

DOCKETED

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Project Title:	2019-2020 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program
TN #:	225842
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Vadxx Plastic to Ecofuel (Open) Feb 2018

Additional submitted attachment is included below.



CLEVELAND, OH

VALUE PROPOSITION



Proprietary recycling technologies that convert plastic waste into high-value EcoFuel™ & petrochemicals

VALUE PROPOSITION IN ACTION



AKRON, OH

CAPITAL RAISED TO DATE

VADXX Raised To Date

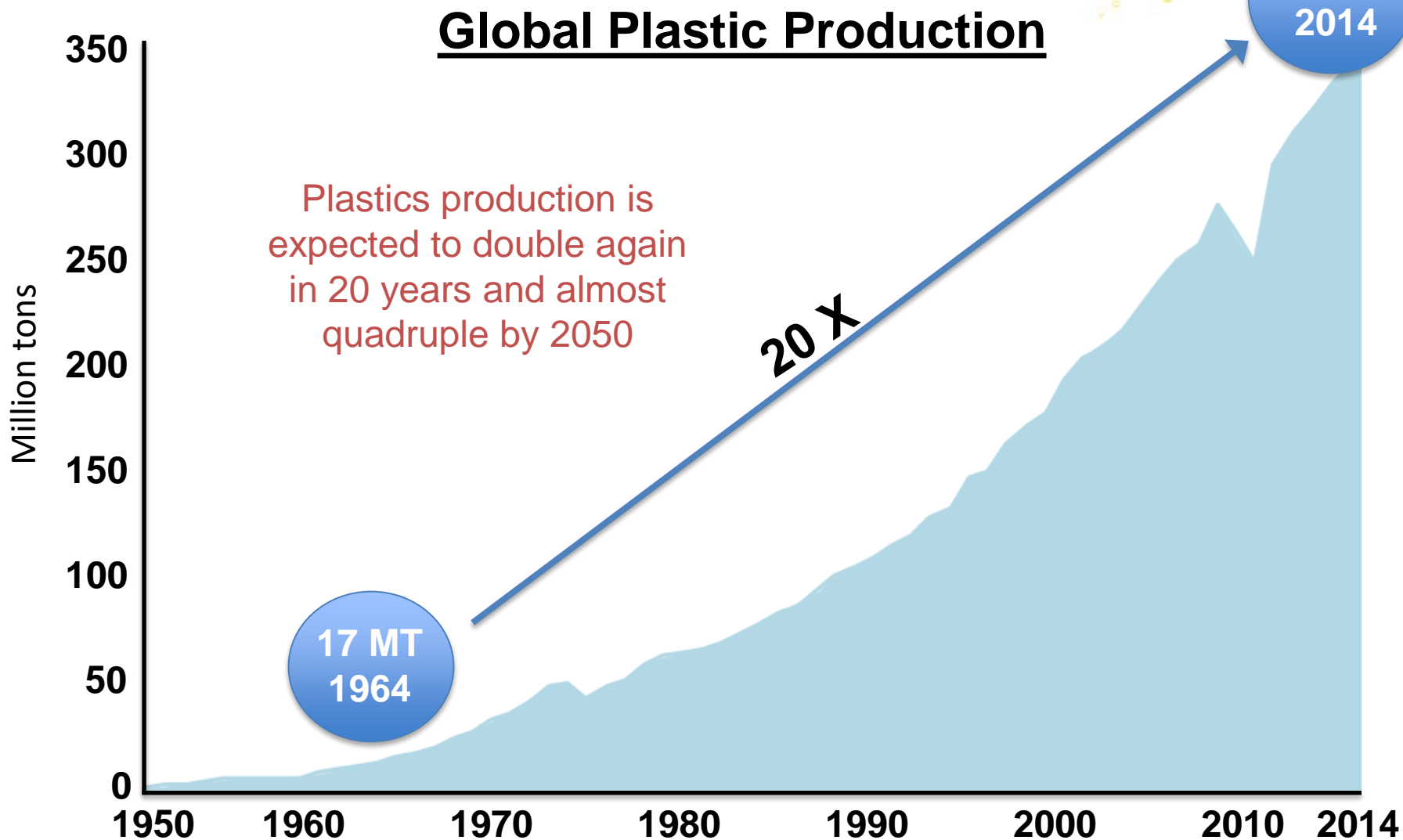
**Unit #1 Akron, OH
(Liberation Capital)**

**VADXX + Unit #1 to develop
and commercialize the
technology**

\$40 mil

Note: Future Developer Units are project financed with no dilution to VADXX.

WASTE PLASTIC SIZE & GROWTH

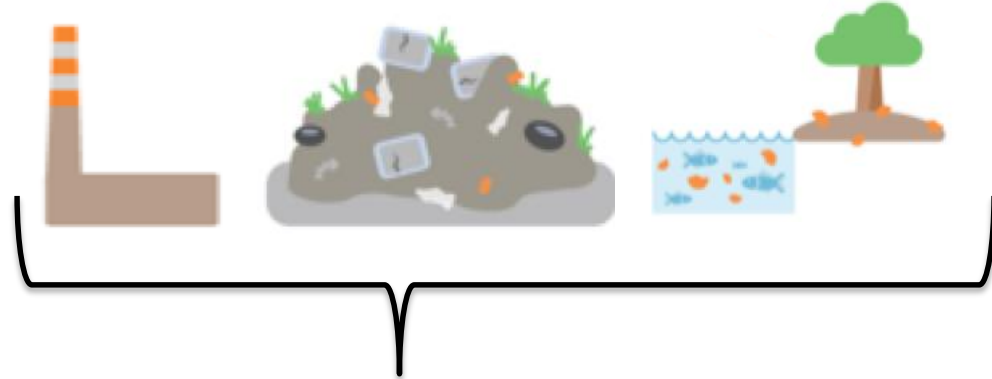
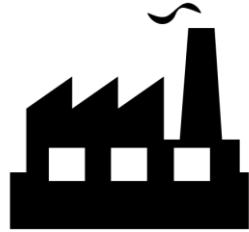


