rate and Pricing Engine: The proposed source-consensus engine for governed reference exchange values and pricing data.

GEMS – Global Energy Monetary System: The proposed nine-layer target architecture connecting physical energy, authentication, reserves, issuance, settlement, markets, and interfaces.

GERR – Global Energy Reserve Registry: The proposed authoritative inventory record for qualifying reserve energy, facilities, meters, reserve states, obligations, and encumbrances.

kWh – kilowatt-hour: A unit of energy equal to 3.6 megajoules. Ten kilowatt-hours equal 36 MJ.

legal finality: The point at which applicable law and governing agreements recognize a transfer or settlement as final.

MJ – megajoule: One million joules, a standard unit of energy.

Monetary Kernel: FTG-controlled non-delegable functions including the unit constitution, metrology, reserve qualification, issuance, ledger, rights, finality, governance, and recovery.

named inventor: The individual identified as inventor on a patent record; this status is distinct from current ownership or assignment.

physical invariance: The property that one FTG remains denominated as 10 kWh or 36 MJ even though fiat price, purchasing power, liquidity, and redemption terms may change.

qualifying reserve energy: Measured, authenticated, unencumbered, available energy accepted under the governing reserve policy after all losses, controls, and safety margins.

registered beneficial interest: The default FTG holder-rights model: a transferable recorded interest in a governed qualifying reserve pool, subject to operative agreements and applicable law.

reserve certificate: A governed authorization artifact confirming that qualifying reserve capacity has passed every required gate before issuance.

RWA – real-world asset: A physical, financial, or legally enforceable off-chain asset or right represented through a digital record or tokenization architecture.

SDEC – Sovereign Debt-for-Energy Conversion: A proposed voluntary transaction in which an eligible creditor claim is legally extinguished in exchange for an enforceable FTG-denominated position supported by independently verified qualifying reserve.

SEV – Strategic Energy Vault: A controlled energy-storage facility or node proposed for qualifying reserve custody and telemetry.

technical finality: The irreversible committed system state reached under the technical protocol, separate from legal finality and later compensating entries.

THE ORIGIN

NICHOLAS VANDENBREKEL **CREATED FTG ENERGY CURRENCY.**

He conceived the proposition that authenticated electricity could become a standardized monetary position.

He is the named inventor on U.S. Patent Nos. 11,962,710 B2 and 12,647,288 B2.

The technologies, institutions, operators, and partners that follow may build, govern, verify, and extend FTG.

The origin remains Nicholas VandenBrekel.