Executive Summary: Pennsylvania – *AISF* (American Innovation & Sustainability Fund)

The **Pennsylvania initiative** within the AISF Master Plan focuses on **leveraging SHURE® technology** to extract **lithium** and **rare earth elements (REEs)** from **fracking wastewater** and **coal ash**, positioning Pennsylvania as a **critical hub for domestic supply** of essential minerals vital for **electric vehicles (EVs)**, **renewable energy**, and **national defense**.

Key Objectives

1. **Lithium Extraction from Fracking Wastewater**
   - **SHURE® (Sustainable Hydrometallurgical Unit for Resource Extraction)** technology aims to extract lithium carbonate from **Marcellus Shale** wastewater, which could meet **38–40% of U.S. demand**.
   - **Goal**: Recover **1,160 tons of lithium** annually by **Year 5**.
2. **Rare Earth Element (REE) Recovery from Coal Ash**
   - **Pilot extraction processes** for neodymium, yttrium, cerium, and other REEs from coal ash deposits.
   - Over **11 million tons** of recoverable REEs exist in Pennsylvania's coal ash, valued at **$8.4 billion**.
3. **Environmental Remediation**
   - Eliminate toxic fracking wastewater and **coal ash** by converting them into valuable materials.
   - Restore contaminated water sources and reduce hazardous waste sites in the **Appalachian Basin**.
4. **Economic Development**
   - Create **500 direct jobs** and **2,000+ indirect jobs**, boosting local economies—particularly in areas affected by **coal industry decline**.
   - Leverage partnerships with **Penn State University**, **Eureka Resources**, and the **Department of Energy (DOE)** for funding and regulatory support.

Project Phases

➢ **Phase 1 (0–12 months)**

- **Feasibility & Site Selection**:

  - Identify **3-5 fracking wastewater treatment facilities** with high lithium concentrations.
  - Assess **coal ash sites** in the **Appalachian Basin** for REE recovery.
- **Pilot Testing**:
  - Deploy SHURE® pilot units at select fracking wastewater sites to **recover lithium** (50% recovery rate) from **100,000–200,000 gallons/day**.
  - Begin **lab-scale REE extraction** from coal ash, producing initial concentrates.
- **Partnership Formalization**:
  - Finalize agreements with **Eureka Resources** (wastewater treatment) and **Penn State** (research collaboration).
  - Secure **$5M–$10M** in early-stage funding.

➢ **<u>Phase 2 (12–24 months)</u>**

- **Facility Construction**:
  - Build a **modular lithium extraction plant** to process **500,000 gallons/day**, recovering **100–200 tons** of lithium annually.
  - Start construction of a **coal ash processing facility** to recover **50 tons** of REE concentrates per year.
- **Environmental & Community Engagement**:
  - Launch **monitoring programs** to track water quality improvements.
  - **Community outreach** for transparency on project impact.
- **Revenue Generation**:
  - Sell **lithium carbonate** to battery manufacturers and **rare earth concentrates** to magnet and electronics producers.
  - **Initial Revenue**: **$5–8M** in Phase 2.

➢ **<u>Phase 3 (24–36+ months)</u>**

- **Full-Scale Operations**:
  - Scale the lithium extraction plant to **1M+ gallons/day**, recovering **1,160 tons** of lithium annually.
  - Expand the REE refinery to **500 tons of rare earth concentrates** per year for **national magnet manufacturers**.
- **Economic & Environmental Impact**:
  - **500+ jobs** at the lithium and REE facilities, adding **$30M** in annual local economic impact.
  - **Treat 1 million gallons** of wastewater daily, remediating **50+ miles** of polluted waterways.
- **Revenue Projections**:
  - **$50–75M** annual revenue by **Year 5** from combined **lithium and REE sales**.
  - Profitability achieved by **Year 3**.

