SEED-PHL
A PROPOSED PUBLIC | PRIVATE PARTNERSHIP
BETWEEN:

Seedling

SEPTA

GREENWORKS
PHILADELPHIA

Office of
Fleet Management

PHILADELPHIA
WATER
EST. 1801

PECO
An Exelon Company

PennState

PHILABUNDANCE

Proposed by Seedling LLC., October 2018
Seedling LLC. is a Philadelphia-based circular economic agricultural company that combines industry-proven technologies to enhance regional agricultural production rates. Two primary systems complement each other to produce high-efficiency synergies that enable regional installations, referred to as SEEDs, to provide scalable circular economic impacts.

Two Complementary Systems
Comprise Seedling’s Logo For Graphical Explanation

1] CONTROLLED ENVIRONMENT AGRICULTURE

- Hydroponics
- Aquaculture
- Hydrology
- Blockchain
- Integrated
- Anaerobic Digestion
- Microgrid Energy
- H₂
- Hydrogen

2] EMBODIED ENERGY RECLAMATION
System Value Synergies Mapped

**Sustainable Food Systems**
- Annual growth capability
- Land-use density ≤30x
- Customer-specified growth
- Academic integration
- Crop-growth automation
- No Pesticides
- No Fungicides
- No Herbicides

**Organic Fertilizer**

**Anaerobic Byproducts**
- Organic Fertilizer & Biogas
- Pressed fiber packaging
- Bioplastic components

**Sensor-driven Blockchain Data**
- Aquatic health
- Water quality | optimization
- Hydrogen inventory | purity
- Water production rates
- Carbon-capture rates | purity

**Sensor-driven Blockchain Data**
- Crop-specific nutrient profiles
- Soil-responsive formulations
- NOP-UREC compliance
- IBM Food Trust

**Micro-Grid Power Utility**
- Crisis response power provider for microgrid distribution

**OFMSW Food-Waste Processing**
- Municipal processing center for consumer food-waste
- Produce-customer food-waste collection

**Direct-To-Customer Brokerage**
- Silent | Zero Emissions | Direct to Customer
- Crisis response | Distributed power generation

**Hydrogen Fuel Cell Electric Vehicles**
- Zero Emissions except water
- Greater power-to-weight than battery
- Market available vehicles

**Integrated Quality**
- Holistic Quality Control
- Data-integration | Optimization
- Infrastructure efficiencies

**Water Recycling**
- 95%+ water reuse potential
- Water testing for farms

**Sustainable Seafood | Restocking**
- Aquatic protein production
- Fish & Wildlife service support
- Liquid nutrient source

**Carbon-Negative Operation**
- Landfill diversion of food-waste
- Carbon sequestration in biomass
- Carbon-offset from Hydrogen
- Carbon-capture energy system

**Water**

**Subscription Fertilizer Service**
- Soil & atmosphere-responsive
- Crop-specific formulation
- Organic certified fertilizer

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Each Seedling installation is referred to as a SEED. A SEED installation is a split equity LLC shared between Seedling and local interests. This structured business design embeds economic returns into the circular economy the local region. The SEED scale is determined by the daily food-waste intake that the SEED requires to operate. SEED sizes are currently 50, 150, & 270+.

The SEED is supported by redundant utilities to ensure continued operation, and offers regional utility support during crisis.

### SEED Production Attributes

#### SEED Sizes:

**SEED-270**

- Food-Waste: 270 T/day
- CO₂ Diverted: ≥210,000 T/Year
- Organic Fertilizer:
  - Solid: ≥ 29,000 T/Year
  - Liquid: ≥ 3,900,000 Ga./Year
- Kw: 2,350/hr
- Kg H₂: 1,270/day
- STAFF | Job Creation: 55
- Exec. | Dir. | PhD. : 5
- Mid-Level : 17
- Entry-Level : 33
- CAPITAL COSTS : $74.7M
- YEAR 5 REVENUE : $22.4M
- Total Crop Growth Area: ≤ 240,000 ft²
- Water System: ≤ 2,400,000 ga.
- Aquaculture Option: + 1,200,000 ga.

