

SUSTAINABLE SOLUTIONS FOR THE 21ST CENTURY

“The Future of the WTE Technology and Industry”

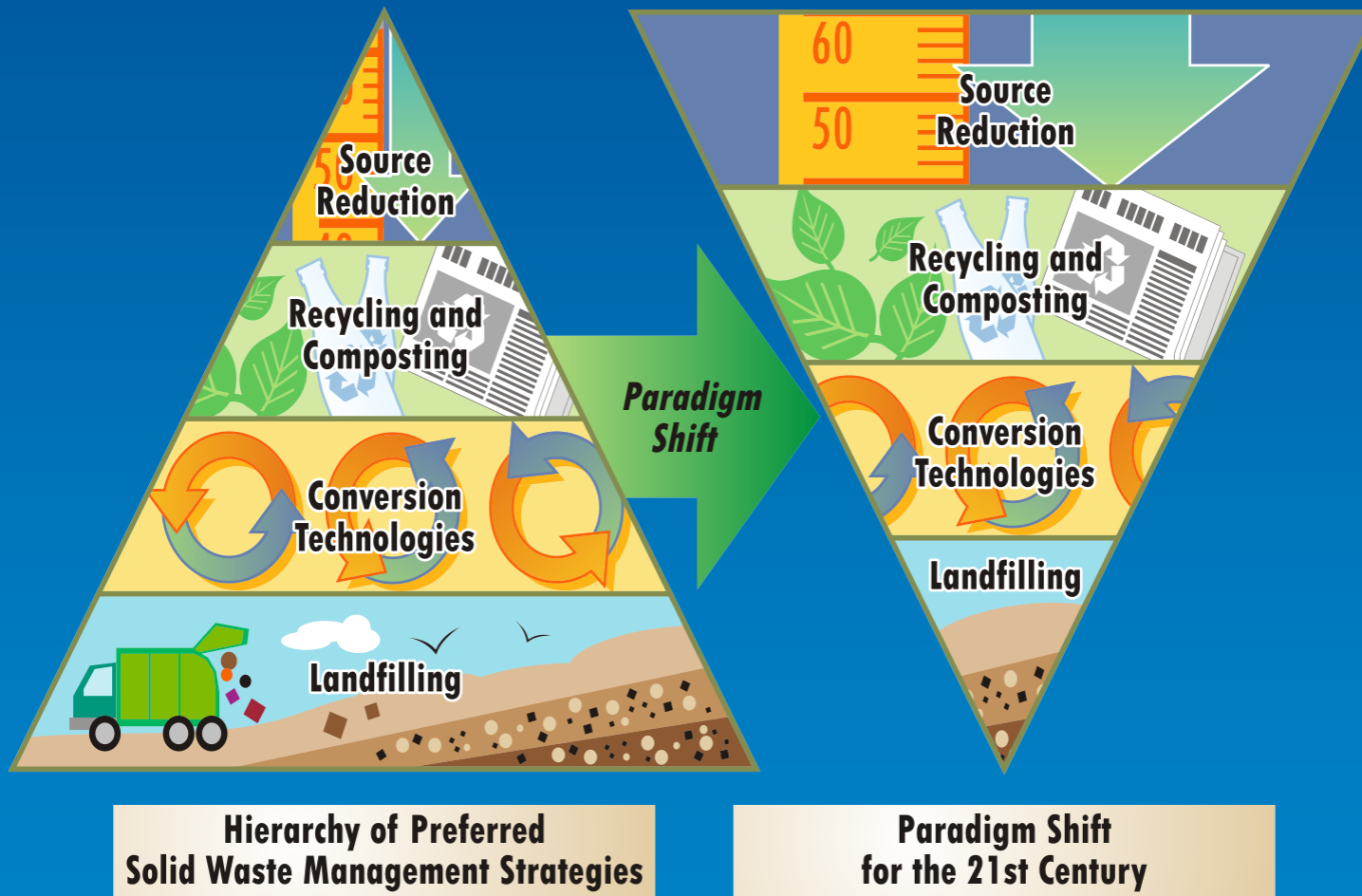


Waste-to-Energy
Research and
Technology Council
Bi-Annual
Conference
October 18, 2012

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Intended Consequences of the Integrated Solid Waste Management Hierarchy



The Three Rs of Recycling...Plus Two!

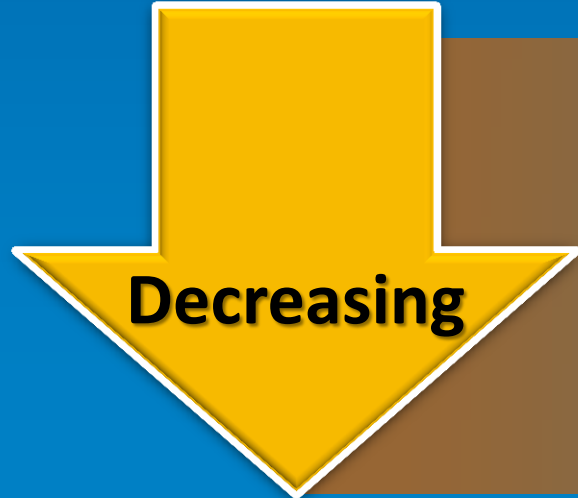


Modern WTE Trends



Increasing

- WTE facility expansions and new construction
- Attention to aesthetics/LEED®/innovation
- More stringent emission limits and GHG reporting
- MSW Higher Heating Value (HHV)
- Boiler/T-G availability
- Use of reclaimed water for cooling
- Gross/net electric generation
- Non-ferrous metal recovery (including “fines”)
- Integrated solid waste management/eco-campus



Decreasing

- Resistance to WTE in established communities
- Air emissions
- Reagent consumption
- Water consumption
- **Lower payments for renewable electricity**

Ze Future...

We'll see it...when
we believe it!



Dare to Dream...

Future WTE Plant under Dome



- Improved noise and visual buffer
- Superior dust and odor emissions control
- Attractive aesthetics for populated urban areas
- Superior resistance to high velocity winds
- Less weather impacts to operation and maintenance

First WTE Facility Under Dome Marchwood England

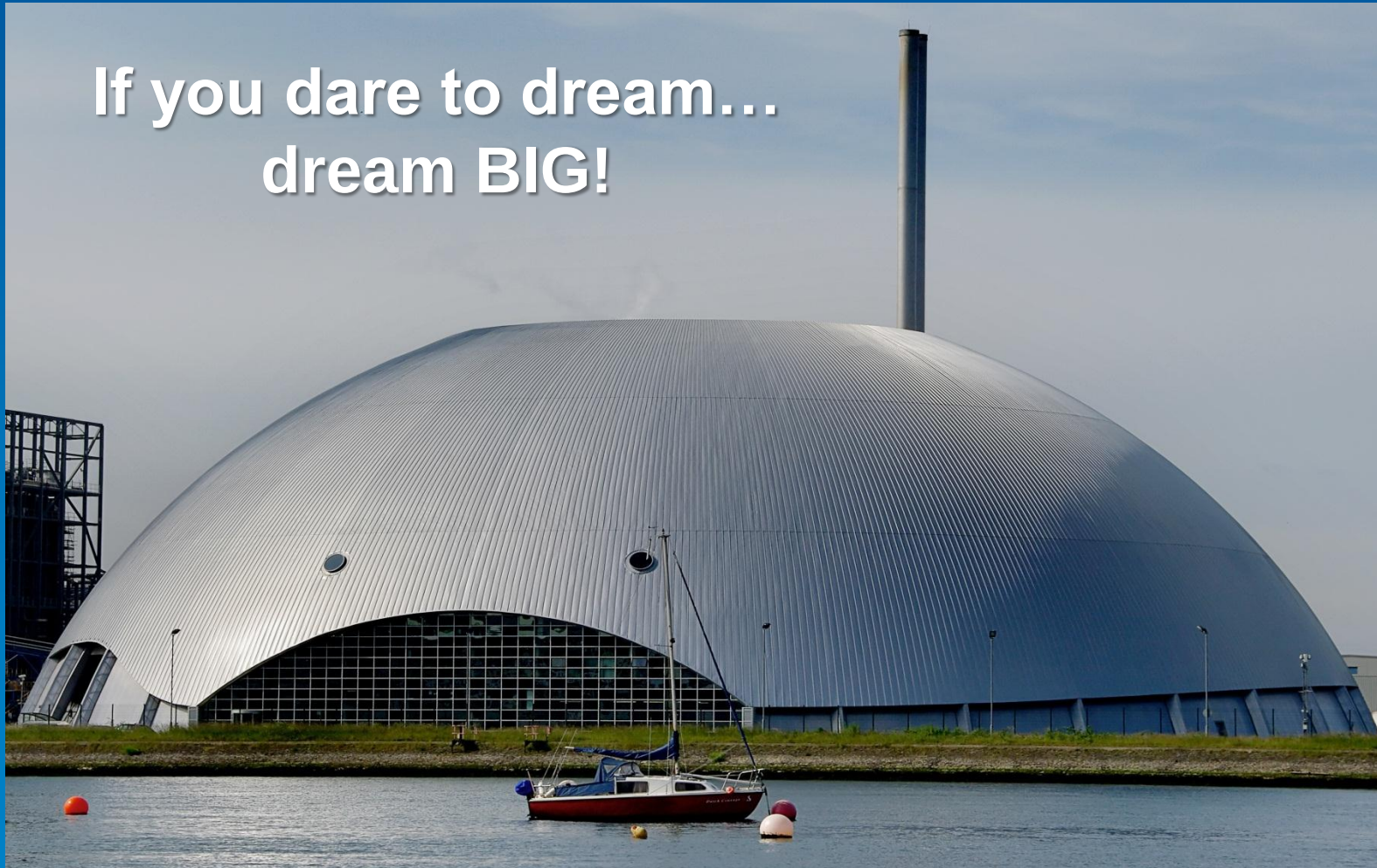
500 TPD facility
under construction
(2006 - 2007)



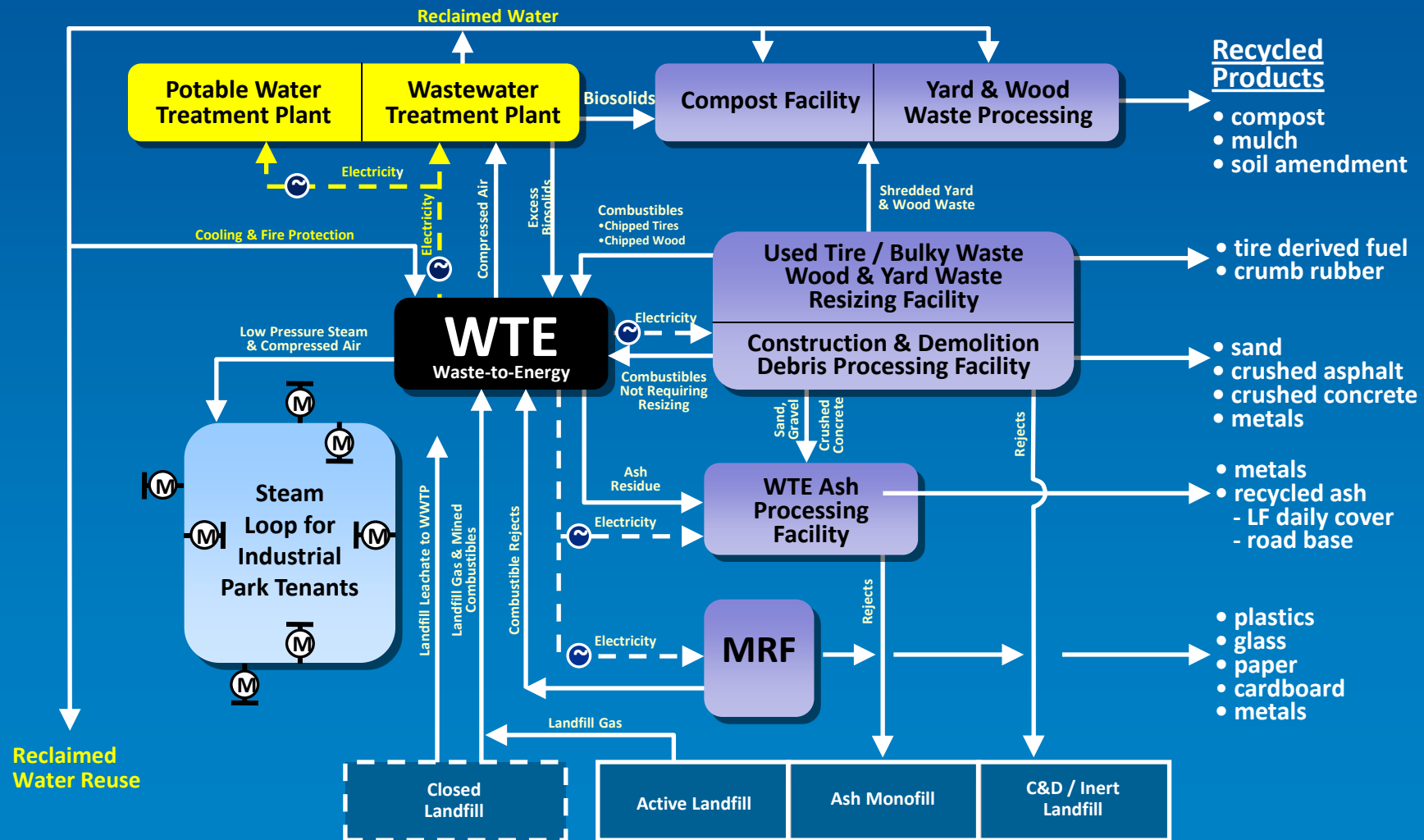
Marchwood England 2007

WTE Facility Under Dome Completed

If you dare to dream...
dream BIG!