NOTE: Production from virgin petroleum-based feedstocks only

SOURCE: PlasticsEurope, Plastics – the facts 2013 (2013); PlasticsEurope, Plastics – the Facts 2015 (2015)

PROBLEM: LINEAR PLASTIC ECONOMY

TAKE → MAKE → DISPOSE

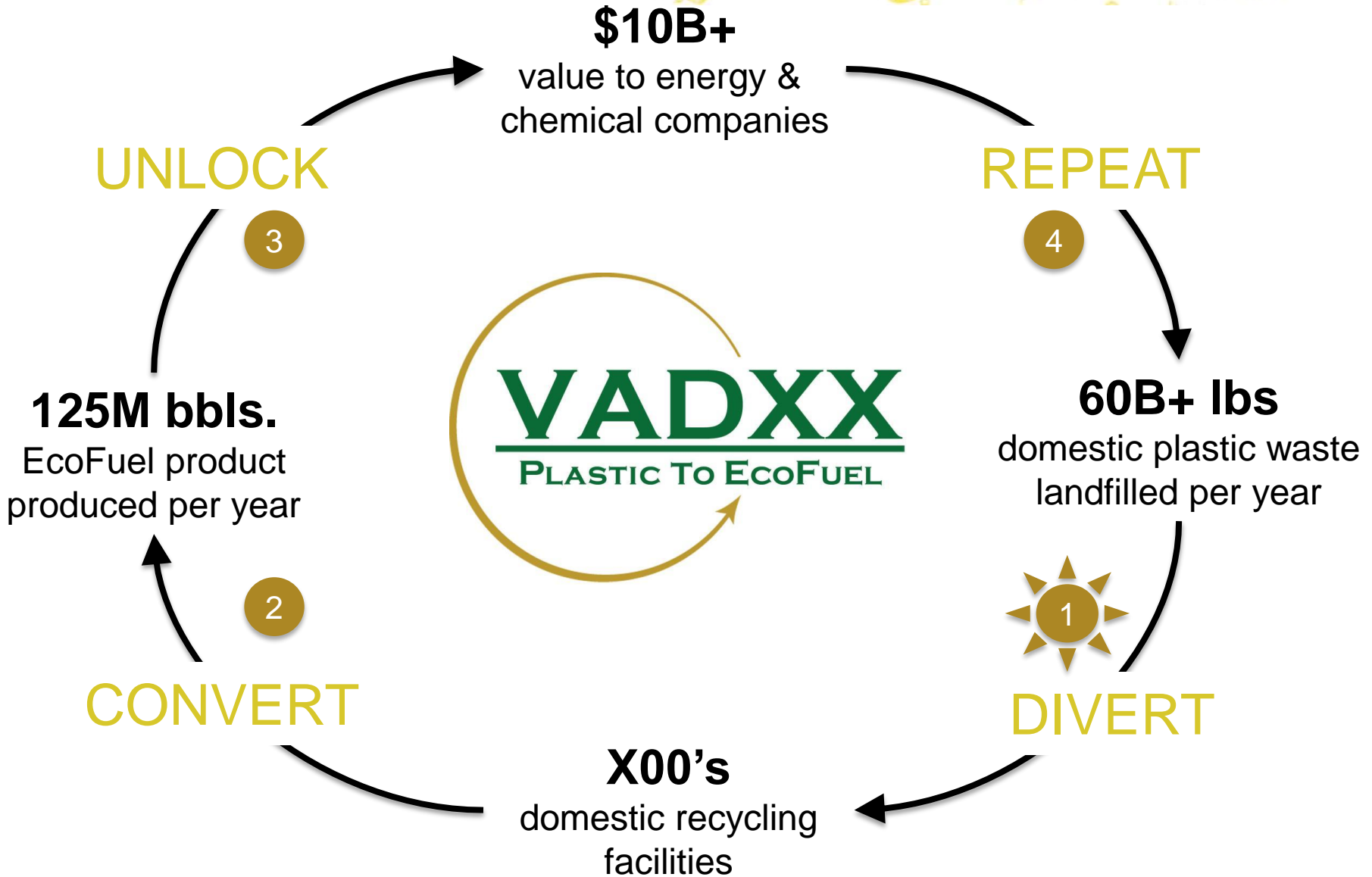


CURRENT PROBLEM

- No economic incentives or mandates in US to recycle plastic
- Little to no economic benefit to recycle most plastic
- **10% plastic recycle rates (90% landfilled / leakage / incinerated)**

Without significant action, there may be more plastic than fish in the ocean, by weight, by 2050.

