

PIVOT

FUELING CLEANER CITIES

Ashley Muspratt, Founder & CEO

World Water Week • August 31, 2017

“Solid fuel from sludge: Resource recovery worth getting heated about”

Pivot's mission

To be the lowest cost provider of fecal sludge treatment for cities

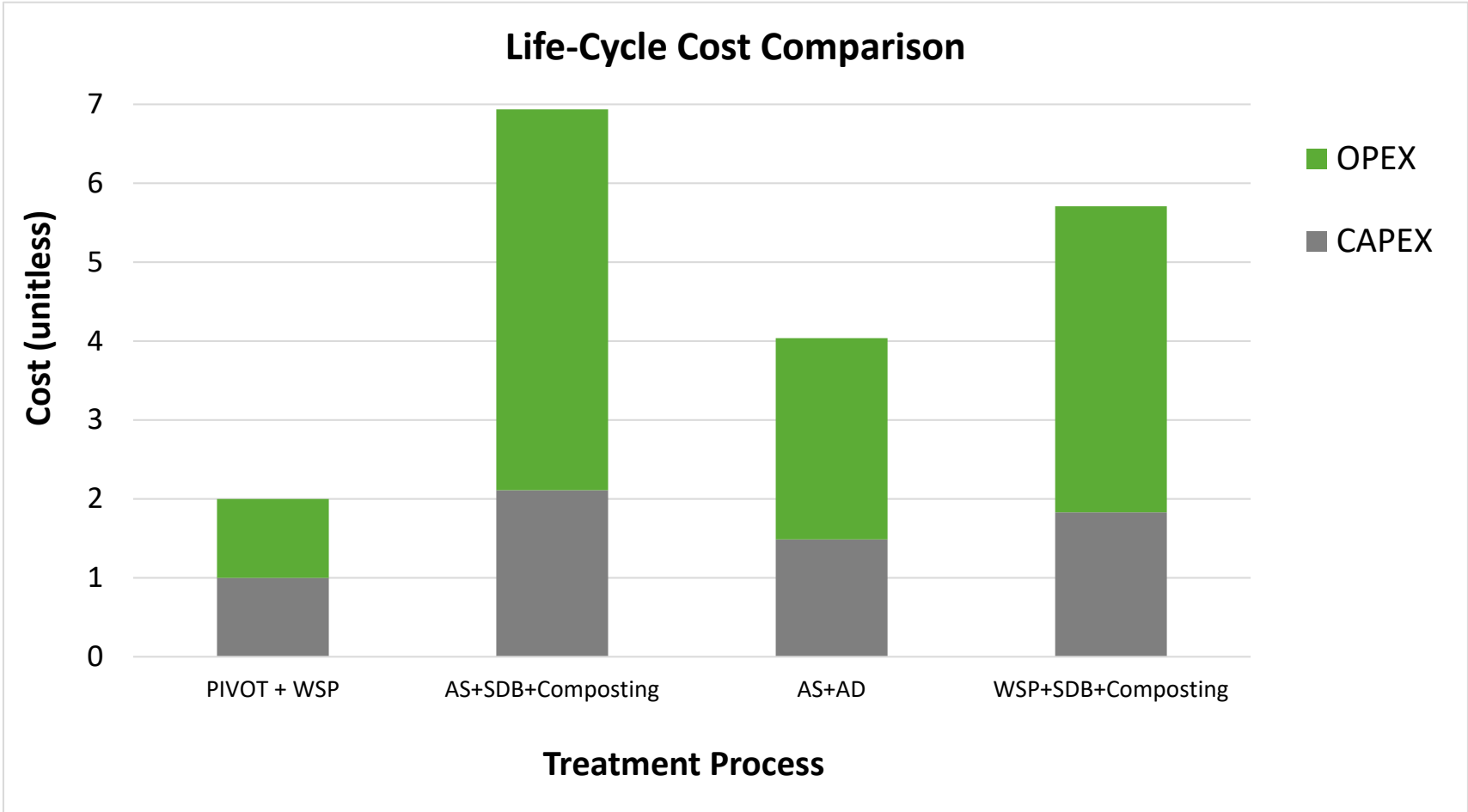
Pivot's approach

Conversion of FS to solid fuel

-Revenue offsets – or covers – O&M costs



Life-Cycle Cost Comparison



Source: MWH Americas Ltd. 2016

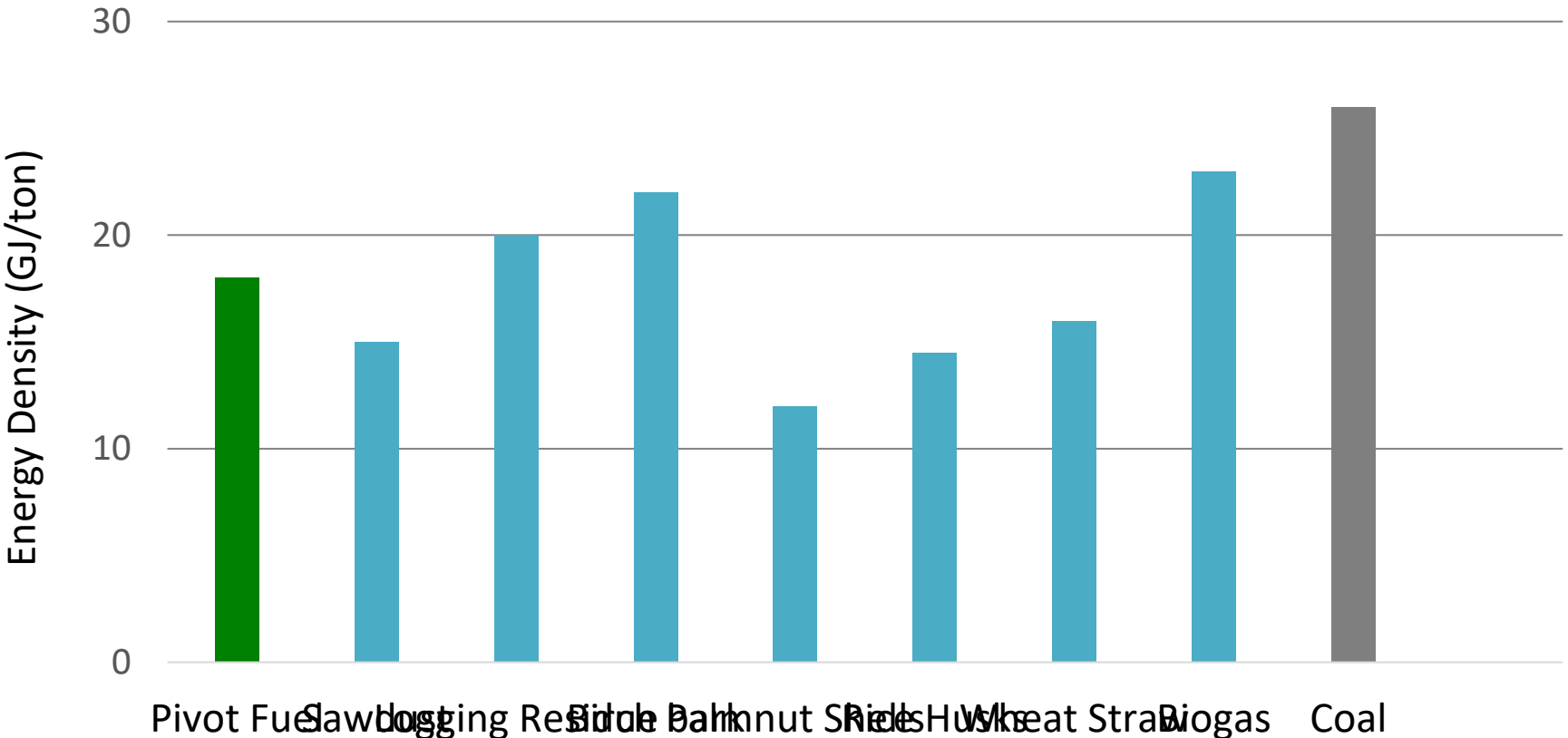
Pivot Works factory



Why solid fuel?

