



The BioBusiness Alliance
of Minnesota



*Destination 2025:
A Plan for Minnesota's Future*

*Legislative Energy Commission
August 4, 2009*

Objectives

- 1. BBAM Background**
- 2. BRIEFLY review the Destination 2025 process and outcomes**
- 3. Discuss Phase III implementation**
- 4. Q&A**





What is the BioBusiness Alliance?

Three Phases of Evolution



- Phase I: Assessment
- Phase II: Vision and Roadmap (Destination 2025)
- Phase III: Implementation (BioBusiness Resource Network)

Core Beliefs

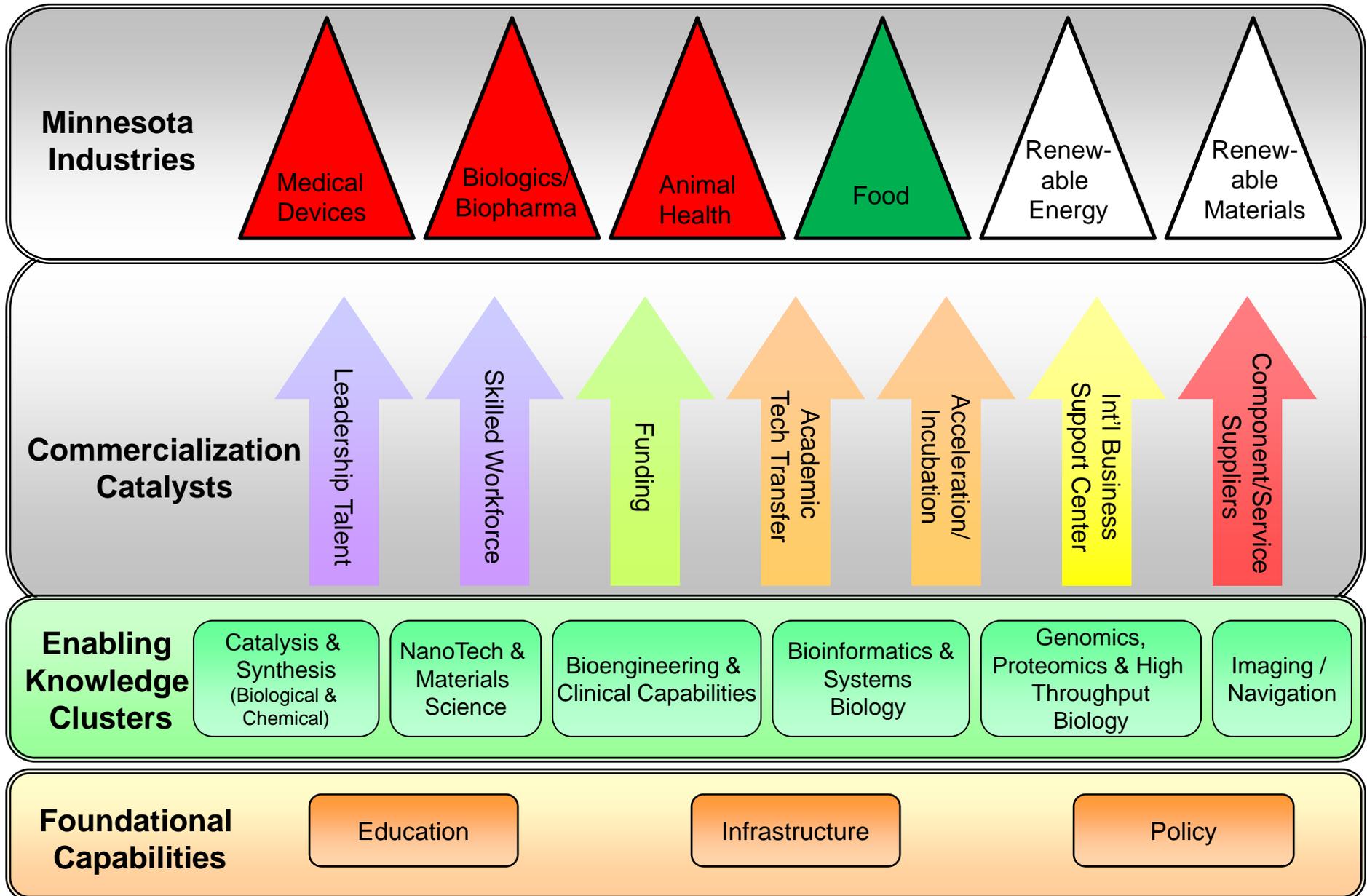
- » **Entering the “Age of Biology”**
- » **Convergence is real and is impacting health and energy**

