

Deploying a Successful Biomass to Energy Project

What Works and Why Many Efforts have Failed

Bulgaria

April 2013



ZEROPOINT
CLEAN TECH™

Background

- ZeroPoint Clean Tech, Inc. Founded in 2006
- Down Draft Biomass Gasification ~ 5MW(th) 2MW(e) per Gasifier
- Built Lab Scale (16cm) Reactors at Clarkson University
- Built and Tested Pilot Scale (65cm) for one year on many feedstocks
- Built Full Scale (1.3M) Pilot Reactor
- Deployed Full Scale Research Reactor with Jenbacher 320 and Flare
- Deployed Full Scale Commercial Reactor with Jenbacher 620 to achieve 1.84MW (and growing) electrical output
- Three rounds of corporate venture funding
- Party to Project Funding Efforts for 2 Deployments





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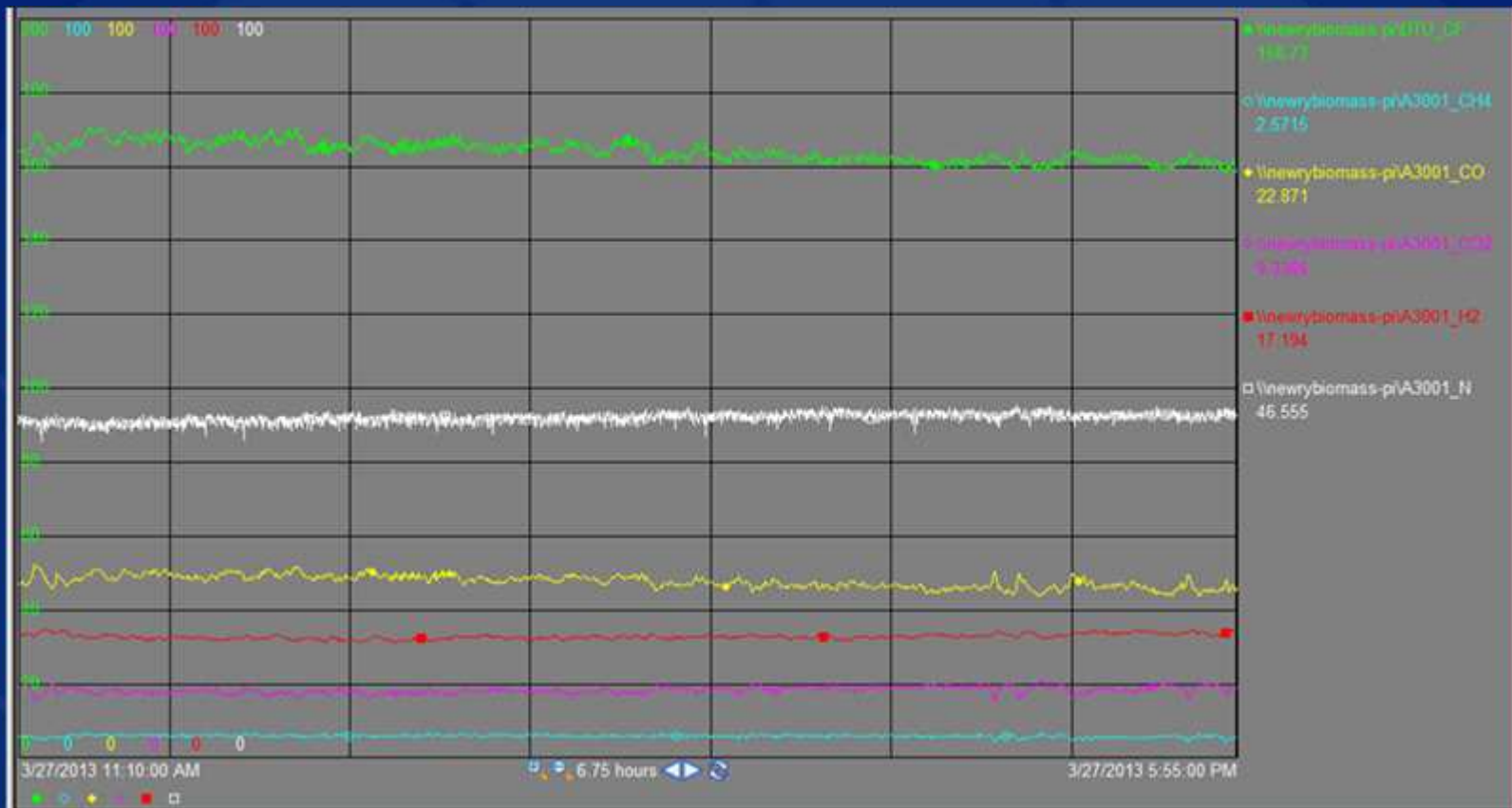
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Gas Chemistry



