# **SynSel Enviro Industrial Parks:**

Leveraging process waste byproducts to create value-add jobs, products & services



#### **Declarations**



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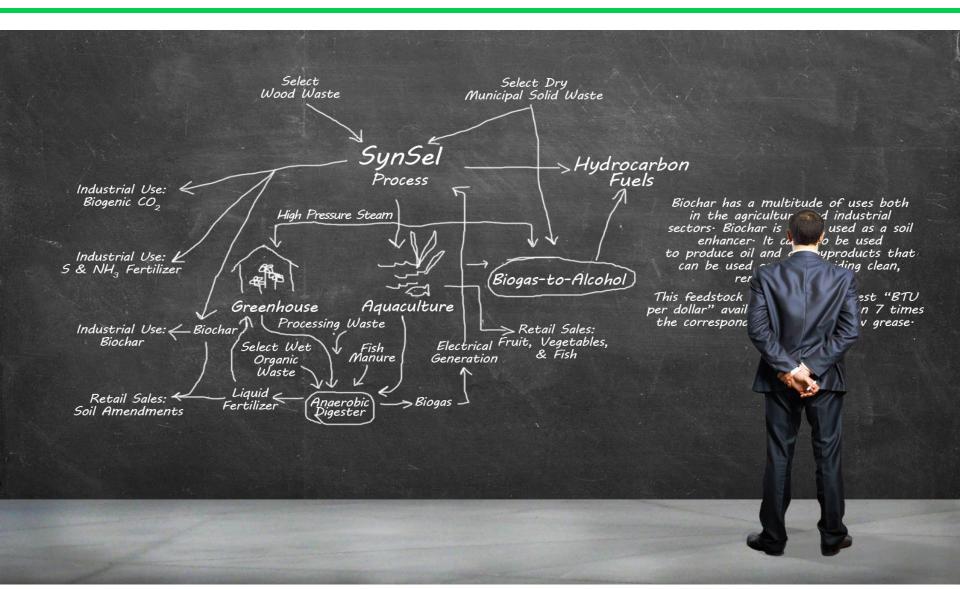
#### **Purpose**



- SynSel Bio-Refineries serve as the anchor to Enviro Industrial
   Parks (EIPs), where process waste byproducts are leveraged to
   create value-add products & services.
- SynSel partners with leading technology providers, business leaders, & local stakeholders to build community resiliency & further solve the local issues of:
  - Long-term job creation
  - Waste mitigation
  - Local food production
- Complementary technologies are integrated with SynSel Biorefineries to approach near zero-waste, end-to-end waste mitigation systems.

### Repeatable Templates for Integrated Systems





#### **EIP Master Planning**



#### **SynSel Biorefinery Construction**

**Feedstock** Selection & **Testing** 

**Technology** Selection & Scaling

**Core System** Integration & Design

**Finalize Economic Opportunities** 

Choose local feedstock that is economically viable and has consistent, longterm availability.

Select technologies that maximize the value of the available feedstock & waste heat of the Biorefinery.

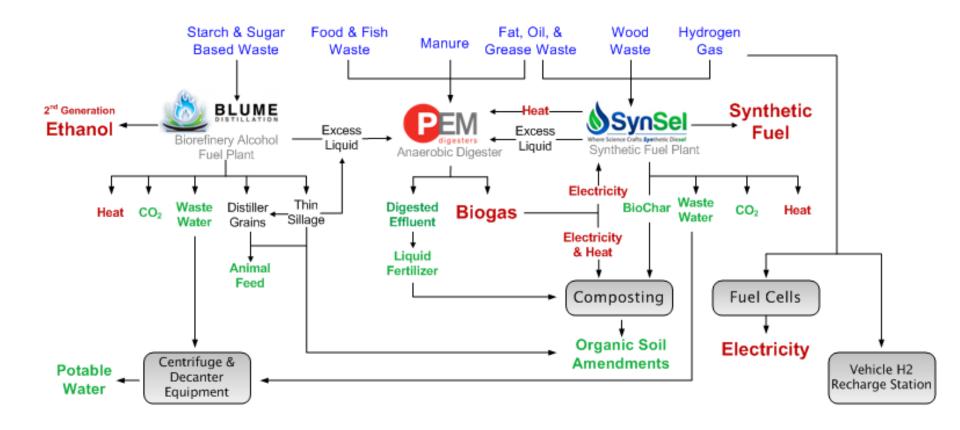
Finalize core technologies & support equipment into the final system design.

Integrate downstream business opportunities based on available outputs.