Enriching Minnesota’s Future through the Biosciences

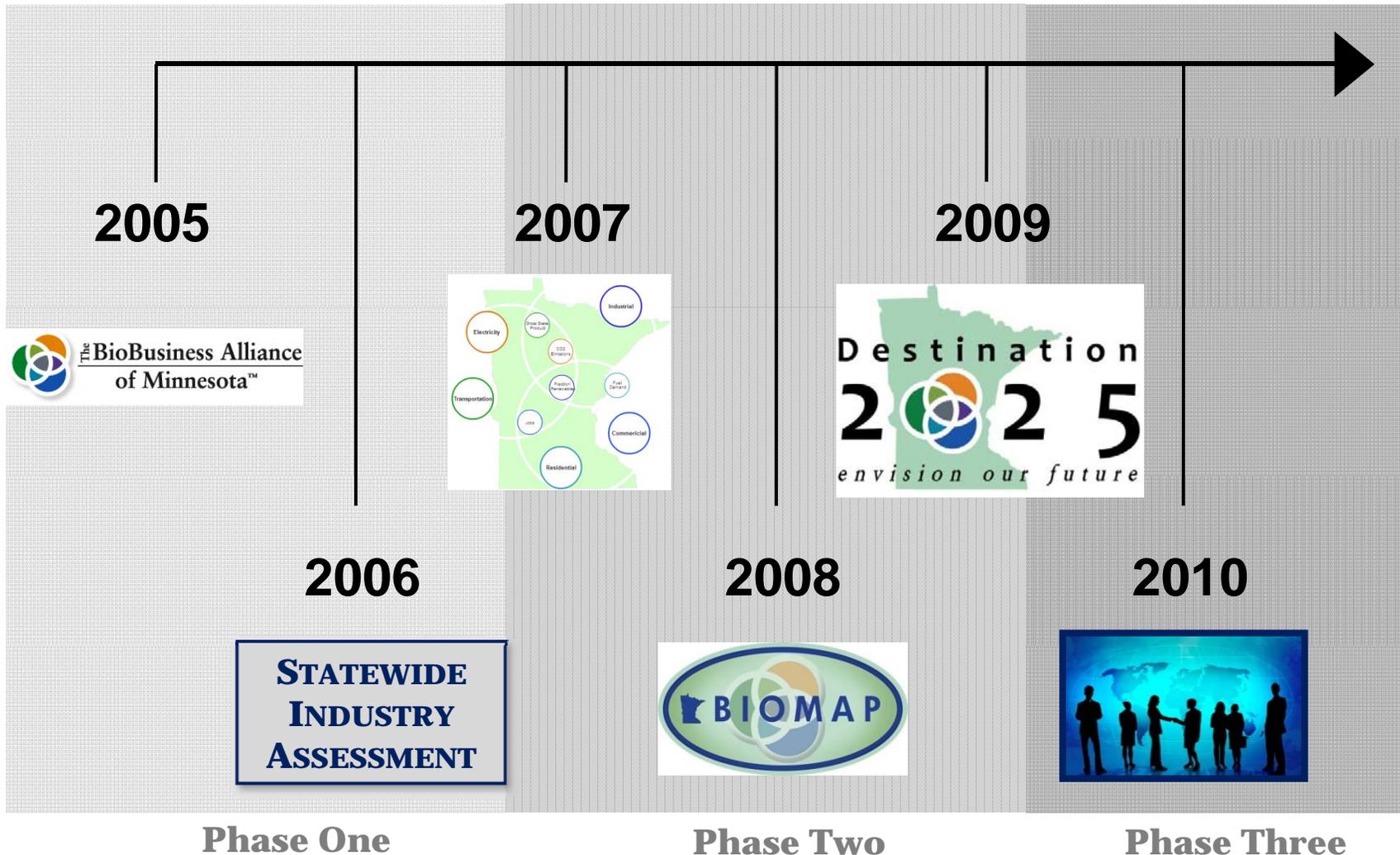


**The BioBusiness Alliance
of Minnesota**

Minnesota Life Science Community



The BioBusiness Alliance of Minnesota

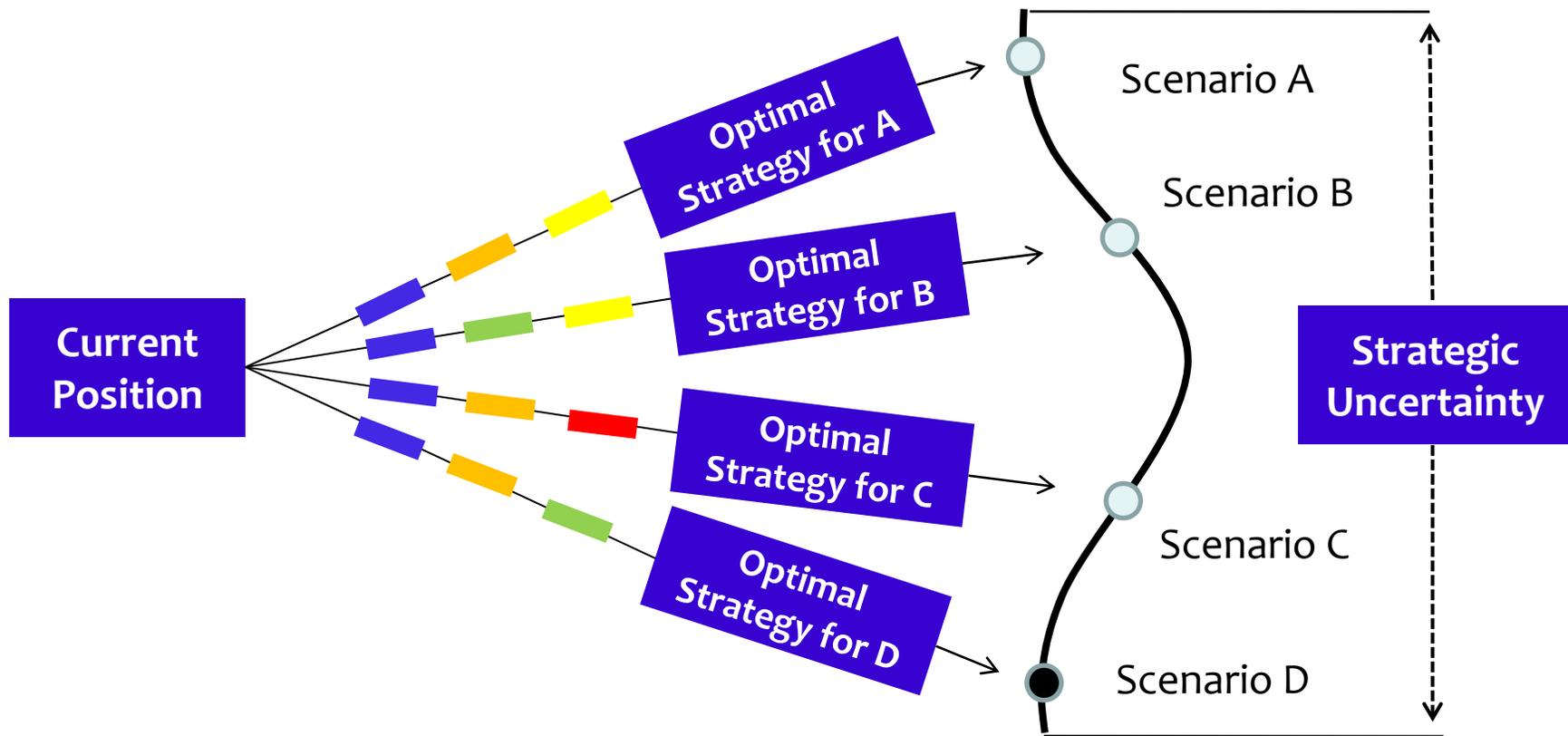


What is Destination 2025?

