

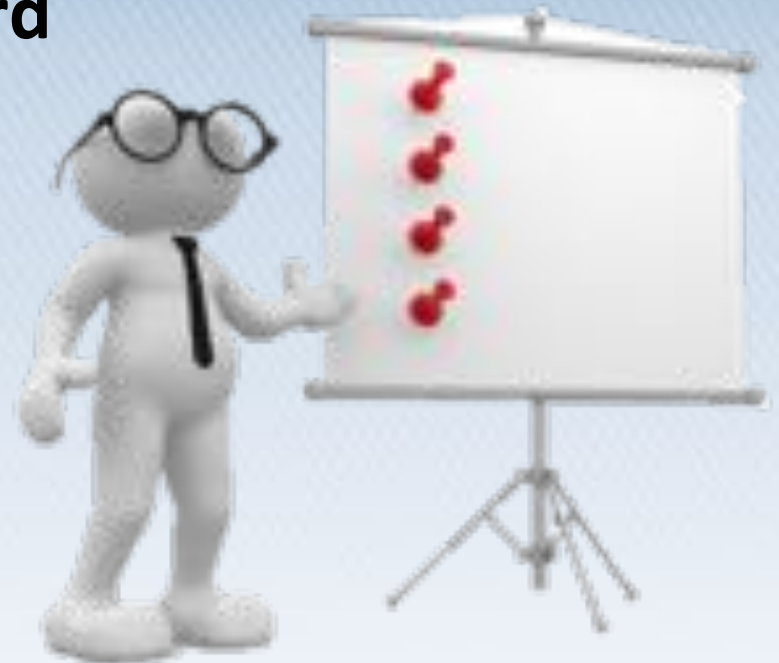
Biosolids Stabilization in Concord, New Hampshire – So where do we go from here?

Presented by:

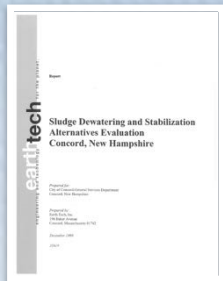
Chris Dwinal, PE

Presentation Overview

- **History of biosolids in Concord**
- **Current RDP lime stabilization system**
- **2015 Biosolids Stabilization Evaluation**
- **Short-term plan**
- **Long-term recommendations**
- **Key factors in ultimate path forward**

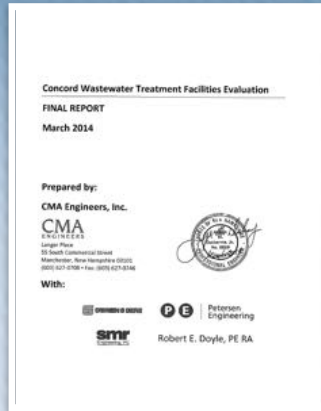


History of Biosolids



First Biosolids Study recommends belt filter presses and RDP Class A lime stabilization

Dewatering and RDP Upgrade Complete



Comprehensive WWTF Evaluation recommends THAD and RDP evaluation

RDP Upgrade Underway



Pre-1999

- Plate and frame press
- Class B lime stabilization
- Land spreading through RMI

1999

2002

2003

2005

2010

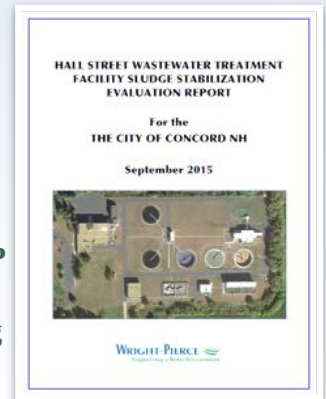
Multiple studies/upgrades to address process issues and fugitive odors and lime dust

2014

2015

Biosolids Stabilization study recommends RDP short term, ATAD/TPAD long term

2016



Issues with RDP Technology

- Difficulty meeting Class A with varying sludge
- Ineffective mixing of lime and biosolids
- Fugitive dust/odor emissions
- Led to ventilation, odor control, and conveyor/mixing upgrades 2008-2010
- System finally running well for past 5 years, but still not ideal...



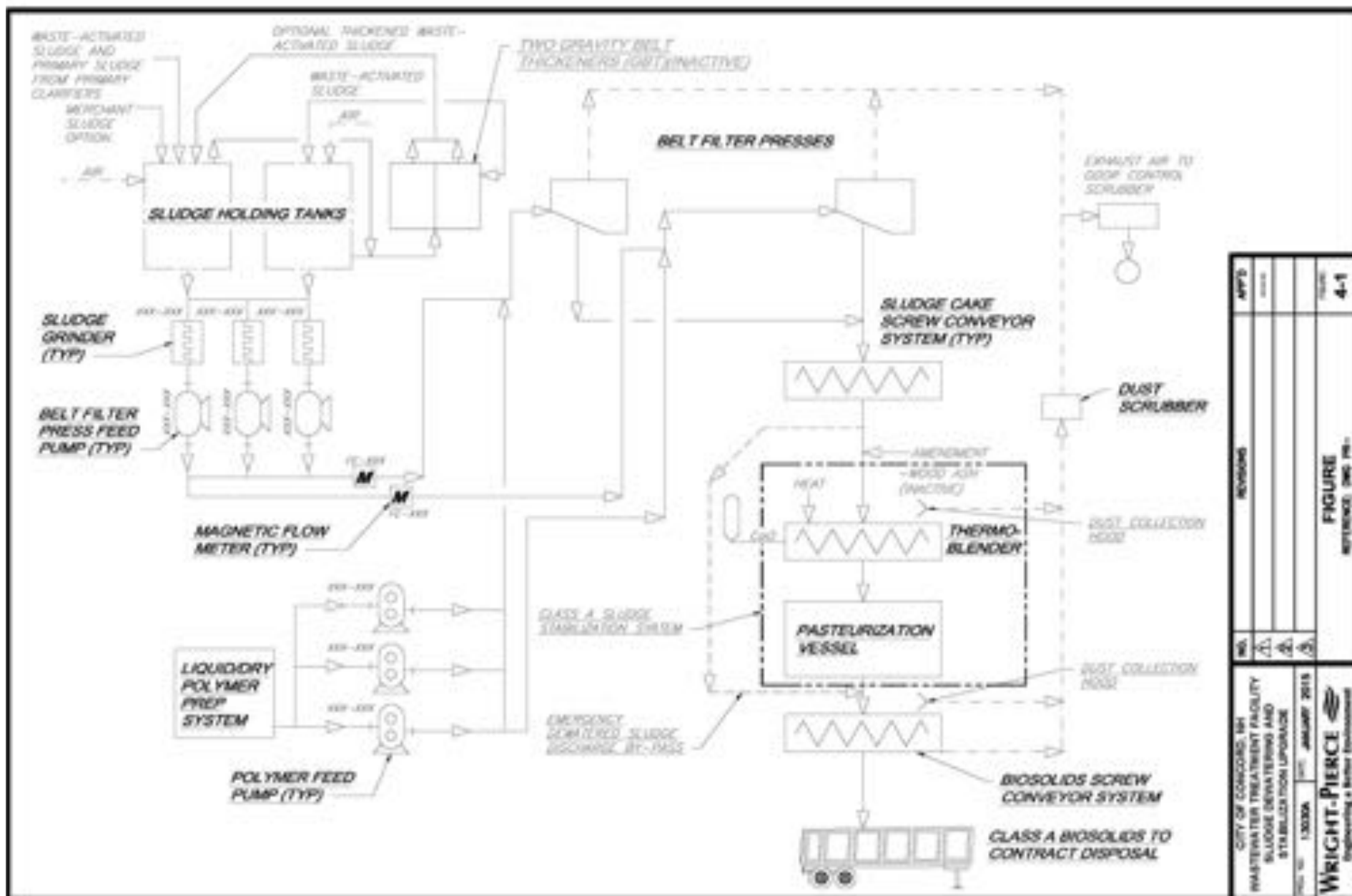
Biosolids Processing Options Considered 1999-2014

