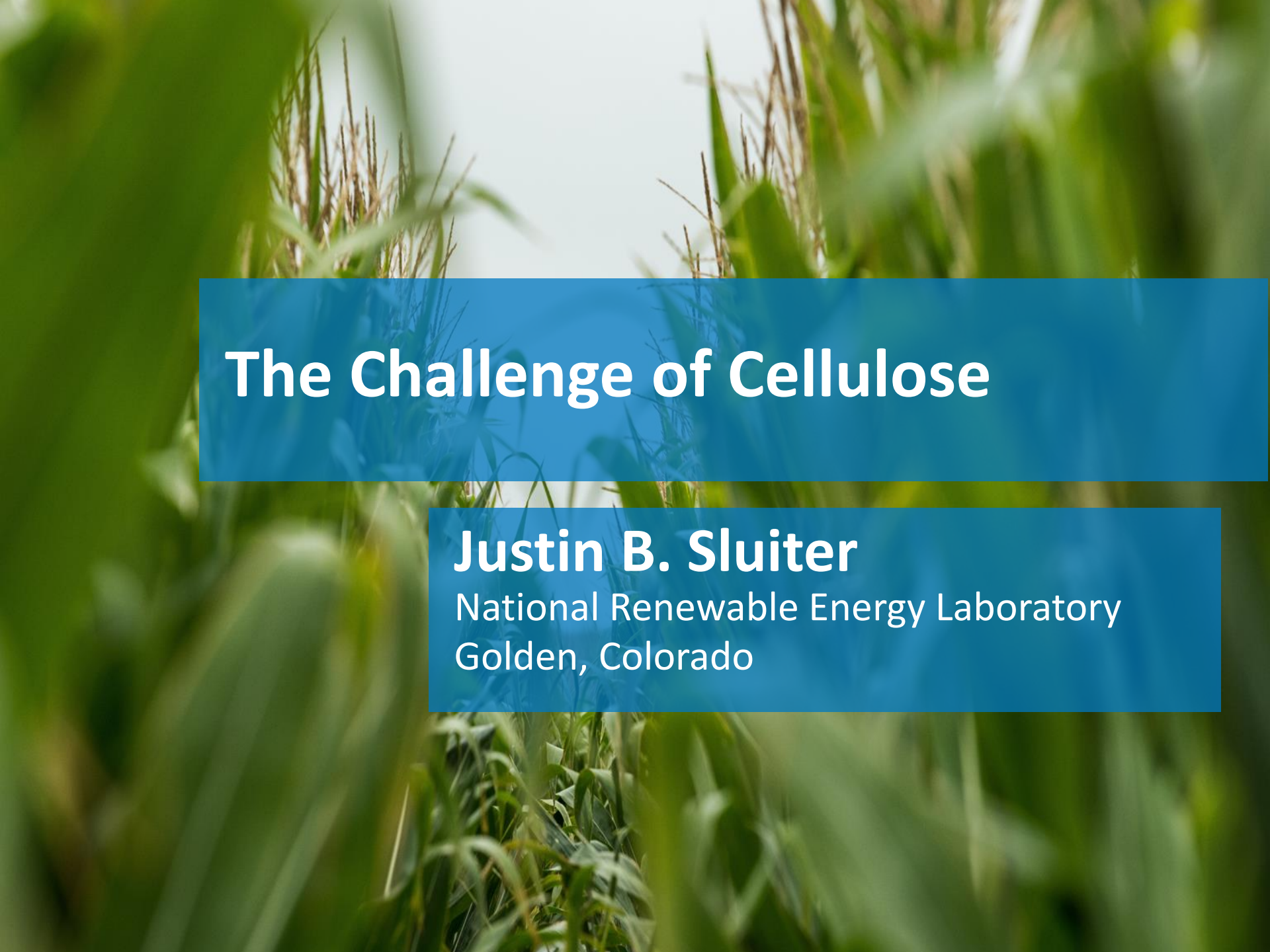
