

# Lynx Engineering, LLC

## Kelly N. Ibsen, PE

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### PROFESSIONAL SUMMARY

Professional Chemical Engineer with more than twenty years' experience in research, development and deployment. Distinguished 15-year career at NREL, DOE's premier renewable energy laboratory, which culminated in a lead role managing the cellulose to ethanol R&D program. Directed the process design of biorefineries using bagasse, poplar, corn stover and switchgrass. Performed technology reviews and audits for DOE in support of their grant programs, and for employers to support technology commercialization.

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### KEY SKILLS

#### Technology Assessment

Participant in several review committees for DOE's Energy Efficiency and Renewable Energy Program including R&D, pilot and demonstration scale proposals for grants, financial assistance, small business and other programs. Experience in evaluating alternative technologies for cellulosic fuels and chemicals.

#### Technology Development

Skilled in developing robust R&D plans to achieve long-term technology goals for next generation ethanol production. Completed design reports for cellulose to ethanol and full design packages for biomass to chemicals

#### Project/Program Management

Successfully directed multi-million dollar R&D advanced technology programs and projects for cellulosic ethanol through directed, economics-driven targets

#### Engineering & Design

Lead complete systems' design and build activities including process simulation, equipment and facilities specifications, and life cycle/environmental assessments for targeted processes

#### Partnership Development

Expertise in identifying partnership and funding opportunities. Strong ties with key industry and government (DOE, USDA) organizations in the biomass and green chemicals community

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### CERTIFICATIONS

Licensed Professional Engineer in Colorado  
Member of the American Institute of Chemical Engineers

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### CAREER HISTORY

#### Lynx Engineering, LLC

July 2009 – present

Owner and principal engineer providing process engineering and consulting services. Proposal development for federal funding opportunities. Expert engineering and analysis support including process design, cost estimation and data analysis. Independent engineering analysis services.

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#### BioEnergy International, LLC

2007 – June 2009

#### Director of Technology Transfer & Scale-up

Responsible for the process scale-up of biomass-derived (bagasse and stover) fuels and chemicals from processes using advanced pretreatment, enzymatic hydrolysis and fermentation methods and catalysts. Manage

engineering firms in the development of basic and detailed design packages. Oversee construction and operations teams including EPC contractors, operations and maintenance personnel to successfully build, shakedown and operate biorefineries using cellulosic feedstocks. Conduct due diligence and independent analysis for partnership opportunities.

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## **National Renewable Energy Laboratory**

### **Biochemical Platform Lead**

**2004 – 2007**

Developed and directed a multi-million dollar R&D program in cellulose to ethanol for DOE's Biomass Program that provided the highest quality research to achieve targeted results. Using diverse engineering and research teams including pilot plant operations developed cost effective conversion processes for biomass (wood, stover, switchgrass) to fuels and chemicals. Coordinated with feedstock and products R&D programs at other national labs and with private partners to optimize cellulose deconstruction technology. Supported DOE's Office of the Biomass Program by participating in formal and informal engineering reviews of cellulose-based technologies for ethanol, butanol and others.

### **Analysis and Partnership Development Group Manager**

**2002 – 2004**

Managed the teams charged with engineering and partnering roles to the Biomass Program. Implemented an economics-driven approach to R&D for DOE's Biomass program which resulted in projects moving more directly to commercially viable processes.

### **Process Engineering and Analysis Team Lead**

**1997 – 2002**

Lead engineer for several DOE and industry projects including enzyme development contracts with Genencor and Novozymes, and the Biochemical Conversion Platform. Developed designs and cost analysis and directed cost-driven experimentation. Co-author of 2 design reports on cellulose conversion. Supervised 8 staff and annual budgets of \$2 million.

### **Pilot Plant Team Lead & Process Engineer**

**1992 – 1997**

Responsible for the full-time operation of a \$16 million pilot facility to convert biomass to ethanol. Assembled annual capital and operating budget of \$5 million and managed a staff of 15 operators. Oversight for plant upgrades and maintenance.