- Class A and B lime stabilization
- Composting
- Thermal drying
- ATAD
- Incineration
- Landfill
- Anaerobic digestion – mesophilic, thermophilic, thermal hydrolysis



2015 Biosolids Stabilization Evaluation

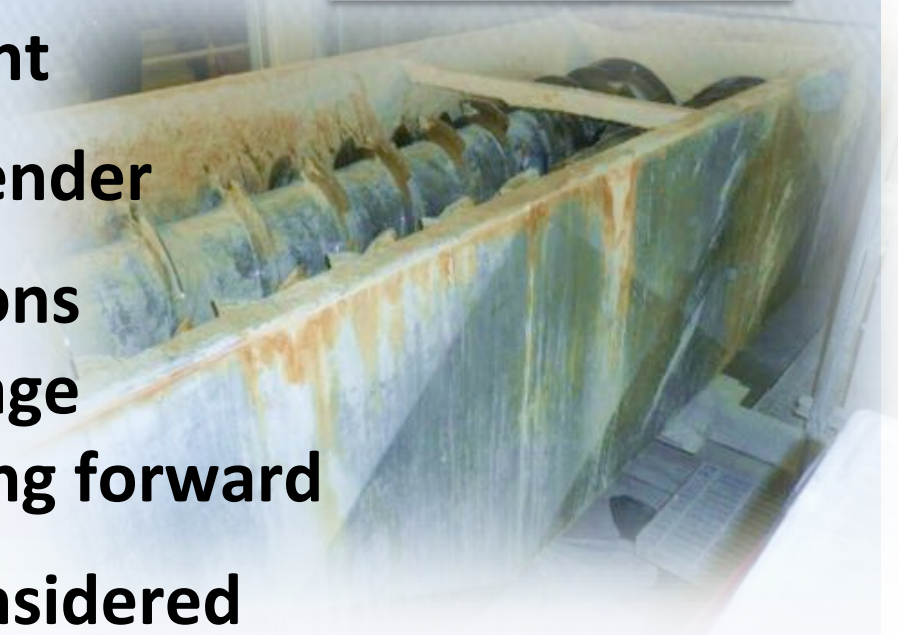
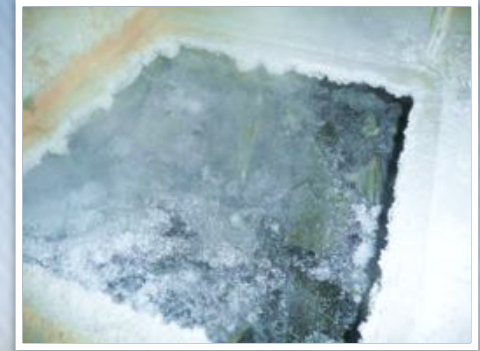
- **One of several completed since 1999**
- **Goals**
 - **Conduct comprehensive evaluation of condition and life expectancy of RDP system**
 - **Recommended in 2014 Comprehensive Evaluation**
 - **City has contract with RMI through 2021 for trucking and reuse of Class A lime stabilized solids (\$29.10/wet ton)**
 - **Conduct a comprehensive review of all biosolids processing and reuse options available to Concord**
 - **NH DES recommendation**



REVISED		APP'D	DATE
1	1		
2	2		
3	3		
4	4		
5	5		
FIGURE 4-1		REFERENCE: DWS 10-1	
CITY OF CONCORD, NH WASTEWATER TREATMENT FACILITY SLUDGE Dewatering AND STABILIZATION UPGRADE		WRIGHT-PIERCE Engineering & Better Environment	

Findings of RDP Evaluation

- Great shape for 12 yrs. of service
- All equipment still functioning
- Auger heaters are weak point
- Some damage to Thermoblender
- Lime dust/ammonia emissions in processing room and garage not acceptable to City moving forward
- Several upgrade options considered