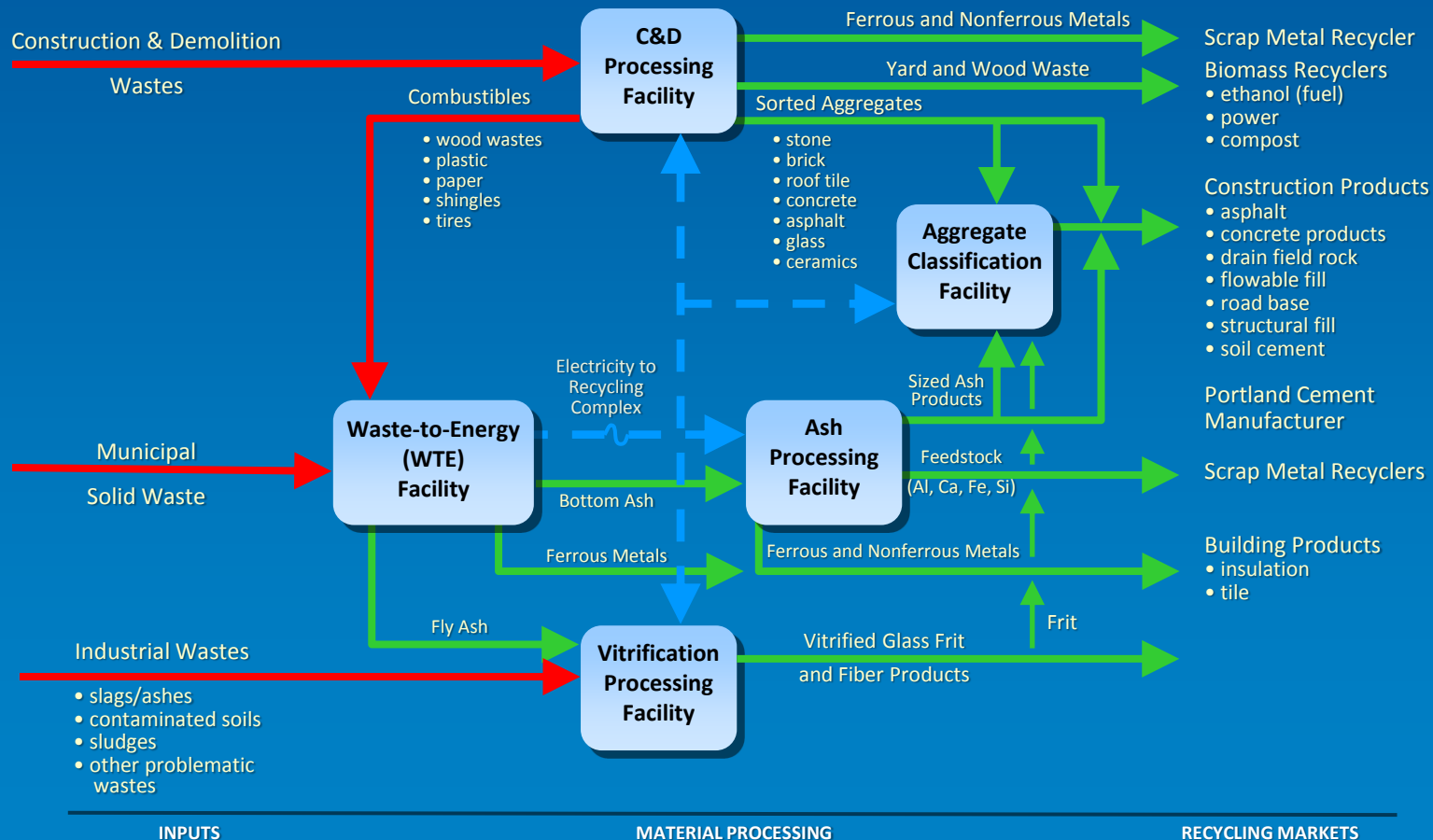


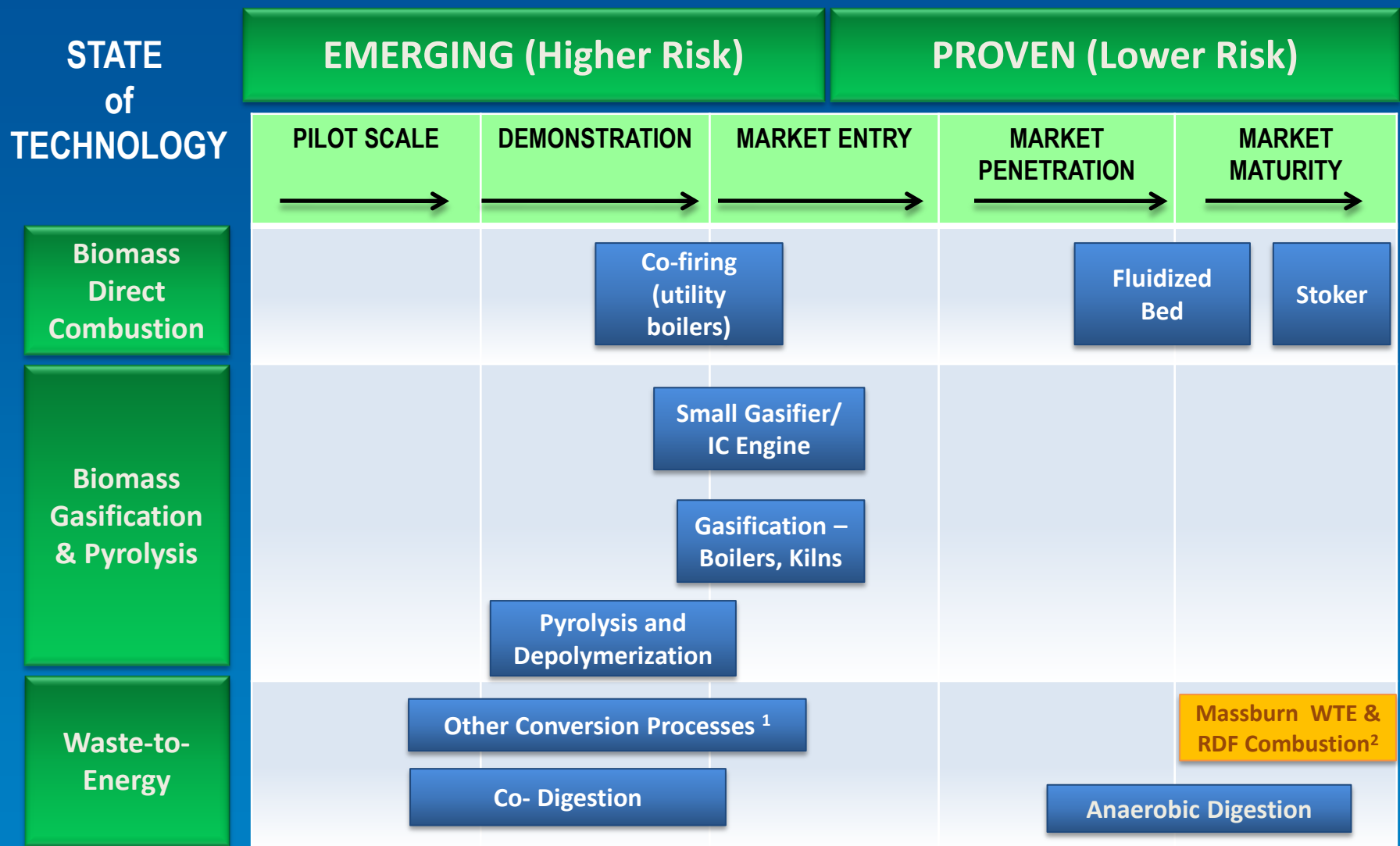
Integrated Campus for Management of Solid Waste, Recyclables, and Water Resources