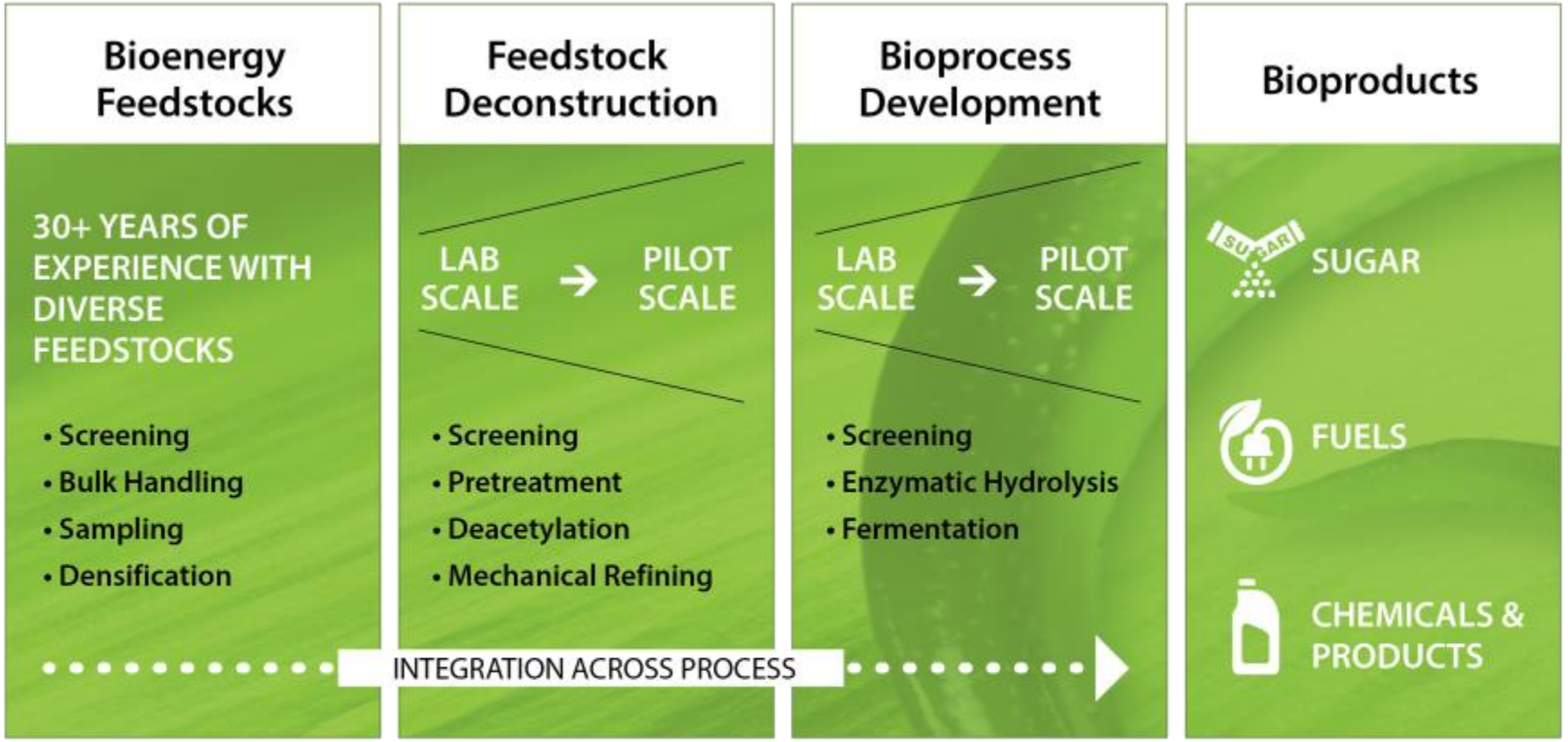