Long-Term Biosolids Stabilization

Composting

Class A lime stabilization

Anaerobic and aerobic digestion

Drying – mechanical and solar greenhouse

Incineration

Gasification

Carbonization

Dewatered Biosolids to off-site processing



Screening Criteria

**Demonstrated
Technology**

**Scalable to
Concord's
needs**

**Potential for
off-site odors**

**End market
for processed
biosolids**

**Possibility of
public-private
partnership**

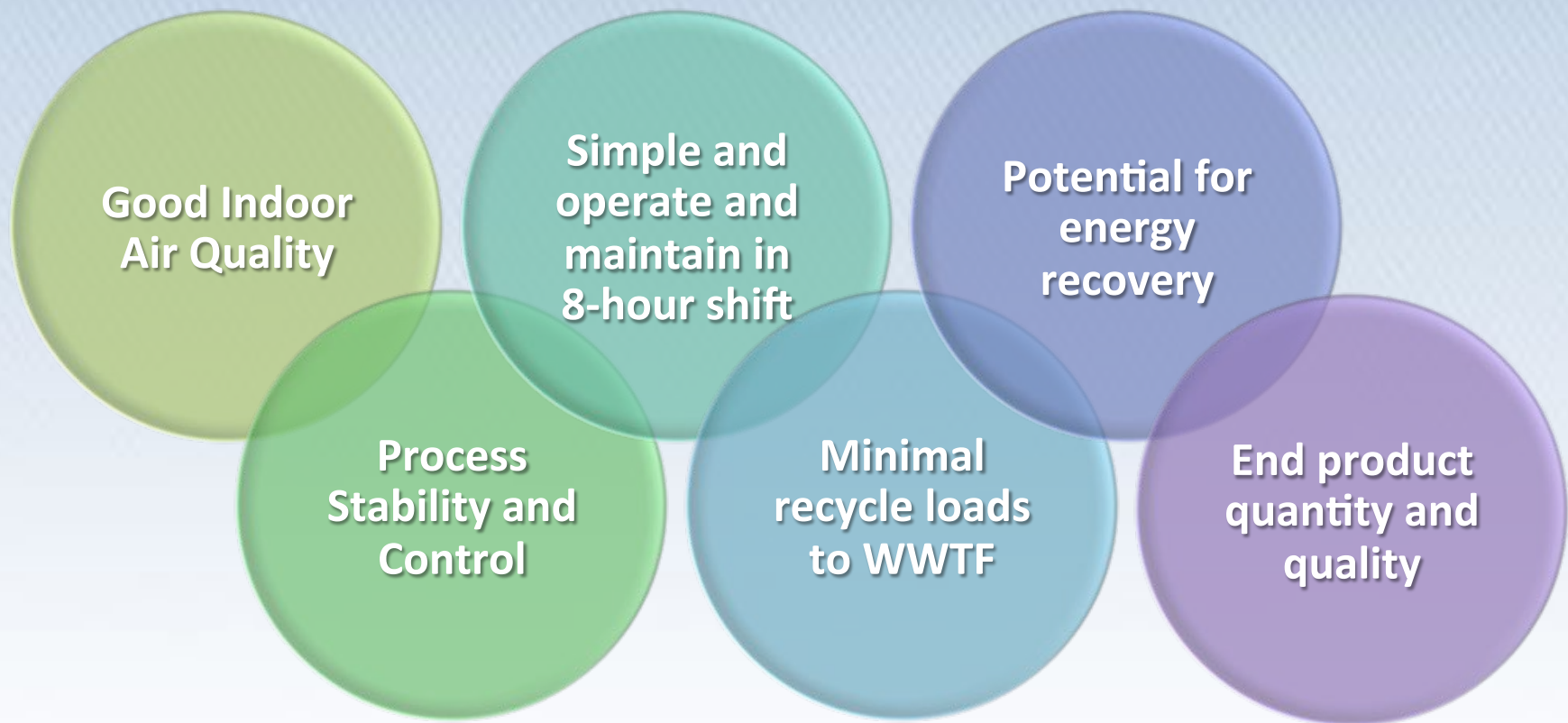
Technologies screened out

- **Not demonstrated**
 - **Carbonization, gasification and thermal hydrolysis**
- **Not scalable**
 - **Incineration**
- **Odor potential too high**
 - **Composting and solar greenhouse drying**
- **Landfilling**
- **Public-private partnership**
 - **Stigma of being dumping ground for the region**
 - **Concerns with odors – historical issues in Concord**

Six remained...

- **3 Class A Lime Stabilization**
 - Retain RDP long-term
 - Schwing Bioiset
 - FKC screw press
- **3 Digestion**
 - Temperature or Two Phase Anaerobic Digestion
 - Mesophilic Anaerobic Digestion with Drying
 - Autothermal Thermophilic Aerobic Digestion

