BlueTech Innovation Forum

Future Technologies for Sustainable Wastewater Treatment

June 8, 2010

San Francisco, CA

WERF
Water Environment Research Foundation

Who is and…
What Does WERF Do?

- Not for Profit Foundation Focused on Water Environment Research
- Provide Peer-Reviewed Research That Advances Science and Technology
- Provide Tools and Information to the Water Quality Community
- Partners and Collaborates with Subscribers, Water Sector Organizations, Policy Makers, Regulators, NGOs, and Industry

WERF
Nutrient Removal

Who Supports WERF Research?

- WERF's 300+ Subscribers:
  - ✓ Public Utilities (WW and SW Agencies)
  - ✓ Environmental and Engineering Firms
  - ✓ Industry
  - ✓ Equipment Manufacturers
  - ✓ State Regulators
- Federal Funding
- Partnerships and Collaborations

WERF Research Is Nationwide

...and International:

- ✓ Australia
- ✓ Canada
- ✓ United
- ✓ New Zealand
- ✓ Japan
- ✓ Singapore
- ✓ South Africa

WERF research partners:

Global Water Research Coalition

NACWA
A Clear Commitment to America's Waters

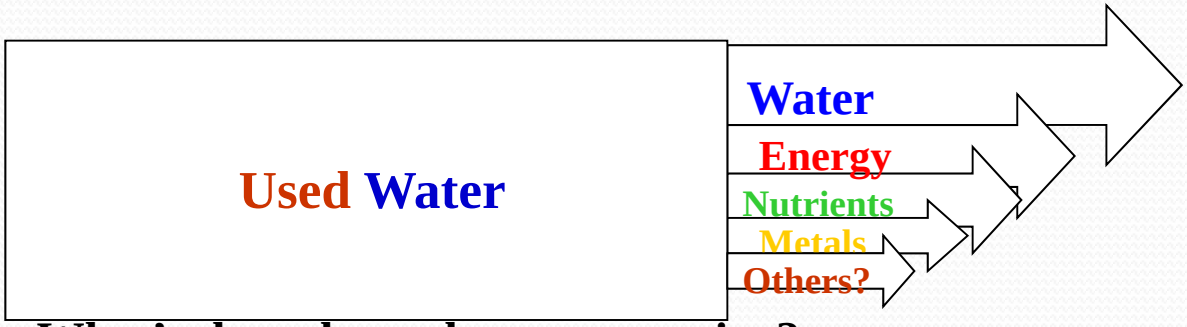
WSAA
WATER SERVICES ASSOCIATION OF AUSTRALIA

Awwa Research Foundation
Advancing the Science of Water®

WERF
Nutrient Removal

Properly Value Water and Wastewater

- Biogas production w/ co-generation of heat and energy
- Imbedded energy in sludge for fuels
- Imbedded energy in wastewater
- Extraction and reuse of constituents



What's the value- what can we mine?