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## **Nestle Foods**

**1985 – 1990**

### **Senior Project Engineer & Plant Operations Engineer**

Developed production lines for new food products including safe ingredient handling, packaging and labeling. Established quality control standards for ingredients, packaging and products. Responsible for obtaining approval by USDA and FDA. Supervised a \$50 million plant renovation including utilities, equipment and instrumentation. Developed layout and installed new equipment for a 20,000 square foot pilot plant facility.

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## **B.Sc. in Chemical Engineering, Colorado State University**

Completed additional professional and college level courses in

- Microbiology
  - Computer programming (Visual Basic, VB for Applications, XML)
  - Process Simulation & Design (Aspen Plus)
  - Equipment and project costing
  - Database development (MS Access, SQL)
  - Risk assessment/Monte Carlo analysis (Crystal Ball)
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## **EDUCATION & TRAINING**

## **PUBLICATIONS**

Dutta A, Dowe N, Ibsen K, Schell D, Aden A. "An economic comparison of different fermentation configurations to convert corn stover to ethanol using *Z. mobilis* and *Saccharomyces*". Published online in Biocatalysts and Bioreactor Design, September 2009. DOI: 10.1002/btpr.311.

Foust TD, Ibsen KN, Dayton DC, Hess JR, Kenney KE. Biomass Recalcitrance: Deconstructing the Plant Cell Wall for Bioenergy, Chapter 2 - The Biorefinery. Michael E. Himmel, Editor. Blackwell Publishing, Oxford, 2008.

Schell DJ, Dowe N, Ibsen KN, Riley CJ, Ruth MF, Lumpkin RE. "Contaminant occurrence, identification and control in a pilot-scale corn fiber to ethanol conversion process". Bioresource Technology 98(15):2942-8, November 2007.

Ibsen, Kelly. "Match the Effort to the R&D Investment", Chemical Engineering Progress, 102(1):47-51, January 2006.

Schell DJ, Riley CJ, Dowe N, Farmer J, Ibsen KN, Ruth MF, Toon ST, Lumpkin RE. "A Bioethanol process development unit: initial operating experiences and results with a corn fiber feedstock". Bioresource Technology 91(2): 179-88, January 2004.

Tucker MP, Nagle NJ, Jennings EV, Ibsen KN, Aden A, Nguyen QA, Kim KH, Noll SL. "Conversion of distiller's grain into fuel alcohol and a higher-value animal feed by dilute-acid pretreatment". Applied Biochemistry and Biotechnology 113-116:1139-59, January 2004.

Aden A, Ruth MF, Ibsen KN, Jechura J et al. "Lignocellulosic Biomass to Ethanol Process Design and Economics Utilizing Co-current Dilute Acid Prehydrolysis and Enzymatic Hydrolysis for Corn Stover". NREL/TP-510-32438, June 2002.

Ibsen KN, McAloon A, Taylor F, Wooley R, Yee W. "Determining the Cost of Production Ethanol From Corn Starch and Lignocellulosic Feedstocks", Joint technical paper with USDA-ARS. NREL/TP-580-28893, October 2000.

Wooley R, Ruth MF, Sheehan J, Ibsen KN et al. "Lignocellulosic Biomass to Ethanol Process Design and Economics Utilizing Co-Current Dilute Acid Prehydrolysis and Enzymatic Hydrolysis Current and Futuristic Scenarios". NREL/TP-580-26157, July 1999.

Nguyen QA, Dickow JH, Duff BW, Farmer JD, Glassner DA, Ibsen KN, Ruth MF et al. "NREL/DOE Ethanol Pilot Plant: Current Status and Capabilities". Bioresource Technology 58(2): 189-196, 1996.

## **PRESENTATIONS**

Presented at various meetings including the 24<sup>th</sup> and 25<sup>th</sup> Biotechnology Symposium for Fuels and Chemicals, the Spring 2004 National American Chemical Society meeting, and the 2002 American Institute of Chemicals Engineers National meeting.