Integrated Aggregate Recycling Project

Public Works Recycling Complex

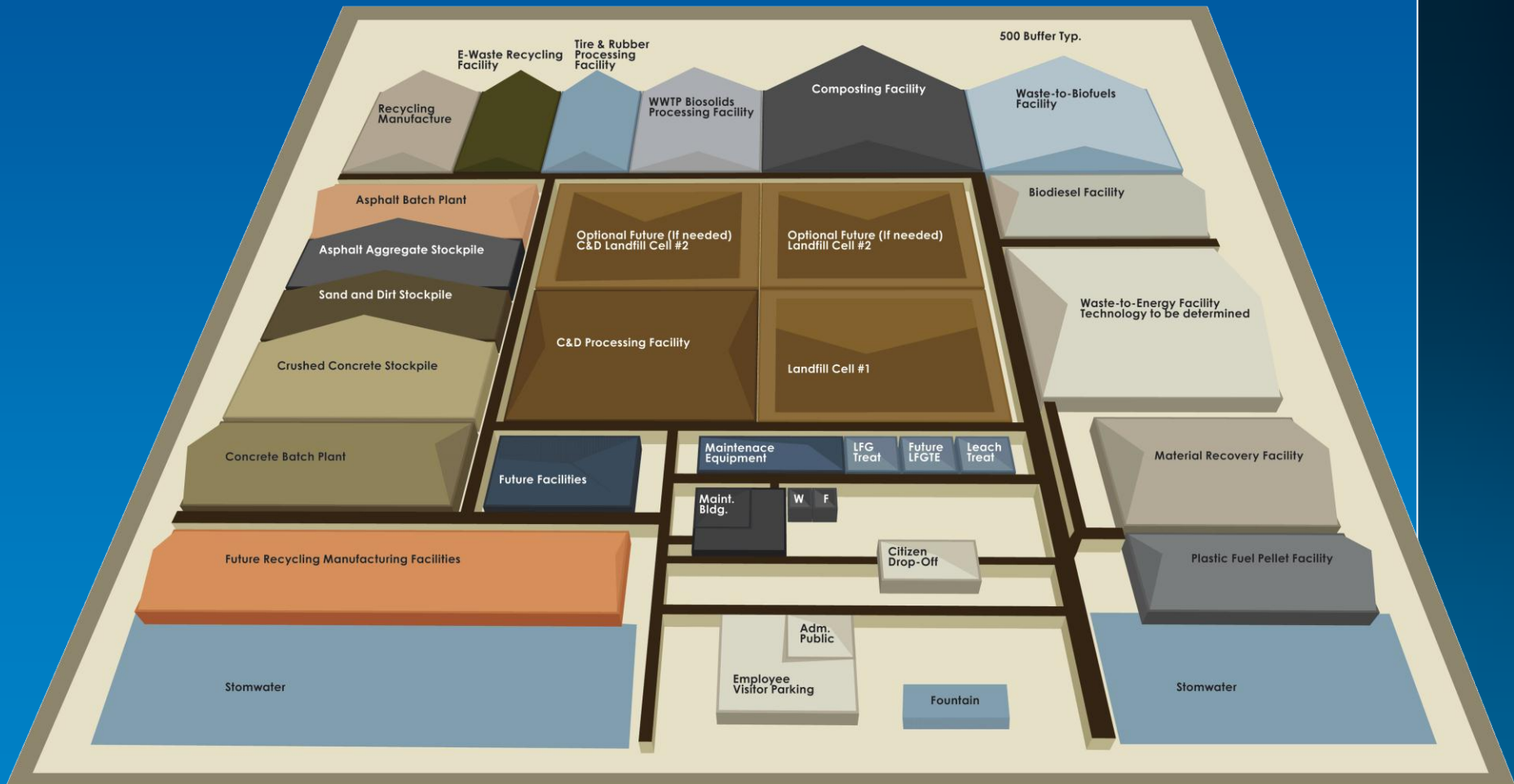




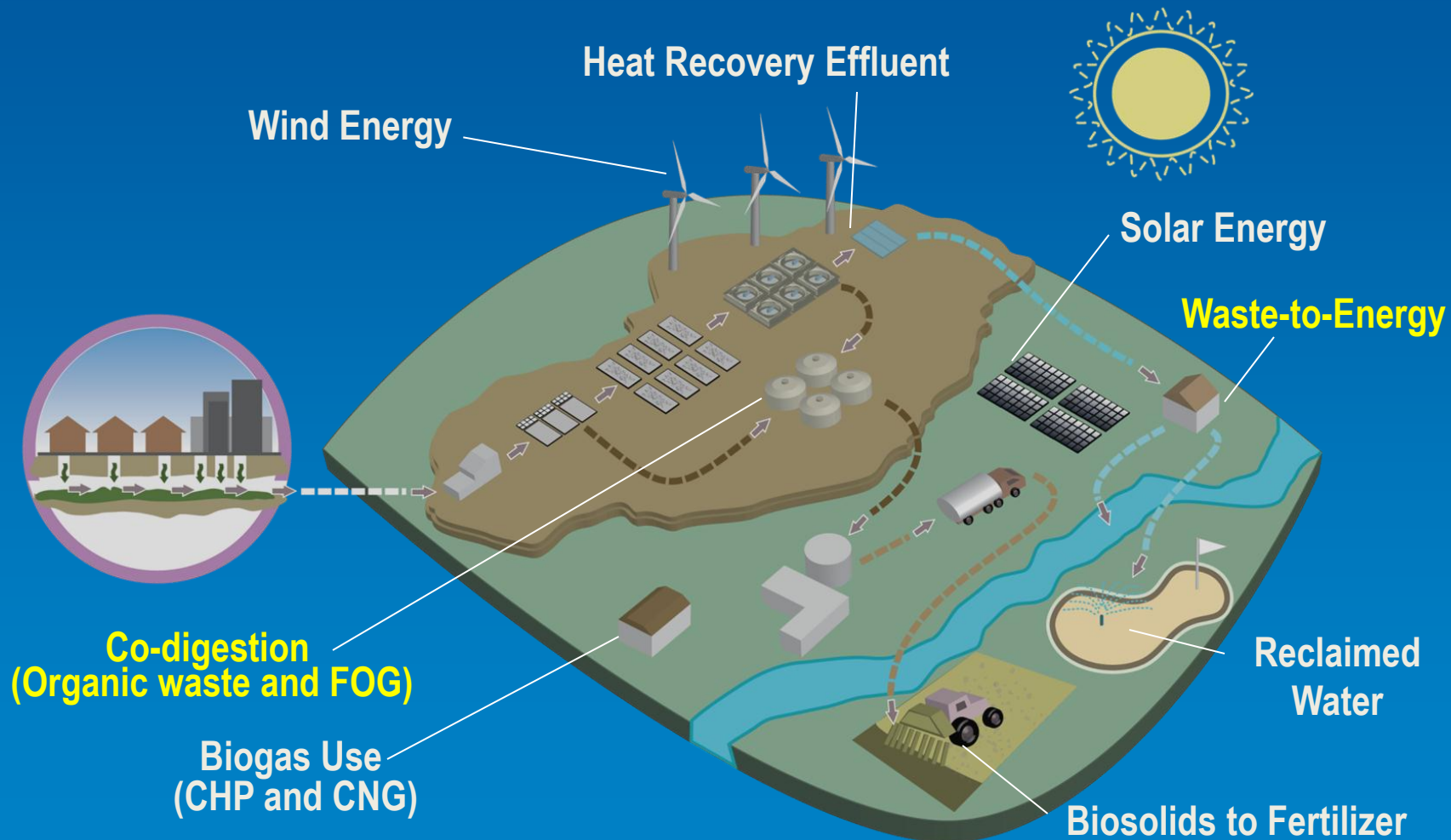
1. Includes RDF gasification, plasma gasification, and pyrolysis

2. RDF = Refuse-derived fuel

Future Eco-Campus



Candidate Renewable Energy Project Opportunities on Wastewater Treatment Sites



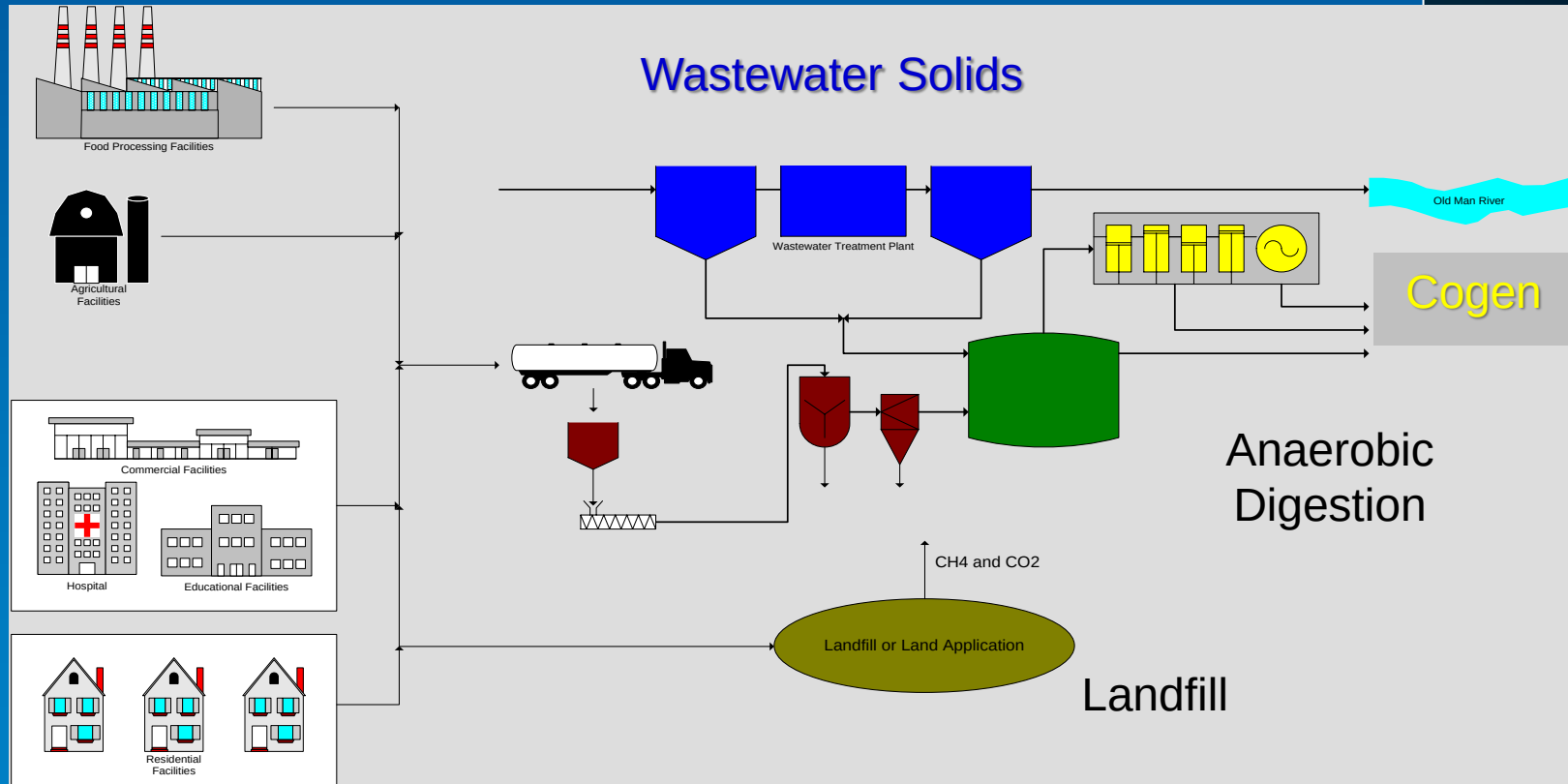
Co-digestion of Organic Waste with Wastewater Solids