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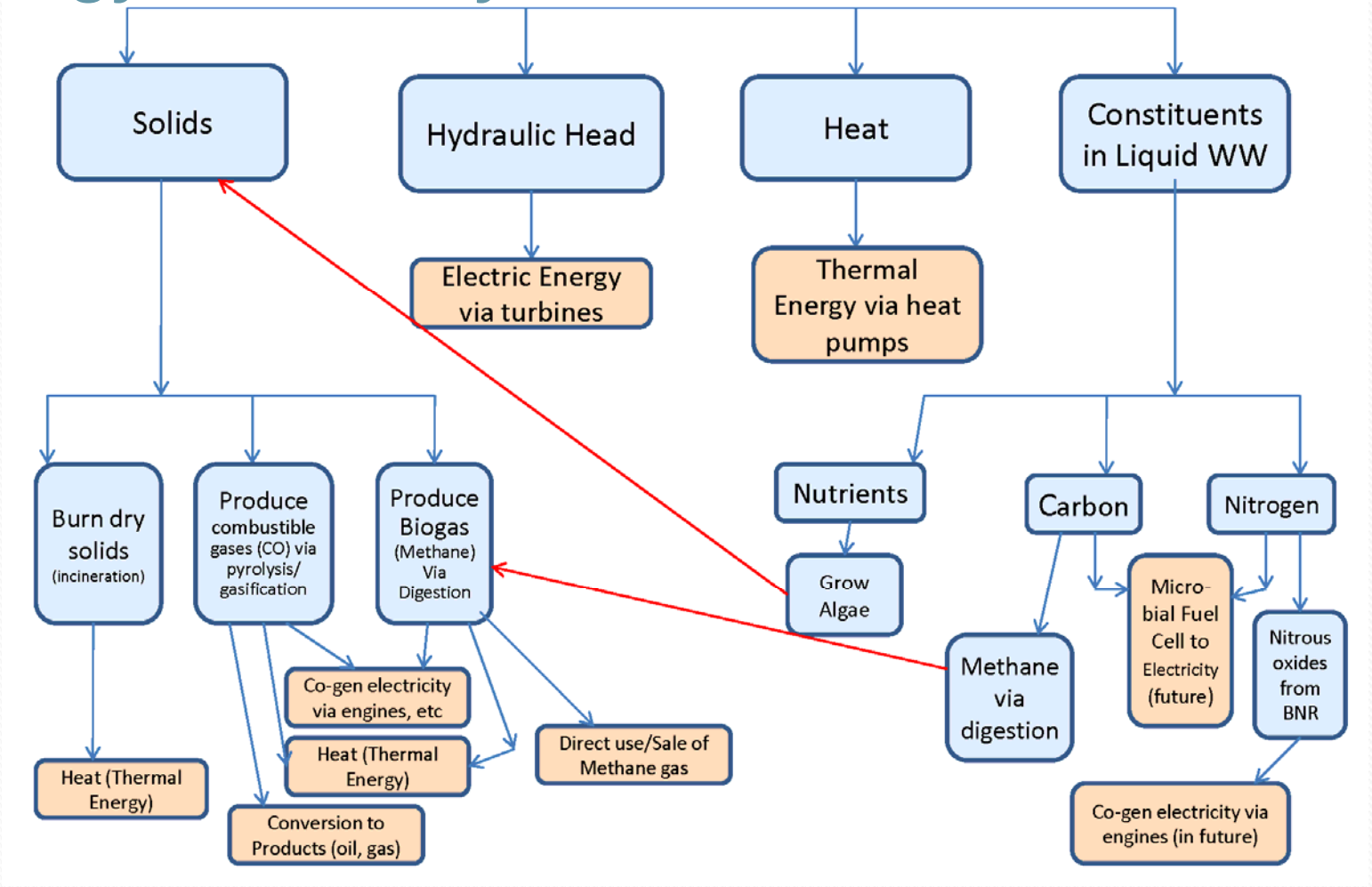
Energy Recovery from Domestic Wastewater



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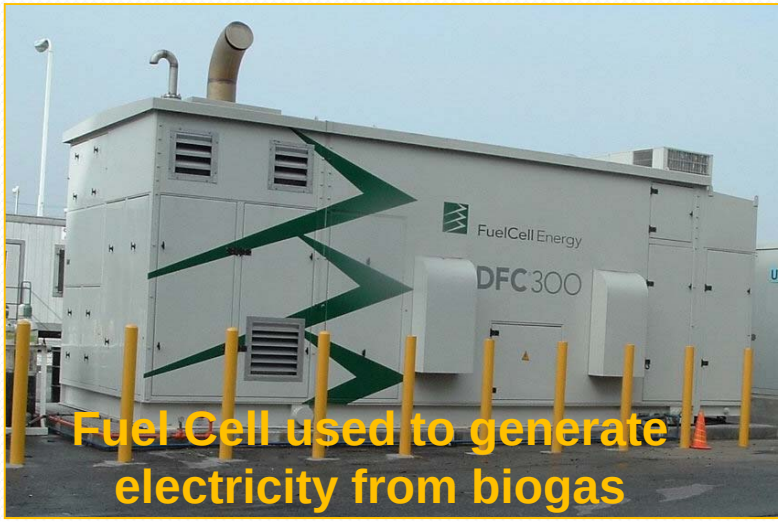
Predicted Effluent/ Reuse Targets