SOLUTION: CIRCULAR PLASTIC ECONOMY



VADXX BUSINESS MODEL

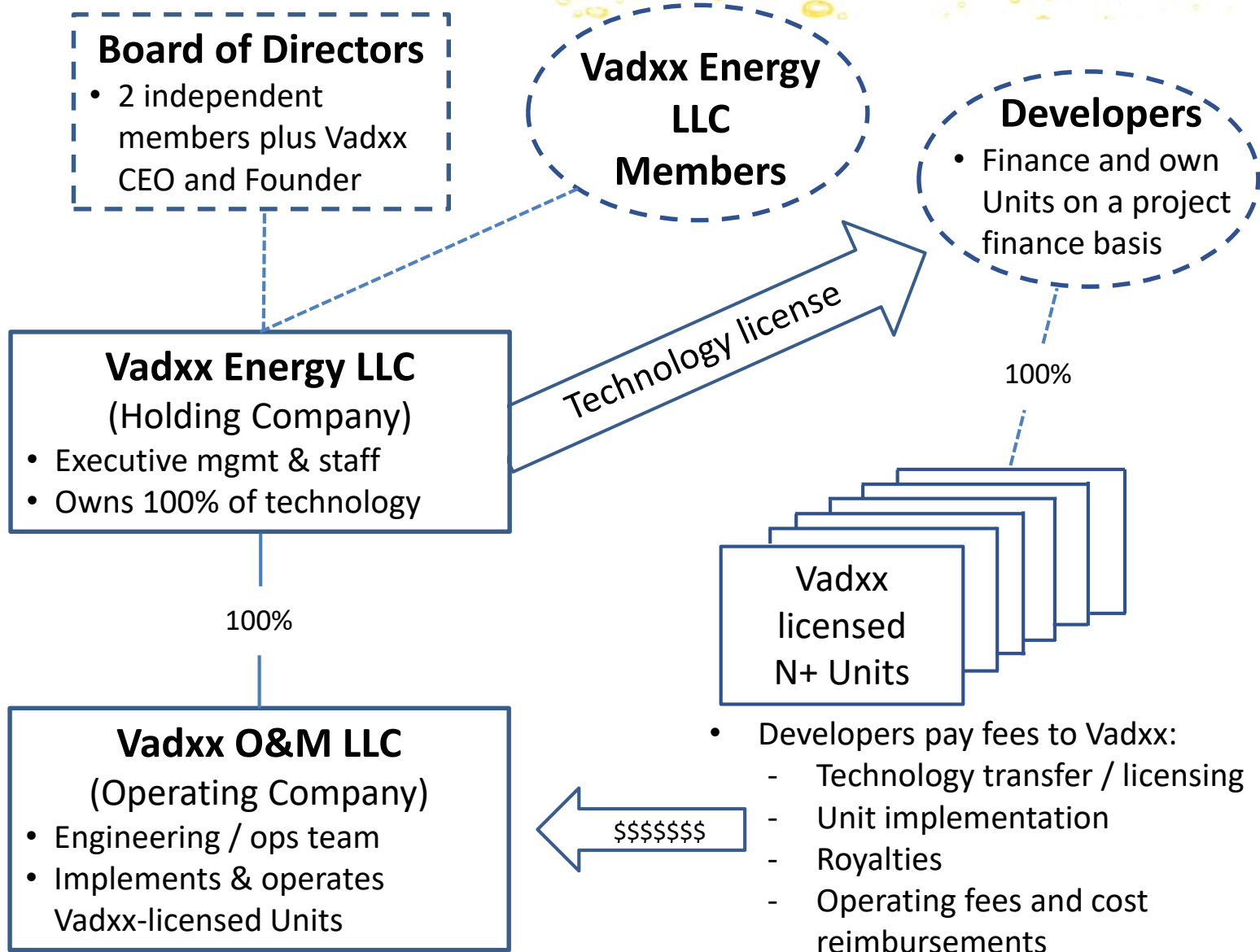
VADXX makes money by licensing its technology to Developers who will finance, build and own recycling facilities (Units) on a global basis who pay VADXX an up-front technology transfer fee (TTF) and a recurring revenue-based royalty fee (RRF).

Units are expected to be highly profitable at \$50/bbl oil price. Unit profitability and Developer financial returns will increase with higher oil prices. Developers make money by selling various transportation fuels (diesels, gasoline, jet fuel, etc.) and other high value-added petroleum products (solvents, naphtha, slack wax, etc.).

VADXX is not likely to invest in Units of its own so that the business model is highly scalable, profitable and capital efficient. VADXX will work closely with the Developers and their approved contractors for feedstock procurement and the engineering, construction and operations of Units.

Developers include waste management, chemical, plastics, oil & gas and other companies, as well as private equity firms and other financial institutions.

VADXX BUSINESS STRUCTURE



MANAGEMENT TEAM



Jim Garrett

CEO

- 30 years of various operations / financial / engineering, executive and officer experience
- Marathon Oil, Consolidated Natural Gas, AGA, Energy West, Tech Start-ups
- Four successful public equity offerings and/or IPOs
- MBA-Finance, BS-Engineering; CWRU; PE-Ohio, CFP



Bill Ullom

CTO & Founder

- 39 years geochemistry, exploration/production and environmental experience with energy and environmental firms
- Central & South West System, Hunt Energy, Placid Oil Company, LOMAK Petroleum, Vadose Environmental (founder and owner)
- BS-Geology; Indiana University



Jeremy DeBenedictis

President Vadxx O&M

- 16 years plant operations leadership, project management, engineering
- General Electric; Lighting & Healthcare businesses// Six Sigma Black Belt; Lean Manufacturing
- BS Chemical Engineering, University of Dayton; MBA, Case Western Reserve University



Dr. Stan Prybyla

VP, Technology

- 30 years chemistry experience
- Goodrich Corporation, Applied Nanoinfusion
- BS Physical Chemistry, Worcester State College; Ph.D. / MS Physical Chemistry, Iowa State

VADXX ORG CHART

Board of Directors

Liberation Capital
Board Observer

HoldCo Investor
Board Member

Felix Brueck
Board Member

Jim Garrett
Board Member

Bill Ullom
Board Member

Tom Waltermire
Chairman

Jim Garrett
CEO

Michele Hoza
Legal Counsel

Jeremy DeBenedictis
President Vadxx O&M

Tony Colello
Dr. Ops Excellence & Business Dev.