Food Industry Waste

Animal Manure and Crop Wastes

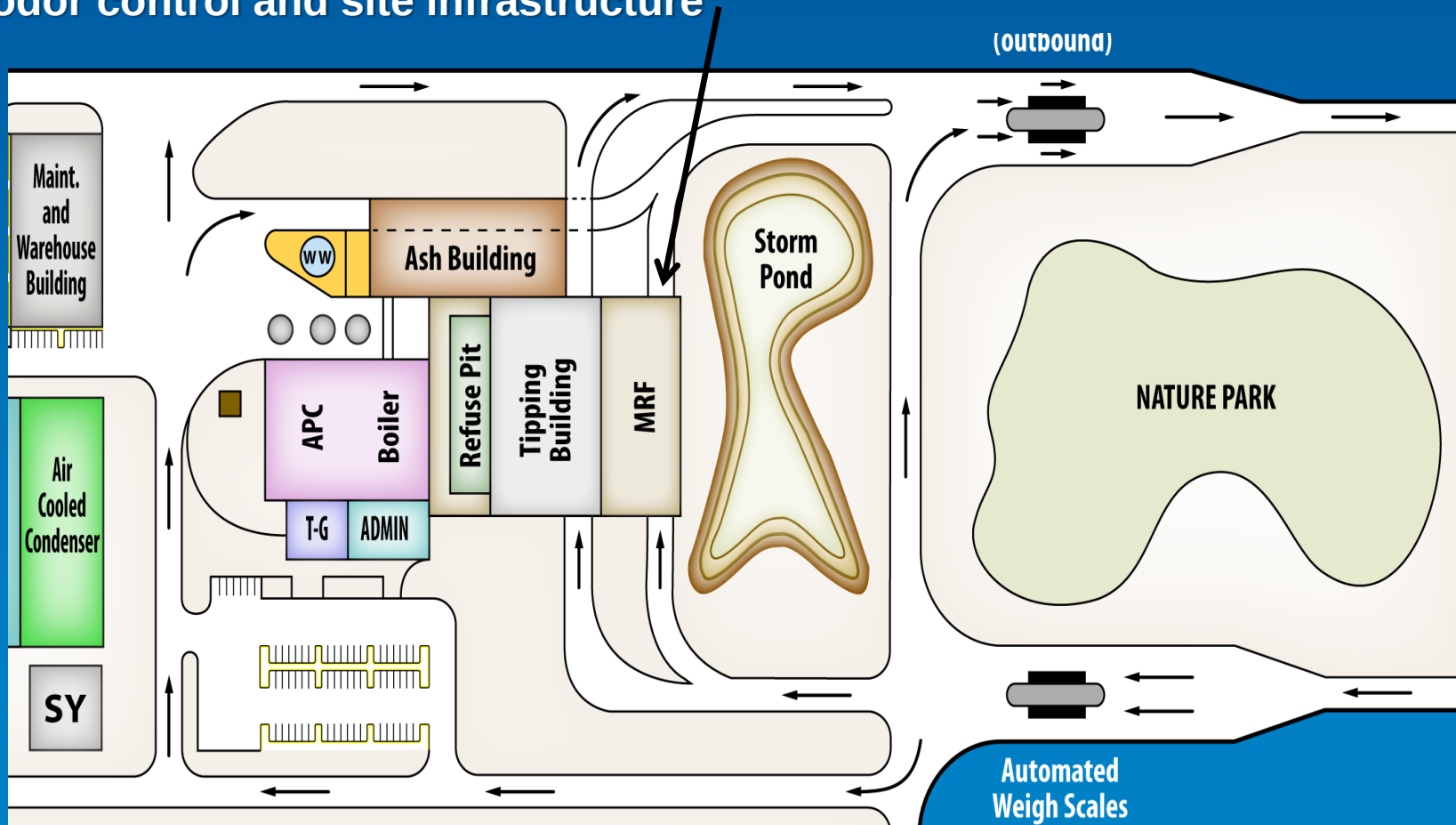
Institutional Organic Waste

Residential Organic Waste

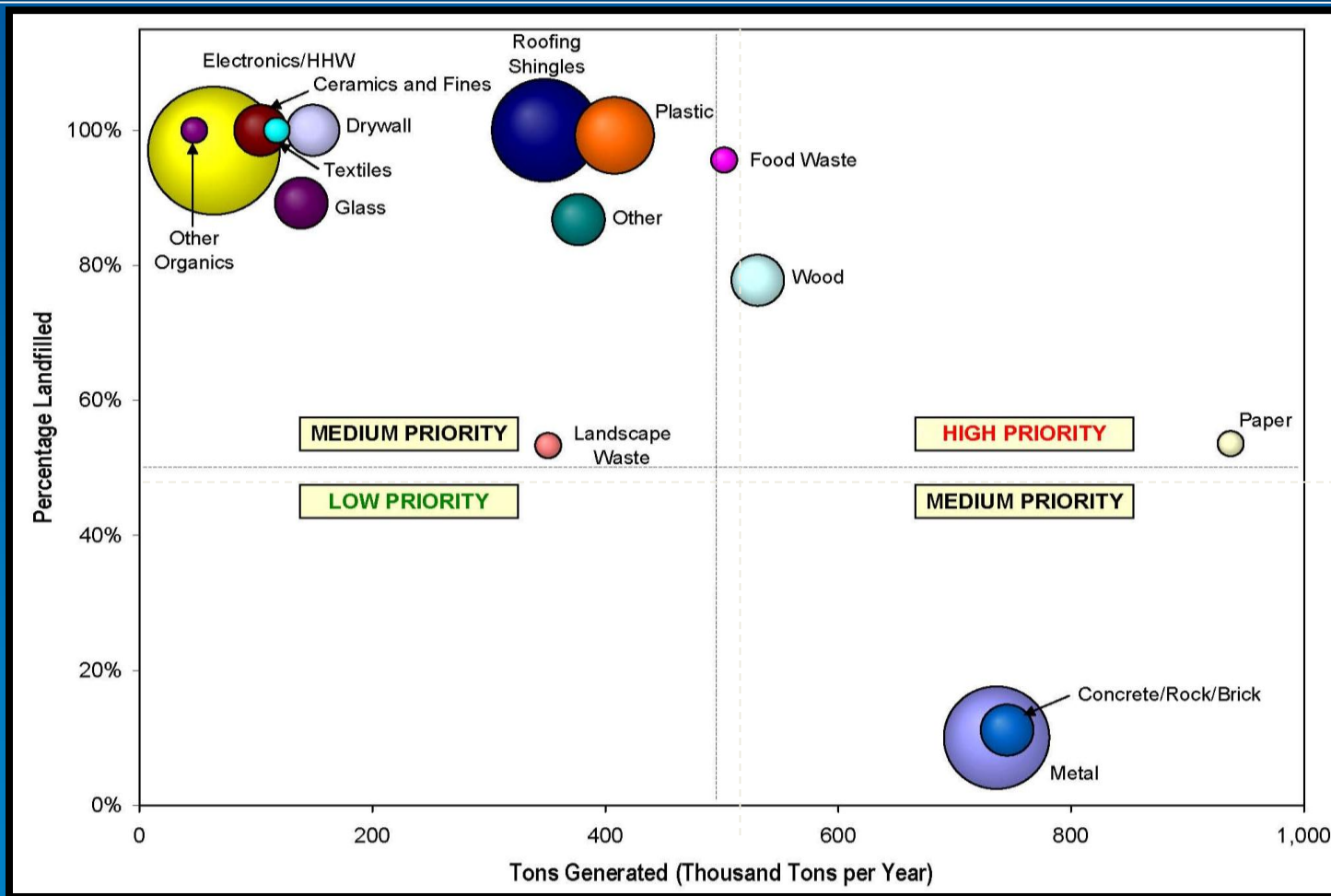


Future WTE Plants Can Include Addition of Material Recovery and Recycling Processes

MRF adjacent to tipping building to take advantage of odor control and site infrastructure



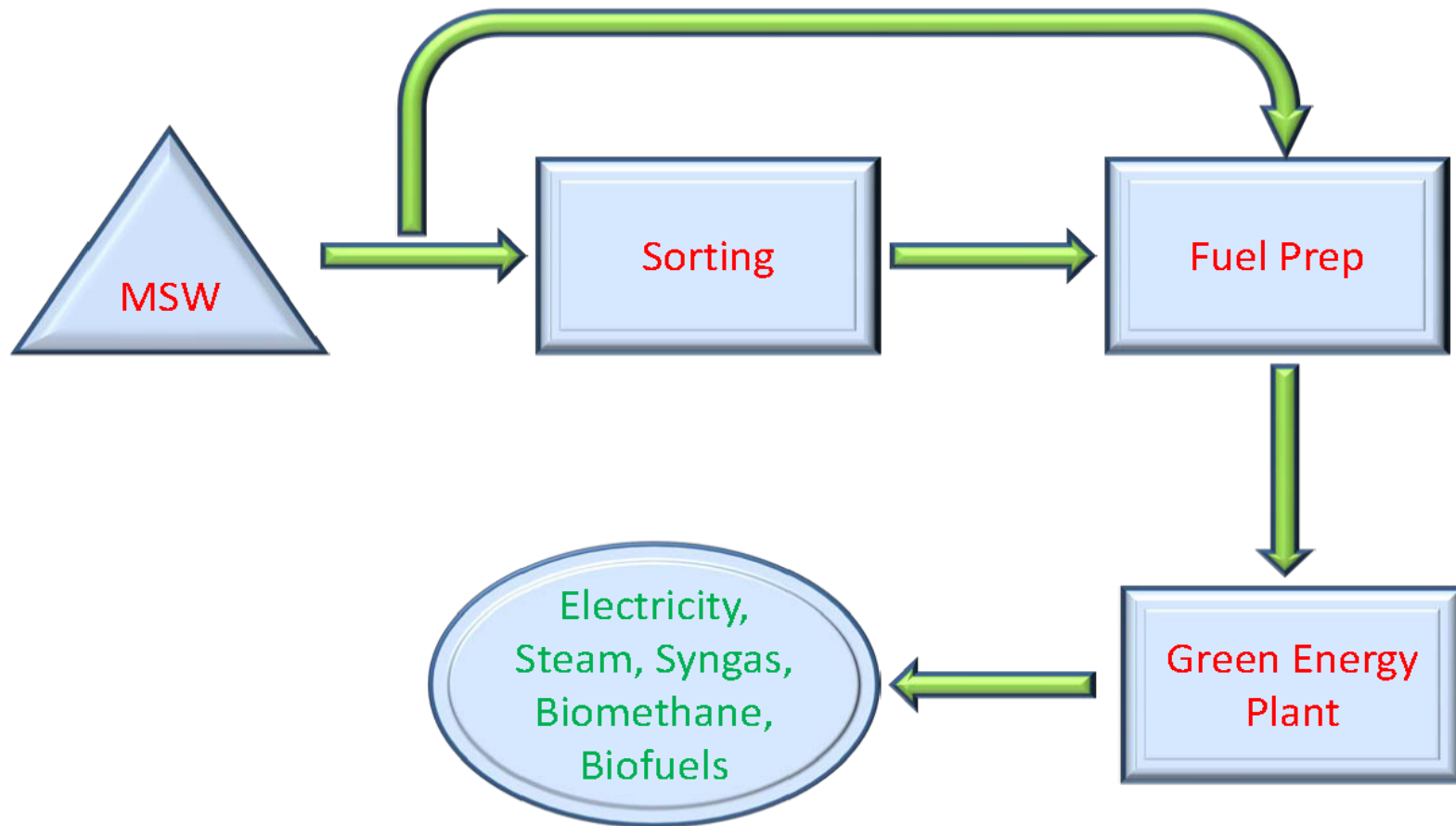
Chicago Zero Waste Study



Note: The size of the data point is relative to the corresponding material's toxicity and/or longevity in a landfill.

Future MRFs Need to be Flexible...

For Integration with Clean Energy Production



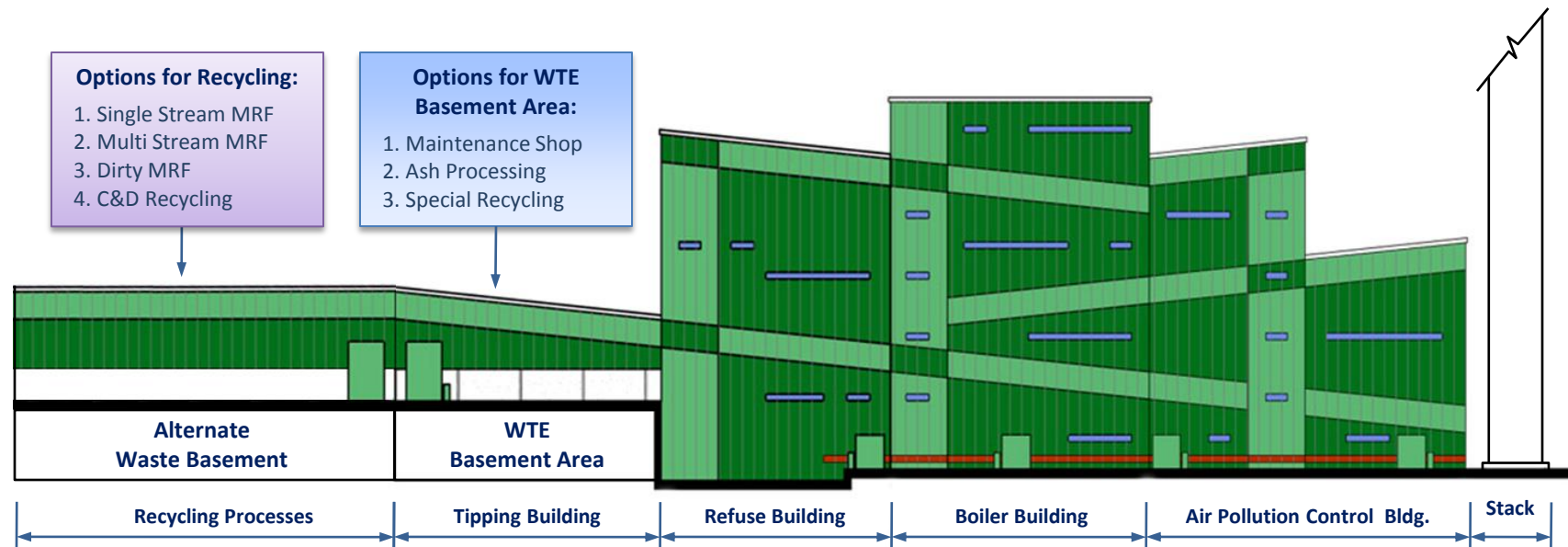
Future WTE Plants Can Include Addition of Material Recovery and Recycling Processes

Options for Recycling:

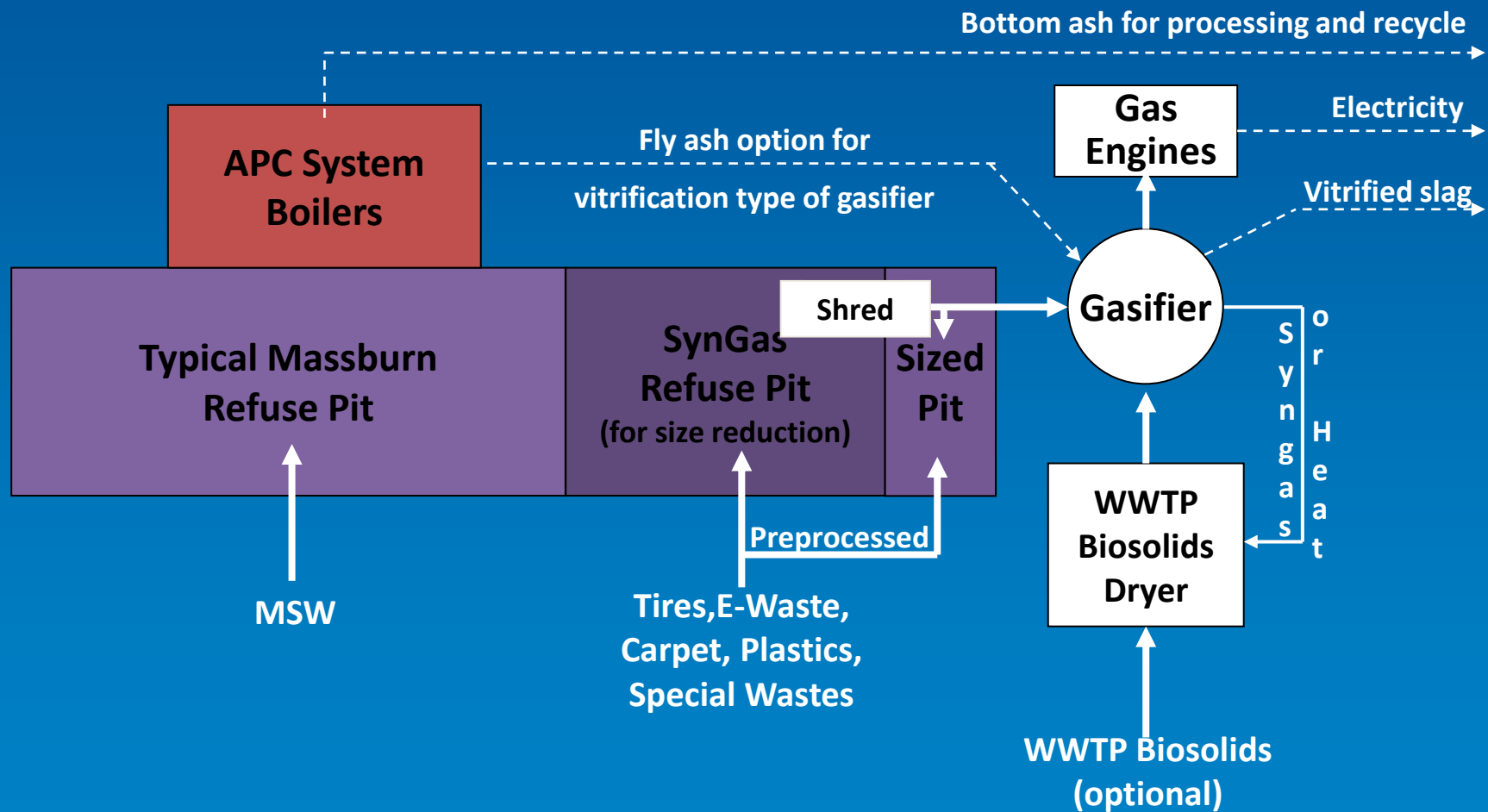
1. Single Stream MRF
2. Multi Stream MRF
3. Dirty MRF
4. C&D Recycling

