

Logistical Support and Modeling Efforts in Pretreatment Research

Paper 516g

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NEOTERICs INTERNATIONAL
Using Technology to Create Business Innovation



Biomass Refining CAFI

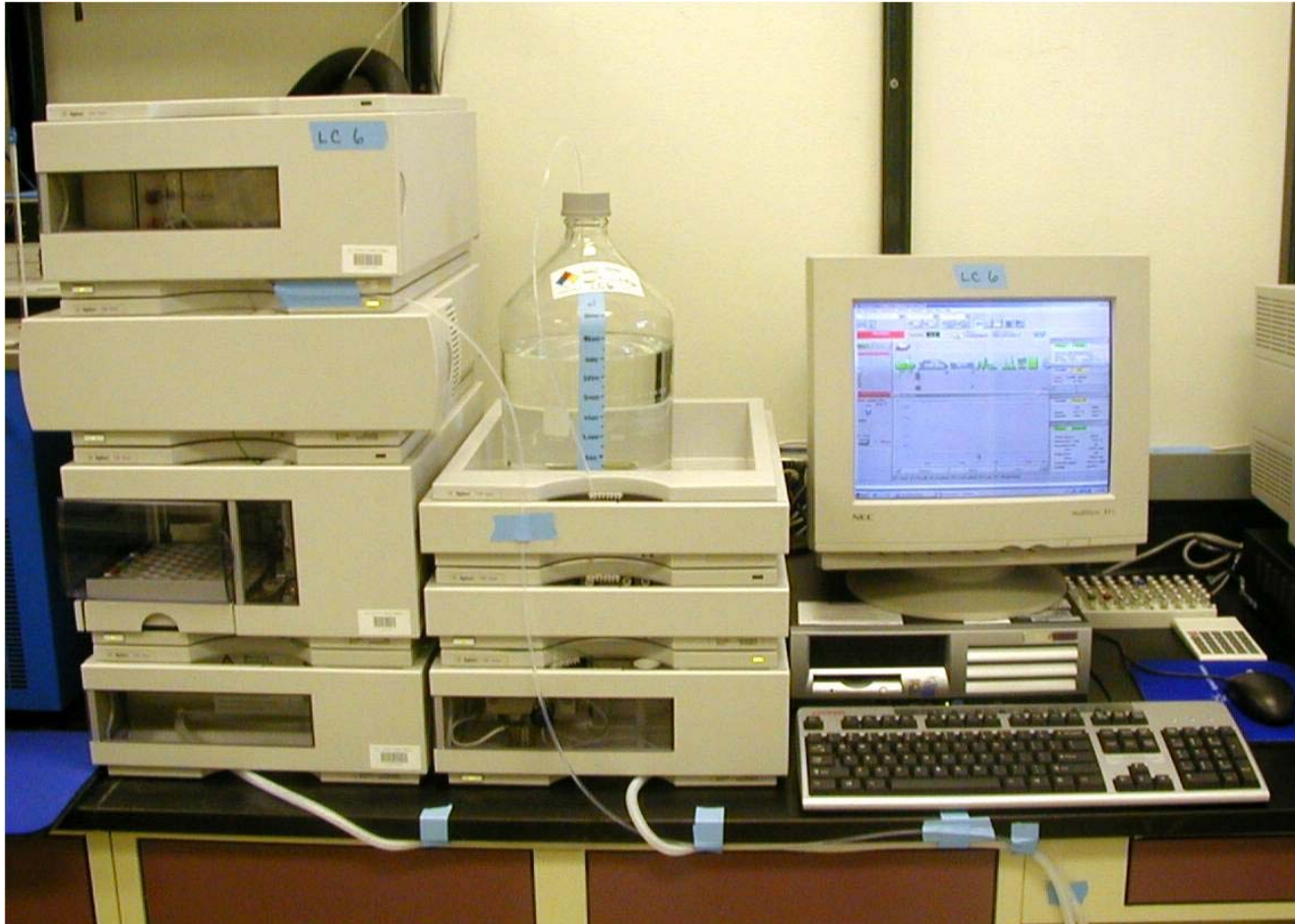
NREL is operated by Midwest Research Institute • Battelle



Outline

- Logistical Support
 - Analytical Protocols
 - Feedstock Supply
 - Surface Characterization
- Modeling
 - Process
 - Economic

