Nick Clark · Published April 27, 2026 · PDF

Decommissioning And Re-Credentialing Attestation

Disclosed herein is an end-of-structural-life decommissioning event by which a credentialed structural element is retired from service under cryptographic signature of a licensed demolition or deconstruction contractor, producing a demolition-recovery attestation that declares the recovered material's grade, mass, and physical state. As part of the cradle-to-cradle credentialed substrate flow of provisional 64/050,895, the decommissioning event is one transition in a lineage chain that runs from pre-installation credentialing through in-service operation, end-of-storage-life, decommissioning, recycling-grade re-credentialing by a recycler authority, and re-installation in a subsequent structural application. Recycling-grade re-credentialing produces a new admissibility profile at recycled grade. A separate continuous re-credentialing primitive records in-service material flows without demolition of the structural element.

Mechanism Of Operation

End-of-structural-life decommissioning is invoked when a credentialed structural element reaches the end of its structural life. The event is a credentialed event signed by a licensed demolition or deconstruction contractor admitted under credentialed scope, the decommissioning authority. It produces a demolition-recovery attestation declaring

the recovered material's grade, mass, and physical state. The attestation is recorded in the element's lineage chain, which comprises pre-installation credentialing, in-service credentialed operation, an end-of-storage-life substate, end-of-structural-life decommissioning, recycling-grade re-credentialing, and re-installation in a subsequent structural application. Each lifecycle transition is a credentialed event signed by an appropriate authority and recorded in the lineage chain.

Decommissioning is distinct from the end-of-storage-life substate. End-of-storage-life is a credentialed transition in which the realized energy storage capacity has degraded below a declared threshold; the credentialed admissibility profile is updated to reflect zero or reduced storage capacity while the structural admissibility surface continues to support the element's structural function. The structural element need not be decommissioned when its storage capacity is exhausted.

Recycling-grade re-credentialing is performed after decommissioning by a recycler authority, which conducts recovered-material processing and produces a new admissibility profile at recycled grade. The recycler authority's signature binds the recycled-grade profile to the recovered material, and the re-credentialing state is recorded in the lineage chain ahead of any re-installation state that returns the substrate to in-service operation.

Lifecycle States And Authorities

The cradle-to-cradle credentialed substrate lifecycle is recorded as a directed graph of credentialed transitions persistent across multiple structural lifetimes. The states are: a pre-installation credentialing state entered through manufacturer-authority signature; an in-service credentialed operation state entered through installation-authority signature; an end-of-storage-life substate signed by the building energy management system under evidential weighting; an end-of-structural-life decommissioning state

signed by the decommissioning authority; a recycling-grade re-credentialing state signed by the recycler authority; and a re-installation state returning the substrate to the in-service state.

Each transition carries the signature of the authority appropriate to that transition. The end-of-storage-life substate is signed by the building energy management system under evidential weighting. The decommissioning state is signed by a licensed demolition or deconstruction contractor admitted under credentialed scope. The recycling-grade re-credentialing state is signed by a recycler authority. These authorities are distinct, and the lineage chain records which authority signed each transition.

Where the substrate carries turbostratic graphene, recovered material may re-enter the closed-loop carbon recovery operation of the disclosed cradle-to-cradle architecture. That operation retains the substrate's carbon mass within the credentialed structural-storage system across arbitrarily many recyclings, the only mass losses being processing inefficiencies typically below five percent per recycling cycle. The recovered turbostratic graphene is independently re-credentialed by the recycler authority and entered into a subsequent structural-storage admissibility profile at the recovered grade.

Continuous Re-Credentialing

The disclosed architecture admits continuous re-credentialing across operational material flows during a structural element's in-service lifetime, including without limitation tuck-pointing replacement of mortar joints, surface-coating refresh, cavity-fill replacement, drywall replacement during renovation, foundation surface coating, topping-slab augmentation, and substrate top-up of any surface or volumetric element. Each said material flow is a credentialed event signed by an installer authority and recorded in the lineage chain, and the substrate's composite admissibility profile is re-evaluated against the cumulative material flow rather than only at original installation.

The continuous re-credentialing primitive supports a metabolic-lifetime model of building operation in which the substrate's credentialed identity persists across material flows while the material flows themselves are credentialed transitions in the lineage chain. Under the metabolic-lifetime model, end-of-storage-life of the original substrate composition does not require demolition of the structural element. The structural element continues in service while incoming material flows refresh, augment, or substitute the storage substrate within the cumulative composite admissibility profile, supporting structural lifetimes substantially exceeding the storage-chemistry cycle life of any individual substrate composition.

This separates the two re-credentialing pathways. Continuous re-credentialing operates on a structural element that remains in service. Recycling-grade re-credentialing follows an end-of-structural-life decommissioning event, after which a recycler authority processes the recovered material and issues a new admissibility profile at recycled grade.

Closed-Loop Carbon Recovery

Where the substrate carries turbostratic graphene, the disclosed cradle-to-cradle architecture admits a closed-loop carbon recovery operation in which end-of-structural-life concrete is processed to recover the turbostratic-graphene fraction for re-incorporation into subsequent structural-storage substrate without loss of the carbon mass to the open environment. The operation comprises a recovery-and-crush stage in which end-of-life concrete is crushed and graded; a fraction-separation stage in which the carbon-rich fraction is separated from the cementitious-aggregate fraction by methods including density separation, magnetic separation of any embedded conductors, and selective dissolution of the cementitious phase; a flash re-graphenization stage in which the separated carbon-rich fraction is subjected to a second flash Joule heating event re-converting any degraded turbostratic graphene to fresh turbostratic graphene of substantially restored electrochemical performance; a profile attestation stage in which the recovered turbostratic graphene is independently

re-credentialed by a recycler authority; and a re-incorporation stage in which the re-credentialed turbostratic graphene is entered into a subsequent structural-storage admissibility profile at the recovered grade.