Options for WTE Basement Area:

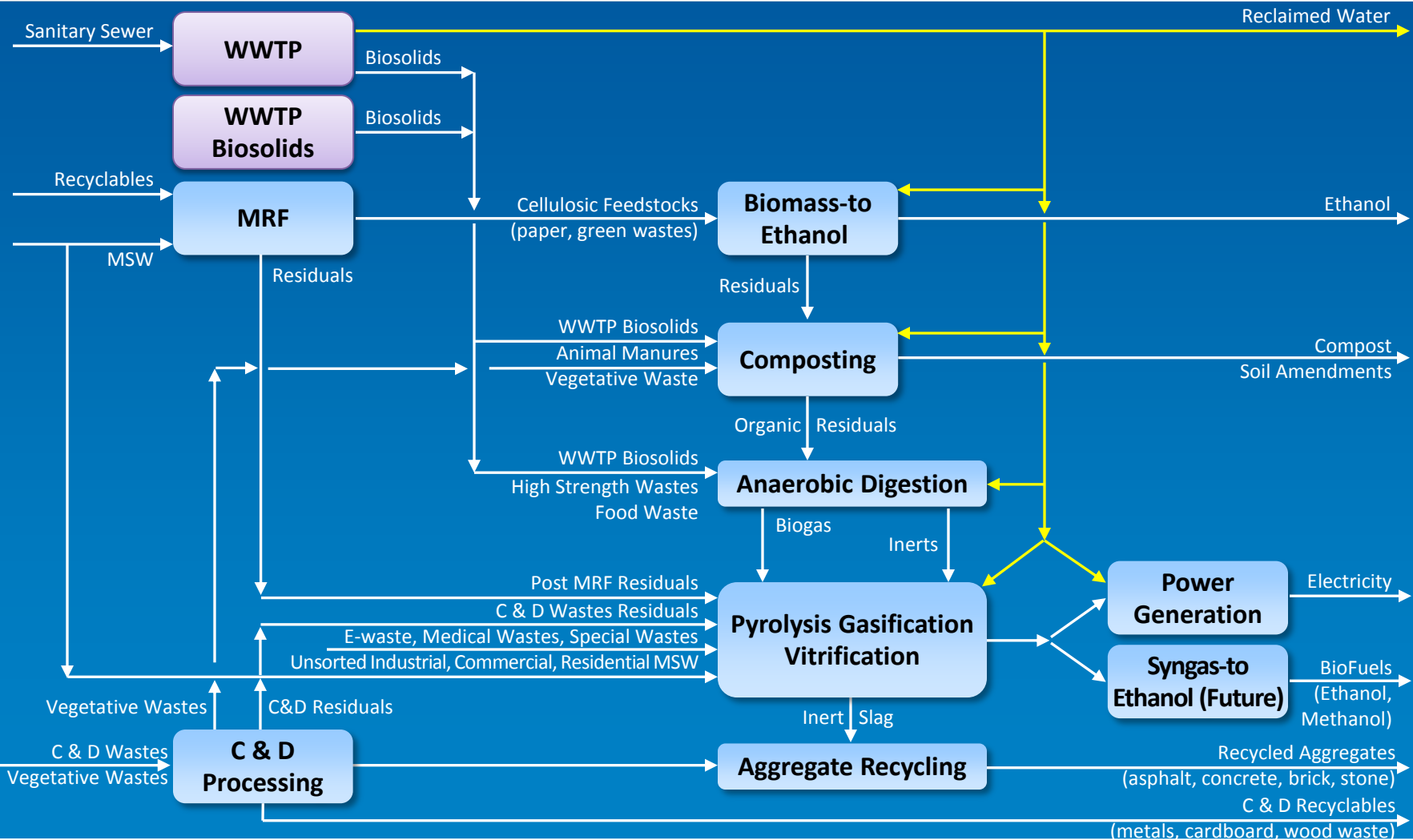
1. Maintenance Shop
2. Ash Processing
3. Special Recycling



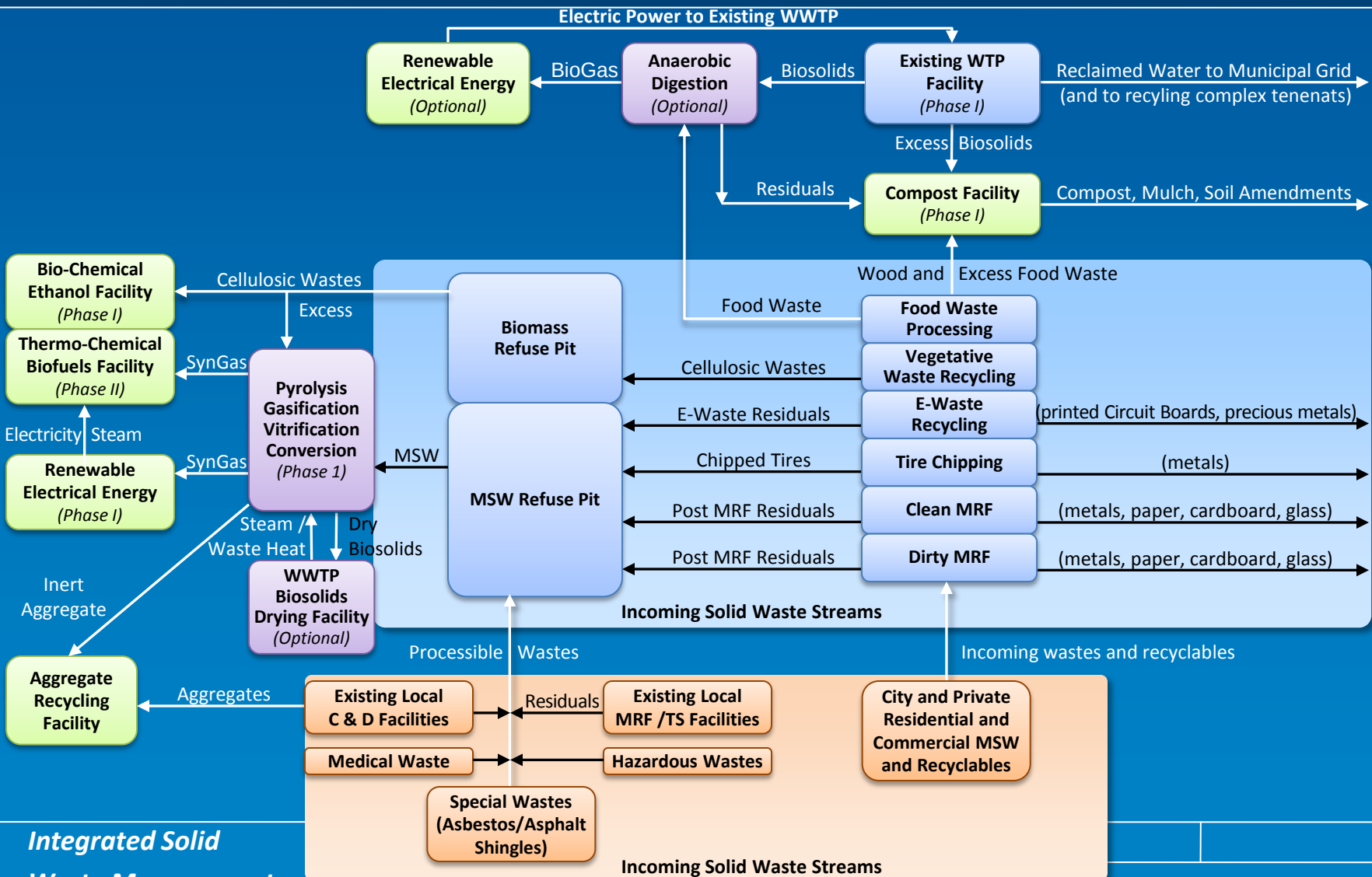
Future Gasification Process Addition to Massburn WTE Facility



Future Resource Management Campus with Gasification, Anaerobic Digestion & Biofuels



Future Resource Management Campus Developed in Phases



City of Tampa WTE Facility

1,000 TPD – 22.5 MW

- Original construction: 1975
- Rebuilt as EfW: 1985
- Retrofit for CAAA: 1998-2001



Portions of this facility are 35 years old and on their third life!

City of Tampa Public Works Campus



Public Works Recycling



**Recycled Asphalt Pavement (RAP) millings stockpiled for future crushing/
screening...for internal use or sale**

City of Tampa Public Works Recycling



Recycled Asphalt Pavement (RAP) millings sized at <1/2 inch and stockpiled for Public Works projects

City of Tampa Public Works Recycling Waste Not...Want Not!



**Toilet bowls and household ceramics stockpiled at City of Tampa
Public Works yard for later crushing and sizing to <1/2 inch**

Hillsborough County Resource Recovery Facility

1,800 TPD – 46 MW

Original 1,200-TPD construction: 1987
600-TPD expansion completed: 2009



Compatible with the urban landscape

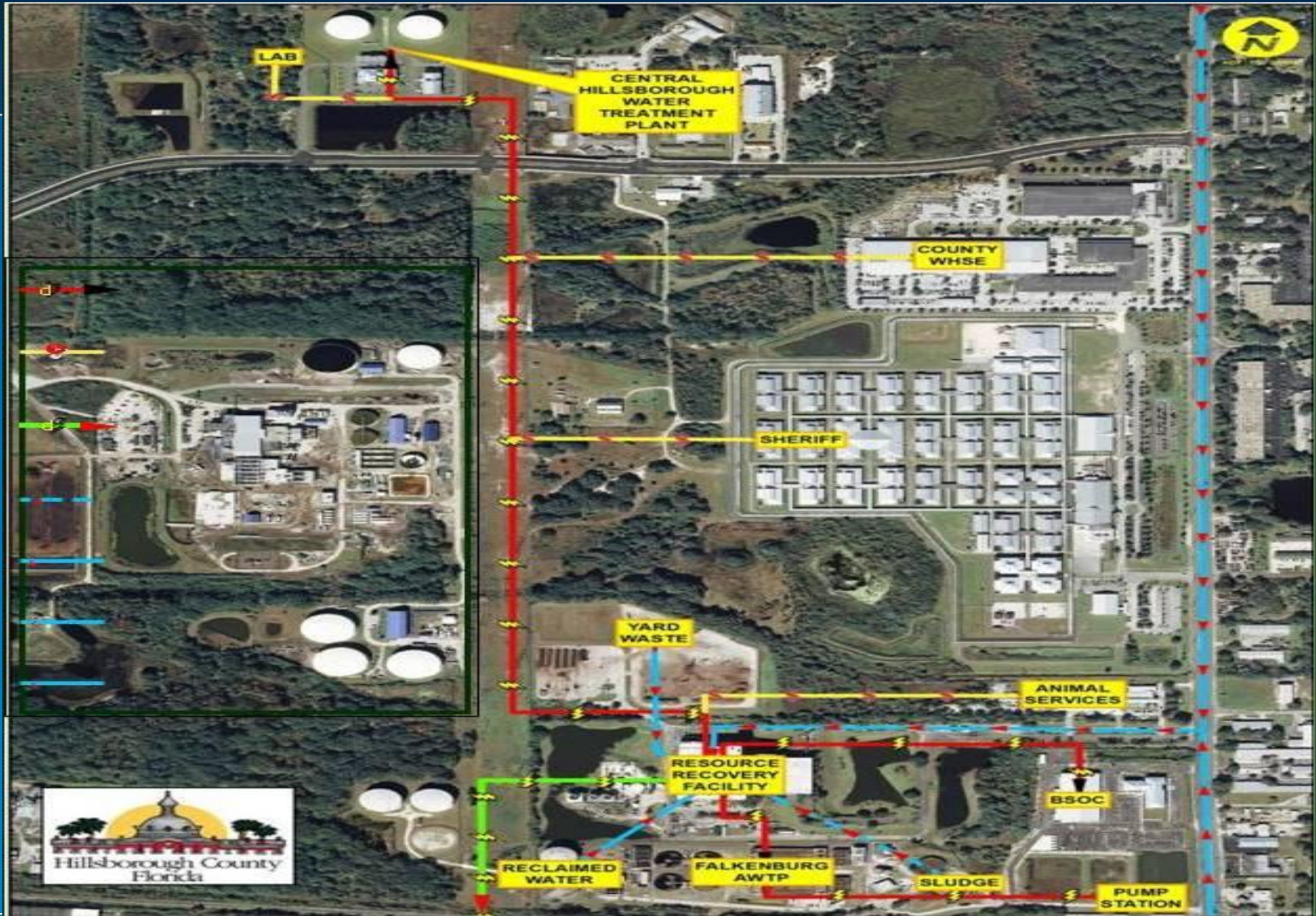
Commercial/industrial development has occurred around facility over 25 years!