- Water quality requirements will drive treatment targets
- Future limits will include:
  - Microconstituents
  - Targeted pathogens
  - Very low nutrients, metals
  - Nanoparticles

Vision of the Future

- Tiered reuse criteria (potable, agricultural, industrial)
- Energy recovery is common practice
- GHG emissions limited – only biogenic carbon leaving the site
- Zero residuals for disposal – all marketable products



Fuel Cell used to generate electricity from biogas

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Vision of the Future

Onsite and neighborhood treatment

- small-scale systems that mimic nature
- Closed-loop water systems, where stormwater and wastewater is treated, reused and minimal waste leaves the site

Solaire LEED Gold Certification

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Technology Roadmap

Treatment Processes	Other Emerging Objectives	Additional Heat/Energy Recovery
Enhanced primary	Recover N, P and S	Capture heat energy
Targeted aeration	Autotrophic removal N	Use wind energy
Fixed film	Phototrophic removal N (use of algae)	Use solar energy
Super bugs	Collect sewer off-gas (methane)	New carbon sources (food waste)
Media filtration and membranes	Improved operating controls	Hydraulic energy recovery and storage
More anaerobic and side-stream treatment	Greater use decentralized or satellite	Use SMART grid technology

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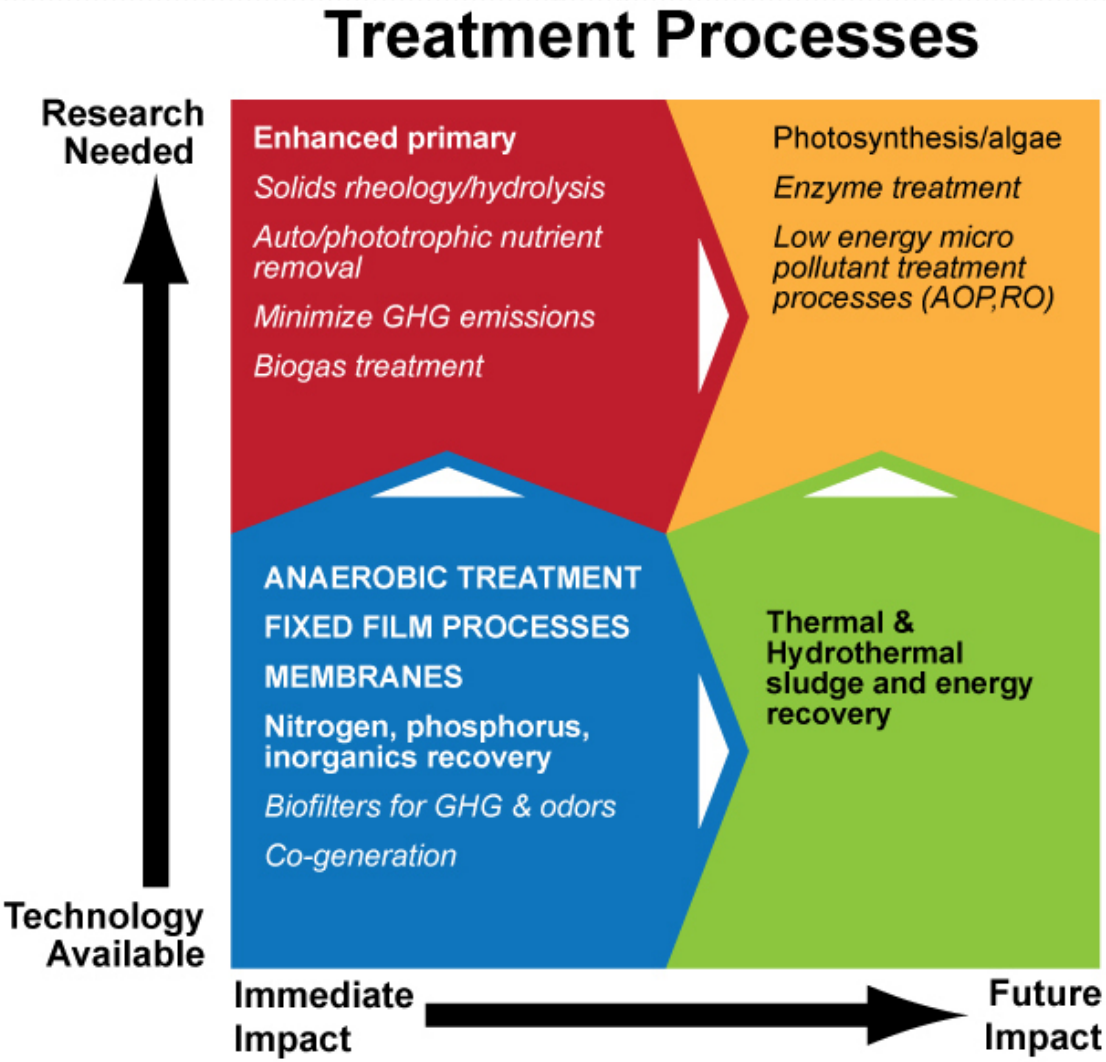
Technology Pathway