	Pivot Fuel	Compost	Fertilizer	Biogas	Electricity
Seasonality	Year-round	Seasonal	Seasonal	Year-round	Year-round
Scale of demand per customer	Very large	Small to medium	Small to medium	Medium	Large (assuming utility)
Willingness to pay	High – benchmarked against coal	Low – limited market awareness of benefits of compost	Low-medium – Market often distorted by subsidies on commercial fertilizer	Low	Medium – utility has fixed prices; bankability of projects varies by country
Ease of production	Simple & reliable	Simple (but quality may vary)	Technologies emerging for concentrated fertilizers	Need a lot of operator attention to ensure consistent production	Need very large scale to justify low conversion efficiency
Ease of storage and transport	Very simple; high turnover, so limited storage requirements	Simple; but seasonal turnover requires large storage	Simple; but seasonal turnover requires large storage	Very difficult and/or inefficient	Simple from producer side; Difficult for utility - not all equipped to receive from independent power producers

Fuel comparison

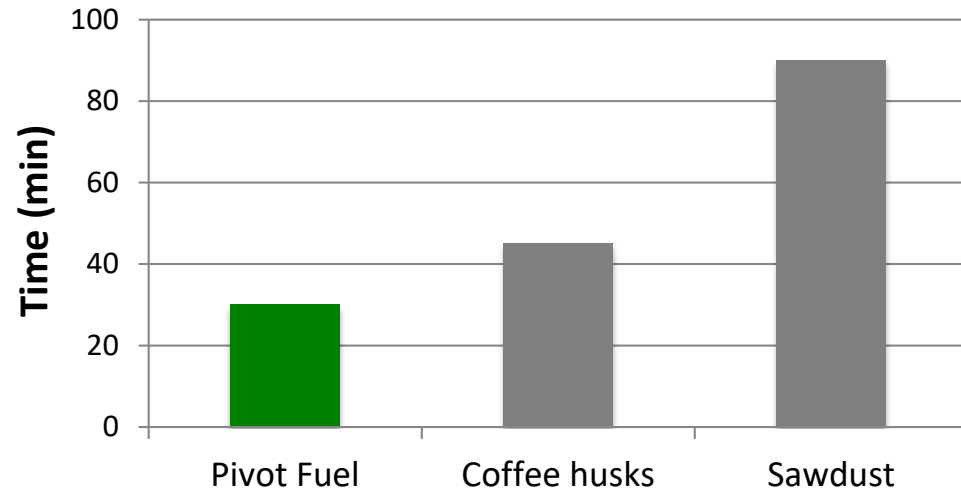


Burning trials

Utexrewa



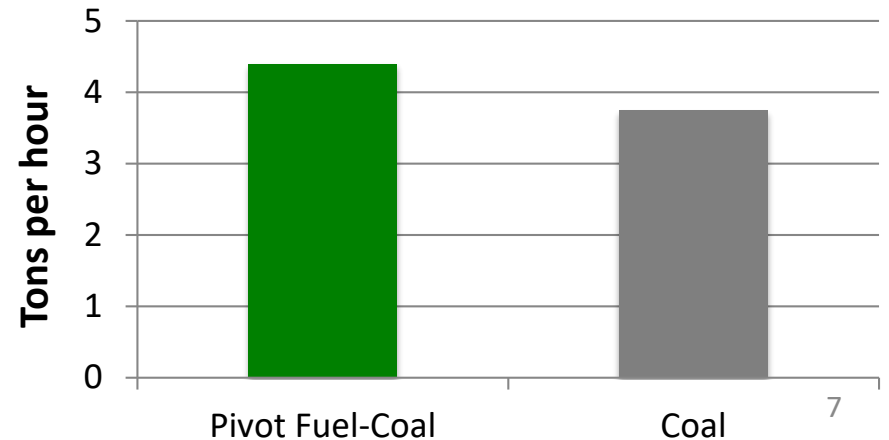
Boiler time to 5 bar



CIMERWA

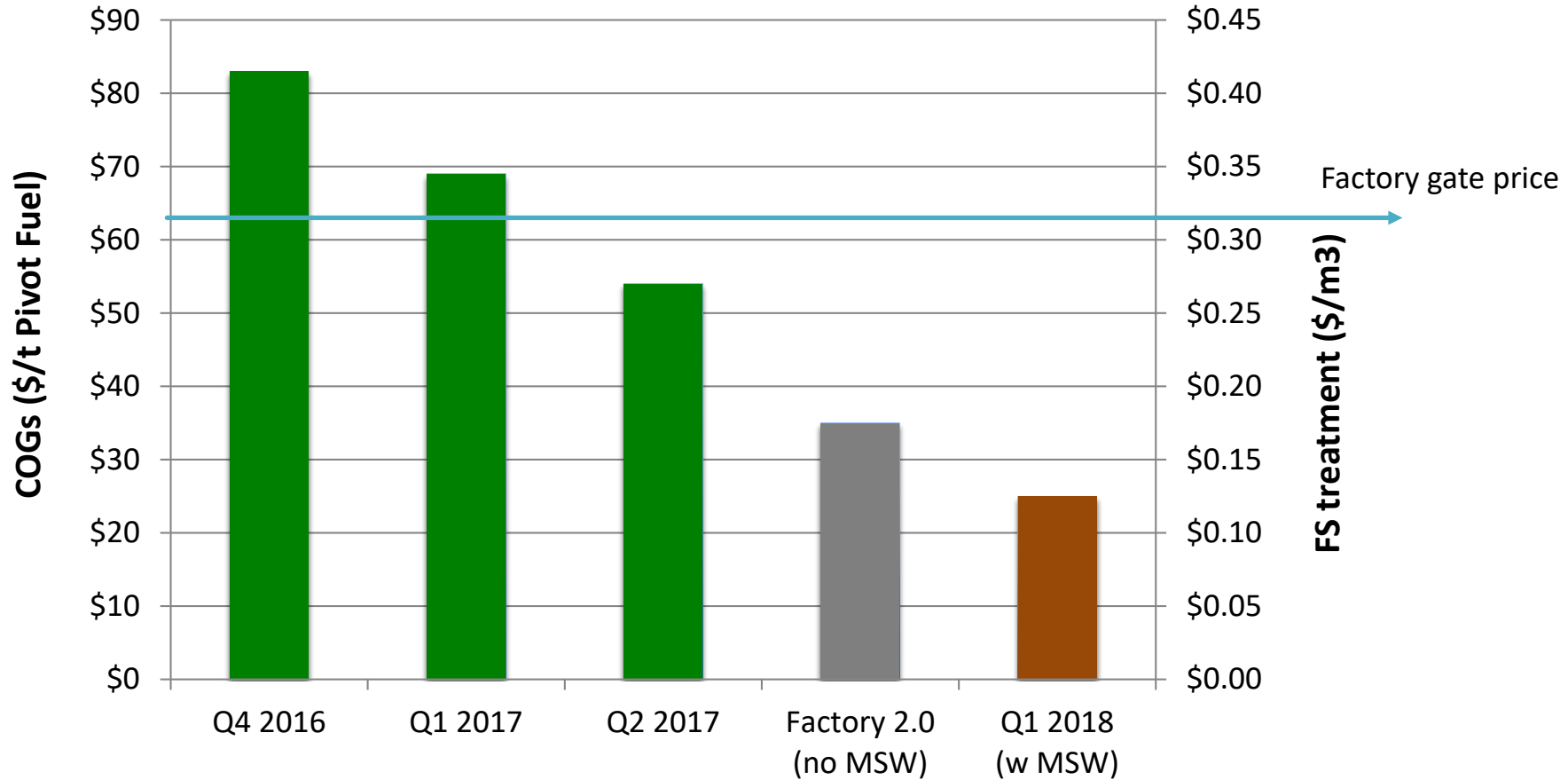
- Fuel added at the pre-calciner to maintain temp. at 900°C
- 50-50 mixture of coal and Pivot Fuel