Evaluation Criteria



Class A Lime Stabilization

- RDP
- Schwing Bioaset
- FKC Screw Press



RDP Class A Lime Stabilization

PROS

Simple to operate

Stackable, dry
end product

No post processing
required

Limited recycle loads
impact

Very cost effective -
existing

50 U.S. installations

CONS

Poor air quality

Poor process control/
stability

Full-time staffing required

No energy recovery

Odors when spreading

Calcium saturation issues

Highest biosolids quantity



Schwing Class A Lime Stabilization

PROS

Fully enclosed good air quality

Good process control/stability

Limited staffing required

Simple to operate

Limited recycle loads

30 U.S. installations

CONS

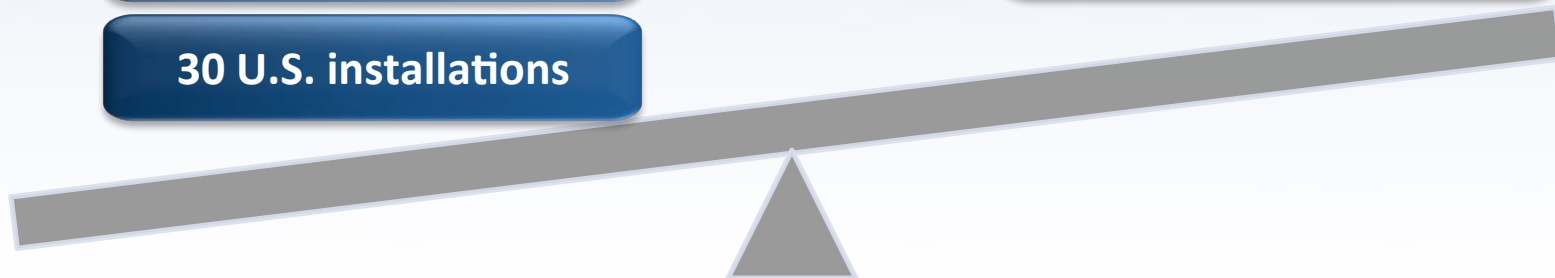
No energy recovery

Poor end product quality

Requires post processing

Calcium saturation issues

High biosolids quantity



FKC Class A Lime Stabilization

PROS

Good air quality

Good process control/
stability

Simple to operate

Limited recycle loads

CONS

No energy recovery

Calcium saturation issues

High biosolids quantity

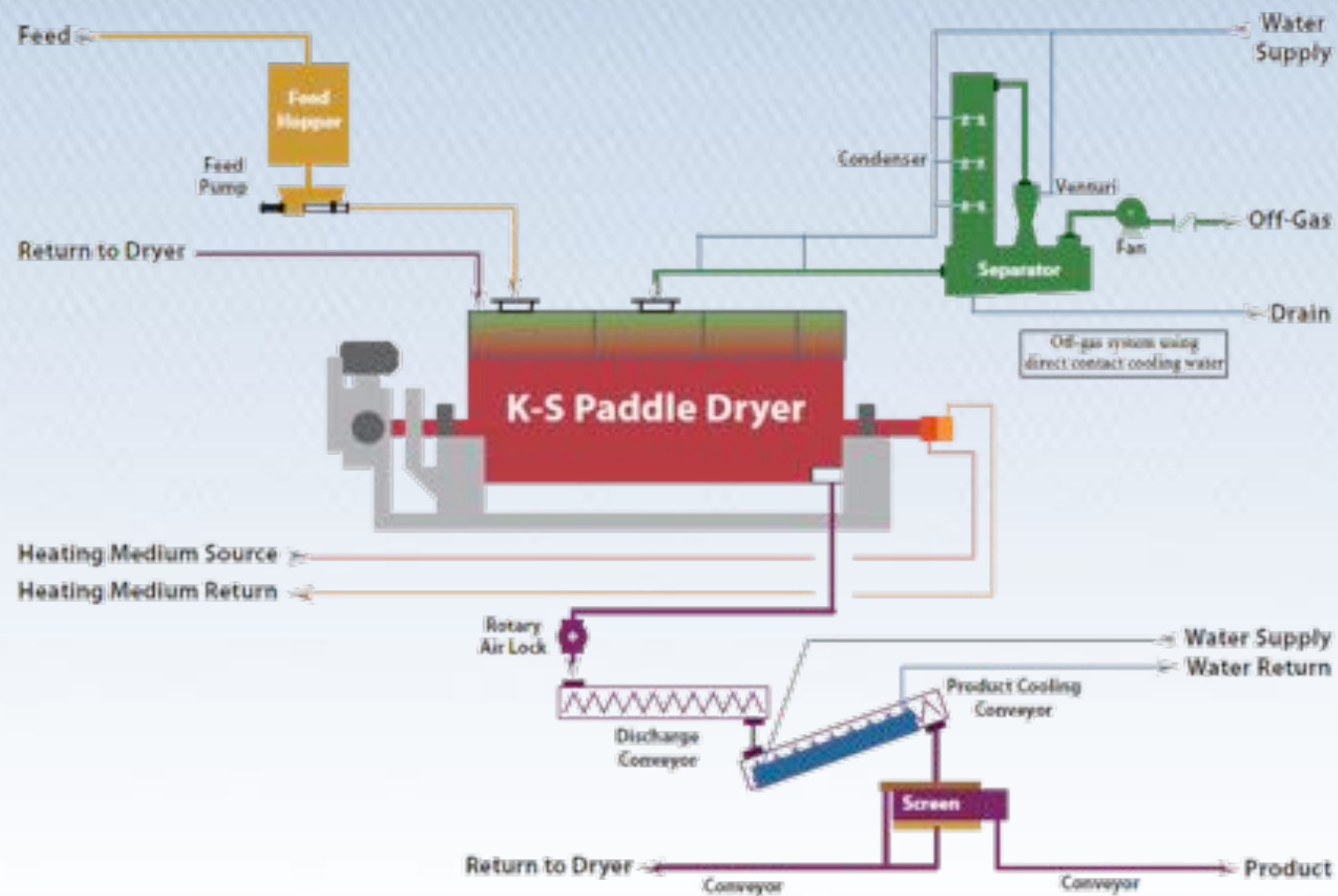
24/7 operation

3 U.S. installations



Mesophilic Anaerobic Digestion w/ Drying

K-S Drying Process



MAD with Drying

PROS

Fully enclosed good
quality air

Good process control/
stability

Good energy recovery

Excellent biosolids quality

Lowest biosolids quantity

30 U.S. installations

CONS

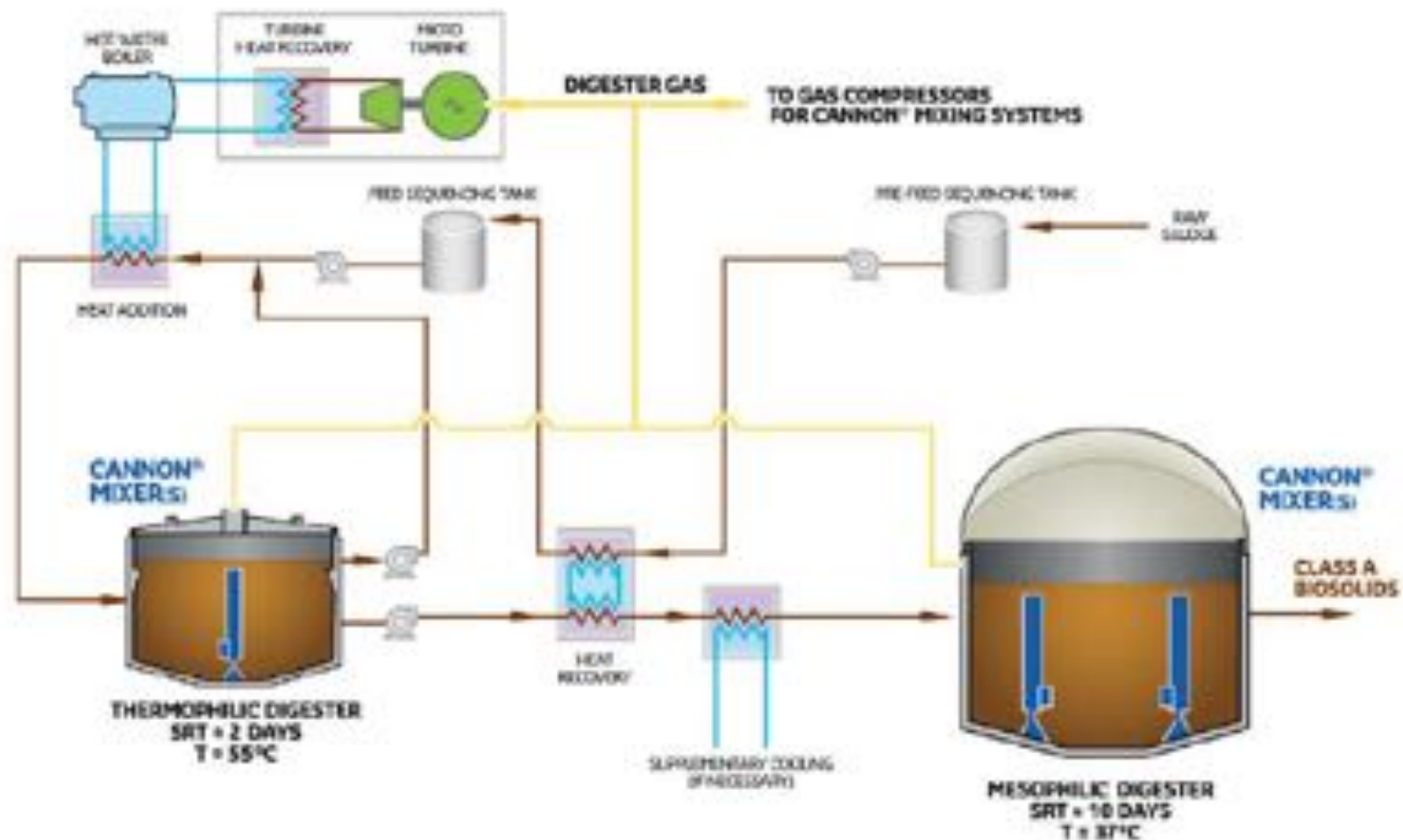
24/7 operation

Complex process x 2

High recycle loads



TPAD/2PAD Anaerobic Digestion



TPAD/2PAD

PROS

Fully enclosed, good air quality

Good process control/stability

8-hour staffing due to automation

Highest energy recovery

Excellent biosolids quality

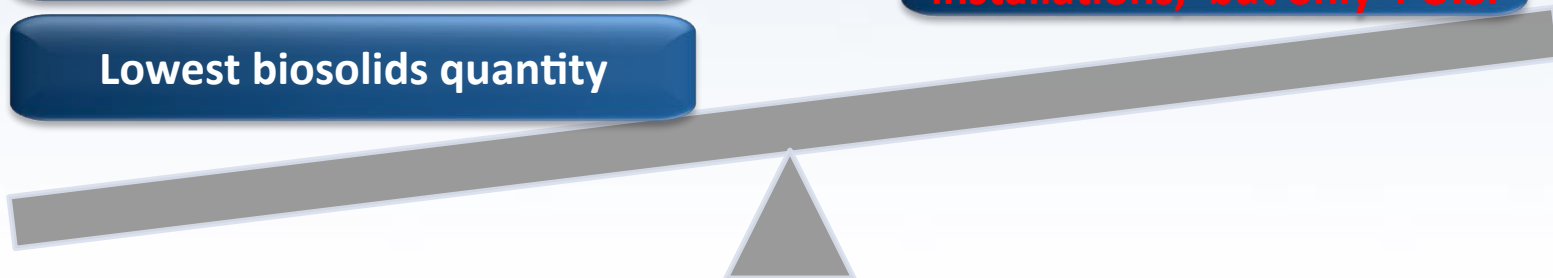
Lowest biosolids quantity

CONS

Complex process

