TECHNOLOGY WHITEPAPER

DRI-EAF + Molten-Oxide Electrolysis: A Technical Deep Dive

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Abstract

This whitepaper details the process architecture, mass/energy balance, and orchestration strategy of the GGSN integrated green-steel and specialty-metals complex. The design couples hydrogen direct reduced iron (H■-DRI), electric arc furnace (EAF) melting, and molten-oxide electrolysis (MOE) refining, all dispatched by the ASIS AI orchestration engine under Article 6.2-compliant carbon accounting.

1. Renewable Backbone

A tri-source captive supply — 1.2 GW solar PV, 300 MW onshore wind, and 180 MW run-of-river hydro — feeds a 400 MWh grid-forming BESS. Firming logic in NIBBLE OS achieves 99.7% renewable dispatch to the electrolyser bank.

2. Hydrogen Production

PEM electrolyser bank (500 MW nameplate, modular 5 MW stacks) produces 90,000 tpa H■ at an LCOH of $1.85–$2.10 / kg over the plant lifetime. Byproduct O■ (720,000 tpa) is sold to the EAF, medical, and industrial markets.

3. DRI-EAF Green Steel

Shaft-furnace H■-DRI (Midrex-class licensor) yields 1.8 Mtpa sponge iron at 94% metallisation. Two 250-t EAFs, oxy-fuel burner assisted, deliver 2.0 Mtpa liquid steel at < 100 kg CO■e / t — a 96% reduction versus the BF-BOF benchmark.

4. Molten-Oxide Electrolysis (MOE)

A 120,000 tpa MOE line refines specialty ferroalloys (Fe-Cr, Fe-Ni, Fe-Si) and produces high-purity O■ as a coupled product. Licensed process, first-mover deployment in West Africa, IP-protected via joint patent portfolio.

5. ASIS Orchestration (NIBBLE OS)

ASIS is a real-time optimisation engine that couples weather nowcasting, electricity price signals, hydrogen storage state, and downstream production schedules. It publishes per-batch attestation packets to the Article 6.2 registry, enabling verified transfer of ITMOs.

6. Carbon Accounting

Scope 1–3 emissions are measured continuously and attested by a third-party MRV partner. Corresponding adjustments are logged against the host-country NDC; unused credits are marketed via the OS Carbon Book.

Contact

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