Shawn Patterson
Operations Dr.

Bill Ullom
CTO

Jim Garrett
Interim CFO

Dr. Stan Prybyla
VP, Technology

Andy Oster
Feedstock Coordinator

Scott Sass
Sr Project Mgr.

Aaron Swope
Sr Project Mgr.

Lou Surlano
Facility & Maintenance

Josh Reader
Production Op.

Chris Oseredczuk
Process Eng.

Dominic Rosace
Lead CME

Nick VanSuch
Lead ME / EE

John Wood
Controls & Automation

Tracy Williams
Controls & Automation

TECHNOLOGY OVERVIEW

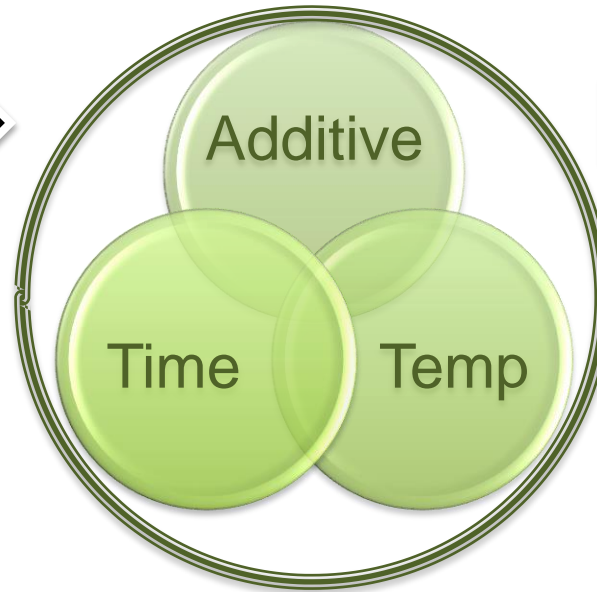
INPUTS

Near Term

- Industrial plastic
- Post consumer plastic

Longer Term

- Auto shredder residue
- Tires
- Other hydrocarbon based wastes



OUTPUTS

Near Term

- Diesel
- Naphtha
- Slack wax (lube oil & wax)
- Synthetic natural gas
- Carbon solids

