Pathway to Localizing Vanadium Flow Battery (VFB) Manufacturing in Australia

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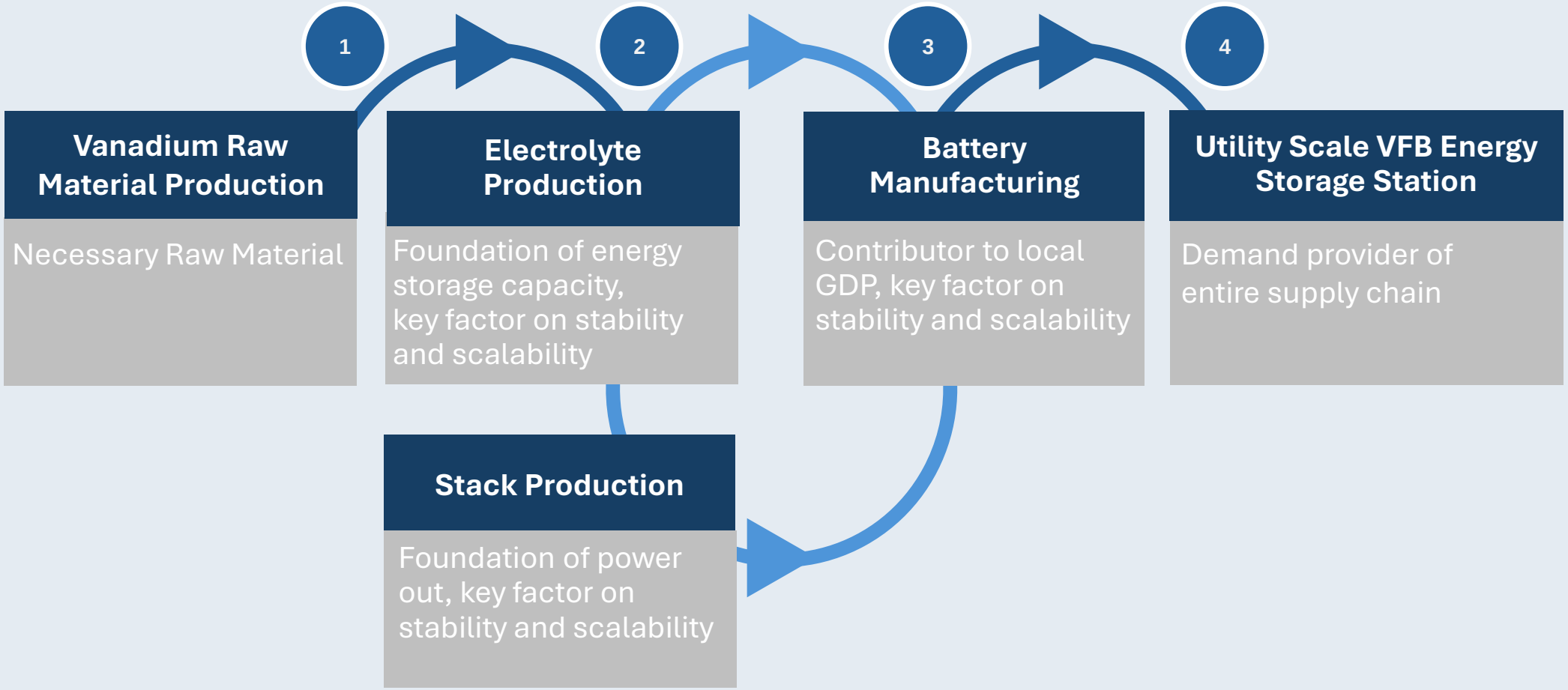
Key Points in Supply Chain



Utility Scale VFB Project – Trigger to Start

- Possible benefits includes grid forming, peak shaving, ancillary services, gird level black start, smoothing output for renewable generation, off grid power supply, and power quality improvement
- Assumed total scale 1 GWh, suggested 100MWh or above for single station, first pilot should be 20MWh or above
- Investment Required: ~USD 400m – USD 800m
- Footprint:90-180 ㎡ / MWh
- Suggested Development Timeline: 2-3 years after completion of pilot project
- Trigger demand at industrial level and enable supply chain localization

Vanadium Raw Material Production

- 1 GWh of VFB needs 8000 tonnes of V_2O_5 equivalent
- Output could be vanadium concentrate, AMV, or V_2O_5 depends on technology used in coupling electrolyte production
- Development Timeline (without considering permitting): 3-5 years
- Economic Output: ≈ USD 100m per every 10,000 tonnes of V_2O_5 equivalent

Local Vanadium raw material supply is the key to attract electrolyte manufacturing investment

Electrolyte Production

- Assumed Capacity: 1 GWh/year
- At the same scale, production costs can vary by more than 40% depending on the technology route， electrolyte produced from high purity V2O5 has the highest production cost among all.
- Minimum 100MWh annual production capacity is suggested for economy of scale
- Investment Required: USD 20M – USD 90M (land cost excluded)
- Footprint: ≈ 120,000 ㎡ per 1 GWh production capacity
- Development timeline without considering permitting : 3-5 years
- Jobs created: 150 – 300 positions / 1 GWh production capacity
- Expected Revenue: ~ USD 230m / GWh

Stack Production

- Assumed Capacity: 1 GW/year
- Automated production is required for product stability
- Minimum 100MW annual production capacity is suggested for economy of scale
- Investment Required: USD 45M – USD 90M (land cost excluded)
- Footprint: ≈ 50,000 ㎡ per 1 GW production capacity
- Development timeline without considering permitting : 2-3 years
- Jobs created: 100 – 200 positions / 1 GW production capacity
- Expected Revenue: ~ USD800m / GW

Battery Manufacturing

- Assumed Capacity: 1 GW per year
- DC Battery module manufacturing based on modular design
- Minimum 50MW annual production capacity is suggested for economy of scale
- Investment Required: USD 25M – USD 60M (land cost excluded)
- Footprint: ≈ 50,000 ㎡ per 1 GW production capacity
- Development timeline without considering permitting : 2-3 years
- Jobs created: 200 – 400 positions / 1 GW production capacity
- Expected Revenue: ≥ USD 2.2b/GW

Thank you.