Key Project Components/Milestones

1. Feedstock Selection
2. Site Selection
3. Biomass Handling Equipment
4. Conversion Technology
5. Engine Technology
6. Balance of Plant
7. Plant Integration Design
8. Plant Construction
9. Plant Commissioning
10. Plant Operations and Maintenance



What Can Go Right?

Only One Thing –

The Plant is On Budget and Schedule
and Operates Successfully



What Can Go Wrong?

Everything!



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Risks with Feedstock Selection

- All Biomass is Not the Same
- The Differences Are Critical to Technical and Economic Success
- Quality – Energy, Moisture, Ash, Fusion, Flow-ability, Contaminants
- Long Term Price
- Long Term Supply
- Properly Matched to Handling Equipment and Conversion Technology



Risks with Site Selection

- Stable Tariffs
- Economic Grid Connection
- Proximity to Feedstock
- Availability of Qualified and Affordable Labor



Risks with Biomass Handling Equipment

- Properly Matched to the Characteristic of Feedstock
- Durable and Reliable
- On Site Quality Control – Size, Contaminants and Moisture
- Properly Sized Storage – Long Term and Short Term



Risk with Conversion Technology

- Does it Actually Work
- Tested, Proven, Reliable
- Properly Matched to Long Term Feedstock
- Properly Matched to Engine Technology
- Properly Supported by Balance of Plant



Risks with Engine Technology

- Properly Matched to Syngas Chemistry, Moisture, Temperatures and Pressures
- Properly Sized and Specified
- Tested with Syngas

Risks with Balance of Plant Components

Does the Balance of Plant Match and Support Detailed Plant Process Flow Diagrams?

Risks with Plant Integration Design

Individual Plant Components are likely not Plug and Play:

Building, Biomass Handling, Gasifier, Gas Conditioning, Gas Header, Flare, Engine, Heating, Cooling, Transformers, Switch Gear, Integrated Control Systems

Getting the Entire Plant Design Right Requires Experienced Engineers

Risks with Plant Construction

- Must be Properly Funded and Staffed
- Involves Many Disciplines:

Economic Modeling, Project Planning, Project Management, Project Finance, Site Work, Building, Process Components, Quality Assurance, Code Compliance, Environment Compliance, Zoning, Codes, Approvals, Testing, etc.

We highly recommend Experienced Investors, Lenders, and EPC Contractor to work with Local Professionals and Government Entities to Coordinate and Manage Construction. We have not witnessed anybody “get it right” without a good prime contractor coordinating all of the subs.



Risks with Plant Commissioning

- Plant and Process Commissioning is a Different Skill Set than Plant Construction and Different from Operations and Maintenance
- High Technical Process Experts that are Good at Debugging and Problem Solving.
- Lead Representative from Each Key Equipment and Controls Vendor working together to individually test each plant component – individually and then together.
- Extensive Cold Flow and Hot Operational Testing
- Coordinated Hand Off to Operational Team

Risks with Plant Operations and Maintenance

- Operations and Maintenance is a Different Skill Set from Plant Construction and Commissioning
- Operations and Maintenance Requires a Fully Staffed Team Experienced in 24-7 Operations
- Details Oriented and Disciplined about Process and Procedure



Why Many Technology Companies and Projects Have Failed

- Making a New Technology Work in a Field Project Environment Spans Many Disciplines and Stakeholders all with individual goals and profit agendas.
- Venture Finance, Science, Engineering, Manufacturing, Transportation, Project Modeling, Project Finance (Equity and Debt), Government Relations, Biomass Handling, Sourcing, Contracting, Plan Design and Engineering, Construction, Commissioning, Operations and Maintenance.
- Investors, Management Teams, Developers, Managers, Governments, Utilities, Vendors, Owners, Operators, etc.
- Planning, Analysis and Stakeholder Alignment is Key



Thank You and Questions

