



Pathways to Sustainability through Process Intensification and Implications for Plant Operations

WaterNZ Conference
September 2018

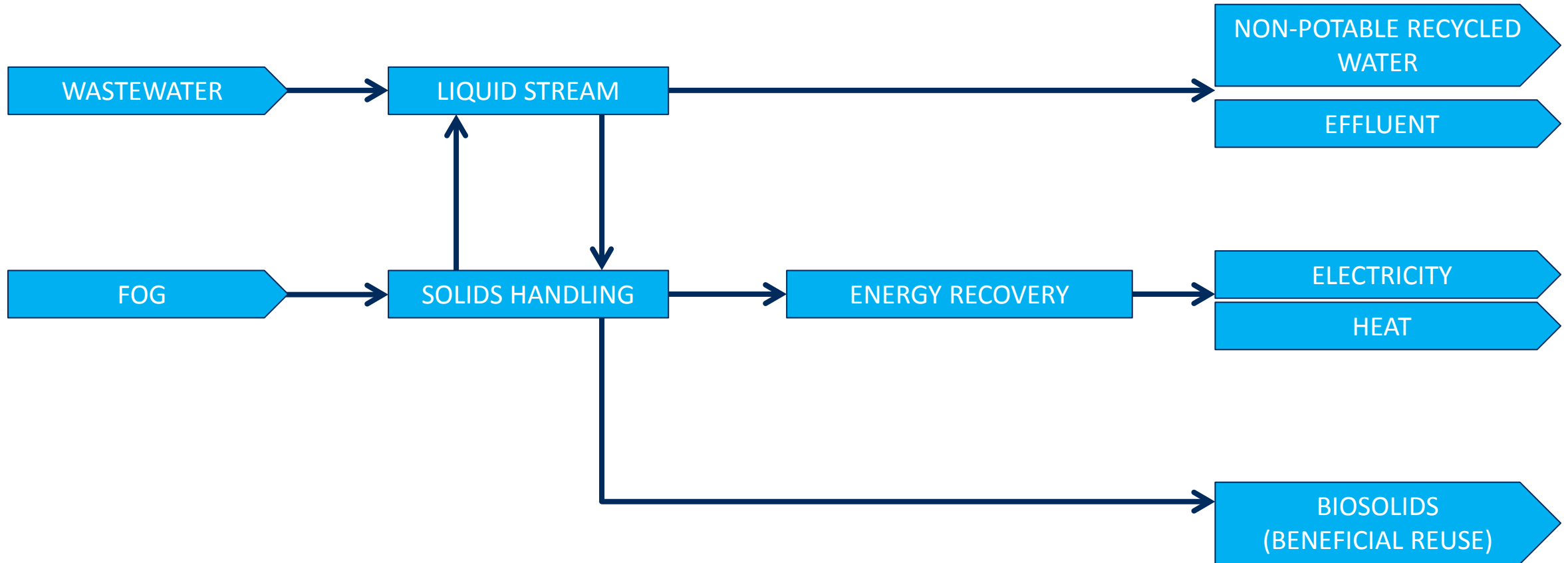
Sandeep Sathyamoorthy
James Currie
Tom Scott