The closed-loop carbon substrate flow is structurally distinct from open-loop end-of-life processing by retaining the substrate's carbon mass within the credentialed structural-storage system across arbitrarily many recyclings, the only mass losses being processing inefficiencies typically below five percent per recycling cycle. The lineage chain accordingly forms a directed graph of credentialed transitions persistent across multiple structural lifetimes, in which a decommissioning state feeds forward through recycling-grade re-credentialing into a re-installation state and subsequent in-service operation.

Biogenic carbon-credit attestations bound to a credentialed substrate migrate with the substrate across material flows and across structural lifetimes, the migration being a credentialed transaction signed by an environmental-credit authority and recorded in the lineage chain. The migrating carbon-attestation primitive supports continuous credentialed carbon-sequestration markets across the substrate's successive lifecycles.

Distinctions

The disclosure treats end-of-life as a credentialed transition in a persistent lineage chain rather than as the disposal of an undifferentiated material. The closed-loop carbon substrate flow is structurally distinct from open-loop end-of-life processing in that it retains the substrate's carbon mass within the credentialed structural-storage system across arbitrarily many recyclings, the only mass losses being processing inefficiencies typically below five percent per recycling cycle. Conventional end-of-life processing does not retain instance-level credentialed identity across recovery, and the recovered carbon mass is not re-credentialed for re-incorporation.

The decommissioning state and the recycling-grade re-credentialing state are signed by distinct authorities, the decommissioning authority being a licensed demolition or deconstruction contractor admitted under credentialed scope and the recycler authority producing a new admissibility profile at recycled grade. The lineage chain records each transition under the signature of the appropriate authority, so the recovered material's grade, mass, and physical state are carried forward as signed attestations rather than as a one-time disposition record.

Continuous re-credentialing is distinct again. It records in-service material flows under installer-authority signature without demolition of the structural element, supporting a metabolic-lifetime model in which the substrate's credentialed identity persists across material flows while the structural element remains in service.

Disclosure Scope

The disclosure encompasses the end-of-structural-life decommissioning event and its demolition-recovery attestation, recycling-grade re-credentialing by a recycler authority, the continuous re-credentialing primitive for in-service material flows, and the cradle-to-cradle credentialed substrate lifecycle recorded as a directed graph of credentialed transitions persistent across multiple structural lifetimes. The closed-loop carbon recovery operation, in which recovered turbostratic graphene is re-credentialed and re-incorporated at recovered grade, and the migrating carbon-attestation primitive are within the disclosed scope.

This subject matter is disclosed in U.S. Provisional Application No. 64/050,895, which describes a multi-function credentialed structural substrate carrying energy storage, electrical distribution, data networking, thermal coupling, and carbon sequestration as composed properties of building materials. The decommissioning and re-credentialing material in this article is drawn from the cradle-to-cradle credentialed substrate flow and continuous re-credentialing primitive of that provisional. Nothing in this article should be read to claim subject matter beyond what that provisional discloses.

Credentialed Surfaces (/credentialed-materials)

All 40 steps → (/inventive-steps)

Building surfaces as credentialed agents that participate in the structure's networking and electrical systems.

Provisional application

PRIMARY TECHNICAL DISCLOSURE

- credentialed-building-materials-cryptographic-admissibility-for-structural-surfaces (/articles/credentialed-building-materials-cryptographic-admissibility-for-structural-surfaces)

SECONDARY TECHNICAL

- credentialed-materials/carbon-sequestration-property-surface (/articles/credentialed-materials/carbon-sequestration-property-surface)
- Composition Rules Governing Surface Interactions (/articles/credentialed-materials/composition-rules)
- **Decommissioning And Re-Credentialing Attestation (/articles/credentialed-materials/decommissioning-and-recredentialing)**
- Electrical-Distribution Admissibility Surface (/articles/credentialed-materials/distribution-property-surface)
- credentialed-materials/end-of-storage-life-attestation (/articles/credentialed-materials/end-of-storage-life-attestation)
- credentialed-materials/energy-storage-property-surface (/articles/credentialed-materials/energy-storage-property-surface)
- Lineage Chain Across Material Lifecycle (/articles/credentialed-materials/lineage-chain-across-lifecycle)
- Master Credential Signature Binding All Property Surfaces (/articles/credentialed-materials/master-credential-binding)
- Multi-Authority Signature Block (/articles/credentialed-materials/multi-authority-signature-block)
- Data-Networking Admissibility Surface (/articles/credentialed-materials/network-property-surface)
- Profile Versioning Continuity (/articles/credentialed-materials/profile-versioning-continuity)
- credentialed-materials/structural-property-surface (/articles/credentialed-materials/structural-property-surface)
- credentialed-materials/thermal-property-surface (/articles/credentialed-materials/thermal-property-surface)

- Versioned Admissibility Profiles With Lineage Chain (/articles/credentialed-materials/versioned-profiles-with-lineage)
- credentialed-materials/water-coupled-property-surface (/articles/credentialed-materials/water-coupled-property-surface)

Credentialed Surfaces overview → (/credentialed-materials)