JUMPLINK ENERGY SYSTEM INC.

SMART MICROGRID TECHNOLOGY OVERVIEW

Laboratory development of a vanadium redox flow battery, DC/AC inverter and the core components of a future integrated microgrid.

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PUBLIC TECHNOLOGY BRIEF

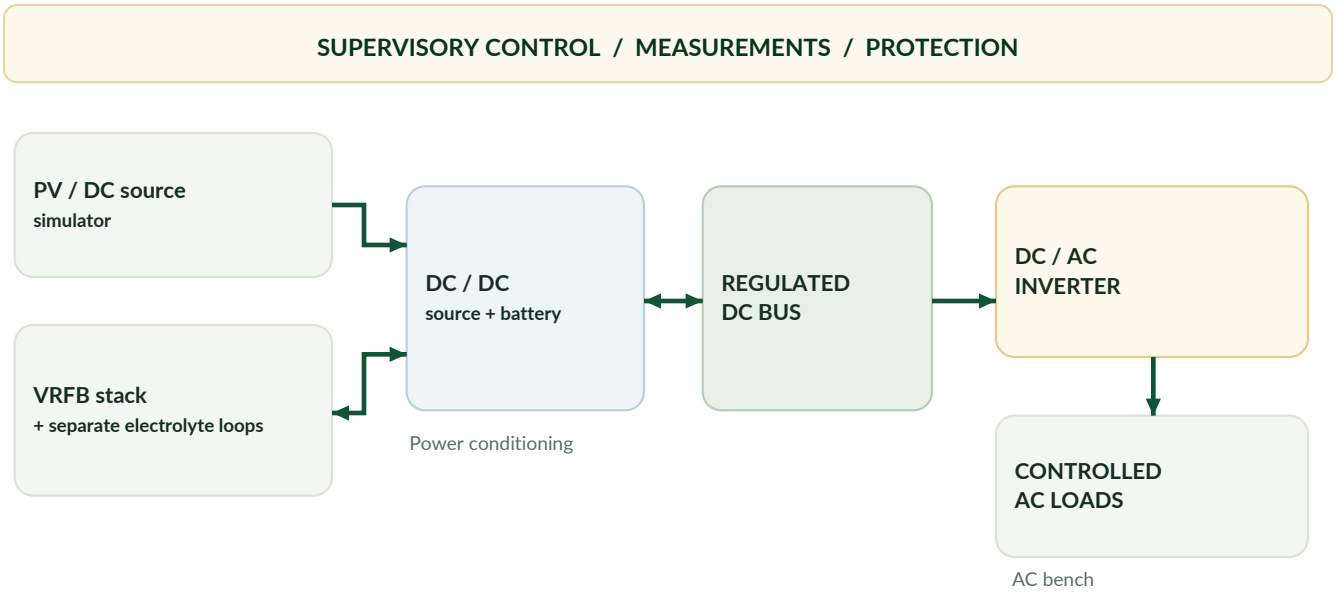
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THE TECHNOLOGY CONCEPT

Jumplink is pursuing two principal R&D; prototypes: a seven-cell, nominal 100 W vanadium redox flow battery (VRFB) and a DC/AC inverter. Supporting power-conditioning, control, measurement and protection modules will be developed and evaluated at laboratory scale before any larger pilot project.

CONCEPTUAL LABORATORY ARCHITECTURE

Functional interfaces only; equipment ratings, topologies and final wiring are subject to design review.



Power flow in testing may be bidirectional where the hardware and controls support it.

Important interface: a nominal ~10 V laboratory VRFB cannot be assumed to drive the inverter directly. A compatible DC/DC stage, DC-bus voltage, isolation scheme and protective functions must be engineered and verified.

CORE COMPONENT PROTOTYPES

01 VANADIUM REDOX FLOW BATTERY

LABORATORY DESIGN TARGET

100 W / ~10 V / 7 cells

The battery stack is a research platform, not a demonstrated commercial product.

Proposed stack architecture includes graphite flow-field plates, graphite felt electrodes, seven Nafion N115 membranes and two isolated circulating vanadium electrolyte loops. Instrumentation will allow repeatable tests of stack voltage, current, flow, temperature, pressure and operating response.