Fuel feed requirements

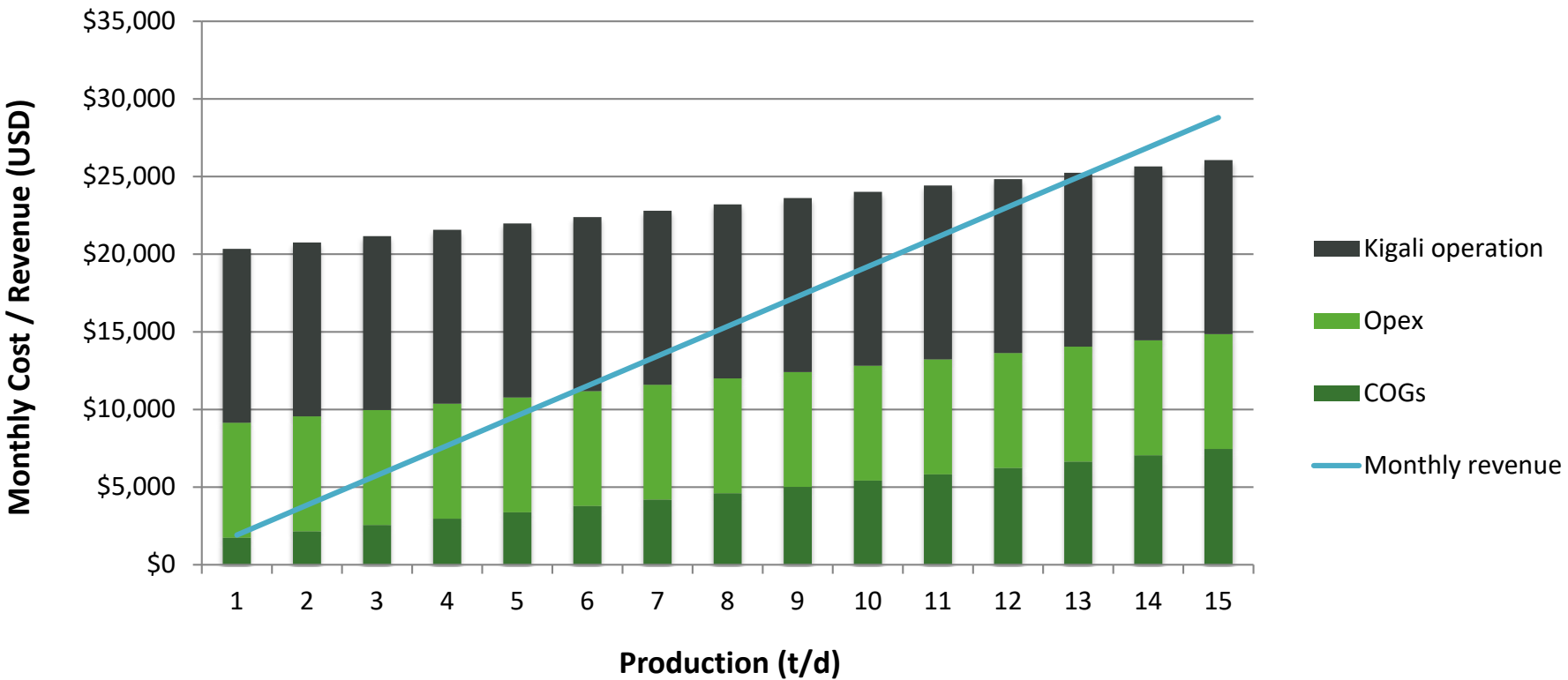


Trends in Pivot Fuel production costs

Influent TS = <1%



Kigali break-even unit economics



Break-even points

COGs	<1 tpd
Production (COGs+OPEX)	6 tpd
Kigali operation (Production + General Admin)	13 tpd

Driving up fuel production: MSW incorporation

- MSW “cross-subsidy” for FSM
 - Accessible (e.g. 300 tpd in Kigali)
 - High yield (>70% usable vs <1%)
 - Energy dense
 - Cheap to process

@ 6 tpd = \$13/t operation

\$6.75/t amortized annual

maintenance



Projections: Kampala

Options analysis for gaining 800 m³ additional FS treatment capacity

	Pivot Works factory at Lubigi STP	New Plant
Input (m3/d)	1200 (up from 400)	800
Capex	\$4 M	\$13 M
Land	No new land use	5 ha
Project development time	<12 months	>3 years (land acquisition, EIA, design, construction)
Opex	<i>Operations revenue positive</i> ~\$100,000/yr post-tax	>\$370,000/year