Analytical Protocols



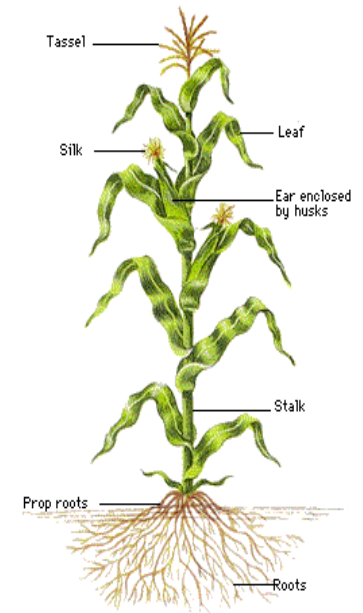
http://www1.eere.energy.gov/biomass/analytical_procedures.html

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Feedstocks

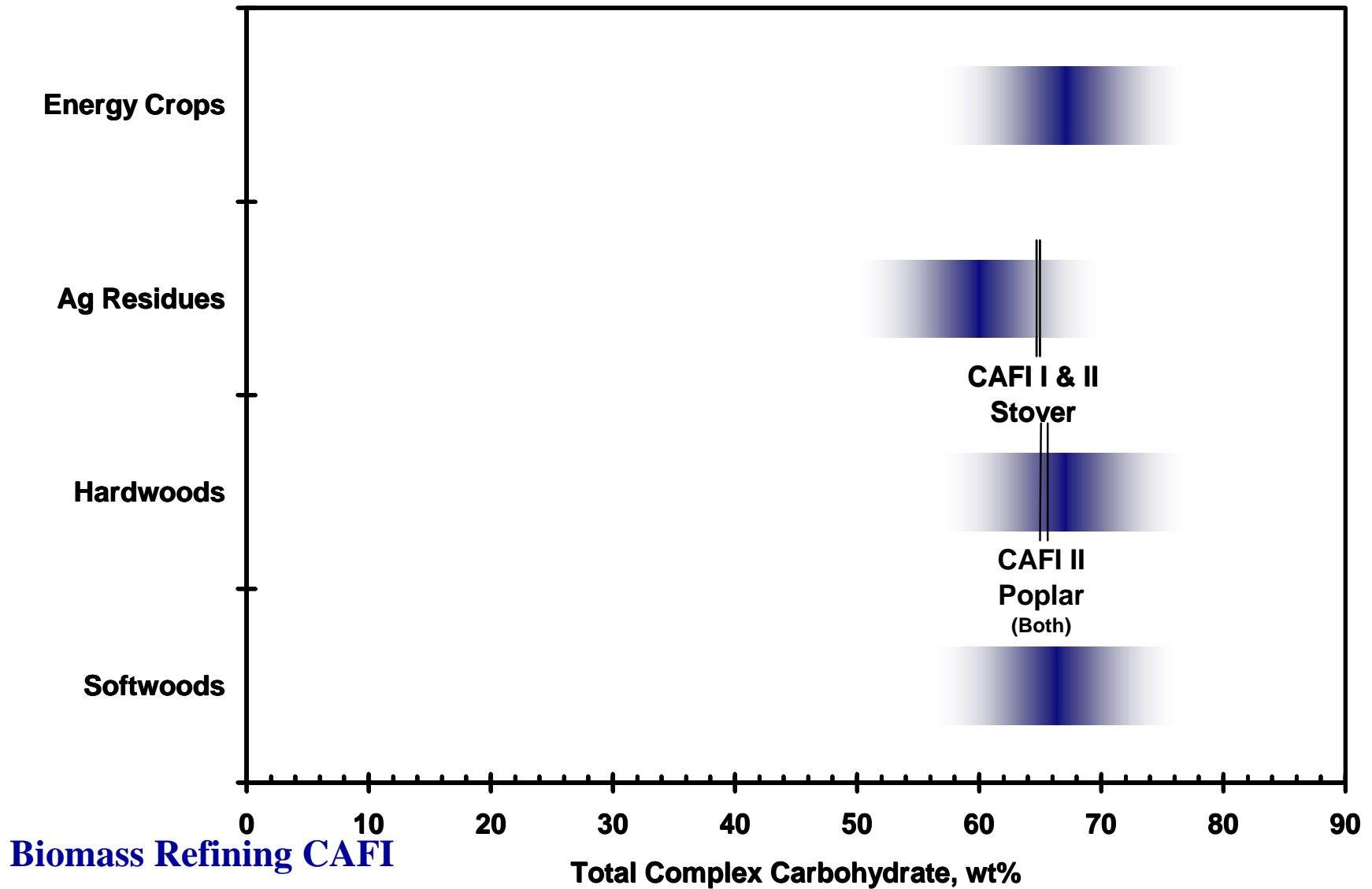


	Hybrid Poplar	CAFI II Stover	CAFI I Stover
Glucan	43.8 %	34.4 %	36.1 %
Xylan	14.85 %	22.8 %	21.4 %
Arabinan	0.61 %	4.2 %	3.5 %
Mannan	3.94 %	0.6 %	1.8 %
Galactan	1.02 %	1.4 %	2.5 %
Lignin	29.12 %	11.0 %	17.2 %
Protein	-	2.3 %	4.0 %
Acetyl	3.62 %	5.6 %	3.2 %
Ash	1.07 %	6.1 %	7.1 %
Uronic Acid	-	3.8 %	3.6 %
Extractives	3.56 %	8.5 %	-
Sucrose	-	2.2 %	-
Non-structural Sugars	-	-	1.2 %