Longer Term

- Solvents
- Jet fuel

Proprietary recipe

=

Material

+

Kinetics

+

Thermodynamics

+

Chemistry

Plastic &
Additive

Rate of
reactions

Heat &
energy

Change of
material

- VADXX owns 100% of the technology
- Patent pending
- Numerous trade secrets

TECHNOLOGY EVOLUTION

IP Generation

Thermodynamic Confirmation

Commercial Scale Up

2009

2011

2013

2015 - 2017

Bench top

Pilot Plant Gen 1,2

Pilot Plant Gen 3, 4, 5

Facility #1: Gen 6



1 / 20,000th Scale

1 / 100th Scale

1 / 50th Scale

Full Scale

100+ runs completed

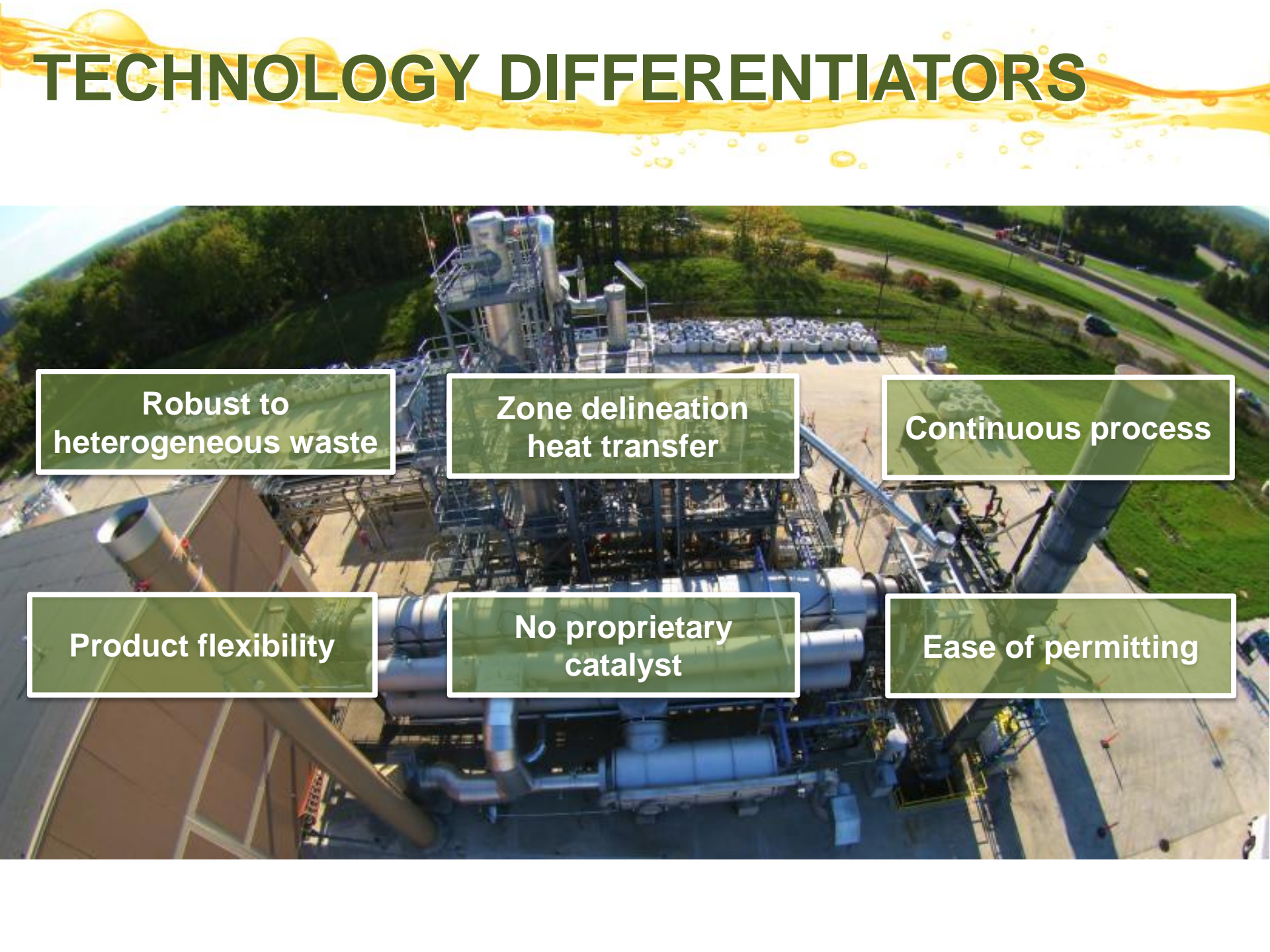
10,000+ lbs feedstock processed

1,000+ gallons fuel produced

Commercial 2017

- 23,000 tons per year
- 115,000 barrels per year

TECHNOLOGY DIFFERENTIATORS



Robust to heterogeneous waste

Zone delineation heat transfer

Continuous process

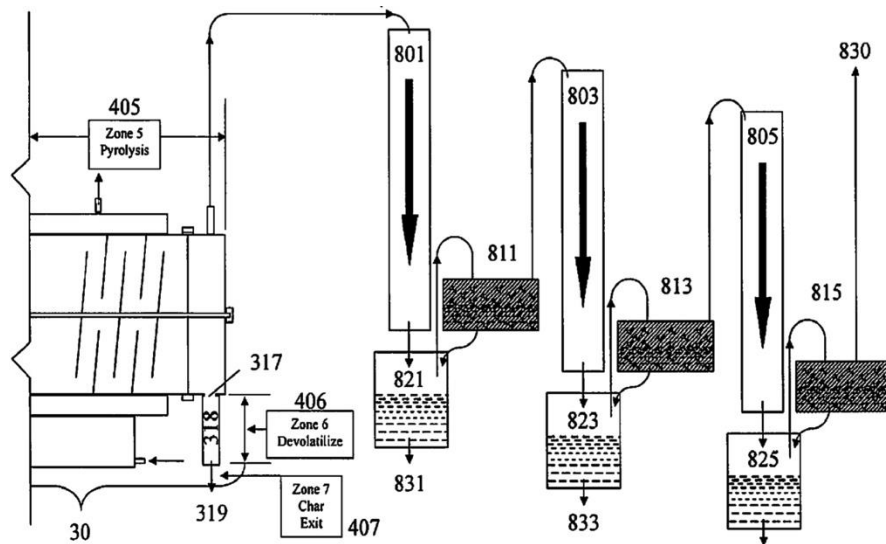
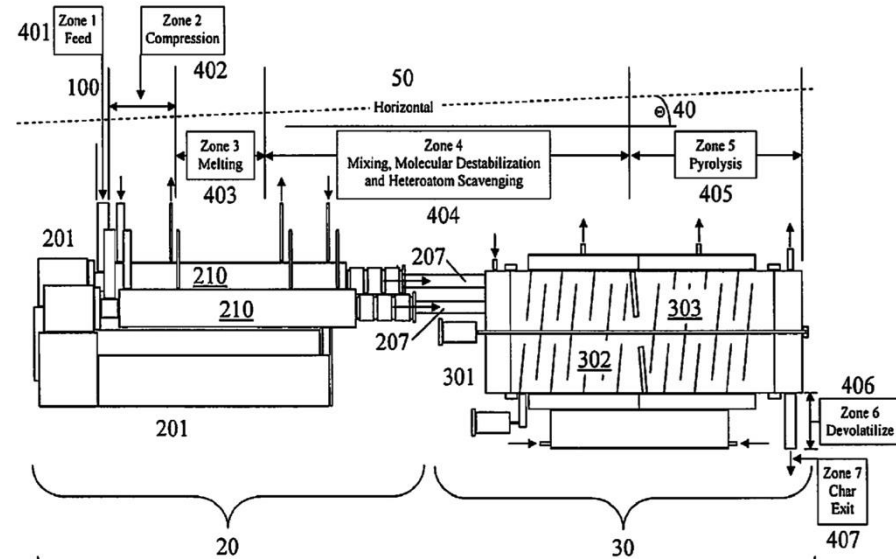
Product flexibility

No proprietary catalyst

Ease of permitting

INTELLECTUAL PROPERTY

- ✓ Zone-delineated, continuous process having multiple sequential zones with progressive temperatures and residence times
- ✓ Optimized to provide the highest product quantity and quality at the lowest operating cost for a heterogeneous mixture of waste plastics.
- ✓ Maintain and strategically enlarge the patent portfolio
- ✓ Continue developing materials, processes and procedures protected as confidential trade secrets.