Highest recycle loads to WWTF

Numerous international installations, but only 4 U.S.



ATAD – 2nd Generation

TPS THERMAER[®] PROCESS

Your system will be custom engineered to fit your needs exactly, whether you want the 100,000 lb. or 10,000 lb. system. In typical installations, such as the one illustrated here, you will have the flexibility to continuous or batch heat the process body, after increasing the heat intensity.

Assured product quality – with no compromises

With the patented ThermoAir[™] Process, you can achieve the results you want without compromising your quality or cost objectives. The system delivers superior volatile solids reduction, extremely low odor and pathogen reduction in any reactor configuration – and, where required or desired, assured EPA Class A certification.



Heat from the ThermoAir[™] Process is used to pre-heat the waste, which is then fed into the reactor. The ThermoAir[™] Process is a patented technology designed to efficiently and reliably reduce volatile solids, odor and pathogen reduction in any reactor configuration – and, where required or desired, assured EPA Class A certification.



Pump Gallery — Douglas, OK. 100,000 lb. system. Pump mounted at grade for all pump access.



Reactor Displacement System — Douglas, OK. Reactor displacement system allows for the flexibility of adding the liquid depth to the reactor.



Control Panel — Douglas, OK. An integrated control package provides the flexibility to control the process by a single button or the process.



Air Distribution System — Oklahoma City, Oklahoma, OK. Uniform air distribution system provides even airflow across the reactor with 1-4% waste concentration or more.



Pump Gallery — Oklahoma, OK. Commercial size of pump gallery can already handle the operating and maintenance staff.