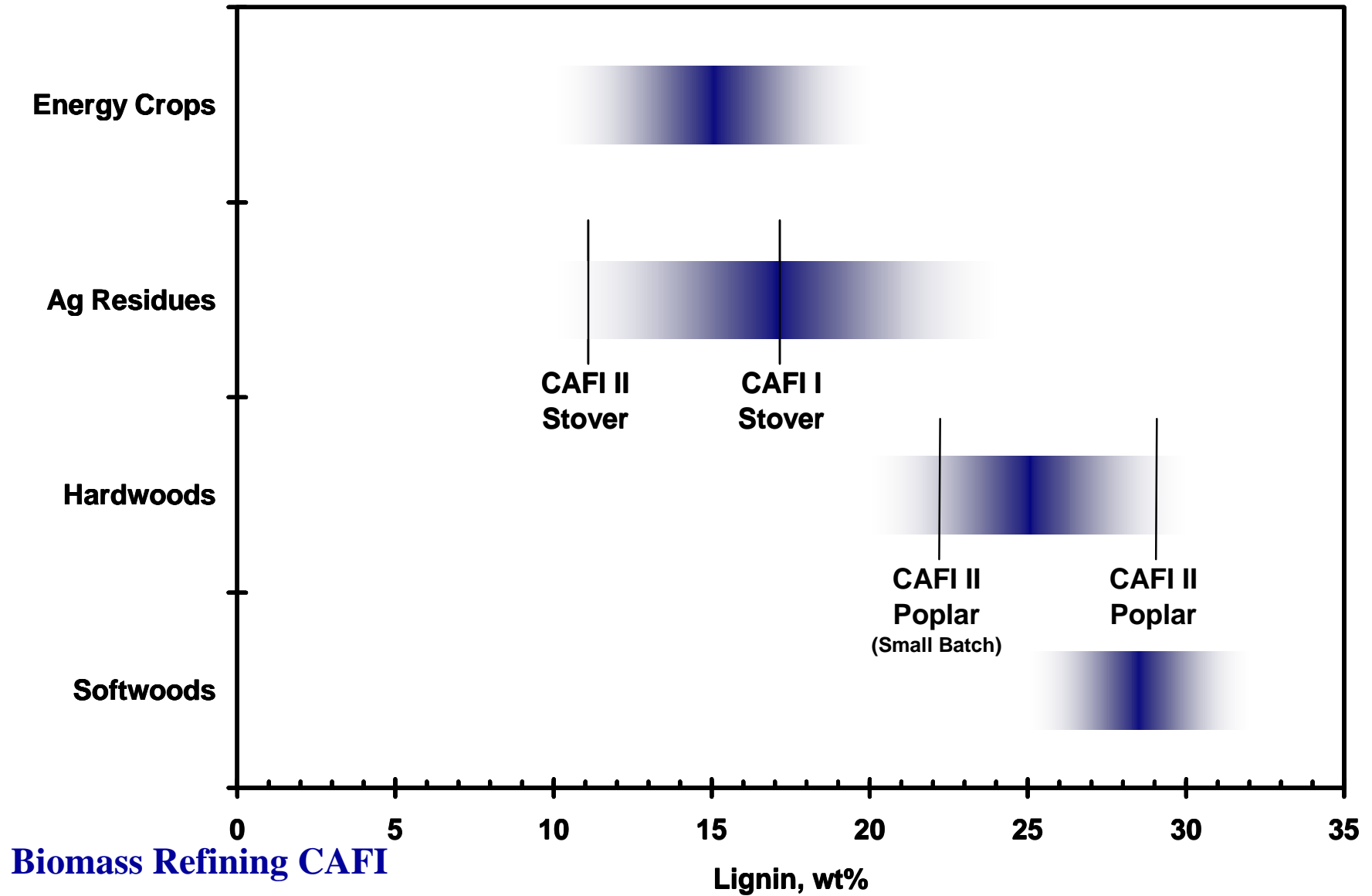


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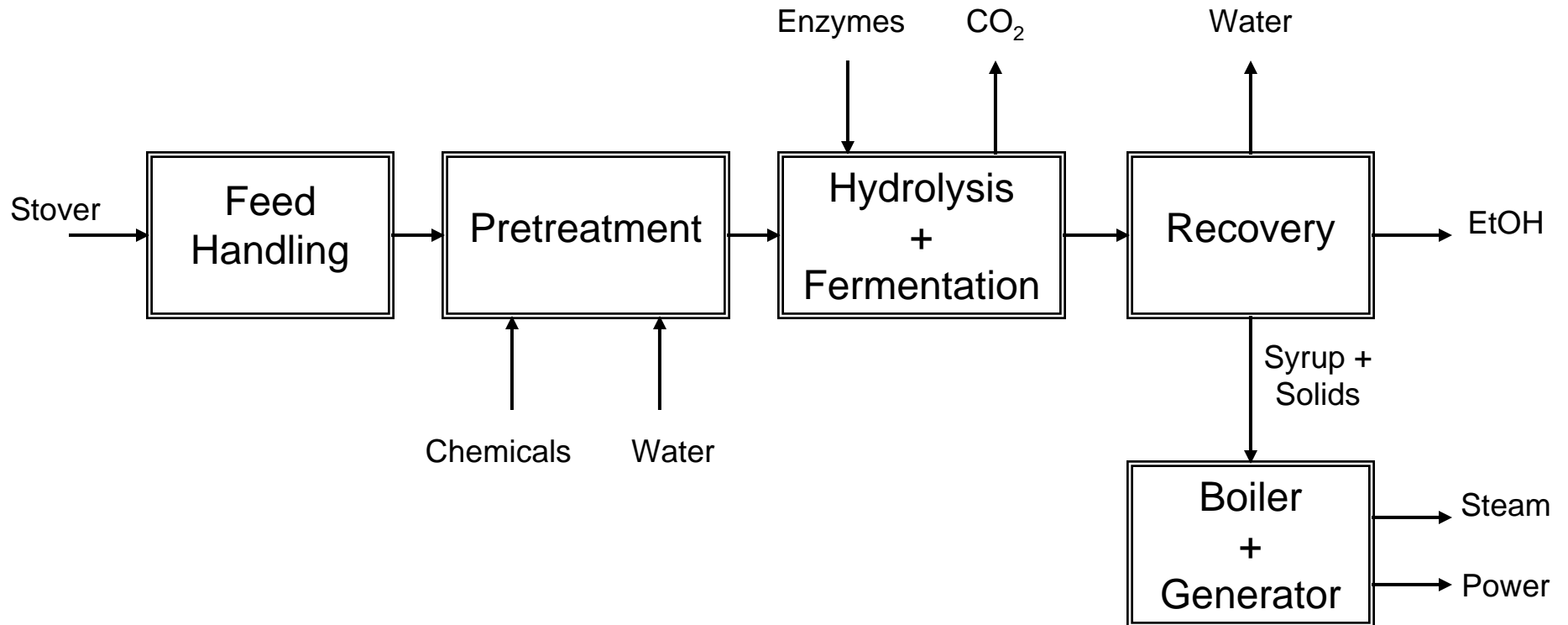
Feedstocks



