Seizing the New Bio-Economy

Regional Partnerships Driving New Opportunities

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Technology is the “necessary” for the new bio-economy.  

*But regional partnership is the “sufficient.”*

- Technology is unleashing a powerful new bio-economy.  
- However, the opportunities have regional footprints.  
- Seizing them takes regional partnerships—to help coordinate investment, re-shape regulation, and create shared long-term vision among businesses.  
- Such partnerships are rare in rural America, but there are often strong starting points.
Seizing the New Bio-Economy in Rural America

- Defining the bio-economy, and sizing up opportunities.
- Two concrete examples from an overwhelmingly rural region — Southern Minnesota:
  1. Plant-made pharmaceuticals.
  2. Wind energy
- The implications for rural America & public policy.
Three Paths to the Bio-economy?

Or, is the power in the nexus?

A Region with Many Strengths

• 38 counties
• 988,000 people
• Nearly 2/3 of MN’s farm income
• World-class health care
• Strong manufacturing—factories employ 1 in 5 workers in the Region
• Excellent educational institutions
Two examples from Southern MN:
“Farmaceuticals” & Wind

Proteins are the heart of the pharmaceutical industry.

• But the fermentation process to produce them is expensive ($800,000 to $1m per kilogram) and capacity-constrained.

Many of the same proteins can now be extracted from plants—at huge potential savings and virtually unlimited capacity.

• Cost savings estimated at between 10X and 100X, depending on the protein and the “yield.”
Southern MN has powerful “farma” assets.

- World-class agricultural prowess.
- World-class medical research & practice.
- World-class life science research.

How can these combine in a new bio-economy for the Region?
Mayo Clinic
Rochester, MN

- Research scope is vast—major expertise in cancer research, genomics.
  - A National Cancer Institute-designated center
- Research and education budget in excess of $700 million.
- 3,043 dedicated research staff. Another 3,000 split between research and practice.
Mayo Clinic Rochester, MN
Research scope is vast — major expertise in cancer research, genomics.

Mayo Clinic Cancer Center is a National Cancer Institute-designated center.

Research and education budget in excess of $700 million.

3,043 dedicated research staff.
Another 3,000 split between research and practice.

Hormel Institute Austin, MN

- A research unit of the University of Minnesota.
- A collaborative partner with Mayo Clinic as well as IBM.
- Well-known discoveries in the cancer/dietary connection.
- Recent $23 million facilities expansion.
New partnerships will be necessary to connect these assets creatively within the Region.

**Partners to convene**

- Mayo, Hormel, & Univ. of MN
- Farm groups
- Commodity groups
- State regulatory groups
- Rural development groups
- Entrepreneurial support groups
- Regionally based venture capital groups.
- Consumer organizations
- Environmental organizations

**Issues to address**

- Which pipeline proteins could be grown in plants?
- Which crops in Southern MN?
- What are the production protocols?
- What is the business ownership structure to maximize the win for everyone?
How would the Region benefit?

- Farm income: several hundred $ an acre to growers.
- New processing facilities → high-pay jobs and wealth creation.
- New “farma” start-ups.
- Additional research $ in MN.

*First to build the 21st century pharmaceutical industry to scale?*
Wind Energy:

*Could supply 20% of U.S. electricity needs.*

The Region bet early and big on corn ethanol.

- The food-fuel issue puts this at risk ...
- As do potential changes in subsidies, tariffs, and carbon regulation.

The Region may be well-positioned for cellulosic, whenever that technology comes on line.
Ethanol Production Facilities

Existing Capacity

Under Construction

Source: Renewable Fuels Association
Wind Energy:

*Could supply 20% of U.S. electricity needs.*

A more immediate option is wind—not normally considered a “bio-fuel” but in this case, the land is almost entirely owned by farmers.

- Thus, an energy investment that pays a unique dividend to the existing “bio-economy.”
- Also, the future may bring anhydrous production.
But reaping the wind will take a LOT of coordination to pull off.

**SW MN has some of the best wind potential in the nation.**

- The Region has the potential to add several hundred thousand MW of generating capacity.

It is relatively easy to transmit the power to MSP, which has a high proportion of “green” consumers.

With additional lines, could consider supplying as far away as Chicago.
Wind Energy: A Huge Win for the Region

New companies are locating in the Region to build the turbines:

- Dutch company (600 employees) making turbine blades in the Region, and a Finnish company is moving there to build turbines.

A flourishing maintenance industry is emerging.
New Transmission Lines Critical

Exhibit 1: Conceptual 765 kV backbone system for wind resource integration (edited by AEP).

Source: AEP and NREL.
Wind Energy:

*How would the Region win?*

- Farm income: direct payments to farmers.
- Attract “green energy” manufacturers.
- Build long-term “compact” with Twin Cities.
- Reduce natural gas prices (~ $1).
- Reduce water use (1.6 trillion gallons saved by 2030 in the Midwest. Agriculture can benefit from this.
- Potential for anhydrous ammonia production?
New partnerships will be necessary to harness the wind within the Region.

**Partners to convene**
- Farm groups
- Utilities
- Local zoning authorities
- State regulatory groups
- MISO (5 Govs in sync!)
- Regionally based venture capital groups.
- Consumer organizations
- Environmental organizations

**Issues to address**
- How to standardize & coordinate local siting?
- What new transmission lines and where—and how to ensure local access to the grid?
- Who pays for the lines?
- How to ensure reliable supplies with uncertain winds?
- How to coordinate investment across the “bigger” region?
Some Conclusions

- Bio-economy opportunities have huge potential for rural development.
- Most of these build on the “convergence” of life science — human, plant, and animal.
- Technology is necessary in driving these new opportunities.
- However, nearly all of them also have regional footprints AND bring together new partners in new business models.
- Thus, regional partnerships are the “sufficient” for development.
Some Needs for Policy

- Most rural regions still operate under Friday-Night-Football rules:
  
  *The next county over is the competition.*

- Moreover, commodity traditions die hard, and new business models will demand significant innovation.

- “Conveners” (King Arthurs) are in short supply.

- All that said, the appetite for stronger rural growth is high (and driven by concerns about retaining next generations).
Some Policy Directions

• Incentives for regional, rural partnership to form (ample examples from around the world).

• Diagnostics that help regions identify competitive advantages.

• New “transmissions” between innovation “engines” and rural regions.

• New regional equity capital mechanisms.

• New business models that create win-win-win in bio-economy opportunities — farmaceuticals is a prime example.