CELL STACK	ELECTROLYTE LOOPS	PUMPS & TANKS	SENSING & SAFETY

02 DC/AC INVERTER PROTOTYPE

The inverter program will prototype controlled DC-to-AC power conversion and investigate regulation, switching, thermal management, fault response and operation with isolated laboratory AC loads. The inverter output rating, operating voltage and topology remain to be specified and must be matched to the conditioned DC bus.

Integration constraint: the nominal 100 W battery rating does not establish the inverter power rating. Standalone inverter development and a compatible low-power system test are separate milestones.

03 SUPPORTING MICROGRID MODULES

POWER CONDITIONING

DC/DC stage, controlled DC bus, voltage matching and optional galvanic isolation.

RENEWABLE INPUT

PV/DC source emulator and configurable input to evaluate renewable-energy interfaces.

SUPERVISORY CONTROL

Battery monitoring, inverter commands, state handling, alarms and data logging.

PROTECTION & TEST LOADS

Fusing, disconnects, emergency stop, containment, grounding review and AC load bank.

PRE-PILOT SCOPE

Fabricate, bench-test and document the key component prototypes; then validate a safe laboratory system interface before considering a separately financed field pilot.

INTEGRATION & VALIDATION

TEST THE COMPONENTS FIRST, THEN THE INTERFACES

Jumplink's proposed approach is staged: verify the VRFB and inverter separately, commission interface electronics with controlled supplies and loads, then perform integrated tests under documented procedures. The aim is engineering evidence rather than premature commercial performance claims.

REPRESENTATIVE TEST MATRIX

SUBSYSTEM	MEASUREMENTS / CHECKS	EVIDENCE TARGET
VRFB stack	Voltage/current response; flow and pressure; temperature; charge/discharge behaviour	Repeatable logged data and leak-tight operation
DC/DC interface	Voltage regulation; power transfer; electrical isolation where required	Demonstrated compatibility with source and DC bus
DC/AC inverter	Output waveform; frequency; distortion; thermal and fault response	Measured operation into controlled isolated loads
Supervisory control	Sensor logging; setpoints; alarms; controlled shutdown	Traceable control sequences and fault records
Integrated bench	Transitions; power balance; subsystem interactions; emergency stop	Documented laboratory integration report

LABORATORY SAFETY AND BOUNDARIES

Electrolyte handling: chemical-compatible wetted materials, separate positive/negative loops, spill containment, leak and pressure checks, ventilation and appropriate procedures/PPE.
Electrical controls: current limits, disconnects, fusing, emergency stop, insulation and grounding assessment, supervised charging and thermal monitoring.
Grid boundary: early testing uses isolated loads and source emulators. No connection to utility wiring is proposed in this laboratory brief.

PRE-PILOT ROADMAP

ILLUSTRATIVE 12-MONTH PROGRAM

01 — **Architecture and review** — MONTHS 1-2

Requirements, system interfaces, supplier quotations and risk assessment.

02 — **Component fabrication** — MONTHS 3-5

Assemble VRFB hardware and inverter/conditioning test modules.

03 — **Independent commissioning** — MONTHS 6-8

Characterize battery and power electronics under controlled conditions.

04 — **Laboratory integration** — MONTHS 9-10

Commission compatible DC interfaces, control and test-load operation.

05 — **Validation and pilot decision** — MONTHS 11-12

Issue performance report, remaining gaps, revised design and pilot plan.

WHAT THIS PROGRAM IS INTENDED TO DELIVER

Technical outputs: VRFB test data, inverter characterization, verified DC/DC interface, documented control and protection behaviour, and a laboratory integration report.
Engineering outputs: updated drawings/BOM, safety and risk records, supplier cost estimates, performance gaps and an evidence-based next-stage decision.
Commercialization: evaluate future stationary storage, renewable integration and smart microgrid applications only after technical and economic assessment.

PRELIMINARY FUNDING OBJECTIVE

CAD $250,000

The combined battery + inverter + microgrid scope is being re-costed. This amount is a working objective, not a validated full-program budget.

PARTNERSHIPS & INQUIRIES

Jumplink welcomes discussions with energy storage and power electronics companies, engineering partners, laboratories and prospective pre-pilot collaborators. Contact Jumplink through its company website.

BACKGROUND REFERENCES (FOR TECHNOLOGY CONTEXT)

U.S. DOE: Flow battery technology • IEEE 2030.7: Microgrid controllers • IEEE 1547: DER interconnection