Feedstocks

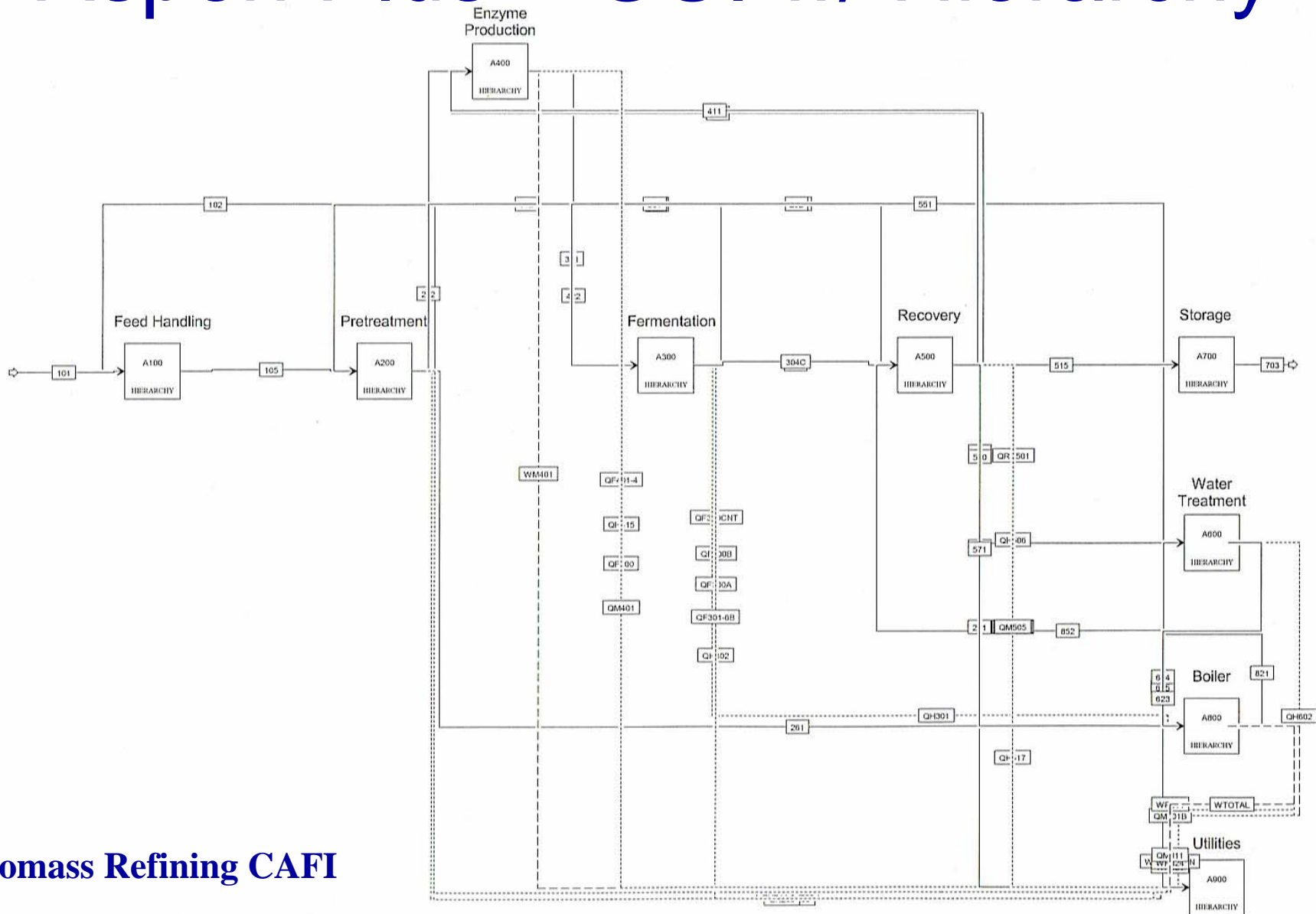


Block Flow



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