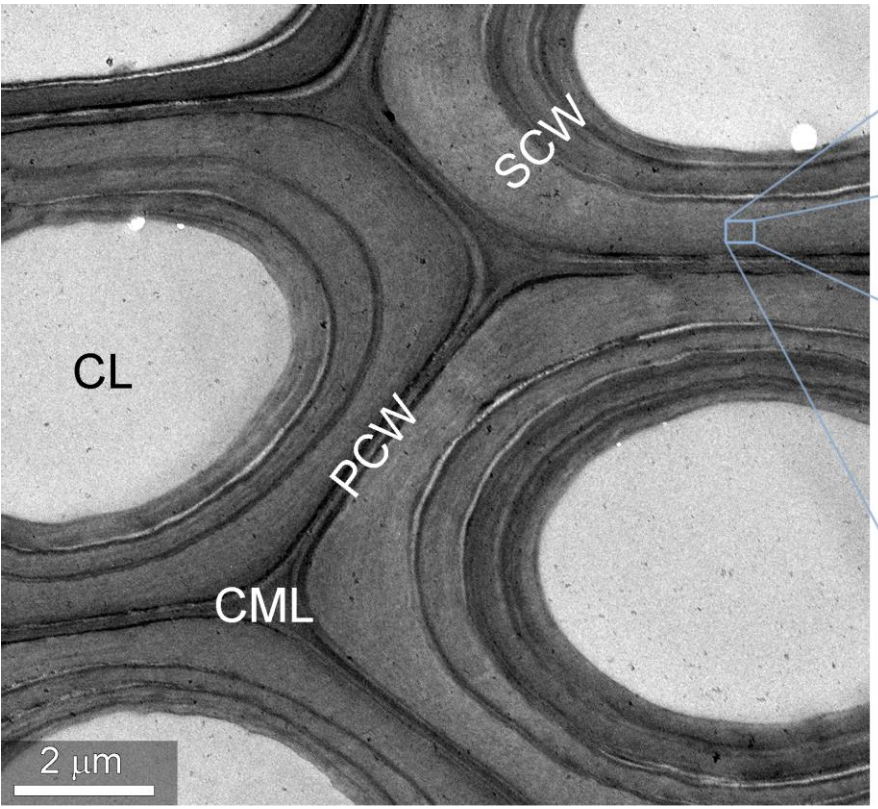
The Challenge of Cellulose

Justin B. Sluiter
National Renewable Energy Laboratory
Golden, Colorado

Analytical Support of Gen 2.0 Biofuels