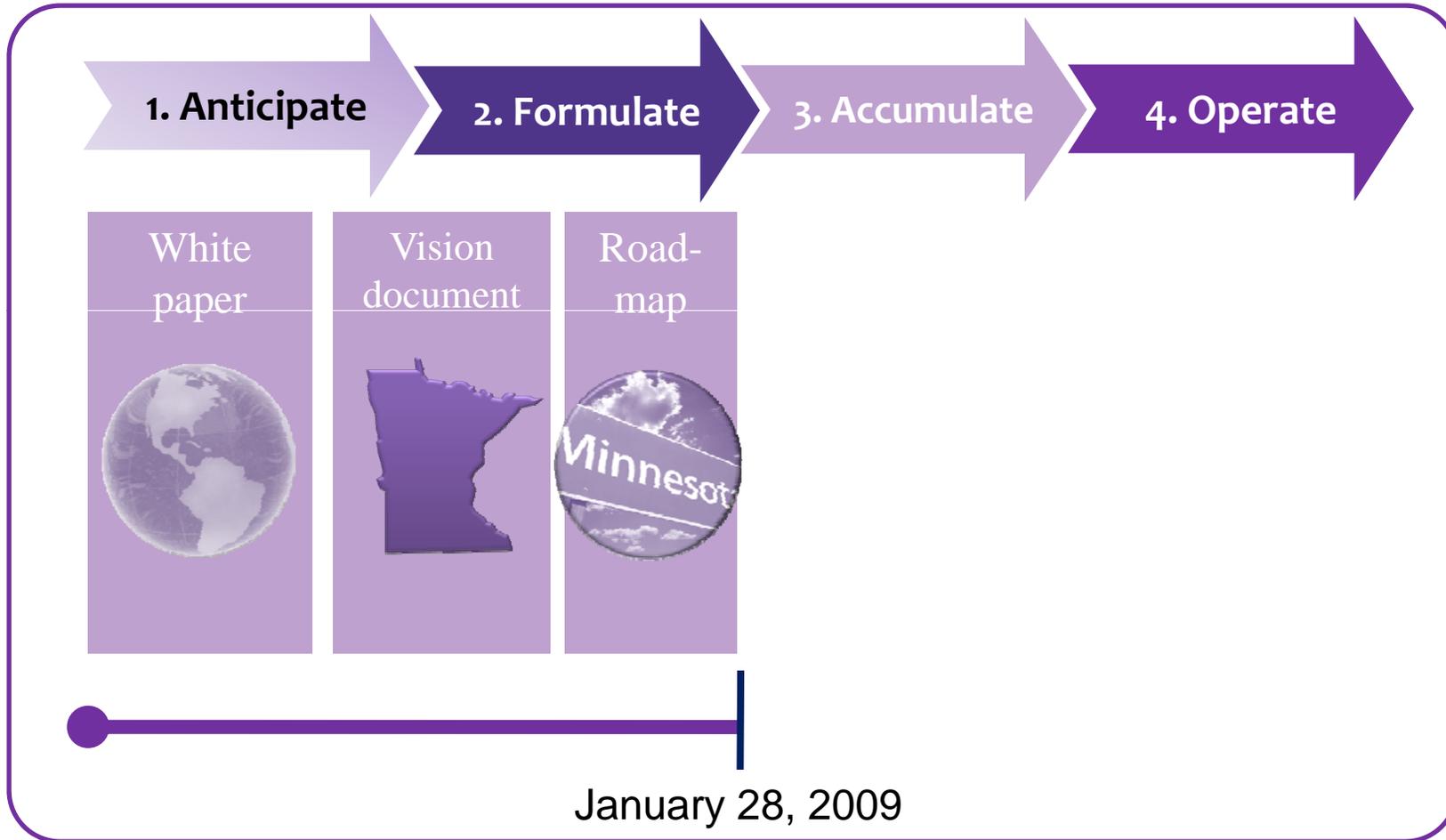
- **A partnership with Deloitte Consulting LLP**
- **A twenty year “vision and roadmap” for the lifescience industry in the state of Minnesota that is intended to help ensure our place in the evolving global economy.**