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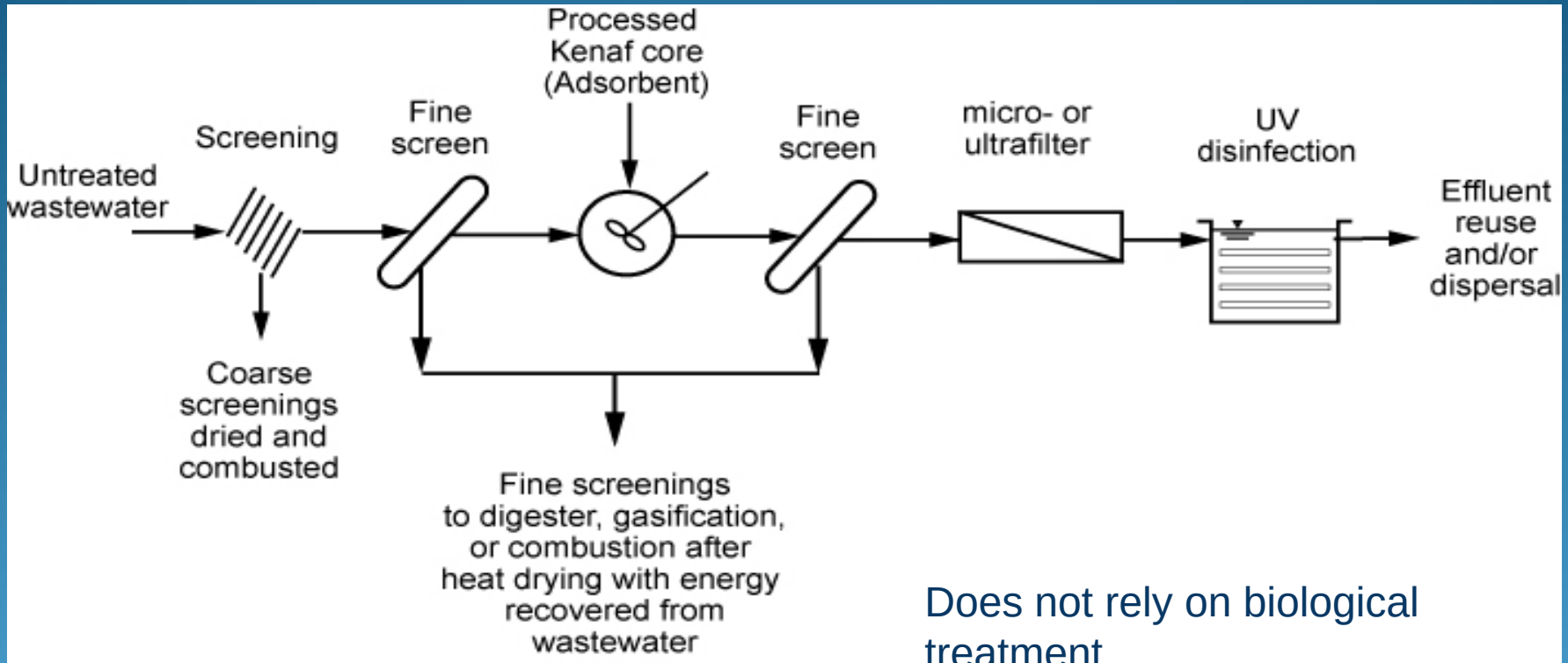
Develop Emerging Biosolids-to-Energy Technologies