ATAD

PROS

Fully enclosed, good air quality

Good process control/stability

8-hour staffing due to automation

Excellent biosolids quality

Low biosolids quantity

Low recycle loads to WWTF

40 U.S. installations

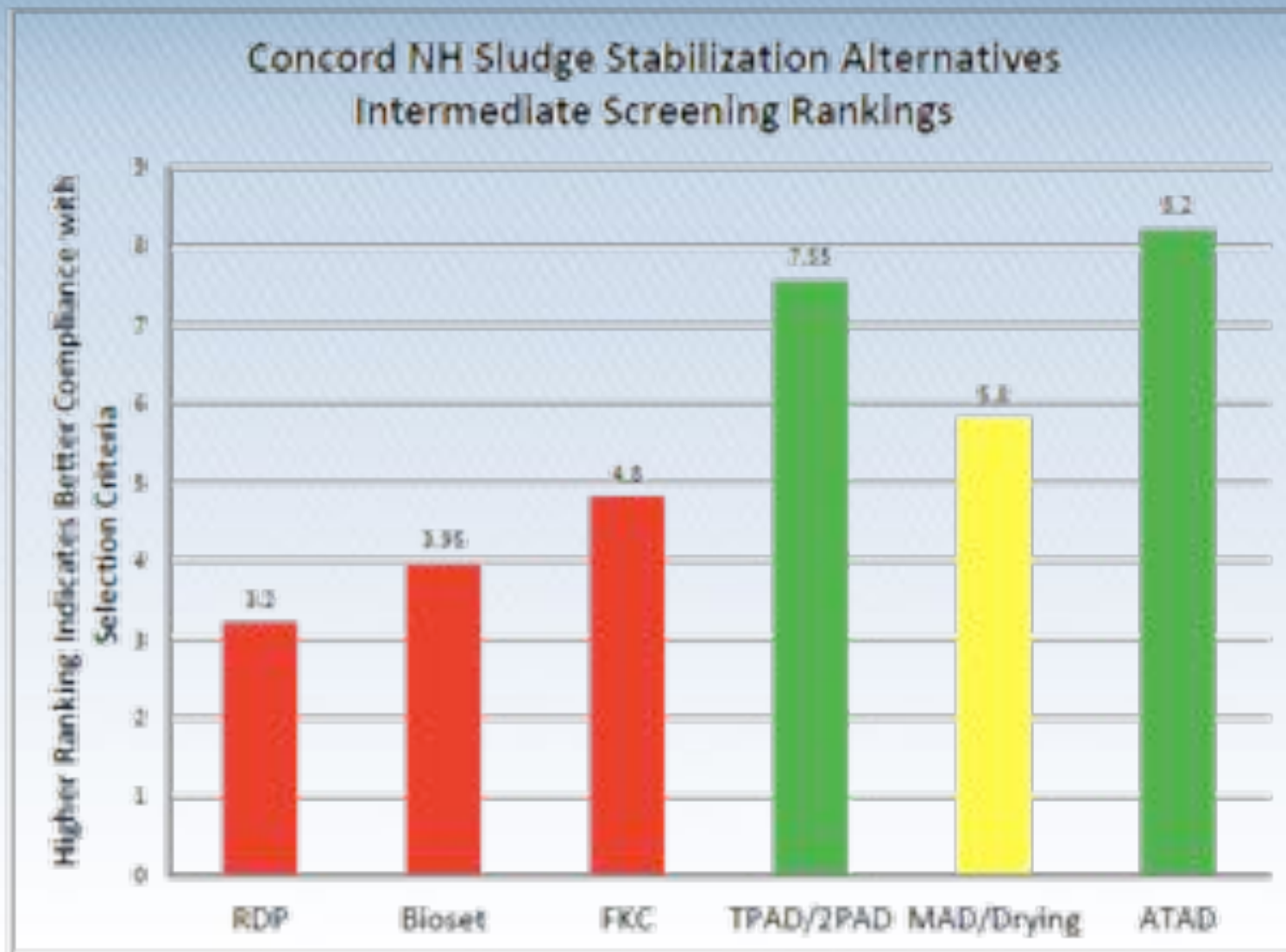
CONS

Moderately complex process

No energy recovery



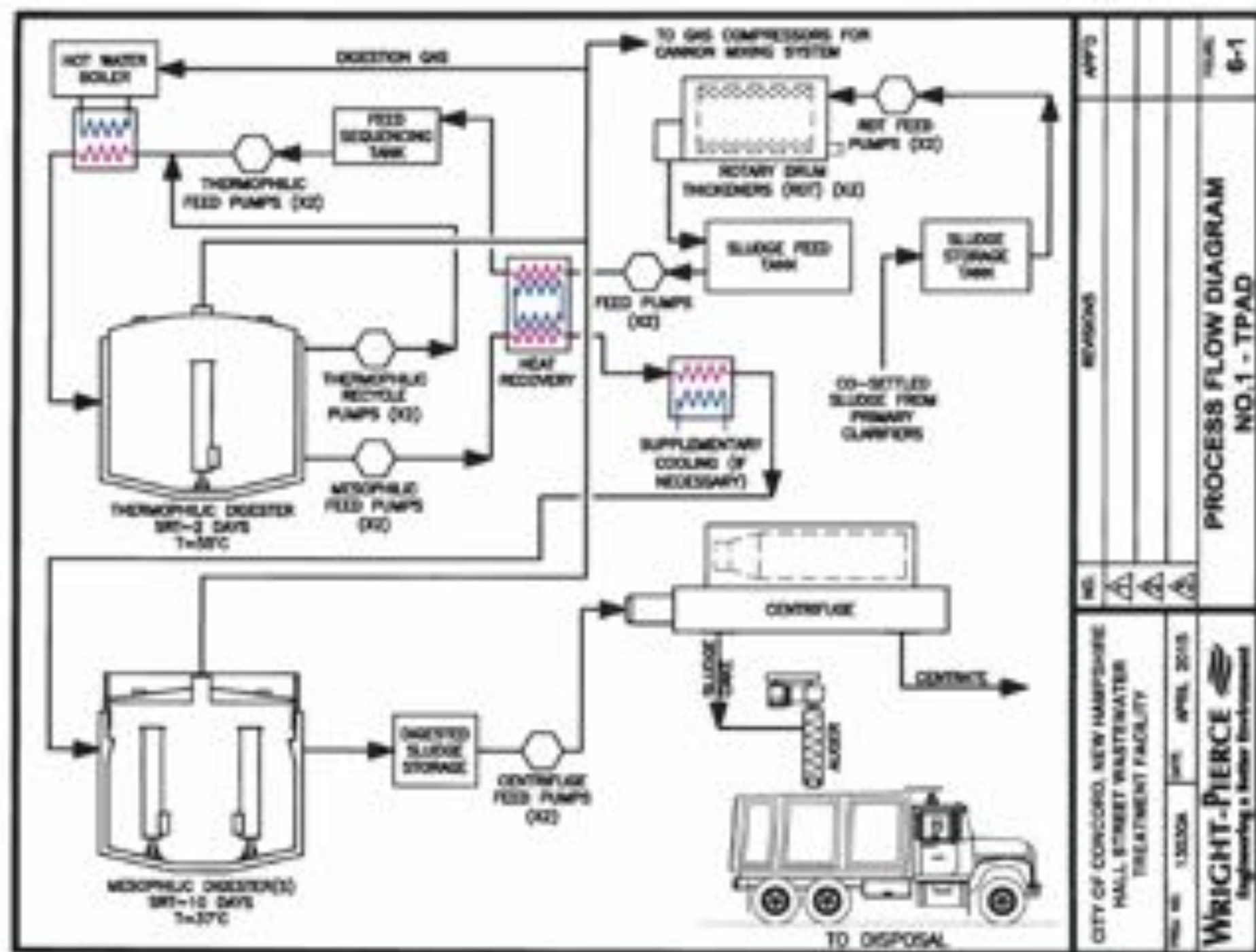
Evaluation Rankings

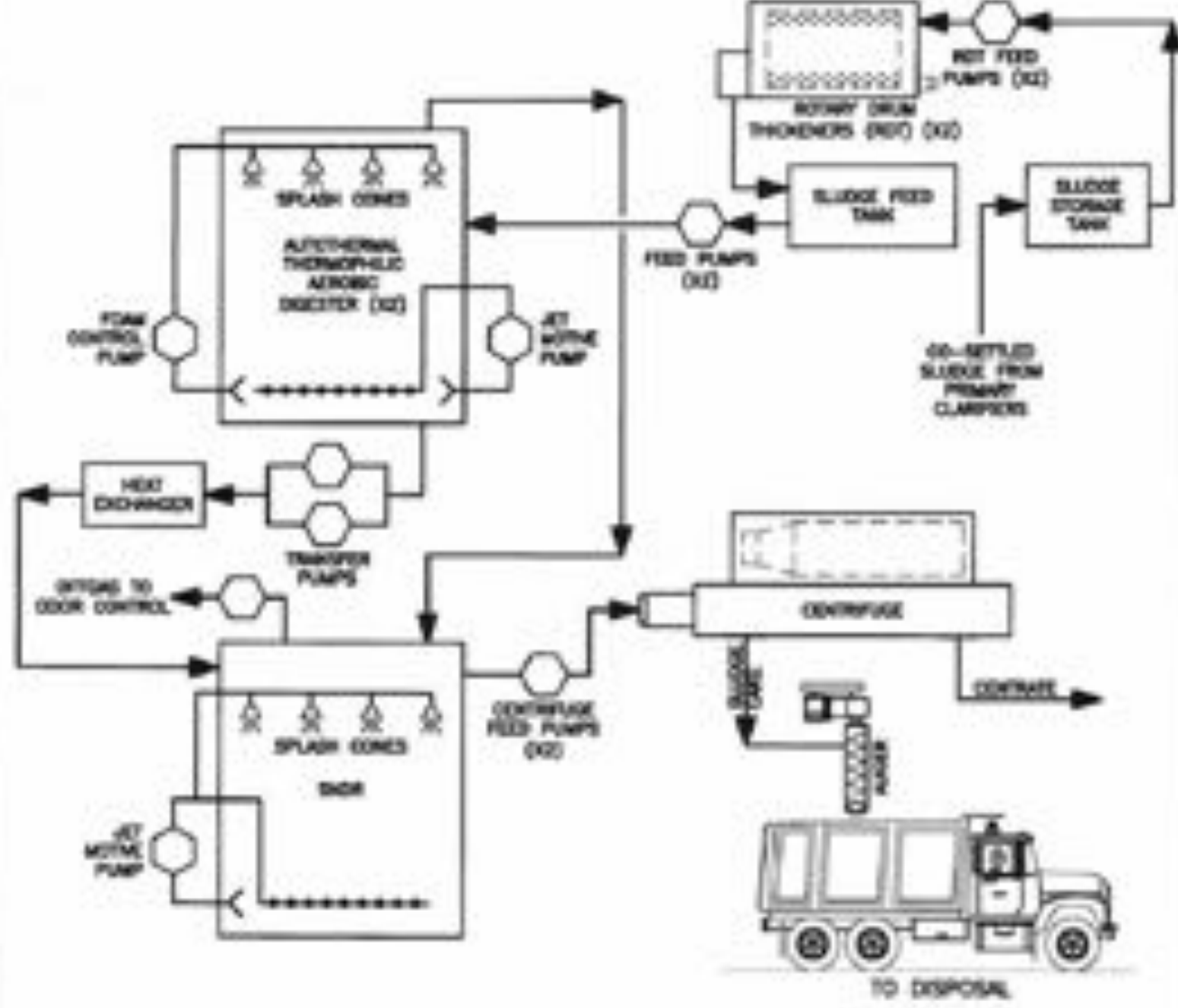


Final Analysis

- **MAD dropped due to complexity and 24/7**
- **TPAD/2PAD and ATAD carried forth**
- **Both ~ \$20 million capital cost**