Strategic Flexibility

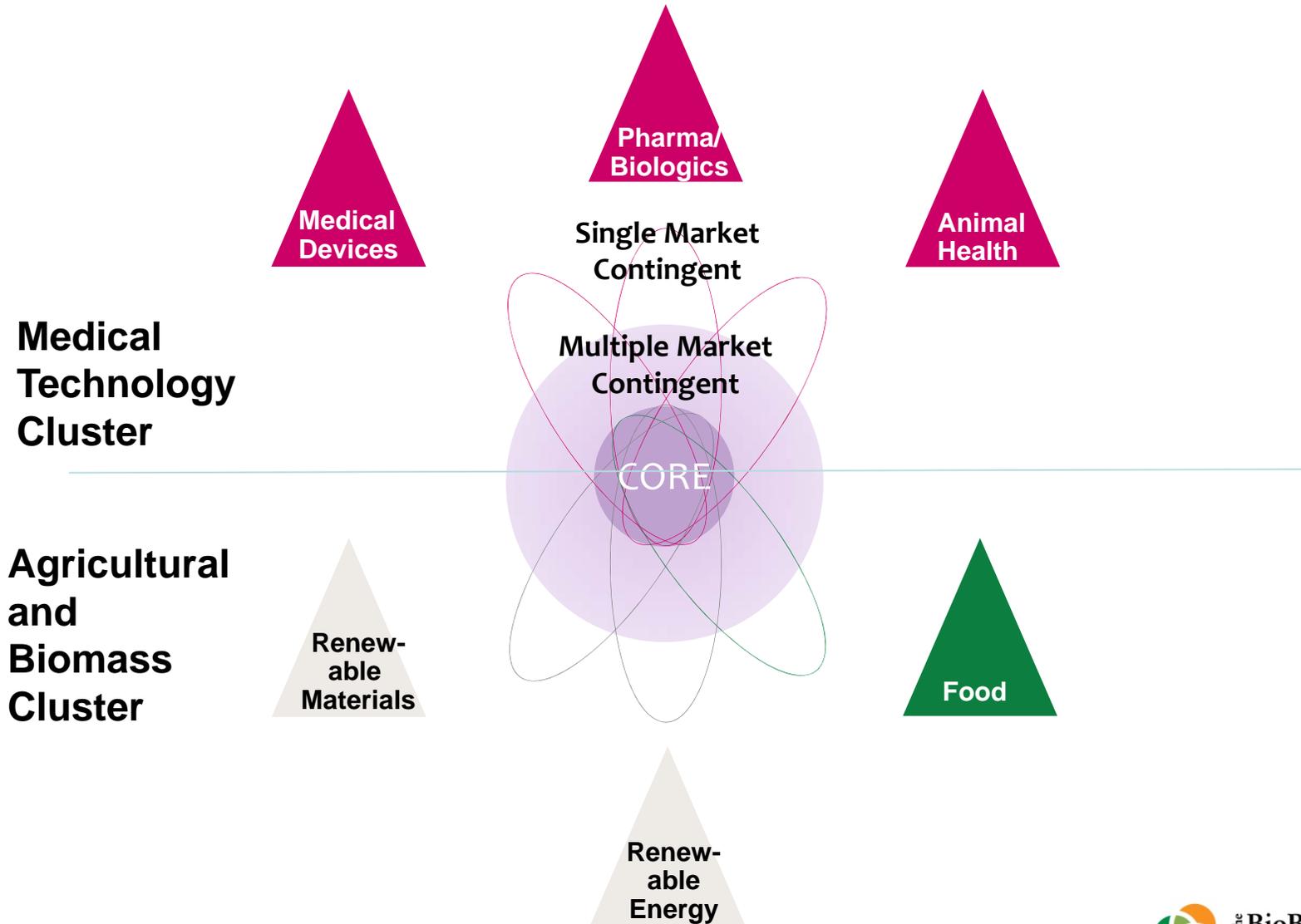


Implementation Is Underway



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Minnesota's Bioscience Industries