INTELLECTUAL PROPERTY

PCT Application No. PCT/US13/25335

- Zone-Delineated Pyrolysis Apparatus for Conversion of Polymer Waste
- 3 independent claims and 25 dependent claims
- Priority date Feb 2, 2012 per US Provisional Application 61596876
- Published August 15, 2013 WO2013119941
- National stage filings July 2014; amended claims August 2014

PCT Application No. PCT/US13/26412

- Dual Stage, Zone-Delineated Pyrolysis Apparatus
- 3 independent claims and 30 dependent claims
- Priority date Feb 15, 2012 per US Provisional Application 61599206
- National stage filings July 2014; amended claims August 2014

US Patent 9,222,612 - Granted

- Anti-Fouling Apparatus for Cleaning Deposits in Pipes and Pipe Joints
- Issued December 29, 2015
- Priority date Jan 6, 2012 per US Provisional Application 61584074

FIRST CONTINUOUS UNIT IN NATION



Video of the plant in operation
<https://youtu.be/FWD1pM4oFDg>

AKRON, OH

UNIT COMMERCIALIZATION SCHEDULE

Q4 2016

- ✓ 3 days continuous operation
- ✓ 30% total capacity
- ✓ 100,000 lbs waste plastic
- ✓ 10,000 gallons liquid output
- ✓ 70% conversion yields
- ✓ Commercial sale of diesel product at 30% premium to oil prices

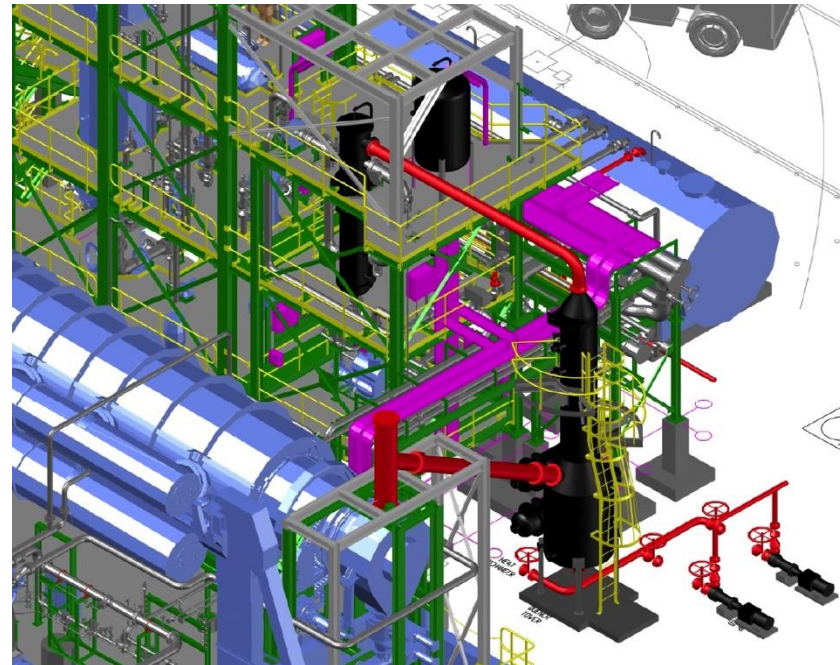


Q1 – Q2 2017

- Design corrections, equipment additions to improve operating uptime and capacity
- Commissioning trials to validate
- Hiring / training operators for full operations

Q2–Q4 2017

- Ramping entire operation—tech proven
- On pause since 9.4.17, plant sale being considered by owner



WASTE PLASTIC SPECIFICATIONS



Markets

- Post-industrial
- Post-consumer (MRF)
- Auto shredder residue (ASR)

Maximize

- HDPE (#2), LDPE (#4), PP (#5)

Minimize

- PET (#1), PVC (#3), Polymers That pyrolyze to form monomers

Limit

- #6 PS, #7 Other (PMMA, PC, Nylon)
- Organic, Inorganic, and Metal Contamination

EVOLUTION OF IMPROVING ECONOMICS

WTI (crude oil)	Plastic Throughput	Conversion Yield	Liquid Output
\$50	23,000 (tons per year)	75%	115,000 (bbl per year)



REV

OPEX

EBITDA

CAPEX

IRR

(20yr, 100% equity)

IRR

(20yr, 50% equity,
8% interest debt)

BREAKEVEN

(per bbl WTI)