- **TPAD lower life-cycle cost due to lower energy requirements**
- **Split decision**
 - **Staff more comfortable with ATAD and more installs**
 - **TPAD/2PAD lower life cycle cost (electric) but far less installs**







CITY OF CONCORD, NEW HAMPSHIRE
HALL STREET WASTEWATER
TREATMENT FACILITY

Rev. No. 1-30-04 Date APRIL 2013

WRIGHT-PIERCE
Engineering & Better Environment

REL

1

2

3

REVISIONS

APPD

PROCESS FLOW DIAGRAM
NO.2 - ATAD

NAME
6-3

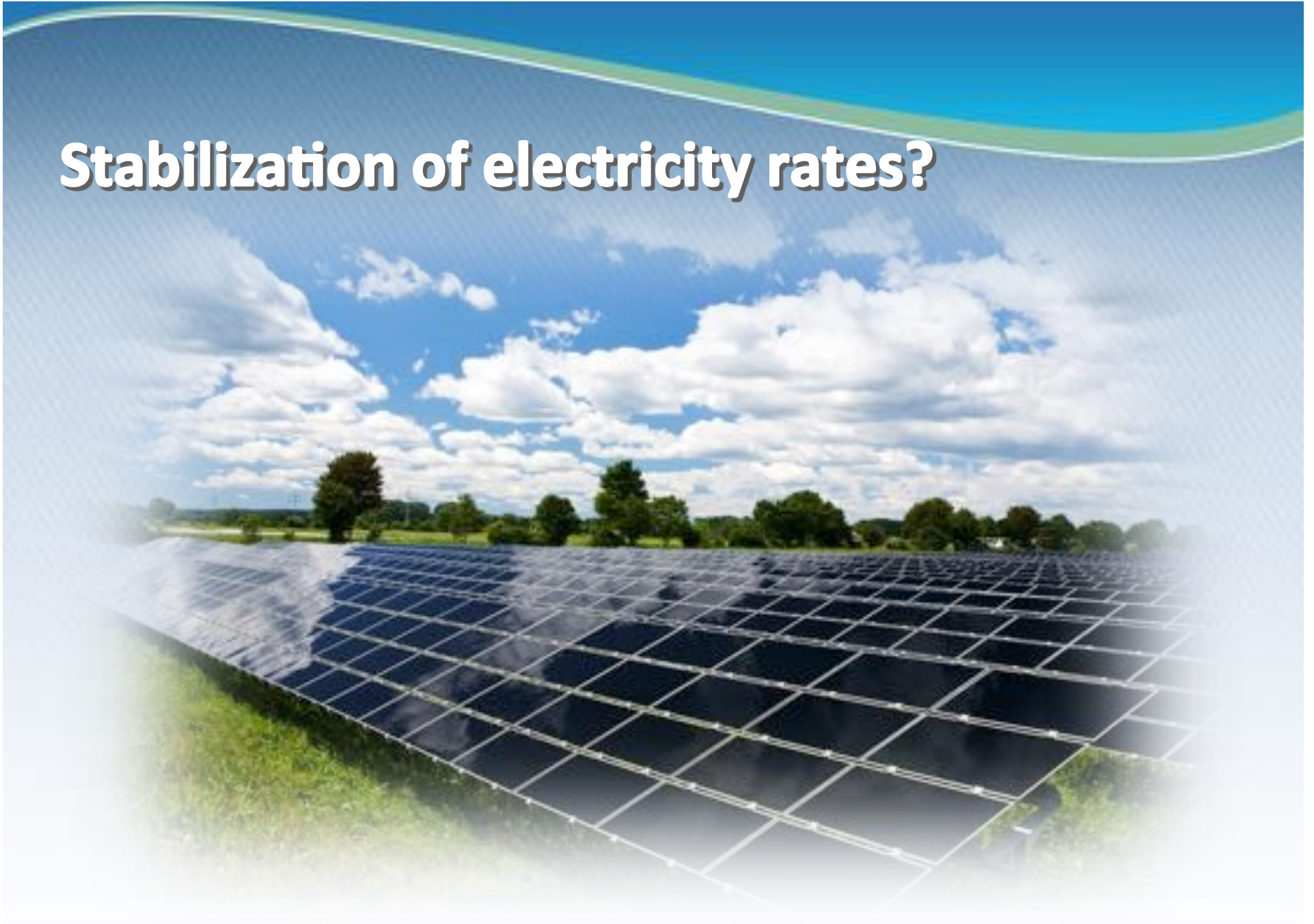
Final Recommendations – Lime Stabilization