What Did We Find?

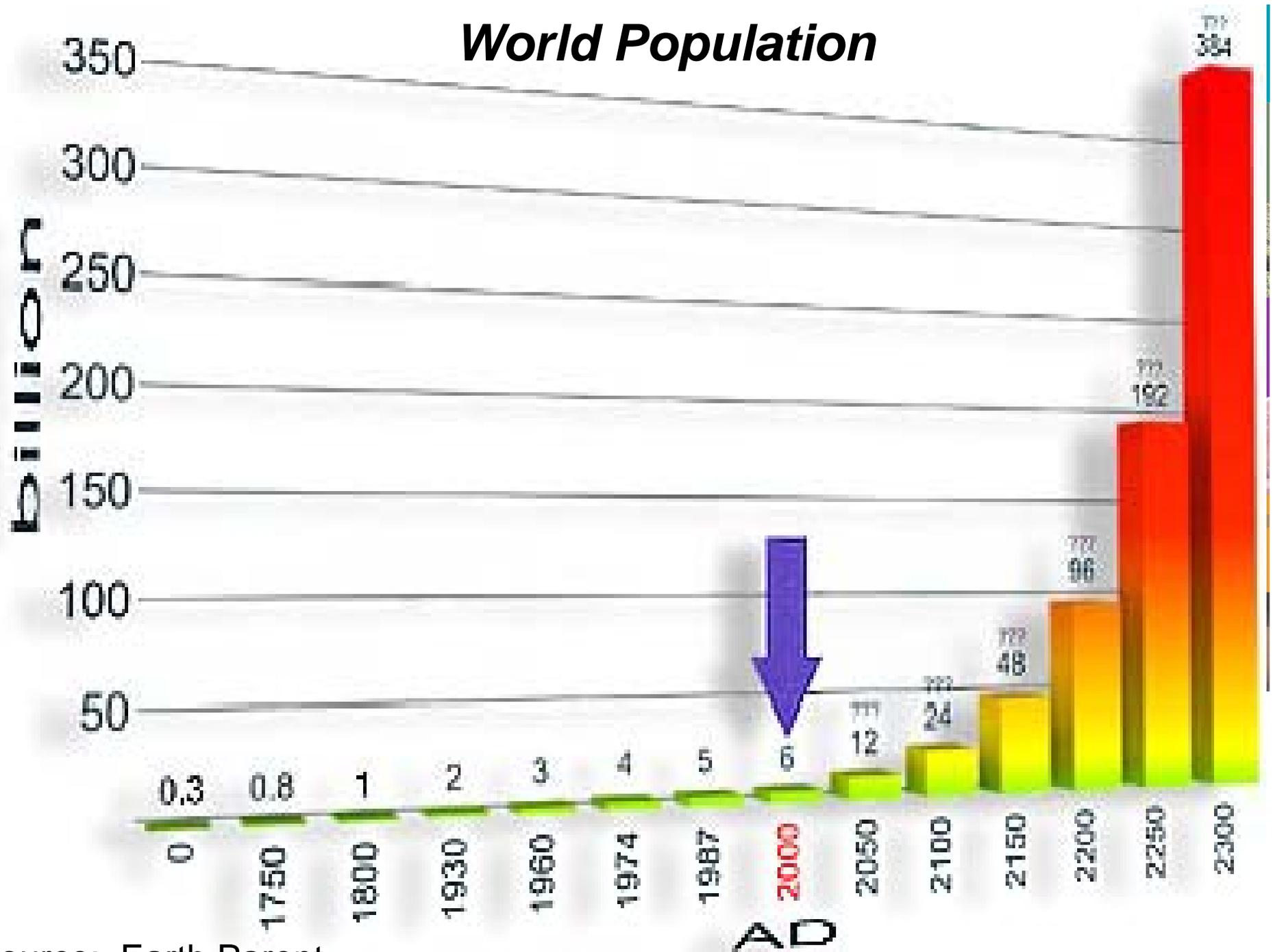
“The greatest shortcoming of the human race is the inability to understand the exponential function”