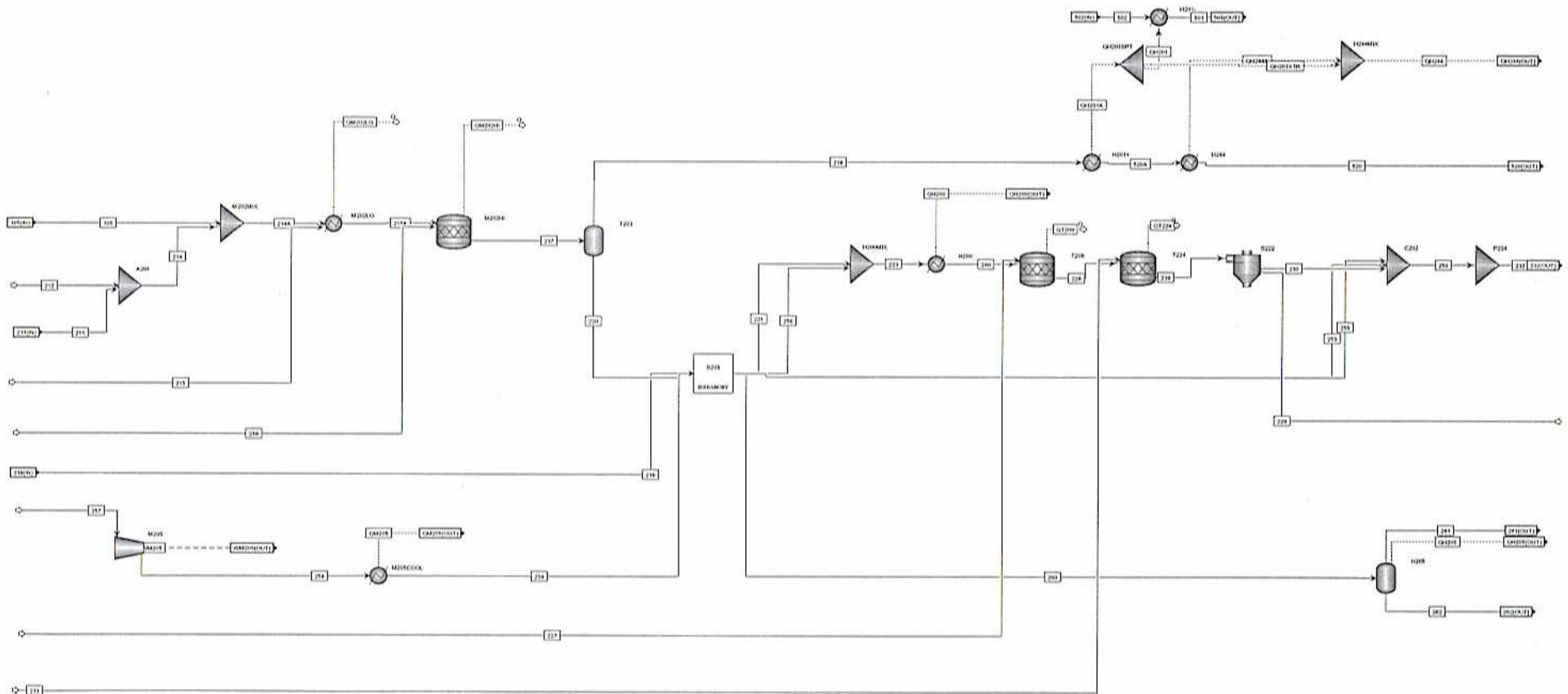
Aspen Plus – GUI w/ Hierarchy