Cell wall structure



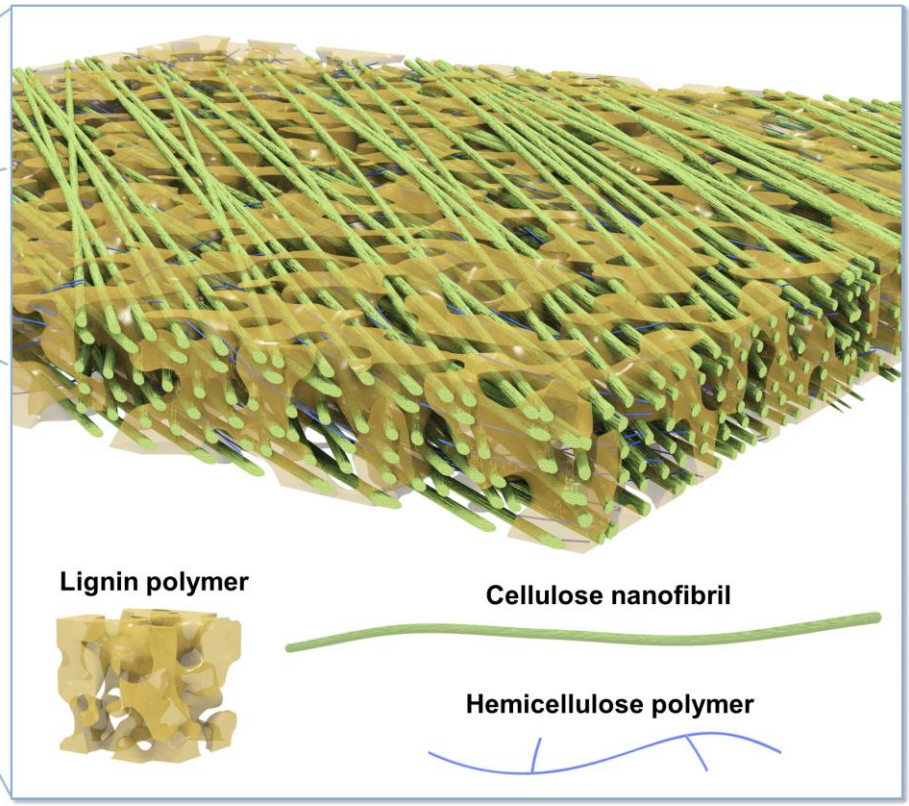
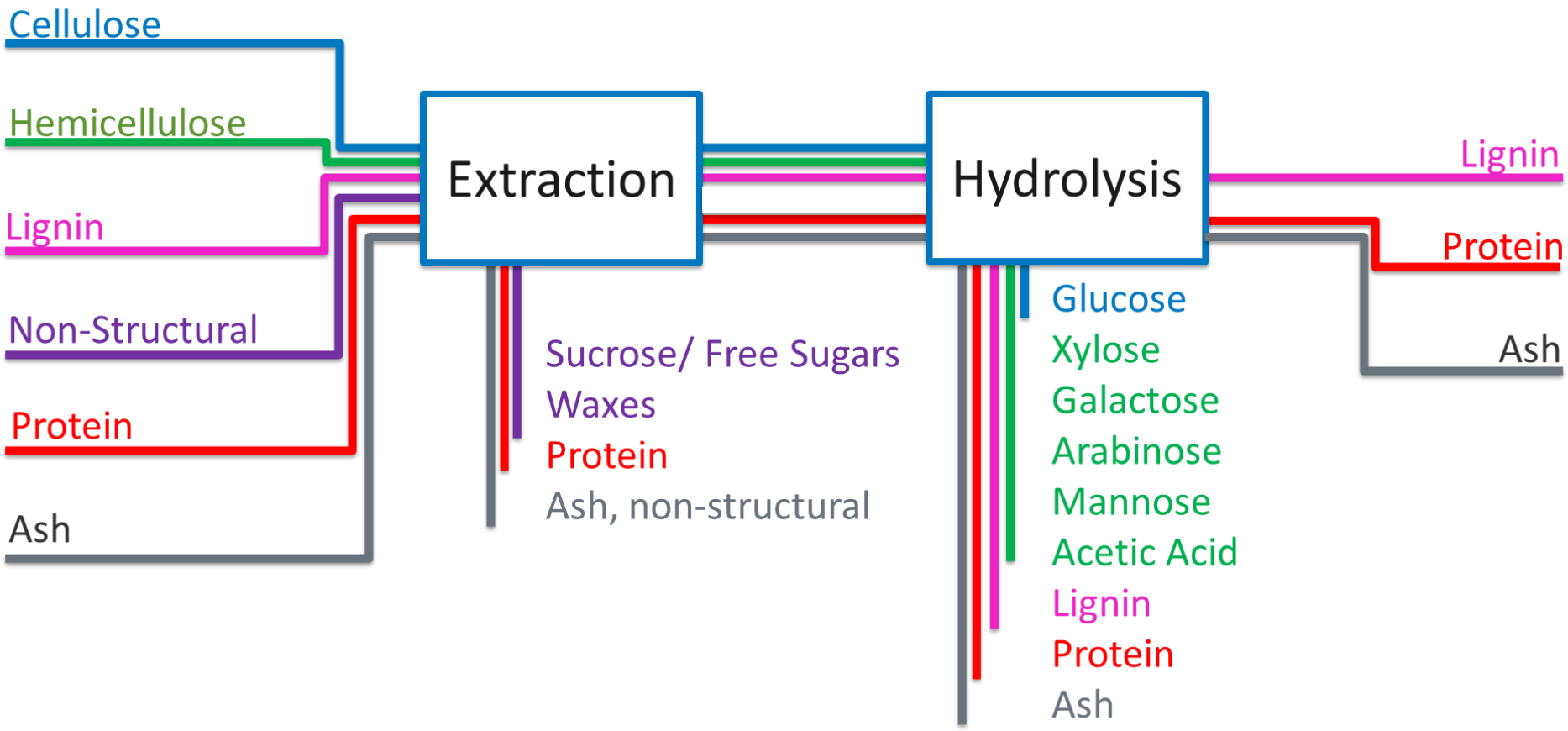
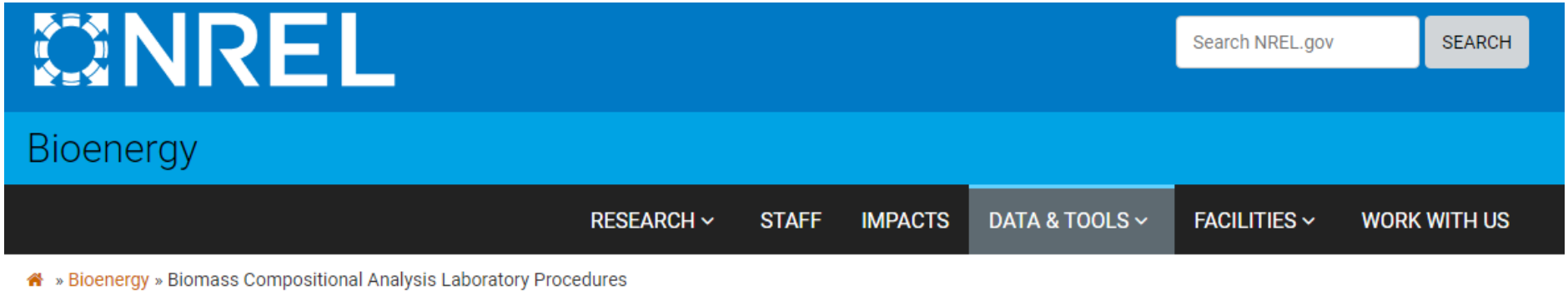