Hillsborough County Resource Recovery Facility

1,800 TPD – 46 MW (Located Adjacent to WWTP)



Hillsborough County Public Works Campus



Pasco County Resource Recovery Facility

1,050 TPD – 30-MW Electrical



- Construction: 1989-1991
- \$90M capital cost

Pasco County Florida

Integrated Solid Waste Management Campus



Pasco County - Solid Waste Campus



Machine for “Halving” Tires on the Rims Supplemental Fuel for Pasco County RRF



Chipped Tires for Pasco WTE Facility



Lee County Resource Recovery Facility

1,800 TPD – 58-MW Electrical



- Original construction: 1994
- 636-TPD expansion completed: 2006

Lee County Florida ISWM Campus



Palm Beach County Florida Integrated Solid Waste Management Campus



Palm Beach County, Florida (2012)

New 3,000-TPD Massburn WTE Rendering *Incorporating Both Sustainability and Aesthetics*



Palm Beach County, Florida Regional Biosolids Processing Facility

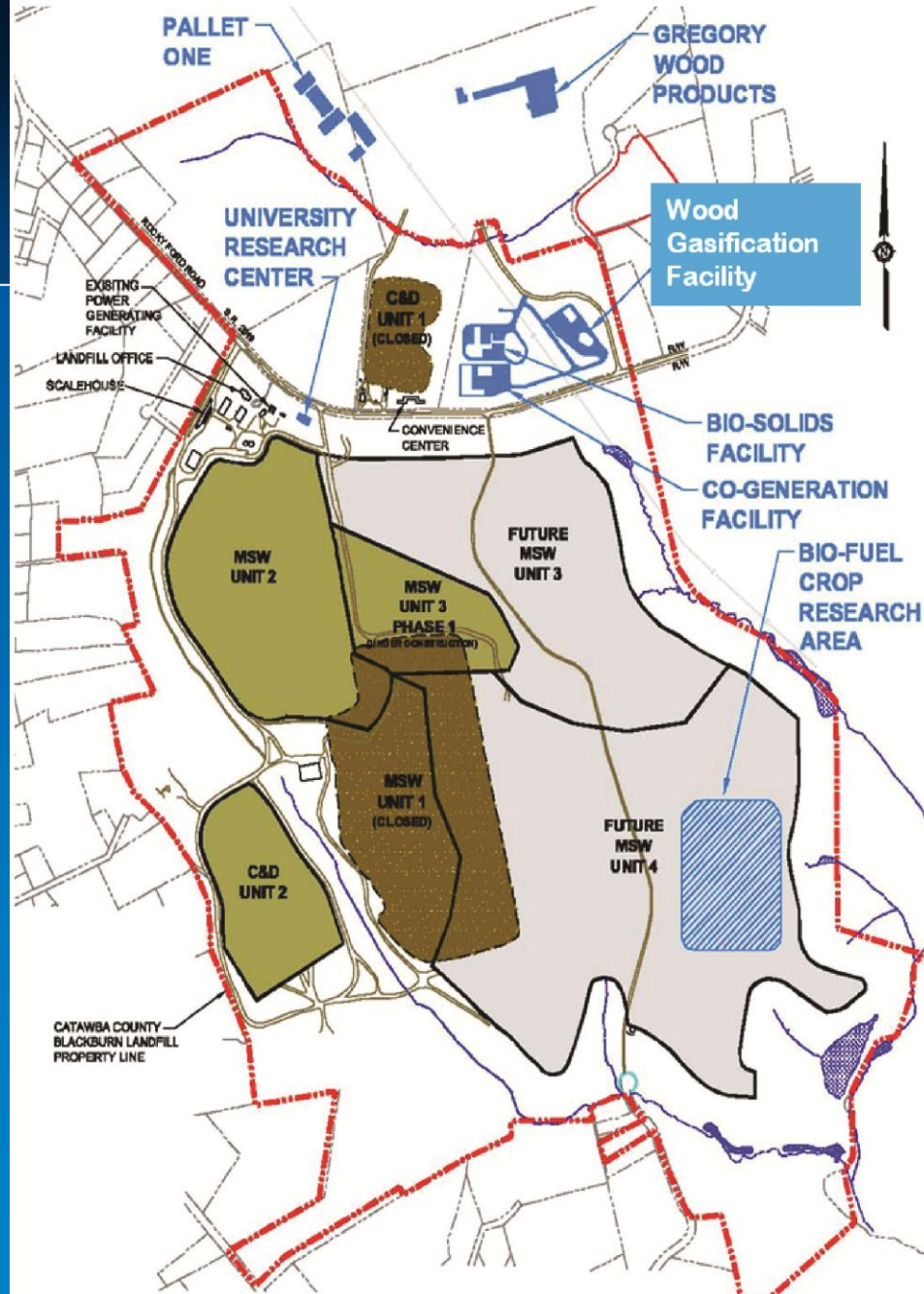


Hennepin County WTE Welcomes Minnesota Twins into the Neighborhood!



Catawba County NC EcoCampus Site Layout

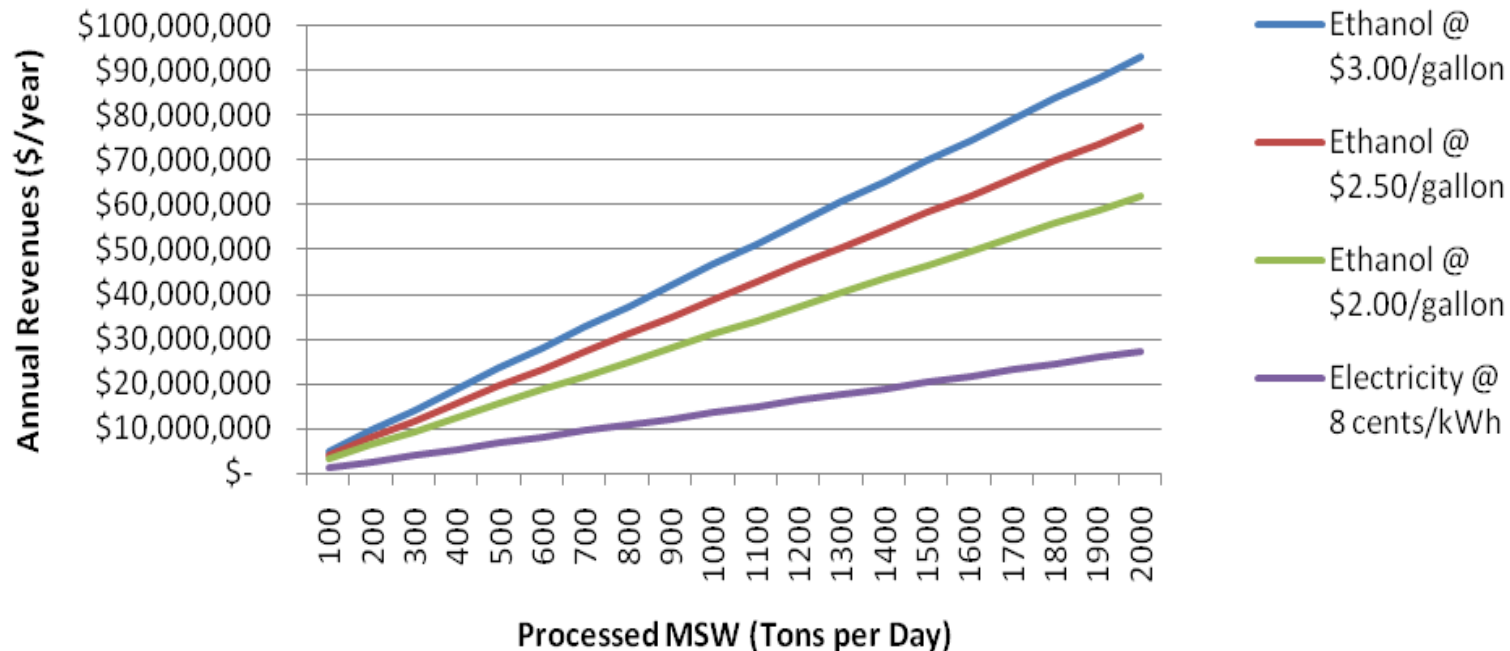
- Lumber & Pallet Partners
- Wood Gasification
- Research Center
- Biosolids Processing Facility
- Digesters for Sludge, Animal and Food Waste for Energy
- Biofuel Research- Algae and Fuel Crops
- Total Project Cost- \$20.7 Million



Enhanced Revenues of Ethanol from MSW ...Only Time Will Tell!

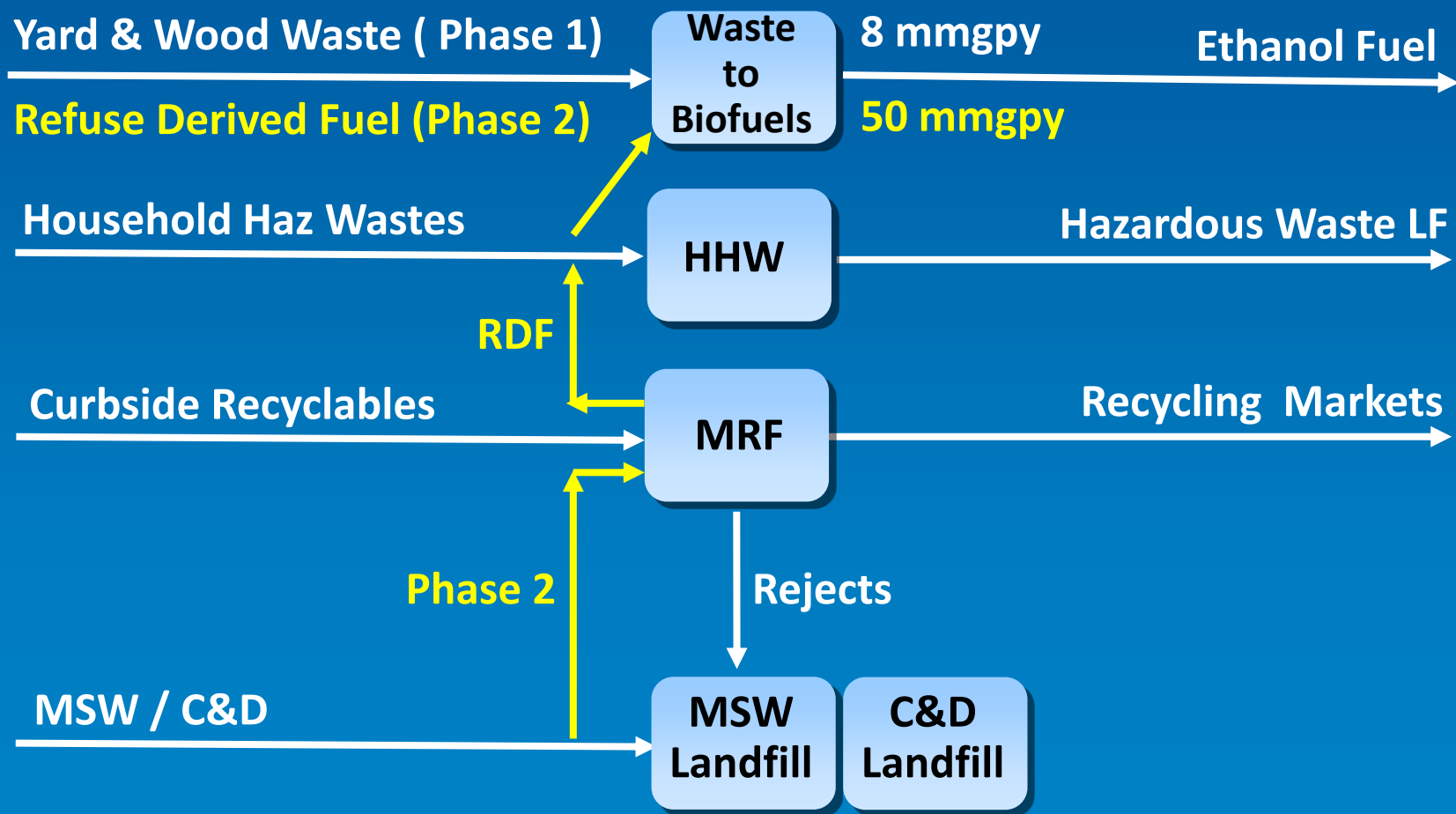
Potentially 2-3 times the revenue stream of electricity