Dr. Albert Bartlett

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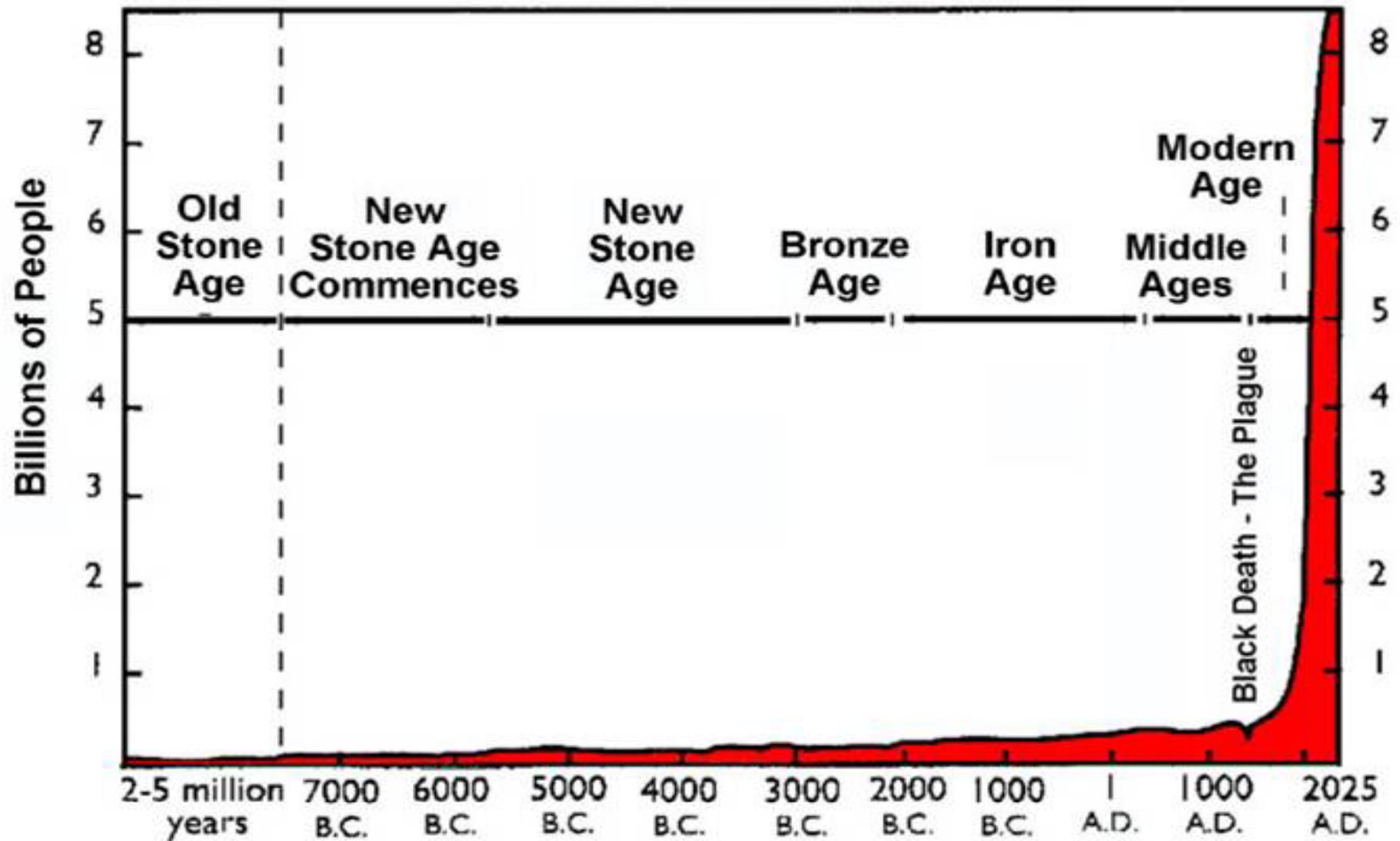