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Aspen Plus – GUI w/ Hierarchy

Area 200: Pretreatment



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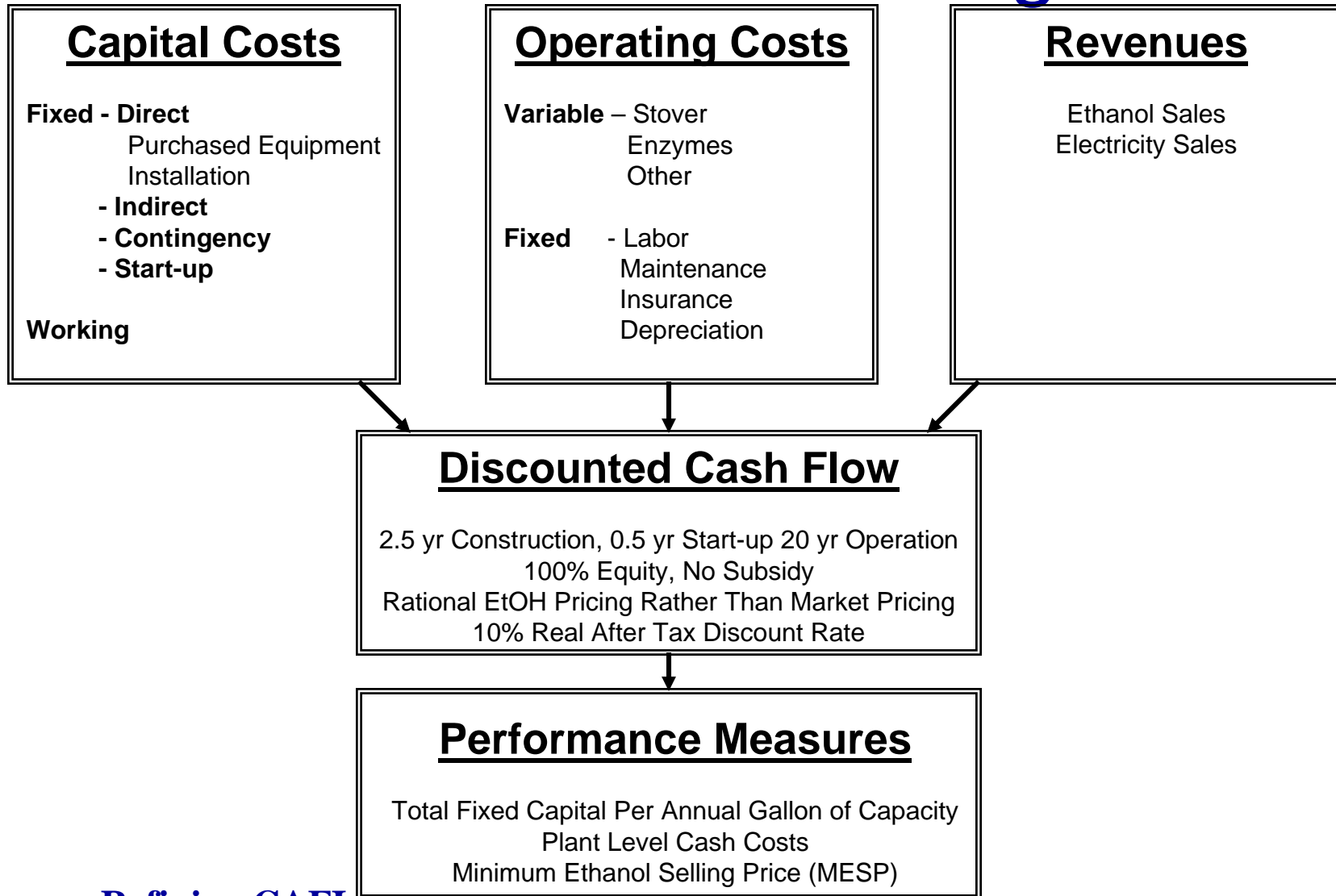
Current vs. Goal