BUILDING A WORLD OF DIFFERENCE®



BLACK & VEATCH

Today's Linear Treatment Model

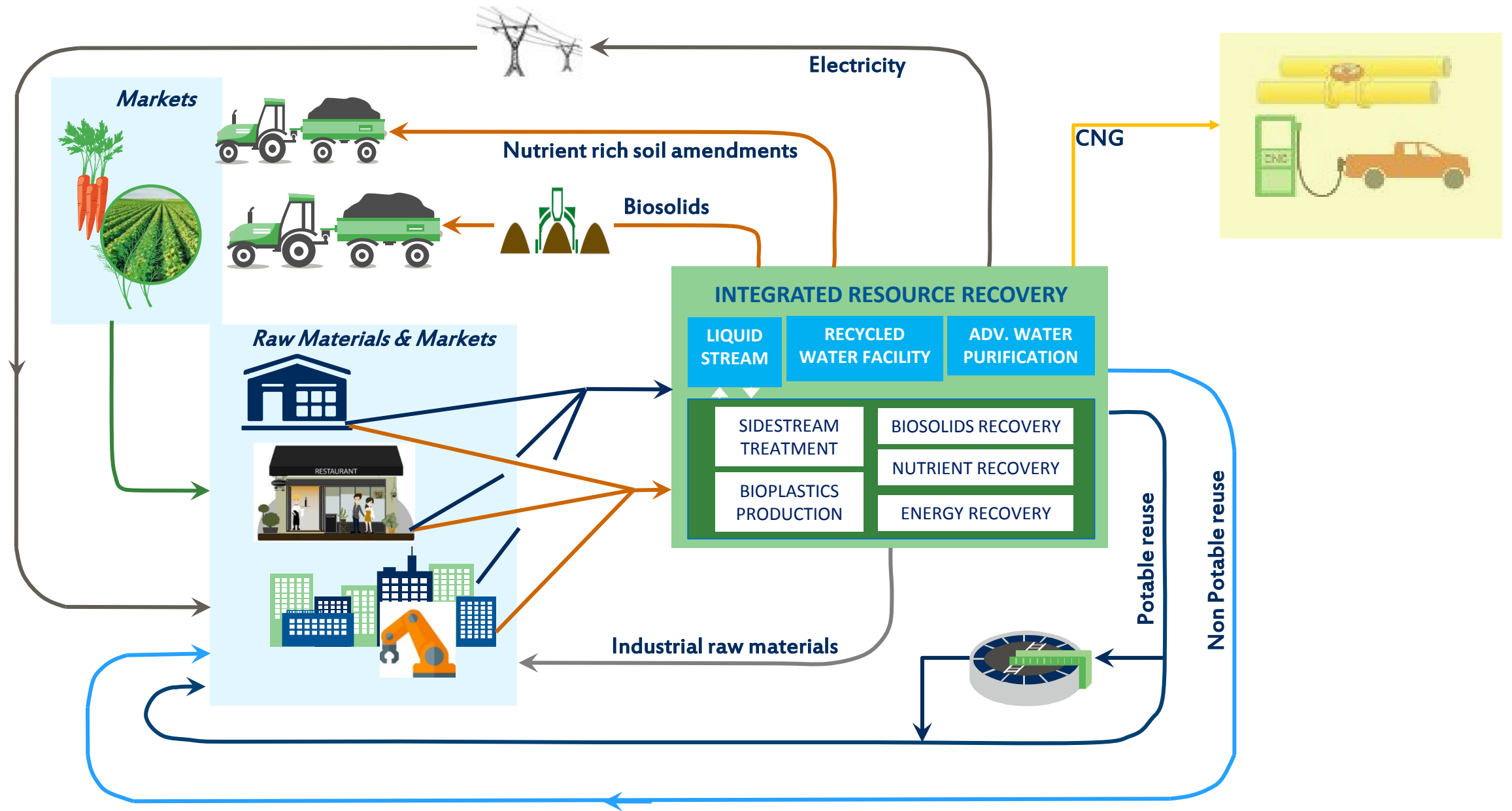


What if...

WWTPs, No

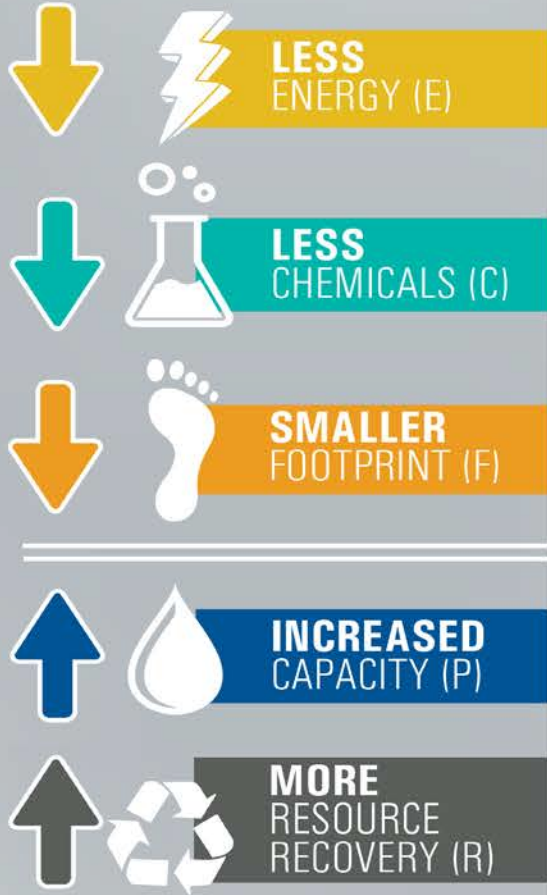
Integrated Resource Recovery Facilities were one hub in a circular economy