- Develop new technologies
  - Thermal solidification
  - Wet air oxidation
  - Gasification
  - Pyrolysis

Nexterra Gasifier

A Treatment Process of the Future

By: Dr. George Tchobanoglous



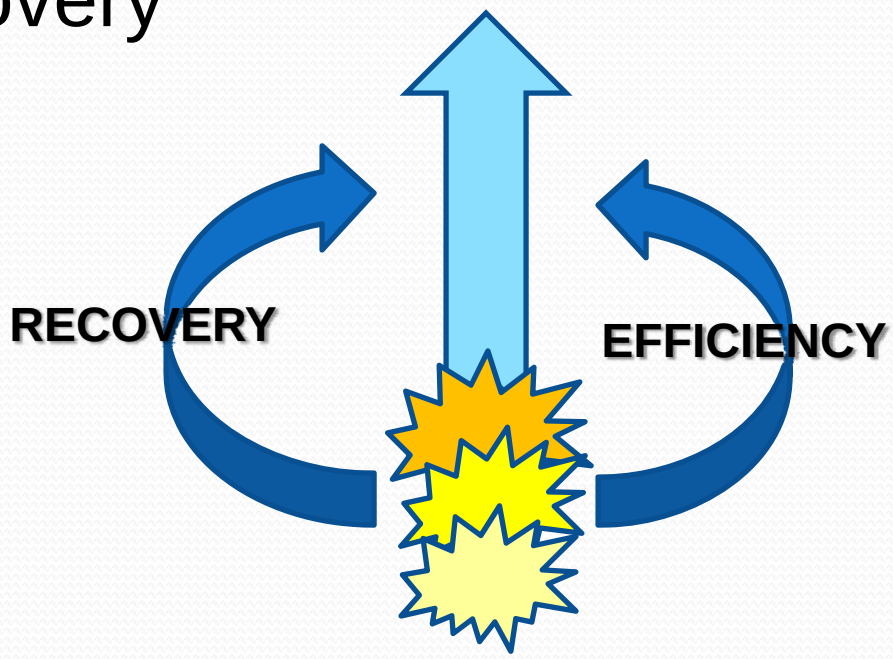
Does not rely on biological treatment

Best Performing WWT Plants..