- Current: Laboratory Performance
 - Pretreatment
 - Conditioning
 - Enzymatic Hydrolysis
 - Fermentation
- Goal: Likely Performance of Above Steps at Commercial Scale

CAFI II vs. CAFI I

- Improved Definition and Consistency of Modeling Assumptions
- Improved/Tailored Enzyme Cocktails
- Conditioning & Fermentability Tests

Economic Modeling



Results (Interim)

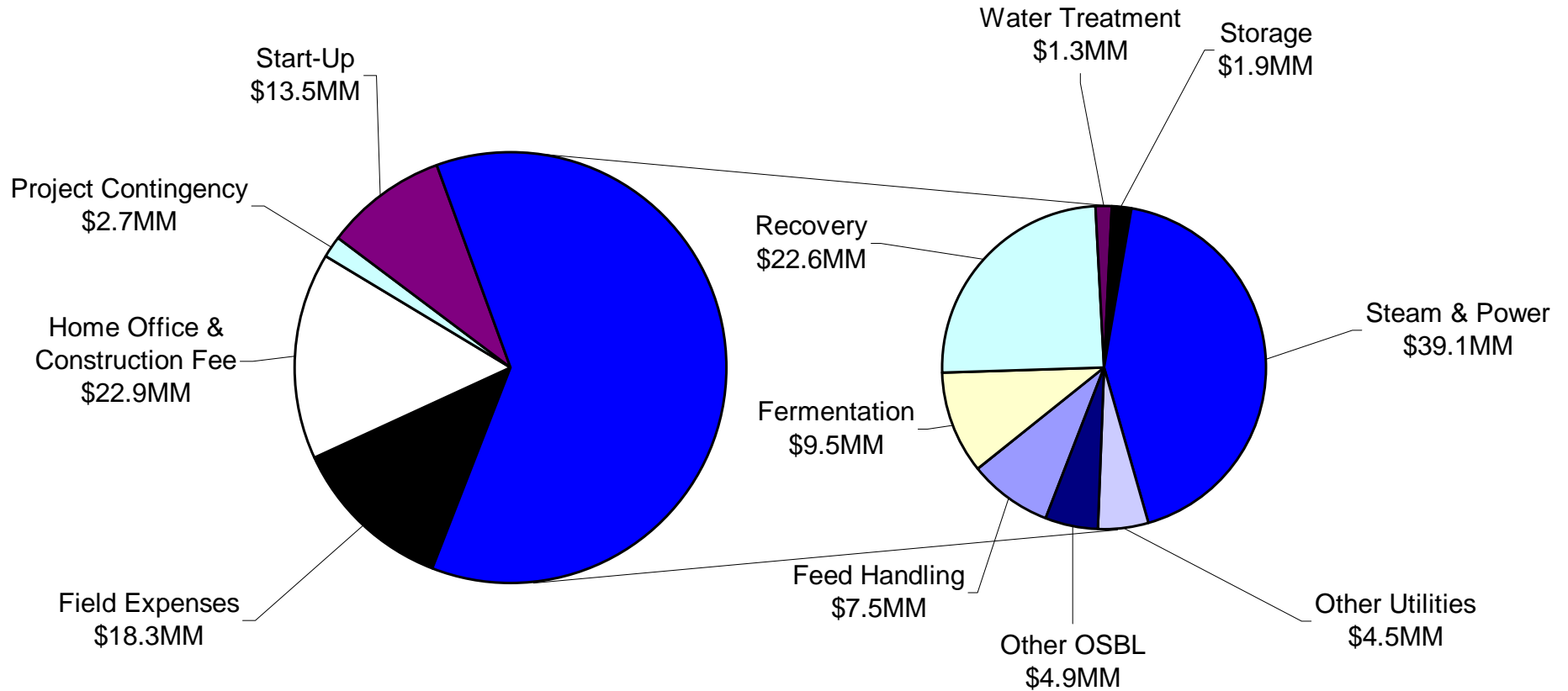
	MESP, \$/gal						
	Stover			Poplar			
	<u>Current</u>		<u>Goal</u>		<u>Current</u>	<u>Goal</u>	
Ideal Pretreatment	1.49	↔	0.81	↔	1.42	↔	0.77
Acidic	↕		↕		↕		↕
Neutral pH				↔			
Alkaline	↕		↕		↕		↕
No Pretreatment	12.86	↔	7.84	↔	36.73	↔	19.63