**Potential Revenues from MSW
Electricity versus Ethanol**



Indian River County, Florida

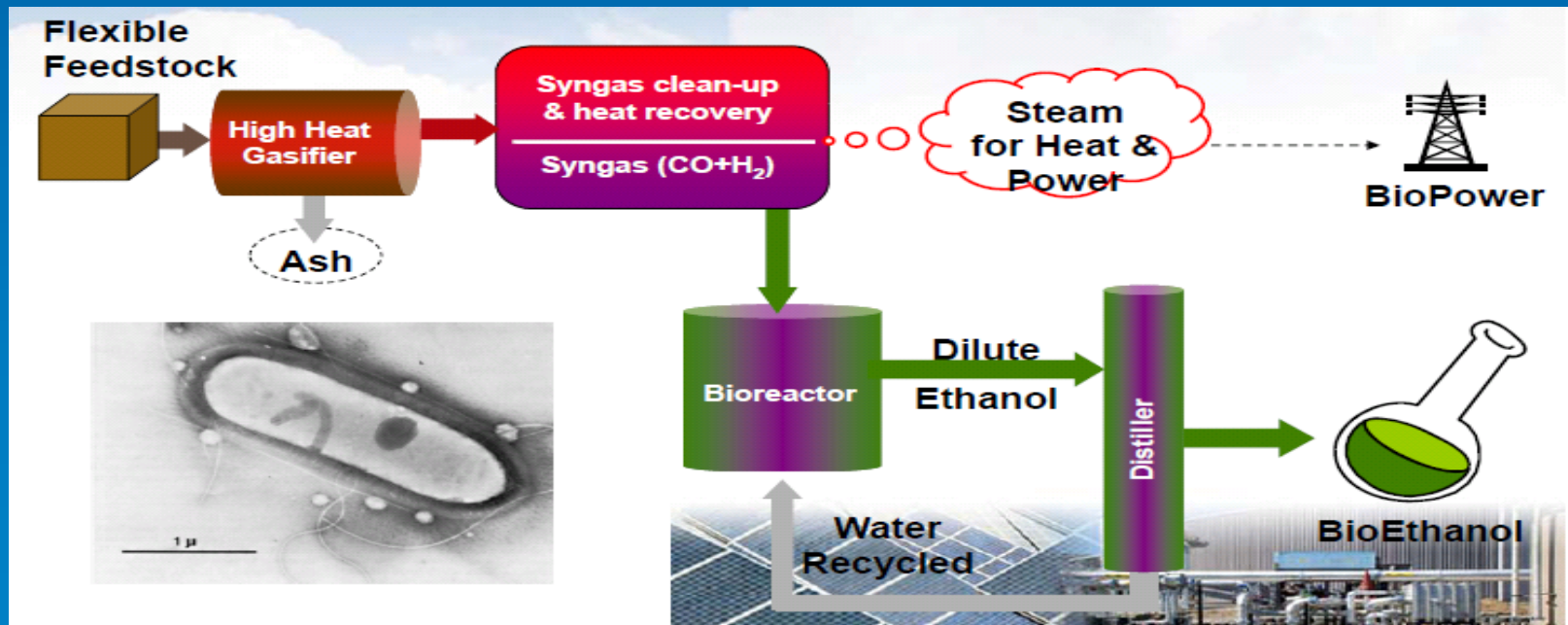
Integrated Solid Waste Management Campus



Indian River County, Florida

First US Commercial Scale Waste Biofuel Project

- CDM Smith supporting role
 - DOE grant application: \$50M awarded in 2009
 - Prepared NEPA compliance/environmental permit applications
 - Civil site/facility infrastructure design
- Anticipated startup 3Q 2012 with full production by 4Q 2012



Water – Energy Nexus

Water and Energy are Inextricably Linked!

- Water scarcity is the new paradigm for the 21st century!
- Lower quality water supply sources require higher levels of treatment
- **Higher levels of treatment require greater inputs of energy**
 - Pumping from greater depths / distances
 - Membrane processes require energy for pressure
 - Advanced disinfection treatments are often electrically derived (ultraviolet light, ozone)
- **Mutual benefits can be shared between solid waste and water resource departments!**

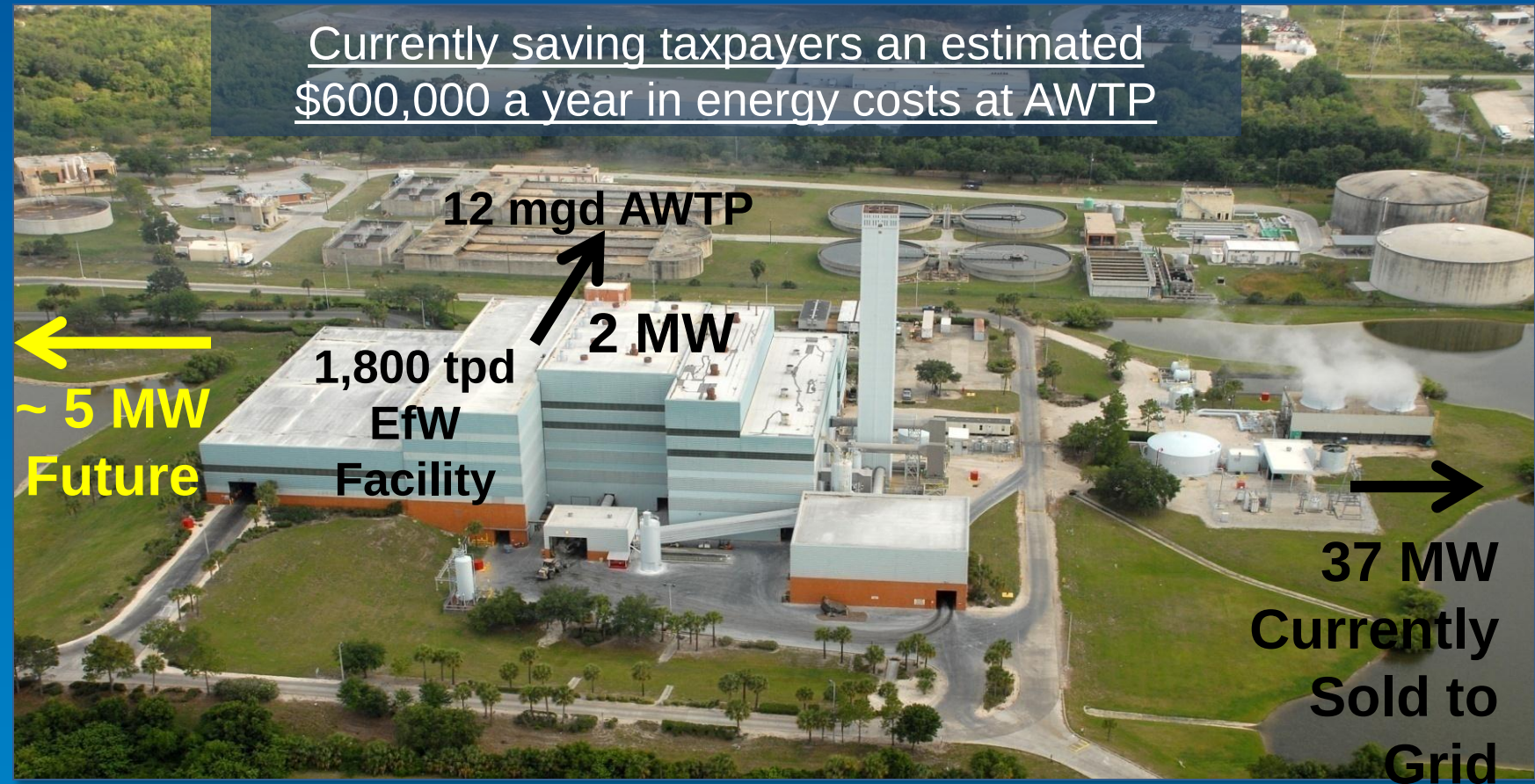
WTE and WWTP Facilities Make Good Neighbors