PROCESS INTENSIFICATION

DOING MORE WITH LESS

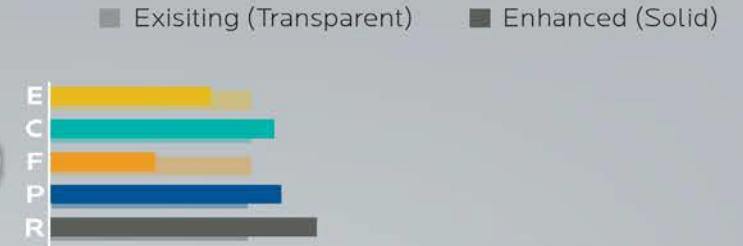


QUICK FACT 1

Enhanced primary treatment results in more robust biological process operation



EPT



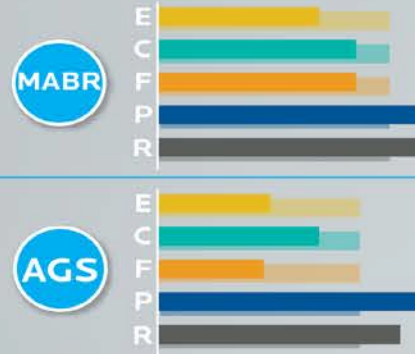
QUICK FACT 2

New biofilm technologies enable 50%-100% increase in capacity with 20%-30% reduction in Aeration Energy Requirements

SECONDARY TREATMENT

MABR

AGS



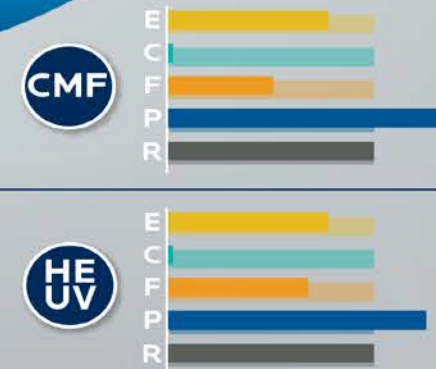
QUICK FACT 3

Tertiary treatment processes can be configured to provide a fit-for-purpose water portfolio