Image: P. Ciesielski, NREL

Component Flow During Acid Hydrolysis



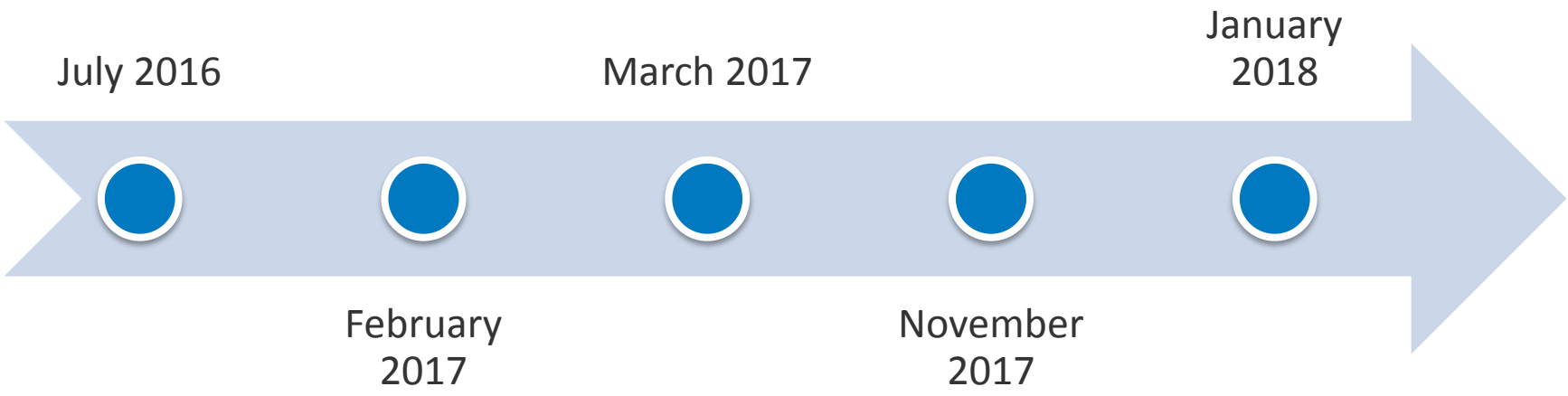
NREL LAPs



In FY17 the website recorded over 10,000 unique site visits, and over 8,000 unique LAP downloads.

EPA RIN Pathway Certification

In the summer of 2016, I participated in my first RIN pathway evaluation and four more up until 2018.