- Maximize energy recovery

AND

- Maximize energy efficiency and conservation



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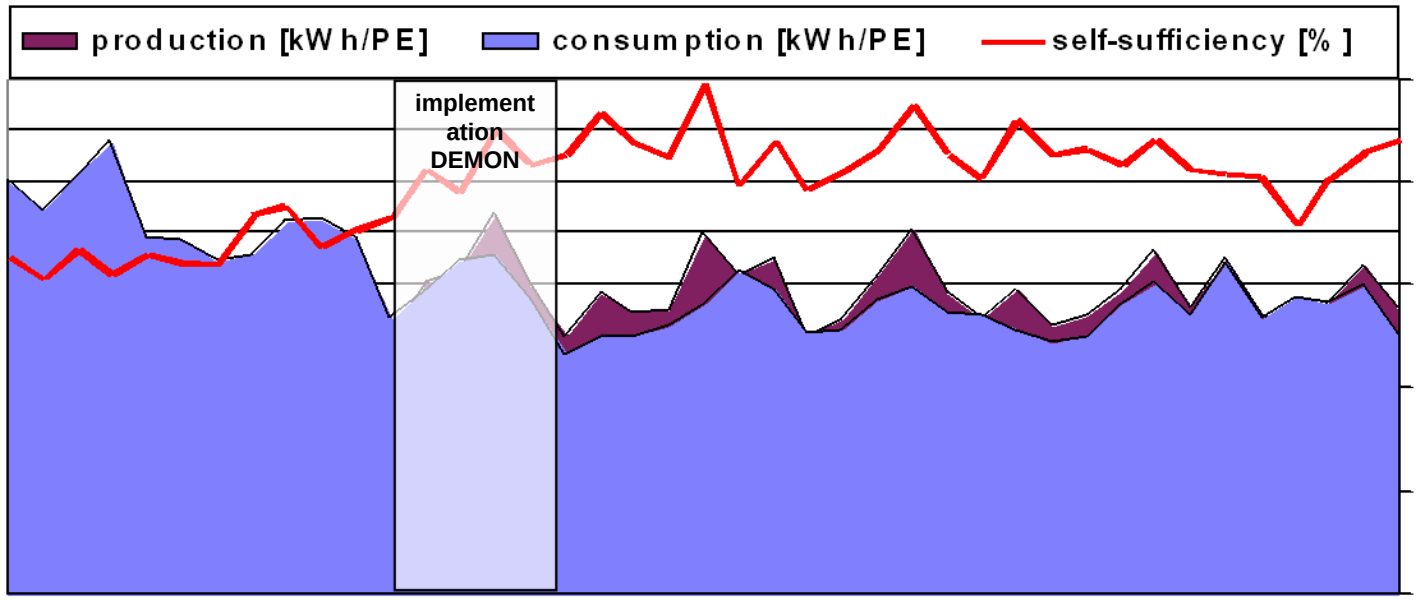
Best Performing WWT Plants..

- Highly educated workforce
- High level of automation
- Use of advanced process analysis tools
- Tolerance of process risk
- Quantifying gains

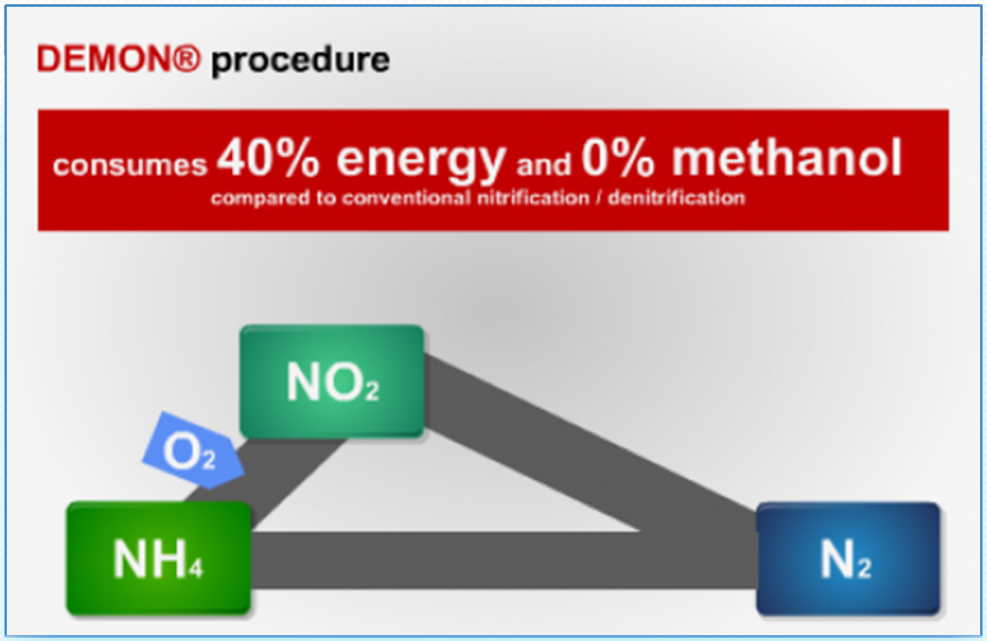
Best Performing WWT Plants..