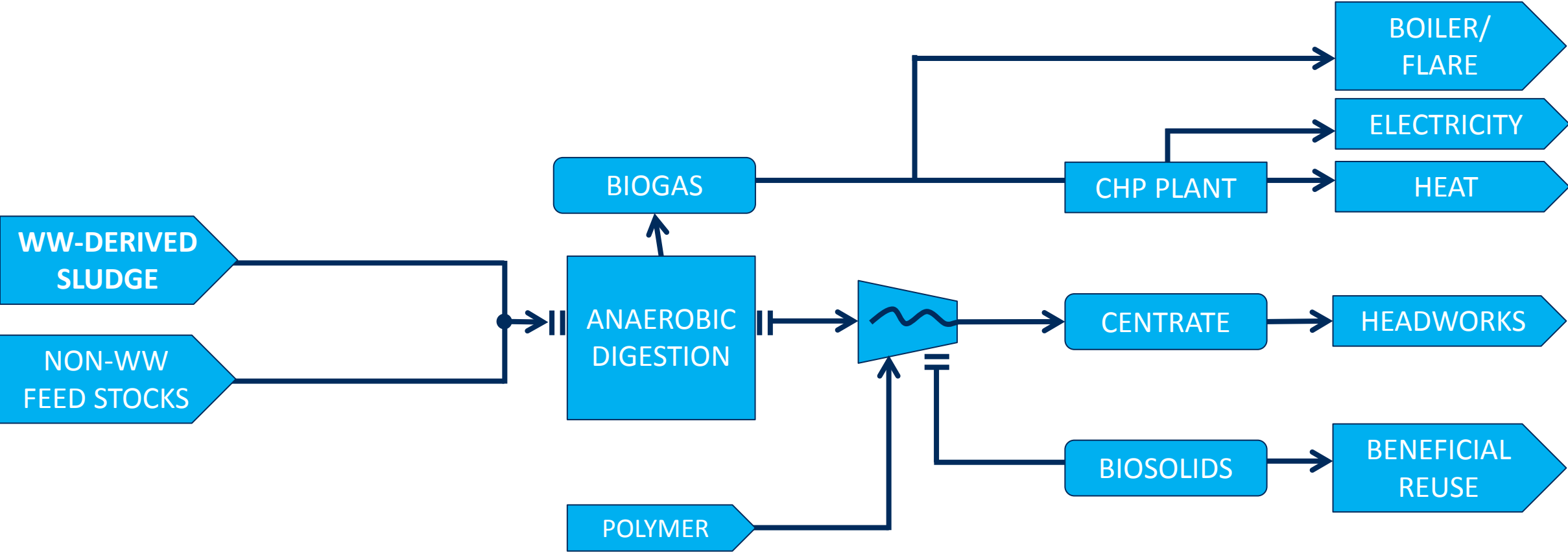


CMF

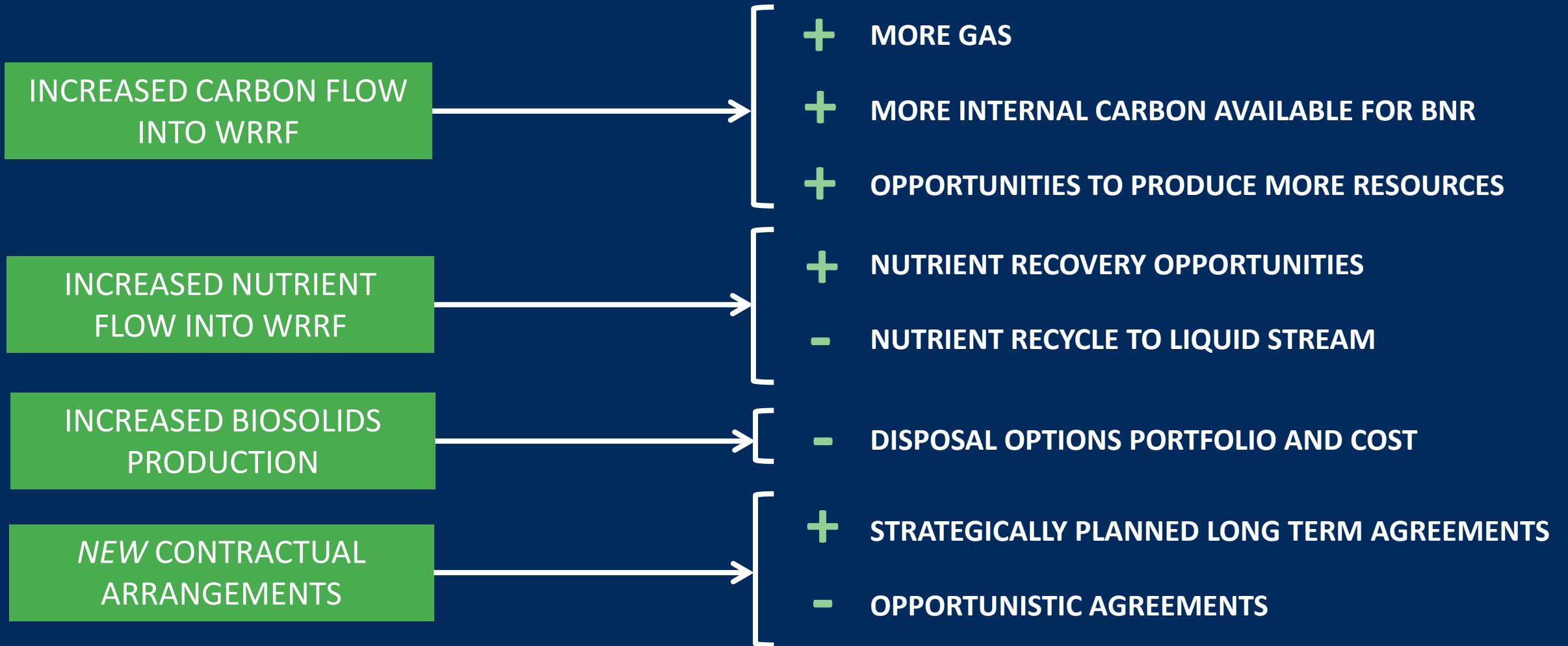
HEUV



Integrating Non-wastewater Feedstocks into the solids handling process



Opportunities and Considerations

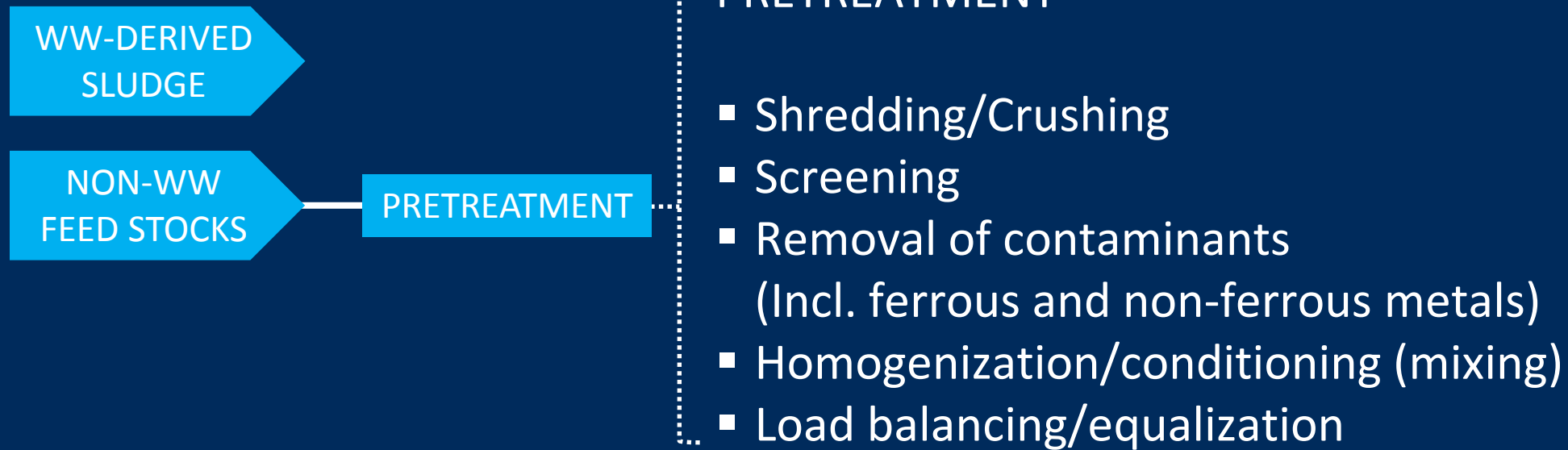


Food Waste Contamination and Feedstock Quality

- STONES, BONES, GLASS, METAL
- PIECES OF SAND, GLASS, SHELLS & GRIT
- ROTO-CUT CLOGGED WITH FILM PLASTICS
- PATHOGEN CONCERNS AND CONSIDERATIONS



Key Components





PULPER:

- Lohse pulper w/heavy fraction removal & drum screen
- BTA 'Hydropulper'

HAMMER MILL:

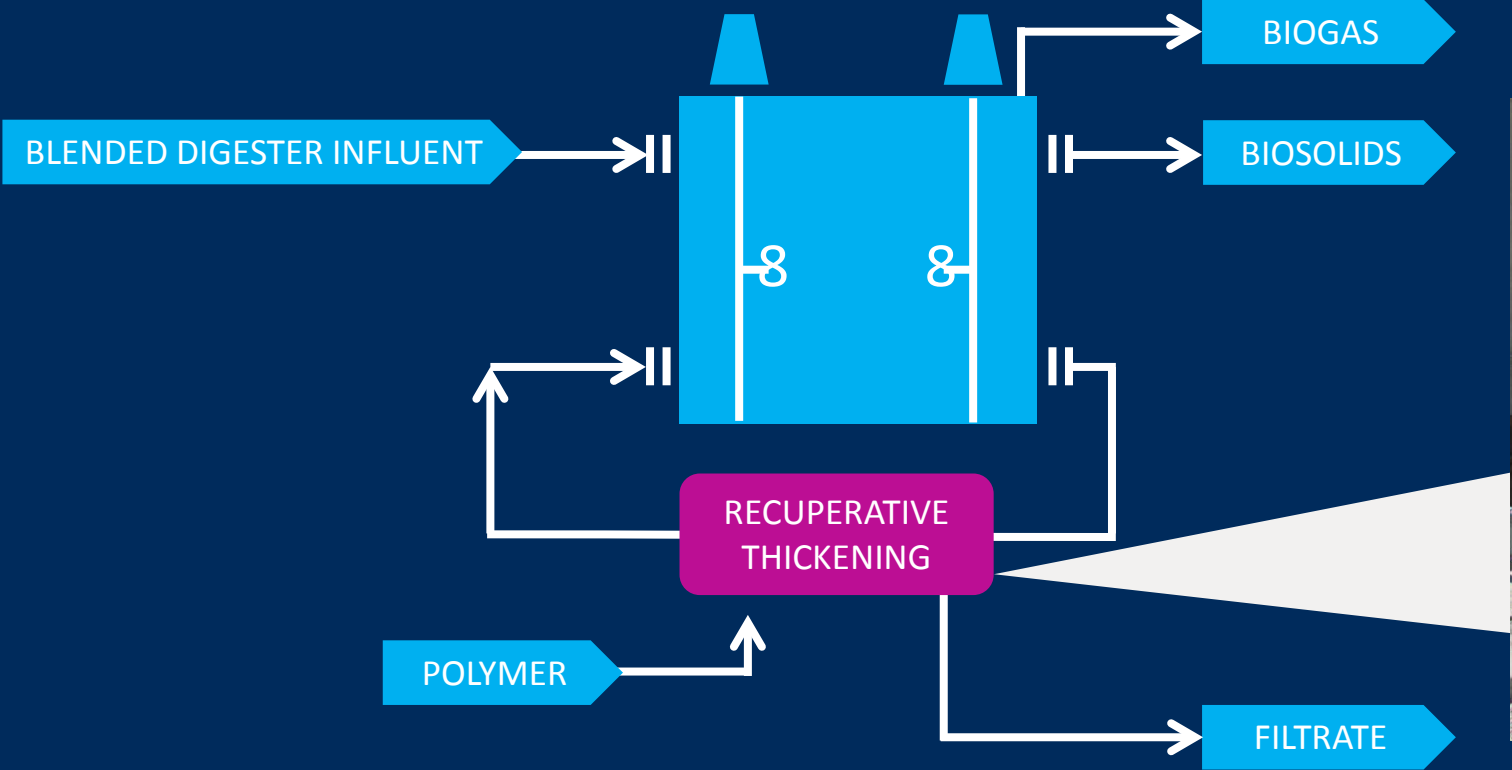
- Hybag
- Haarslev



WASTE SEPARATION PRESS:

- FITEC 'Biosqueeze'
- Anaergia organic extruder press 'OREX'
- Doppstadt DSP 20-5 screw press
- Bellmer Kufferath Akupress