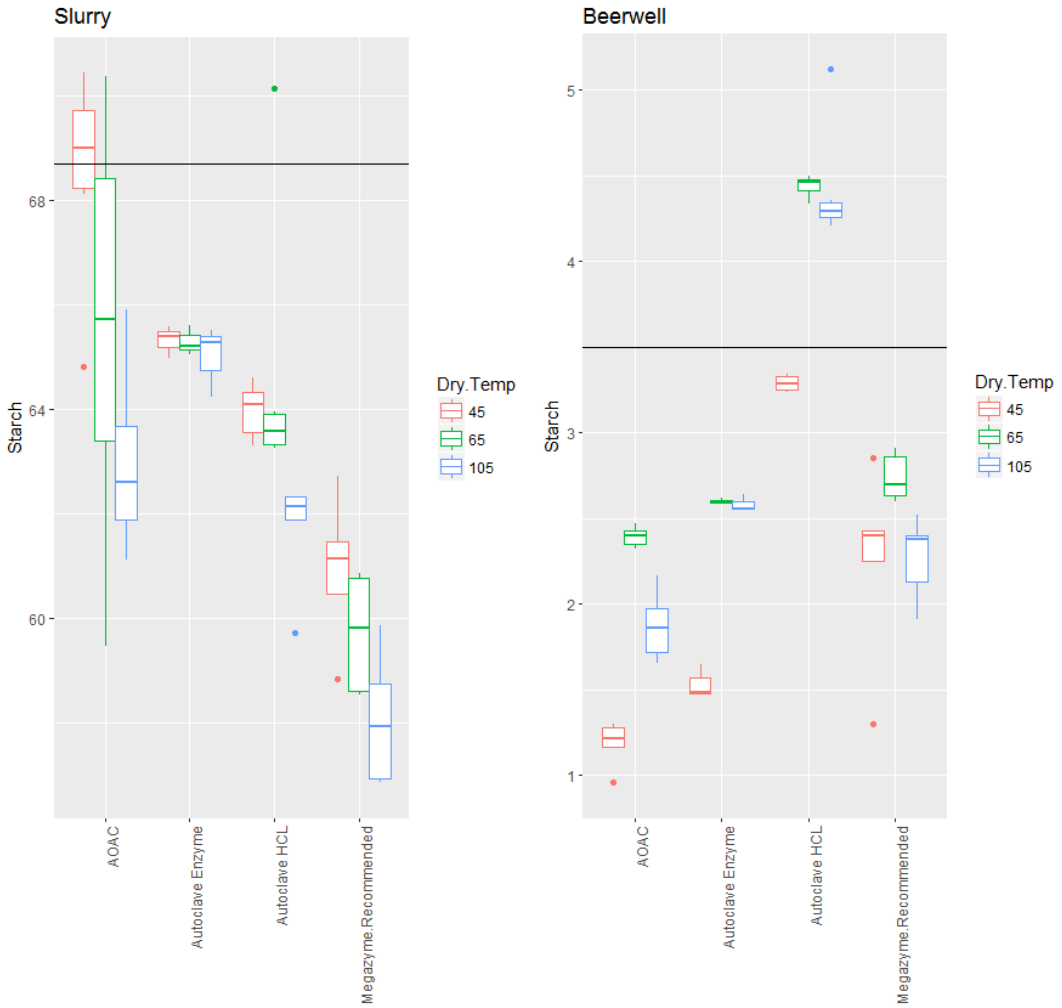


Since then NREL has stopped evaluating methods and shifted to method development to assist the industry.

The Importance of Starch Methods

2017

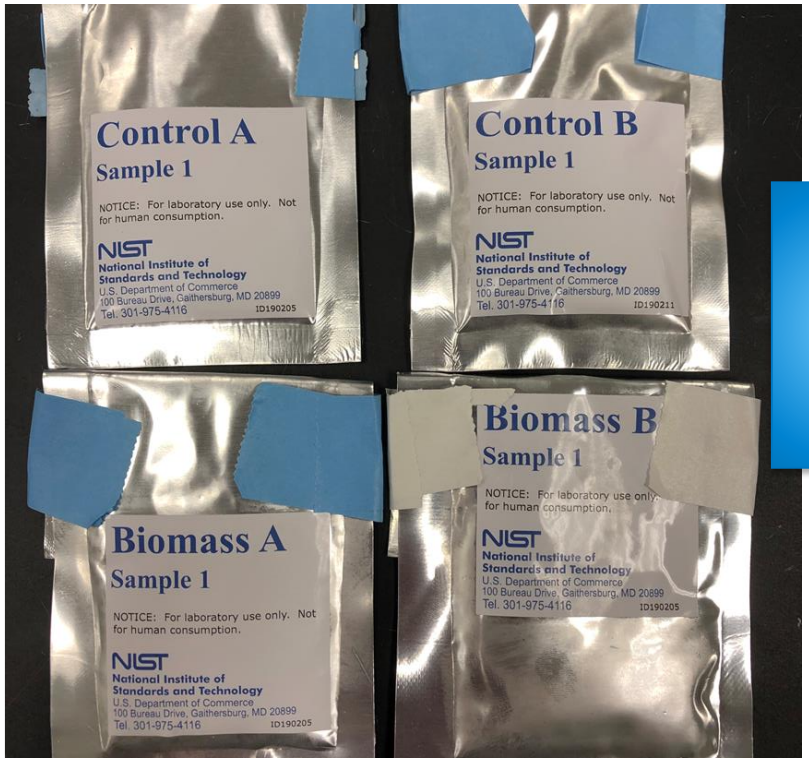
In collaboration with ICM, NREL studied the effect of varying starch assays and drying temperatures on the quantified starch.

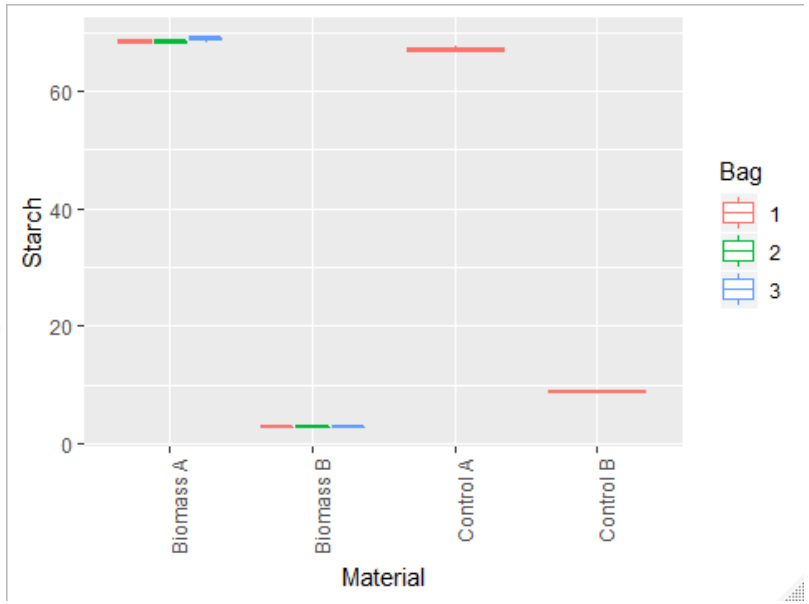


Development of Reference Materials

2017

In August, NREL engaged with NIST to begin development of the reference materials.