**SEED-150**

- Food-Waste: 150 T/day
- CO₂ Diverted: ≥110,000 T/Year
- Organic Fertilizer:
  - Solid: ≥ 16,000 T/Year
  - Liquid: ≥ 2,170,000 Ga./Year
- Kw: 1,400/hr
- Kg H₂: 192/day
- STAFF | Job Creation: 35
- Exec. | Dir. | PhD. : 3
- Mid-Level : 12
- Entry-Level : 20
- CAPITAL COSTS : $43.9M
- YEAR 5 REVENUE : $11.5M
- Total Crop Growth Area: ≤ 125,000 ft²
- Water System: ≤ 1,250,000 ga.
- Aquaculture Option: + 625,000 ga.

**SEED-50**

- Food-Waste: 50 T/day
- CO₂ Diverted: ≥ 35,000 T/Year
- Organic Fertilizer:
  - Solid: ≥ 5,000 T/Year
  - Liquid: ≥ 700,000 Ga./Year
- Kw: 400/hr
- Kg H₂: 48/day
- STAFF | Job Creation: 20
- Exec. | Dir. | PhD. : 3
- Mid-Level : 5
- Entry-Level : 12
- CAPITAL COSTS : $23.3M
- YEAR 5 REVENUE : $3.4M
- Total Crop Growth Area: ≤ 45,000 ft²
- Water System: ≤ 450,000 ga.
- Aquaculture Option: + 250,000 ga.

### Proposed by Seedling LLC, October 2018
Each of Seedling’s system components can work individually, but are amplified when complemented by other systems. Seedling views relationships with customers and our community with the same lens. Philadelphia’s SEED installation, SEED-PHL LLC, is designed as a public-private partnership that provides resiliency and redundancy to the City of Philadelphia in both daily life and crisis events.

Why form a PARTNERSHIP?

**Partnerships:**

- **SEPTA**
  - SEED-PHL’s commitment to SEPTA is a dedicated source of hydrogen fuel for a zero-emissions fleet of fuel cell electric buses and fleet vehicles.
  - Based upon a contractual purchase agreement for a fixed volume of daily dispensing of hydrogen fuel provides the foundation of this partnership.
  - Opportunities for power purchase for charging of battery-electric vehicles and performance data relating to these technologies will be available.

- **Greenworks Philadelphia**
  - SEED-PHL’s commitment to the Office of Sustainability is predicated upon connectivity of data derived from SEED-PHL produced assets, effects on the triple-bottom line of the City of Philadelphia, the data tracking of waste-to-value stream containments, the quality and distribution of locally produced food and mobility systems.

- **Office of Fleet Management**
  - SEED-PHL’s market demand for food-waste leverages the collection of refuse by the PHL OFM, in exchange for a co-evolution of waste stream decontamination and conversion to renewable energy and transportation fuel. Complemented by fueling infrastructure for silent, zero-emissions refuse collection fleets provides an improvement of Philadelphia-resident experience. Contractual hydrogen and/or power purchase agreements for fleet electrification will be available.

- **Philadelphia Water**
  - Analogous to anaerobic digestion and power production activities that PWD has experience with, SEED-PHL provides an opportunity to showcase and evolve hydrological activities for specific community functions that support agriculture and community health.
  - SEED-PHL’s production of deionized water from fuel cell operation provides a reliable, and new source of purified water for developmental testing and technology readiness.

- **PECO**
  - SEED-PHL’s production of energy enables classification as an Independent Power Provider for PECO.
  - During regular operations, this partnership provides redundancy and buffering to the power production and demands of SEED-PHL.
  - During crisis-response SEED-PHL will contractually divert portions of power production to critical infrastructure systems in a microgrid format.

- **PennState**
  - The integrity of SEED-PHL’s operational performance is predicated on the ability of the operating staff. Providing decentralized education, research, and extension services with a leading agriculture academic institution will ensure the future availability of skilled labor across the Philadelphia and Pennsylvania landscapes. The Pennsylvania State University’s capabilities have demonstrated an acuity for the advancement of agricultural resilience and health of regional ecosystems. SEED-PHL is a classroom.

- **Philabundance**
  - Community-centered initiatives are fundamental to circular economic performance. Philabundance’s integration into regional agricultural and food-distribution systems provides SEED-PHL with a resilient customer base for food, as well as direct connections with regional farmers for a greater amplified impact of SEED-PHL’s operation.
  - Assisting regional farmers in the transition to organic certification is fundamental to Seedling and SEED-PHL’s mission. Doing so economically is our responsibility.

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