AMERICAN INNOVATION
Sustainability Fund
(*AISF*)

10–15 Year Outlook: Sustained Growth & National Leadership

Beyond Year 5, the Pennsylvania initiative has the potential to **expand and evolve** significantly, cementing the state's role as a **national leader** in **critical mineral recovery** and **environmental remediation**. Key elements include:

- **Scaling to Multiple Sites**
  - **Replicate** the SHURE® extraction facilities across **other high-lithium fracking sites** and **coal ash repositories** in Pennsylvania.
  - Each additional site could add **200–300 tons** of lithium output per year and **200+ new jobs**.
- **Advanced Materials Hub**
  - Expand **REE refinery** capabilities to include **higher-value elements** like **dysprosium** and **terbium**, critical for **military tech** and **EV motors**.
  - Attract **downstream manufacturing** (magnet production, battery assembly) to **Pennsylvania**, generating **thousands of specialized jobs**.
- **Enhanced Environmental Stewardship**
  - **Clean up** legacy coal ash ponds and fracking waste, restoring **hundreds of miles** of waterways and **reclaiming land** for **community use**.
  - Establish **Pennsylvania** as a **model state** for **industrial waste remediation** and **circular economy** initiatives.
- **Integration with Emerging Technologies**
  - Collaborate with **AI-driven resource management** platforms for **real-time optimization** of extraction rates, chemical usage, and environmental monitoring.
  - Partner with **EV** and **renewable energy** companies to develop **closed-loop supply chains**, ensuring **ethical and traceable** materials.
- **National & Global Export**
  - By **Year 10**, Pennsylvania could **export lithium** and **REE concentrates** nationally and **internationally**, bolstering **U.S. supply chain resilience** and **trade**.
  - Potential to **capture 15-20%** of the **North American** lithium market share and **significant REE segments** by Year 15.
- **Sustained Job Creation**
  - **10,000+ jobs** across **mining**, **advanced manufacturing**, **environmental services**, and **R&D** by Year 15.
  - Continuous workforce development programs in **technology**, **engineering**, and **green jobs** will **revitalize local economies** across the state.
- **Continued Government & Private Funding**

- Leverage ongoing state and **federal grants**, as well as **private-sector partnerships** (EV manufacturers, defense contractors) for **research** and **infrastructure** expansions.
- Attract **long-term capital investments** from private equity and **impact investors** seeking **ESG-compliant** projects with strong **ROI**.

Impact Overview

- **Environmental**:
  - By **Year 10**, process **2+ million gallons** of wastewater daily, mitigating **billions of gallons** of toxic waste disposal.
  - Cumulatively remediate **hundreds of thousands of tons** of coal ash, significantly reducing **hazardous waste**.
- **Economic**:
  - **$30–50M** local economic impact by **Year 5**, scaling beyond **$100M** annually by **Year 10** as multiple sites come online.
  - Sustainable high-paying jobs, especially in **rural communities** transitioning from legacy industries.
- **National Security**:
  - Secure domestic sources of **critical minerals** for **EVs**, **wind turbines**, **aerospace**, and **military applications**.
  - Reduce foreign dependence, strengthening **U.S. supply chains** and **energy independence**.

Financial Projections

- **Initial Capital Investment**: **$20–30M** for Phase 1 & Phase 2 combined (pilot, facility construction).
- **Revenue Generation**:
  - **$5–8M** by Phase 2.
  - **$50–75M** by Year 5.
- **Long-Term Growth**:
  - **Potential $200–300M** annual revenue by Year 10–15, with multi-site expansions and refined high-value REE products.
- **ROI & IRR**:
  - **20–25% IRR** over 5–7 years, breakeven by **Year 3**, and a return on investment exceeding **3x** by Year 5.

- Additional expansions beyond Year 5 could yield **ongoing returns** and **significant shareholder value**.

Conclusion

The **Pennsylvania initiative** under the **AISF Master Plan** provides **long-term economic** and **environmental benefits**, positioning the state as a **national leader** in **sustainable mineral recovery**. By **Year 5**, Pennsylvania can expect **$50–75M** in annual revenue, hundreds of **new jobs**, and significant **environmental improvements**. Over a **10–15 year horizon**, the project has the potential to evolve into a **multi-site** operation that **strengthens domestic supply chains**, **creates thousands of jobs**, and **contributes hundreds of millions in annual revenue**—all while restoring **contaminated water sources** and **mitigating industrial waste**.

With a clear path to **profitability** and strong **local and federal support**, this initiative offers **investors**, **government officials**, and **community stakeholders** a **robust opportunity** for both **financial returns** and **positive social impact**—securing Pennsylvania's role in **America's clean energy transition** for decades.