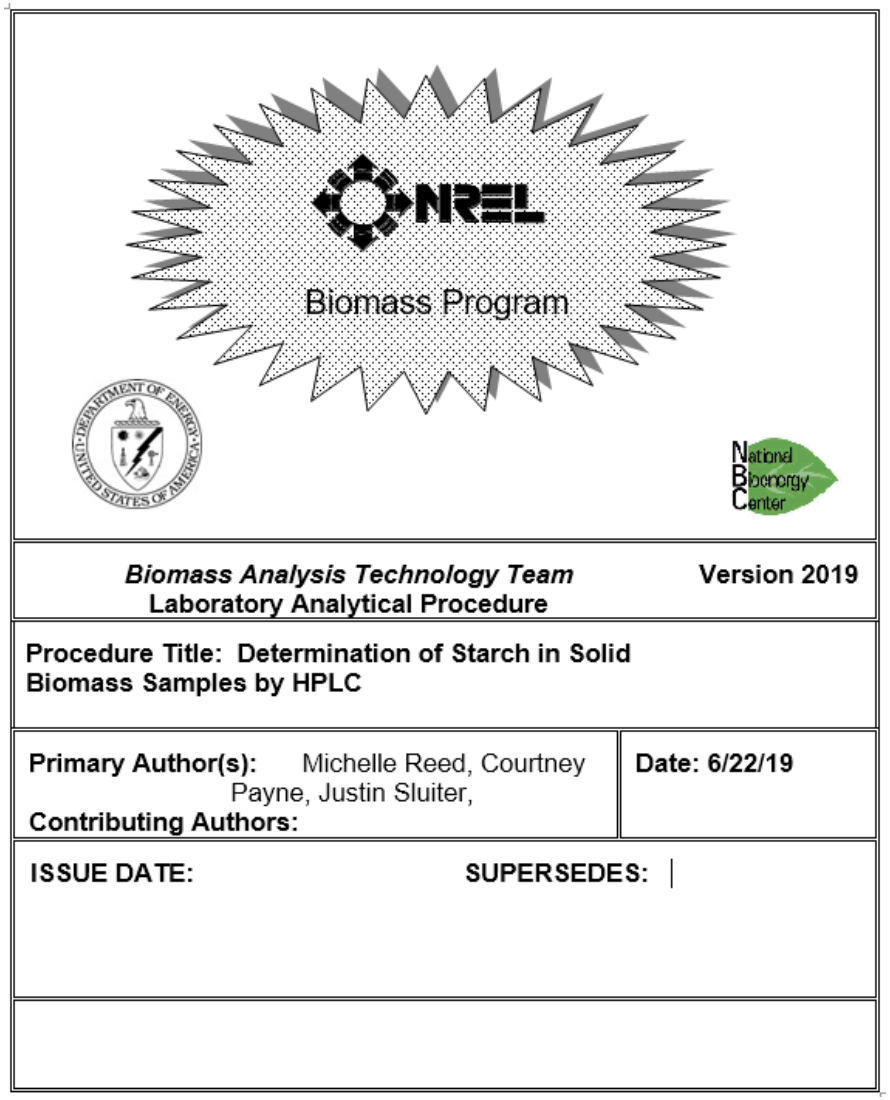
NREL is “Lab #5” in the NIST study

New Starch LAP

2019

To properly quantify the starch in the NIST reference materials, NREL developed a new LAP for starch analysis

- Conforms to AOAC 996.11
- Recommends minor changes of equipment.



NREL
Biomass Program

National Bioenergy Center

Biomass Analysis Technology Team
Laboratory Analytical Procedure

Version 2019

Procedure Title: Determination of Starch in Solid Biomass Samples by HPLC

Primary Author(s): Michelle Reed, Courtney Payne, Justin Sluiter,
Contributing Authors:

Date: 6/22/19

ISSUE DATE:

SUPERSEDES:

EPA guidance document

In May 2019, EPA released ***Guidance on Qualifying an Analytical Method for Determining the Cellulosic Converted Fraction of Corn Kernel Fiber*** with metrics for analytical precision and accuracy.