- **Very cost effective, 25% the cost of digestion**
- **But, not desirable long term**
 - Highest biosolids quantity, lowest biosolids quality
 - No potential for energy recovery
 - Higher operator attention required
 - Concerns with air quality
- **However, good short term option**
 - Upgrade RDP and ventilation - ~\$2 million
 - Low cost tipping fee in place through 2021

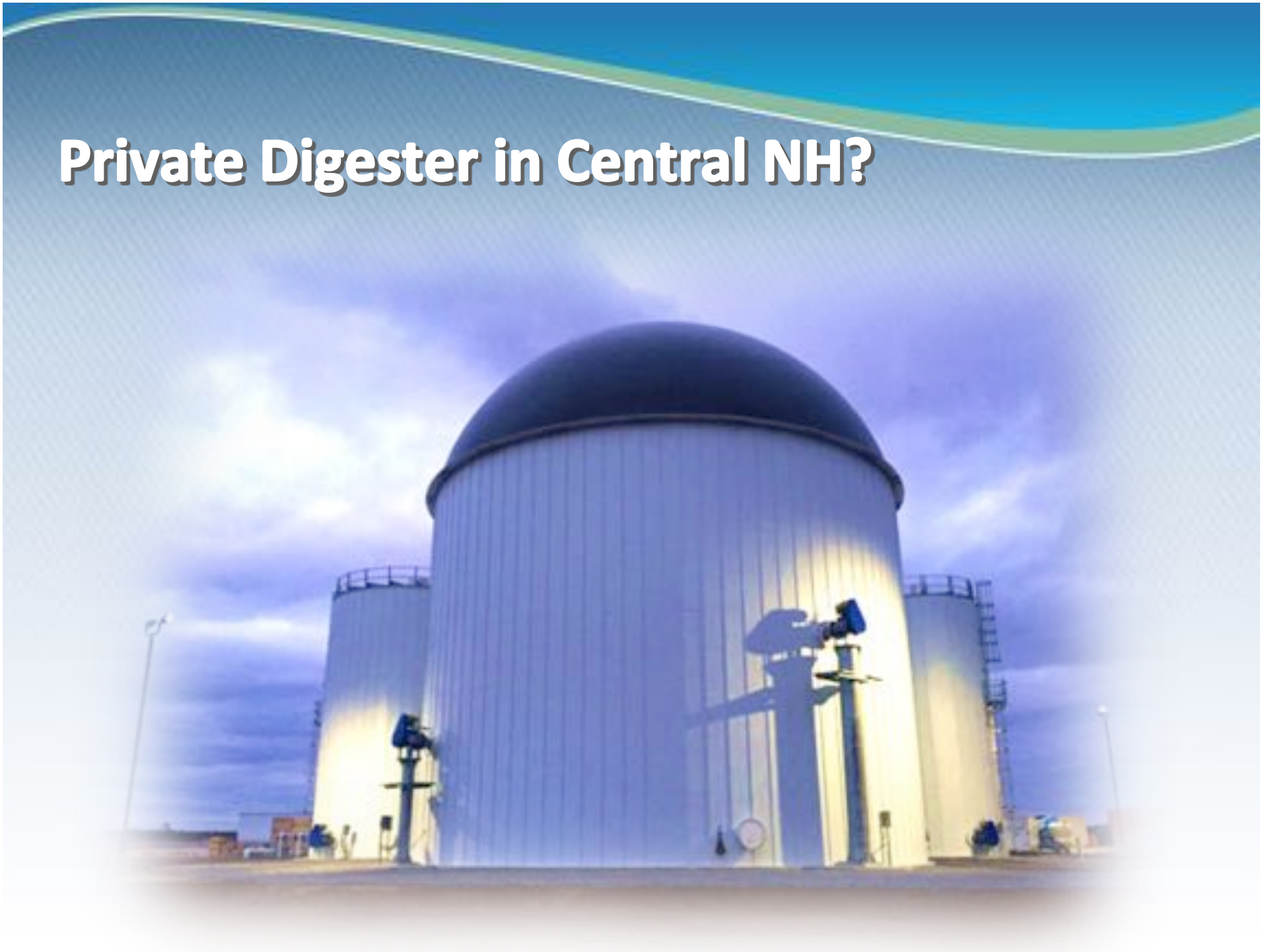
Final Recommendations – Long-Term

- **Some form of digestion – consistent with 2006 and 2014 studies**
- **TPAD/2PAD lowest life cycle costs, but**
- **City staff prefer ATAD**
 - **Familiarity with equipment**
 - **Many more U.S. installs**
 - **Concord WWTF typical size of ATAD installs**
- **So, what's next?**

Stabilization of electricity rates?



Private Digester in Central NH?



The Future

- **TPAD/2PAD life-cycle cost still cheaper with lower electricity cost**
 - capital cost of TPAD/2PAD lower than ATAD
- **Upgrading RDP allows time for...**
 - further advancement of TPAD/2PAD technology
 - Allow for more U.S. installs
 - preliminary designs to nail costs
 - Possible development of alternative power sources to stabilize electricity rates?
 - Possible merchant facility for offsite processing?



Variability in Electrical Rates

- **Over past two years**
 - High of \$0.147/kWh
 - Low of \$0.112/kWh
 - Average of \$0.132/kWh
- **New solar PV in cornfield next to WWTF**
 - 20 year fixed price of \$0.086/kWh just for supply
 - Essentially equal to current supply price for WWTF
 - Will offset other higher price electricity users in Concord



Questions?



WRIGHT-PIERCE 
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