Hillsborough County, Florida

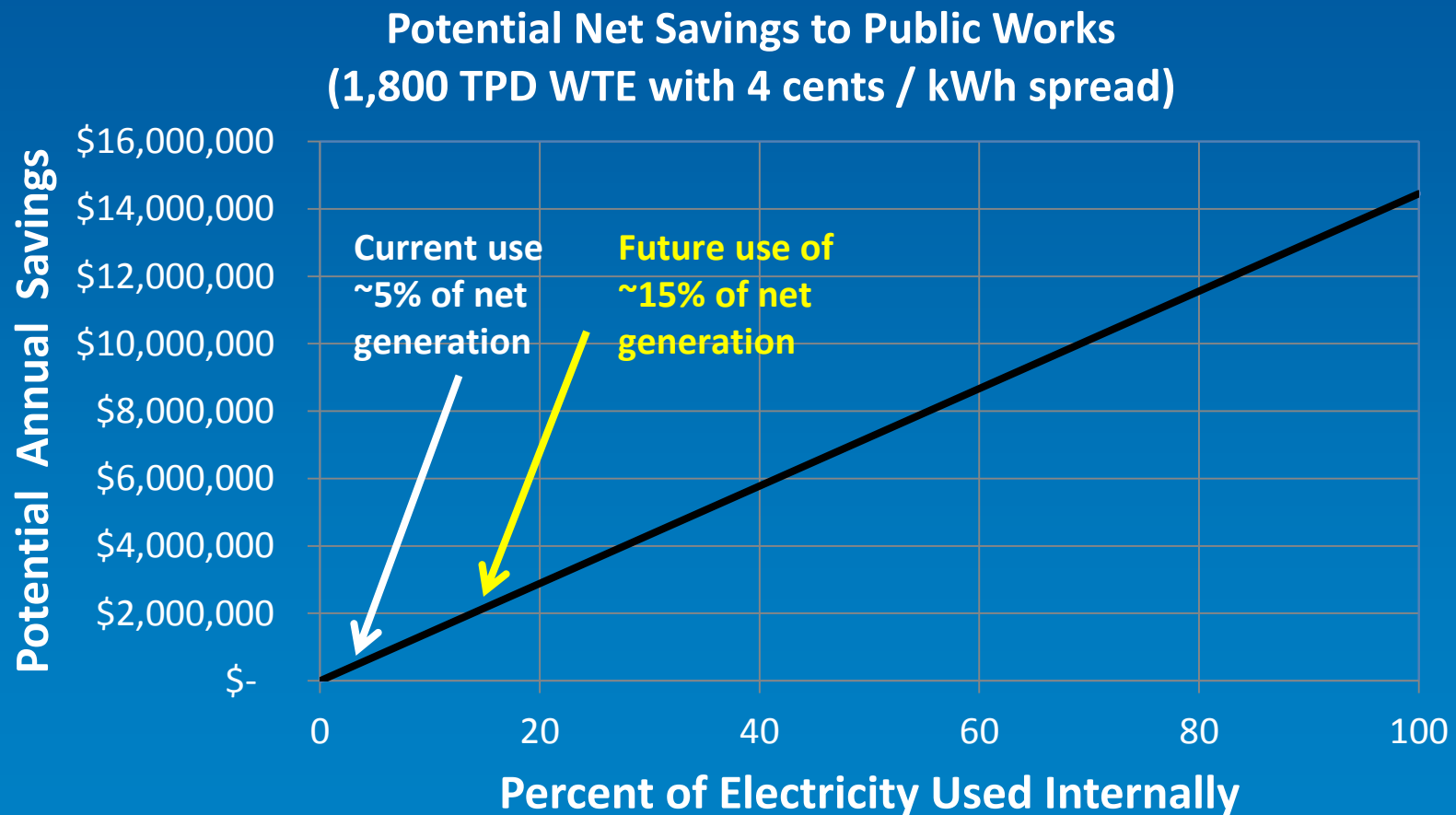
Case Study – WTE and WWTP Synergy

Currently saving taxpayers an estimated \$600,000 a year in energy costs at AWTP

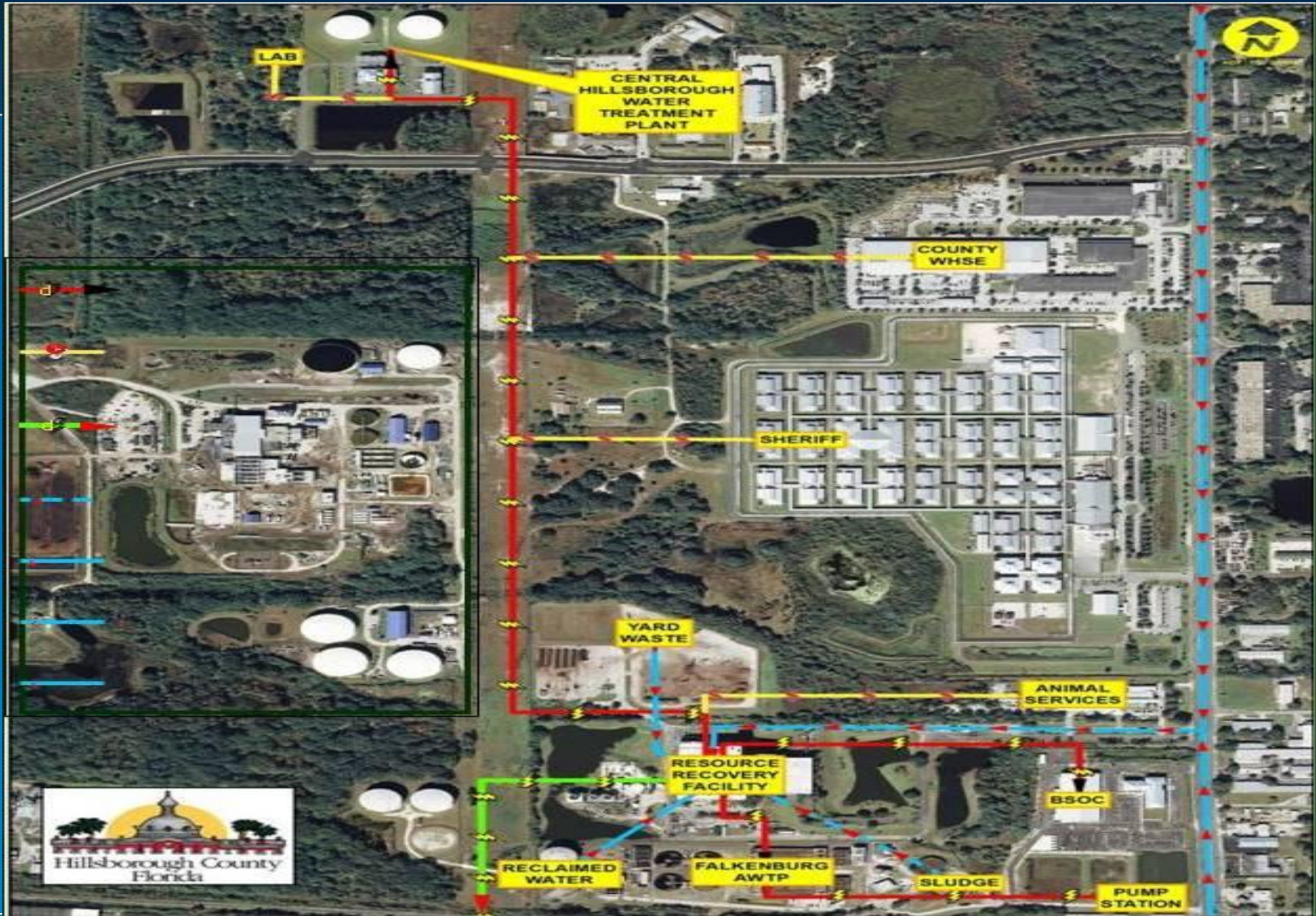


Adjacent AWWTP powered by energy from EfW (Aug 08), with an additional 5 MW soon to be used for other public works and buildings

Significant Potential Savings to Public Works by Using Electricity from WTE Facility Internally

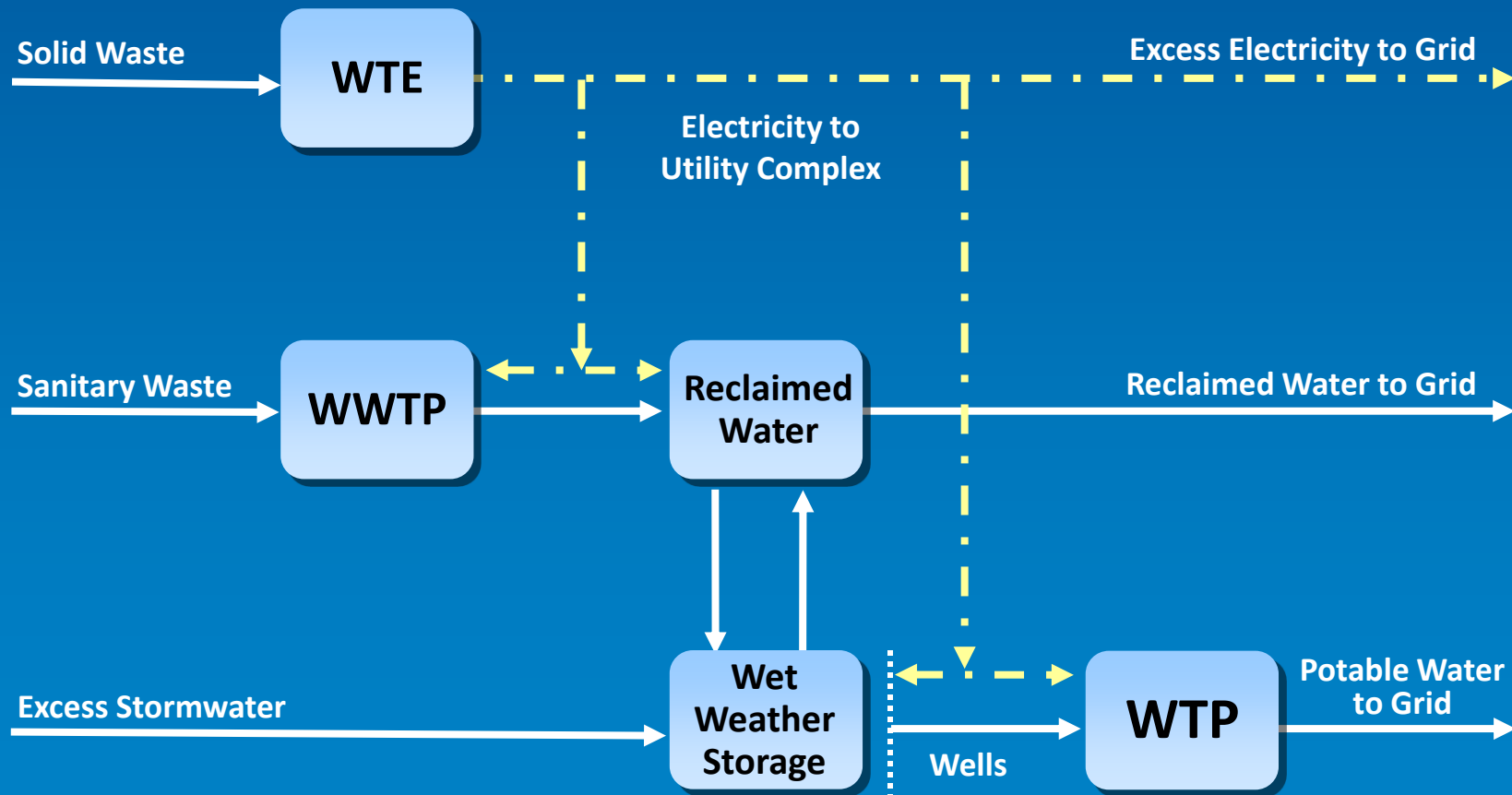


Public Works Campus to be Powered by WTE

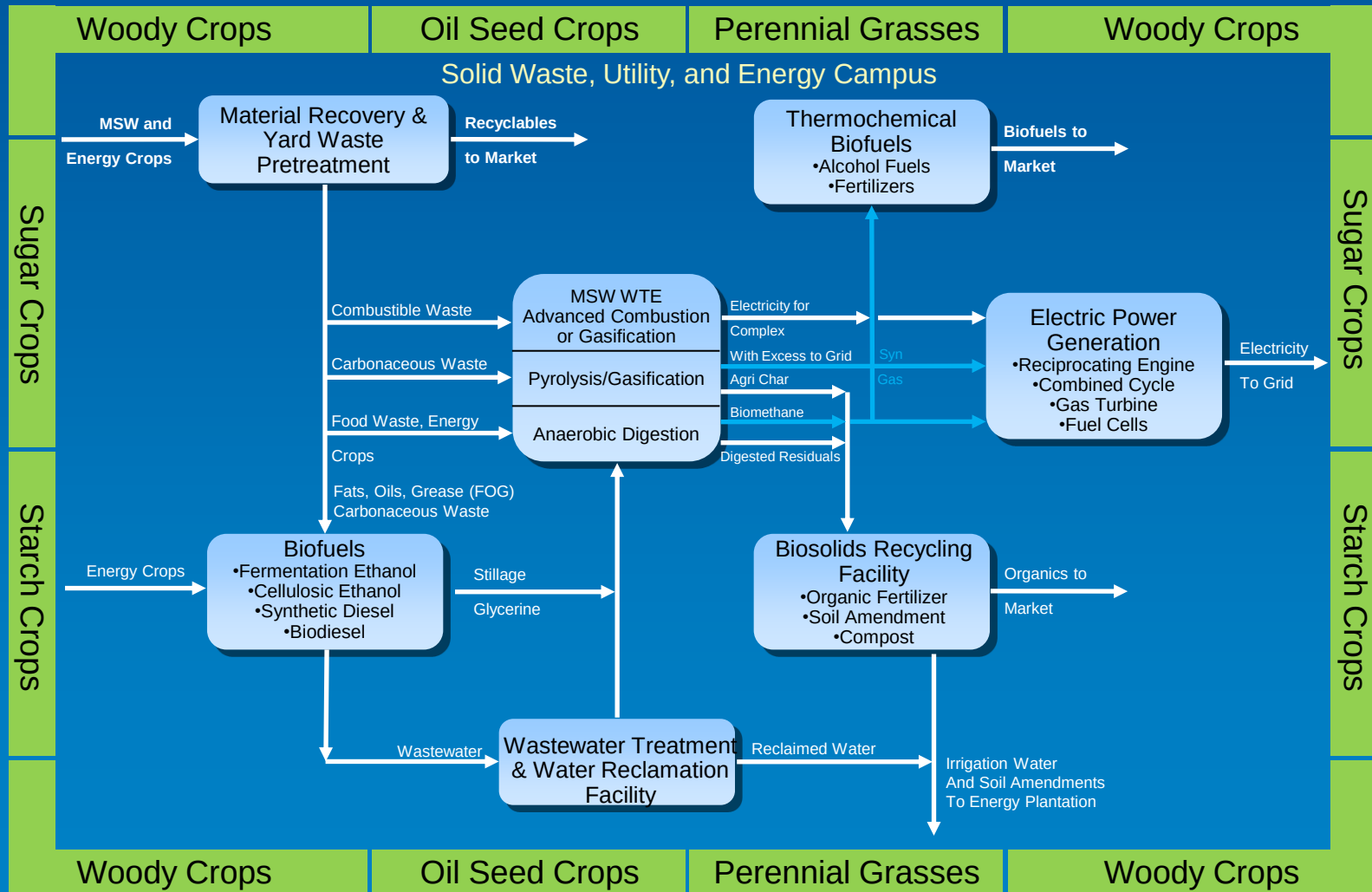


Municipal Utility Campus Synergies

Integration of waste-to-energy with water and wastewater treatment plants



Sustainable Energy Complex Processing Municipal Wastes and Energy Crops from Adjacent Energy Plantation



Ze Future...



- Integration of MRFs with WTE / EfW facilities
- Evolution of combustion into gasification
- Internal use of renewable electricity for powering of water treatment processes
- Integration with public works
 - Recycling of ash with other recycled aggregates (crushed concrete, RAP, ceramics, brick, stone, etc.)
- Biorefinery projects, waste-to-biofuels, including addition of local energy crops
- The paradigm of the 21st century...waste management industry evolves into **“Resource Management”**

Thank You for the Opportunity to Share ...and Imagineer!

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