World Population



Source: Earth Parent

World Population Growth Through History

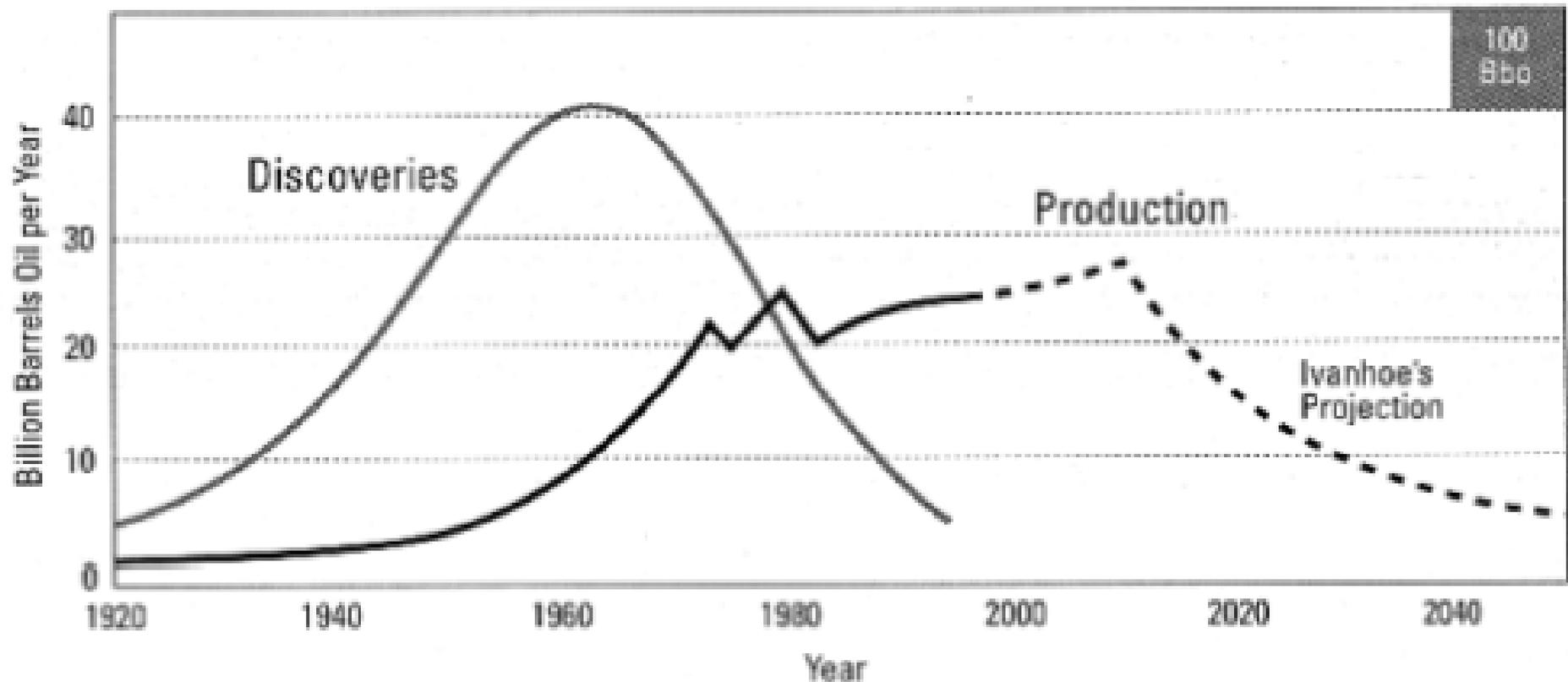


From "World Population: Toward the Next Century," copyright 1994 by the Population Reference Bureau