DETAILS

AVAILABLE

UPON

SIGNING

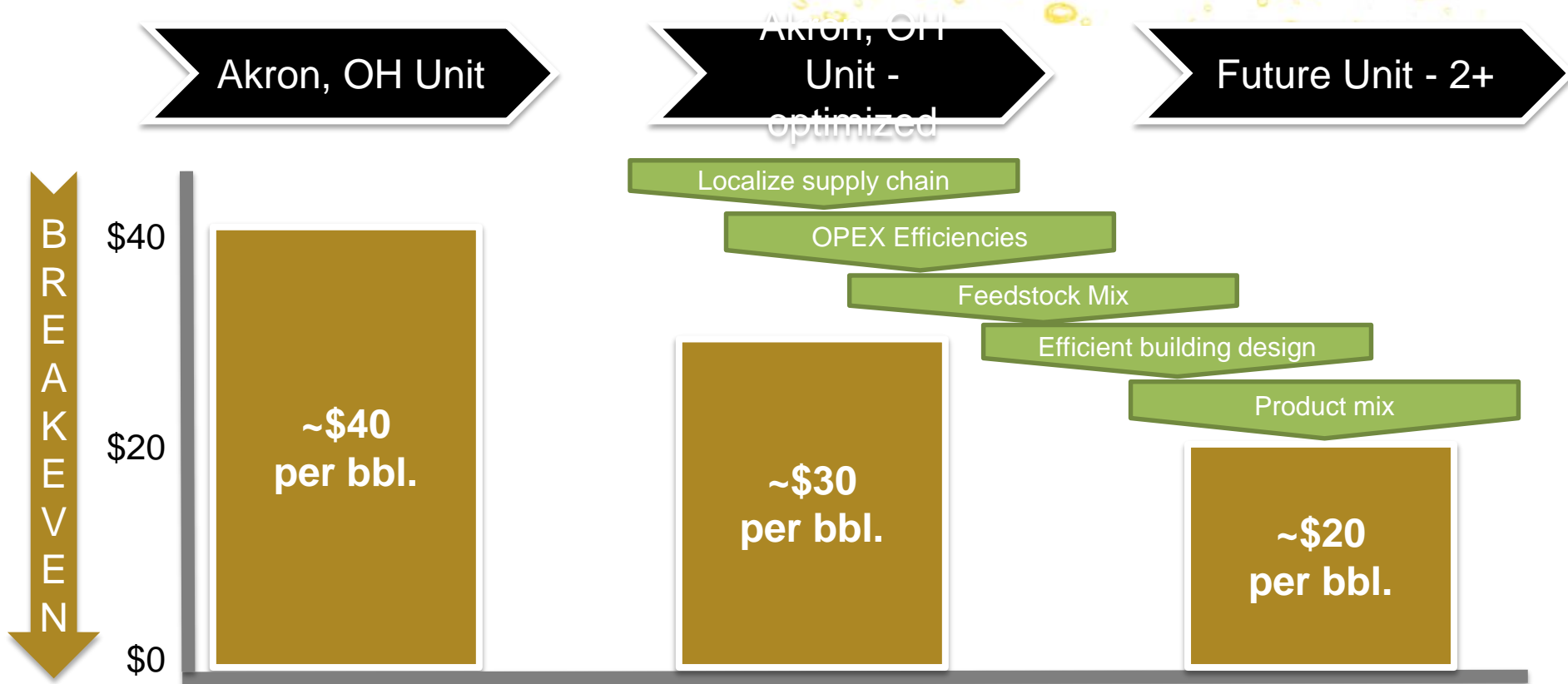
NDA

\$40

\$30

\$20

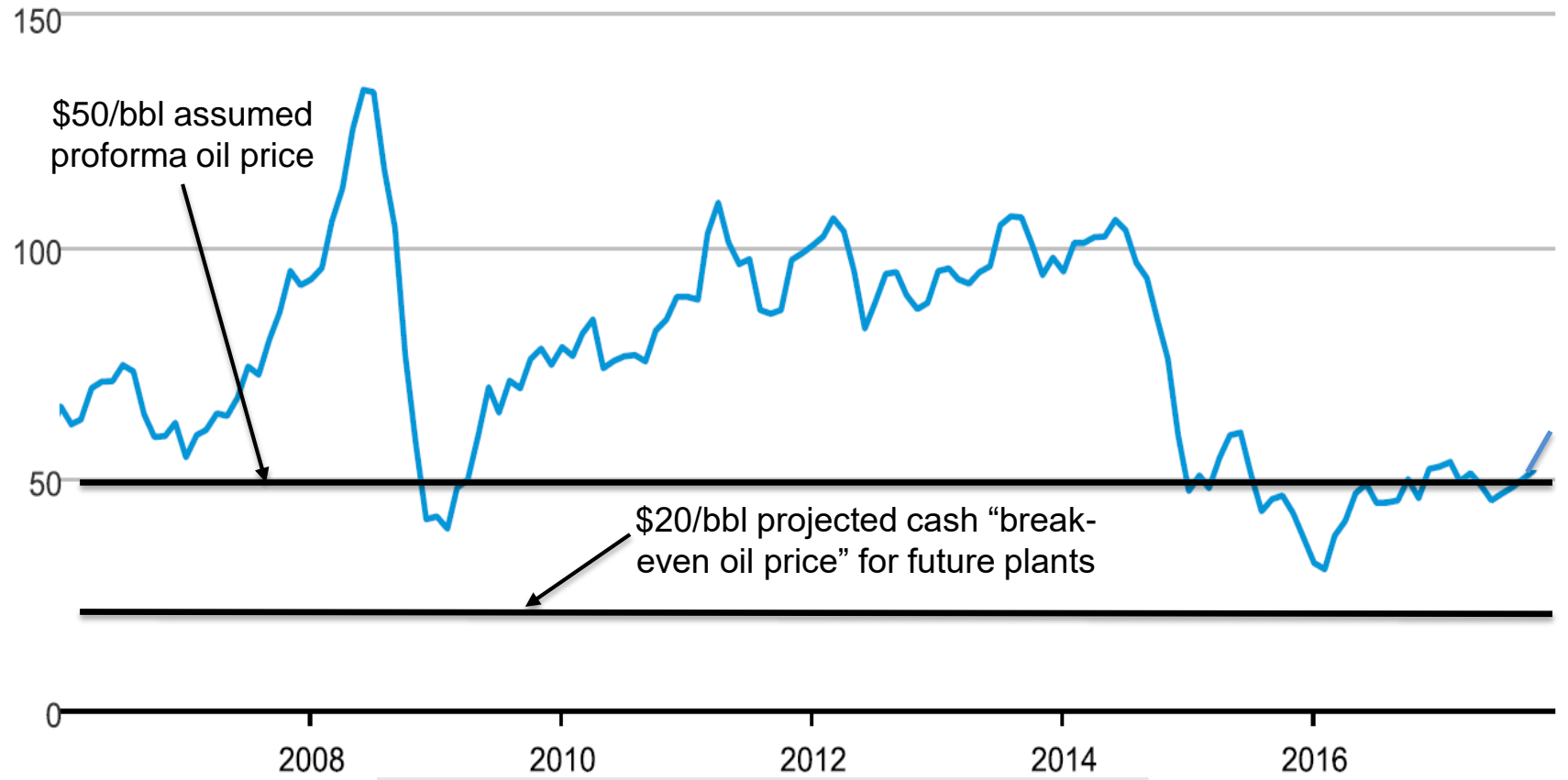
BREAKEVEN IMPROVEMENTS



As the cash “break-even oil price” for future Units begin to approach \$20/bbl, Developer financial returns become very attractive at \$50/bbl oil prices.

OIL PRICE (WTI) HISTORY

dollars per barrel



\$50/bbl assumed proforma oil price

\$20/bbl projected cash "break-even oil price" for future plants

— West Texas Intermediate Crude Oil Spot Price

KEY UNIT ECONOMIC FACTORS

THE OUT's (Products)

- Oil (WTI) price
- Product mix (light, medium, heavy distillates)
- Price premium to oil prices (fuels and chemicals)
- Plant utilization rate / product output
- State, federal or other government tax or carbon credits or other financial incentives

THE IN's (Waste plastic feedstock)

- Conversion yield to liquid products
- Expense or revenue (tip fee)
- Preprocessing necessary (shredding, sorting, drying)
- Distance from Unit (transportation cost)

THE PROCESS (Equipment)

- Capacity (tons waste plastic per year)
- Energy efficiency (required vs. generated)
- Government capital support (grants)
- Project capital structure (debt / equity ratio)



COMPETITION

There are a number of companies in the U.S. and Europe which have tried or are currently seeking to commercialize pyrolysis technologies to recycle waste plastics. These potential competitors include:

- Agilyx Corp. (Tigrard, OR) <http://www.agilyx.com/>
- Cynar plc (London, UK) <http://www.cynarplc.com/>
- Golden Renewable Energy (Yonkers, NY), <http://www.goldenrenewable.com/>
- PK Clean (Salt Lake City, UT) <http://www.pkclean.com>
- RES Polyflow (Chagrin Falls, OH) <http://www.respolyflow.com/>

None of these potential competitors are expected to have commercial plants in operation in the next 12-24 months. Should any of these companies succeed in commercializing their technologies, VADXX does not believe it would have a significant adverse effect on the Company.