Fixed Capital

Stover Goal, Ideal Pretreatment

Total Fixed

Direct Fixed



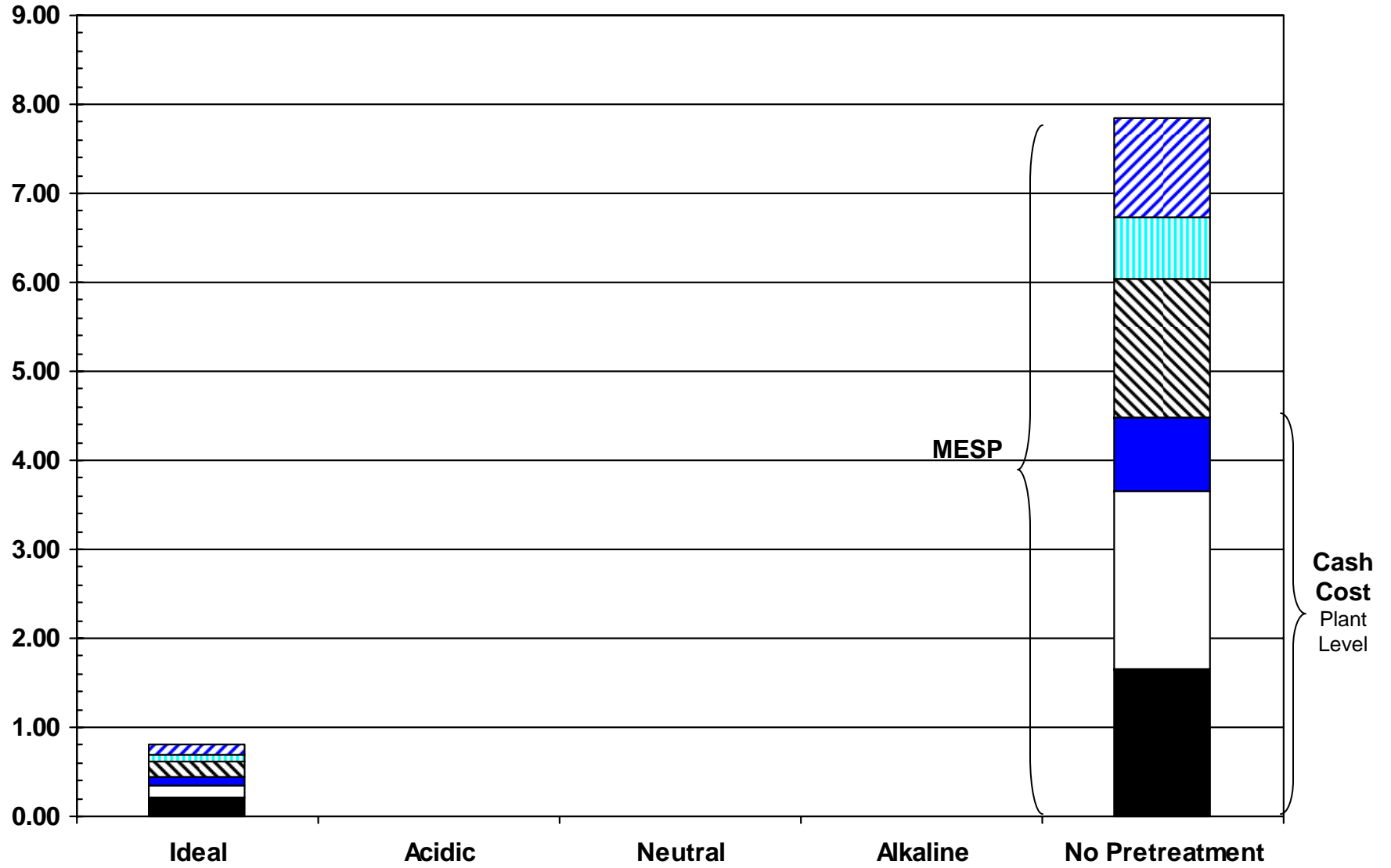
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	\$MM
Direc ts	91.3
Indirects	<u>57.4</u>
Total	148.7

Cash Costs and MESP

Stover Current Cases, Proof Year: 4th Year of Operation

\$/gal EtOH



Conclusions

- Consistent Protocols and Materials
- Improved Methodology vs. CAFI I
- Yield Drives Economics

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- Biomass Refining Consortium for Applied Fundamentals and Innovation (CAFI)
- Natural Resources Canada
- Genencor International

Project Institutions



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