United States Environmental Protection Agency

https://www.epa.gov/renewable-fuel-standard-program/guidance-qualifying-analytical-method-determining-cellulosic 13 pp, 726 K, EPA-420-B-19-022

EPA-DOE Partnership

At the June 2019 ASTM conference in Denver, EPA announced a partnership with DOE/NREL to develop a publicly available analytical method capable of meeting the guidance from EPA.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BIOENERGY TECHNOLOGIES OFFICE

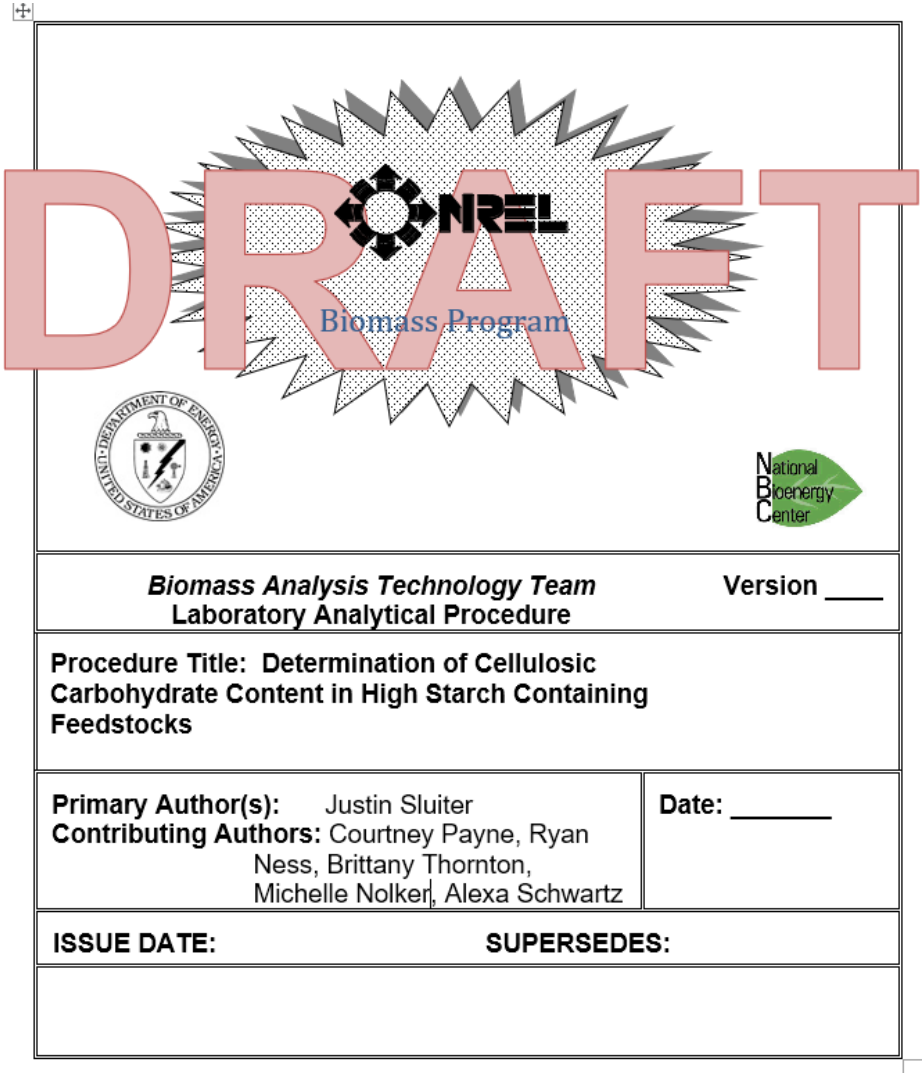
NREL

NATIONAL RENEWABLE ENERGY LABORATORY

Cellulose LAP 2018

In 2018 we developed a DRAFT LAP for "*Determination of Cellulose Content in High Starch Containing Feedstocks*".

It is not validated.



New Cellulosic Method Development

Method Optimization — Winter 2019

- Based on the "*Determination of Cellulose Content in High Starch Containing Feedstocks*".

1.Training and Round Robin — Winter/Spring 2020

- Training DOE laboratory Scientists to perform the LAP
- Performing the round robin on appropriate reference materials

1.Collating the Data — Spring 2020

- With the help of NIST so that the reference material can have a cellulose value added to the certificate

Preparing and Releasing the Report — Summer 2020

- First given to EPA
- Then report and method released to Industry

Thank You

Carbohydrate Analysis Flow Corn Fiber