VADXX believes that its Akron, OH Unit is the largest, most advanced, and lowest operating cost facility of its kind in North America or Europe.

KEY BUSINESS RELATIONSHIPS

Capital



Liberation Capital



Support



Engineering & Construction



TETRA TECH



SNC • LAVALIN

Rockwell
Automation



GEIS
COMPANIES



MECHANICAL INC.

Waste Plastic



WASTE MANAGEMENT



OmniSource



VEOLIA

Green Line

POLYMERS



ENVISION
HOLDINGS

Product Distribution

Burch Thomas Oil, Co.



Marathon
Petroleum Corporation

DEVELOPER STRATEGY

VADXX's business growth model is based on having Developers license and build a meaningful number of Units on a global basis. The Company's financial projections assume 50+ Units (including the Akron, OH Unit) will be licensed within five years of the Akron, OH Unit beginning commercial operations. The Company expects interest from potential Developers around the world to increase significantly beginning in the second half of 2017 after the Akron, OH has been successfully operated at full capacity for a period of time.



Location of potential Developers who have expressed interest in licensing VADXX's technology

VADXX has already had expressions of interest from more than 20 potential Developers from around the world. The Company believes that certain large multinational companies have the potential to license large numbers (>10) of Units.

VADXX FINANCIAL PROJECTIONS

	Year 1 2018	Year 2 2019	Year 3 2020	Year 4 2021	Year 5 2022
Series B Equity Raise (\$Mil)	\$10				
# of Developer Units	6	6	13	25	25
VADXX Capital Requirements (\$Mil)	DETAILS AVAIL PER NDA				
Revenue (\$Mil)					
EBITDA (\$Mil)					

Key Assumptions:

- 1 Unit=50,000 tons/yr (2X size of Akron, OH unit)
- WTI (oil prices) \$50 - \$60 per barrel
- Break even operating costs for future units of \$20 per barrel WTI basis



Jim Garrett / jgarrett@vadxx.com

www.vadxx.com

**See next few pages for additional
investment considerations**