Produce more energy than needed for treatment



Deammonification with DEMON

- Treats sludge dewatering liquors with high nitrogen
- Suspended growth deammonification process
- Energy consumption reduced from 350 kwh/d to 196 kwh/d



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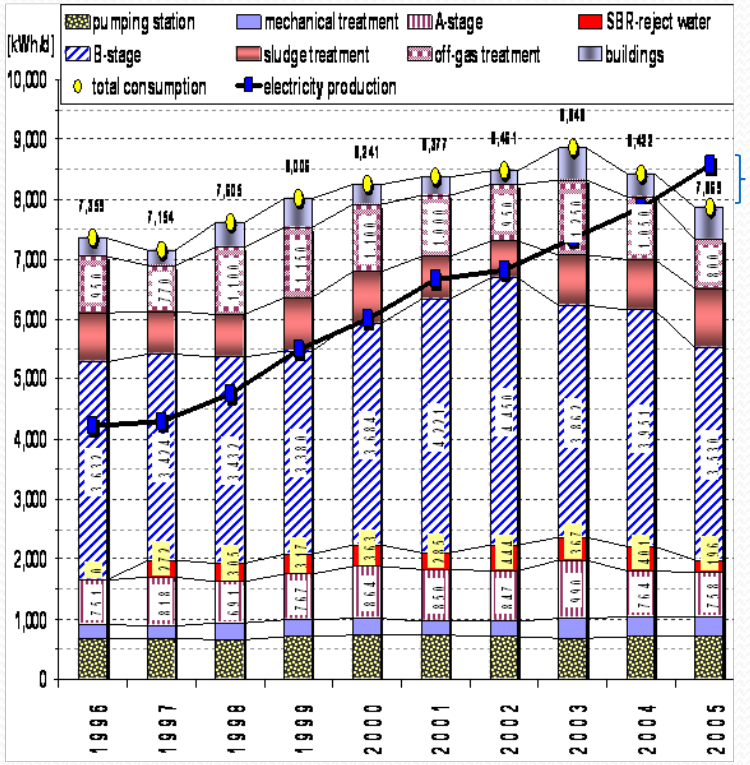
Strass Data and Results

- Plant produces more electricity than it consumes, an achievement made possible through a program of continuous energy efficiency improvement.



Original Energy Recovery Level

Current Energy Recovery exceeds Energy Demand

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Energy Recovery

- Offset from generating onsite power from renewable energy (such as biogas) lowers carbon footprint at WWT plants by 20-40%.

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New High Efficiency Engines

- Strass plant action – replace old co-gen engines
- 38% average energy conversion – a 20% improvement over old engines

GEJenbacher Gas Engine

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Key Opportunities:

- In Enhanced Primary Technologies
- In Energy from Biosolids and other Processes
- In Resource Recovery
- Onsite Systems

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THANK YOU

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