Digester Intensification through Recuperative Thickening



Sidestream management strategies

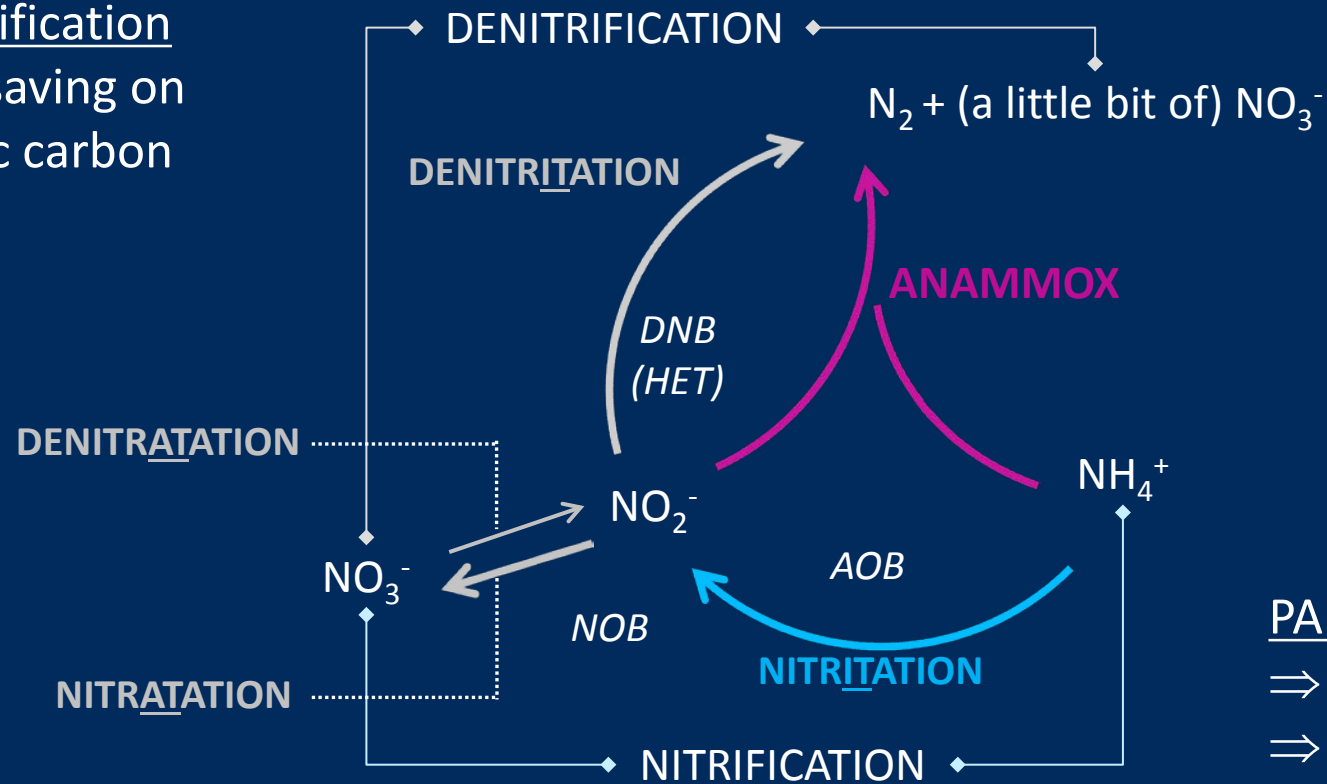
	Flow/Load Equalization	Bioaugmentation Solutions	Complete Nitrogen Management Solutions
	Flow EQ SLIM™	Partial Nitration InNitri® CARRB® BABE® Maureen Sharon	Deammonification using anammox Anita MOX Cleargeen DEMON Anammox® AMX-BBF
			Suite of Technology Options
Ammonia			
Nitrite			
Nitrate			

What is returned to Mainstream?

Deammonification

Deammonification = Partial Nitritation + Anammox

NO Denitrification
⇒ 100% saving on organic carbon

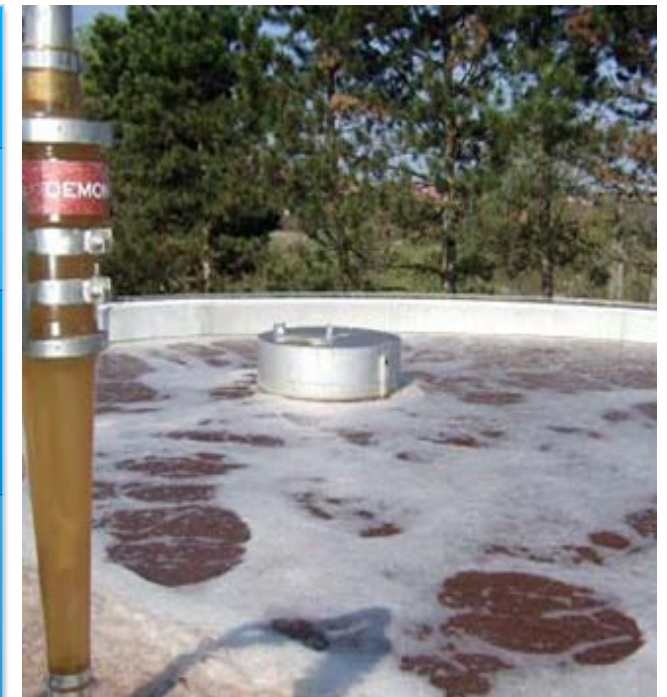


PARTIAL Nitritation

⇒ ~60% saving on oxygen
⇒ ~50% saving on suppl. alk

Sidestream Deammonification Technologies

	AMX-BBF	AnammoPaq®	ANITA Mox	Cleargreen®	DEMON®
Reactor Config.	BAF	Upflow CSTR	MBBR	SBR	SBR with hydrocyclone
Process Config.	fixed-film/ granules	Biofilm granules	fixed-film	suspended growth	suspended growth
Vendor/ Technology Provider	BKT	OVIVO	Veolia	Suez	World Water Works



Phosphorous Recovery as Struvite

HOW/WHO