**EIP Mission:** develop turn key, closed-loop, & carbon neutral systems that provide zero-waste solutions.

#### **EIP Waste-to-Energy & Value-Add Byproducts**





Waste Inputs Renewable Energy Ag Byproducts

## **EIP Technology Considerations**



- SynSel is committed to incorporating best-in-breed technologies into its Enviro Industrial Parks that:
  - Sensibly use the biorefinery's waste heat, biochar, water, & CO<sub>2</sub>
  - Maximize the return from available local feedstocks
- Technologies under consideration include:
  - Hydrogen Generation Plants
  - Anaerobic Digesters (AD)
  - Gasification
  - Gas-to-Liquid Micro Plants
  - Composting Operations
  - Geo-thermal Facilities

- Fuel Cells: H<sub>2</sub> to Electric
- Heat-to-Electric Plants
- Solar/Wind-to-Electric
- Microturbines: Methane-to-Electric
- Ag Waste-to-Alcohol
- Absorption Chilling

#### **Downstream Economic Opportunities**



- The clustering of manufacturing & service businesses near a SynSel plant allows for the sharing of resources: infrastructure, inputs, & information.
- A few of the possible contributors/benefactors include:
  - Data centers
  - Greenhouse Vegetable & Fish Growing Operations
  - Organic soil amendments & fertilizer plants
  - Biogenic CO<sub>2</sub> production plants
  - H<sub>2</sub> generation facilities
  - H<sub>2</sub> vehicle re-fill terminals

- Food & meat processing plants
- Ag CAFOs & crop fields
- Animal feed production facilities
- Re-forestation with hybrid poplars
- Clean diesel/gasoline blending stations & terminals

#### **Summary of Potential On-Site EIP Initiatives**



- Data Centers: serves as anchor to SynSel EIPs with an est. 60% of the EIP cost; takes advantage of ultra-high reliability & security of onsite, inexpensive energy sources
- Greenhouses: Uses inexpensive heating, CO<sub>2</sub>, & low cost electricity for lighting; consumes onsite produced soil amendments & fertilizer; produces locally grown produce
- **Fish Farms:** Uses inexpensive heating; contributes fish waste to soil amendment production; produces locally raised high demand proteins
- Anaerobic Digesters: Uses inexpensive heating to process local wet waste; biogas to produces heat/electricity; generates nutrient-rich liquid fertilizer & biogas
- Vehicle Re-Charge and Fuel-Blending Stations: Uses onsite H<sub>2</sub>, biomethane, alcohol, gasoline & diesel
- Alcohol Production: Converts agriculture waste to alcohol
- Wind & Solar: Supplements electric & heat needs
- Fuel Cells: Uses onsite H<sub>2</sub> to create electricity
- Geothermal: Supplements cooling needs

#### Foundational Pillar: Water Reclamation



- In addition to SynSel's commitment to biorefinery greenhouse gas emission reduction, onsite water reclamation technologies will be implemented to process waste water at the SynSel Biorefinery & throughout the Enviro Industrial Park.
- This onsite waste water processing will minimize the impact for treatment by local waste water treatment plants.
- Nutrients & heavy metals will be separated from waste liquids.
- Waste liquids may be further processed into potable water or land applied as irrigation.



#### **Key Opportunities: Data Centers**



- SynSel Enviro Industrial Parks hold the keys to economically efficient Data Centers due to utilization Biorefinery waste heat
- Security and Reliability are vital criteria for Data Centers: On-site production of electricity, methane, diesel fuel, H<sub>2</sub> and ethanol is highly desirable and unique
- Data Centers diversify the work force, community and economy and require
  7x24 career jobs
- Target Clients: Google, Facebook, Amazon, Microsoft, Apple, IBM, Oracle, Intel, eBay, Cisco Systems, Yahoo, AMD, HP, Netflix, Tesla Motors, among others.
- In a bit of irony, the information/content life cycle goes full circle as SynSel Biorefineries get constructed on the land of shuttered paper mills closed due to the digital transformation age; thus, data centers now become the new "factories" of the "paperless age".

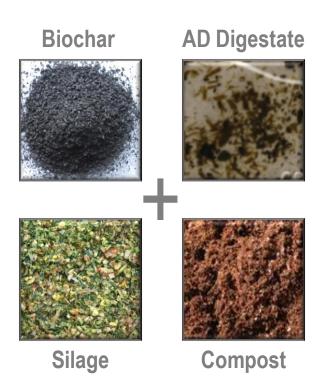
## **Key Opportunities: Greenhouses**



- Demand for greenhouse vegetable & fish growing operations is increasing due to:
  - Requests for locally-produced & sustainable food sources
  - Job creation potential.
- Yet greenhouses are faced with <u>rising</u>:
  - Energy Costs to heat, cool, & light operations
  - Fertilizer Costs for vegetable raising operations;
  - Waste Disposal Costs.
- Hydroponic Greenhouses in SynSel Enviro Industrial Parks benefit from:
  - <u>Energy Production</u>: Heat from the SynSel Bio-Refinery & Biogas from Anaerobic Digesters,
    Electric from Wind, Solar, Methane and Waste Heat, Alcohol from Ag Waste/Ethanol plants.
  - <u>Nutrients Source</u>: Liquid fertilizer from Anaerobic Digesters & silage from Distillation Plants, animal feed from alcohol plant output.
  - <u>Carbon Dioxide</u>: Excess CO<sub>2</sub> from the SynSel Biorefinery & Distillation Plants to enhance the growing atmosphere for higher production.
  - <u>Waste Mitigation</u>: Anaerobic Digestion, Distillation, & composting of vegetable waste.

## **Key Opportunities: Super Soil Amendments**





- The combination of Biochar, Digestate,
  Silage, Ammonia Water & Compost creates a superior soil amendment with:
  - Enhanced soil structure
  - Increased water holding capacity
  - Rich nutrient concentrations
- This valuable soil amendment has direct application in conventional greenhouse growing operations, agricultural field application, & retail sale.



The Synthetic Fuels Revolution has Begun...