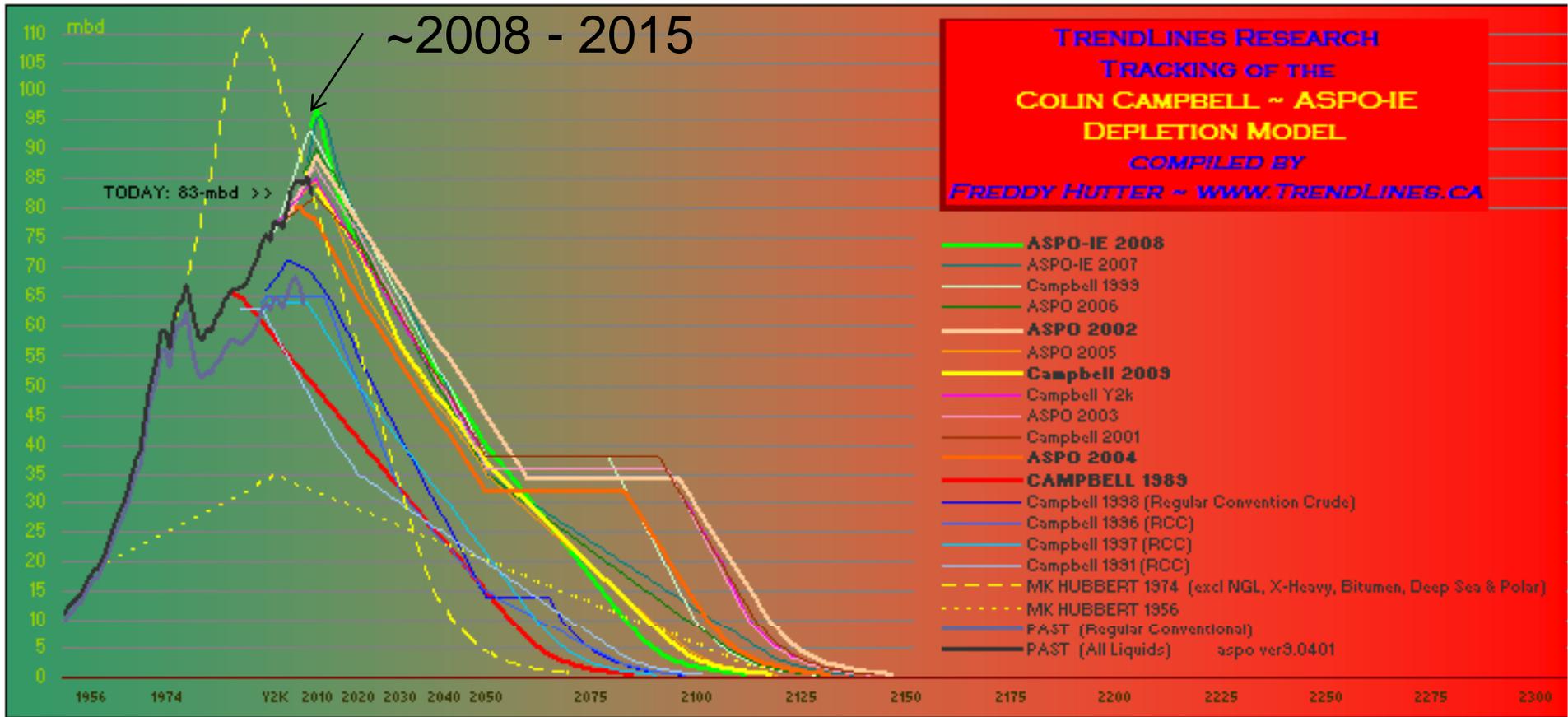


World Oil Supply

The two areas (Discoveries and Production) must ultimately be equal, since one cannot produce more oil than has been discovered.



SOURCES: Discoveries Curve adapted from USGS/Masters, 1994. Production Curve extrapolated by author to match Discoveries volume (area under Discoveries Curve).



What Do We Believe?

“A series of great opportunities disguised as insoluble problems”

John Gardner: Founder of Common Cause



What Do We Believe?

“The green economy is poised to be the mother of all markets, the economic investment opportunity of a lifetime, because it has become so fundamental”

Lois Quam

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Agricultural and Biomass Cluster



Forests

Existing Markets: Lumber, Paper, Energy

Growing Markets: Bioactives & Renewable Materials and Energy

Agricultural Plants

Existing Markets: Human & Animal Food, Energy

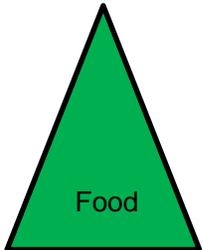
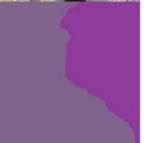
Growing Markets: Functional Foods & Renewable Materials and Energy

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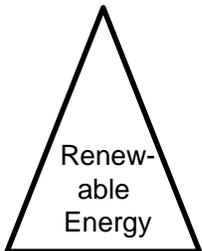


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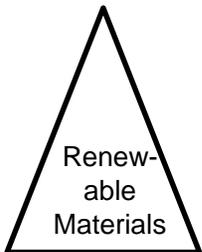
MN's Opportunities: Biomass Cluster



- **Plant engineering: carbon source**
 - **Participation in all other industries**
-



- **Sustainable biomass management**
 - **Combustible biomass industry**
-

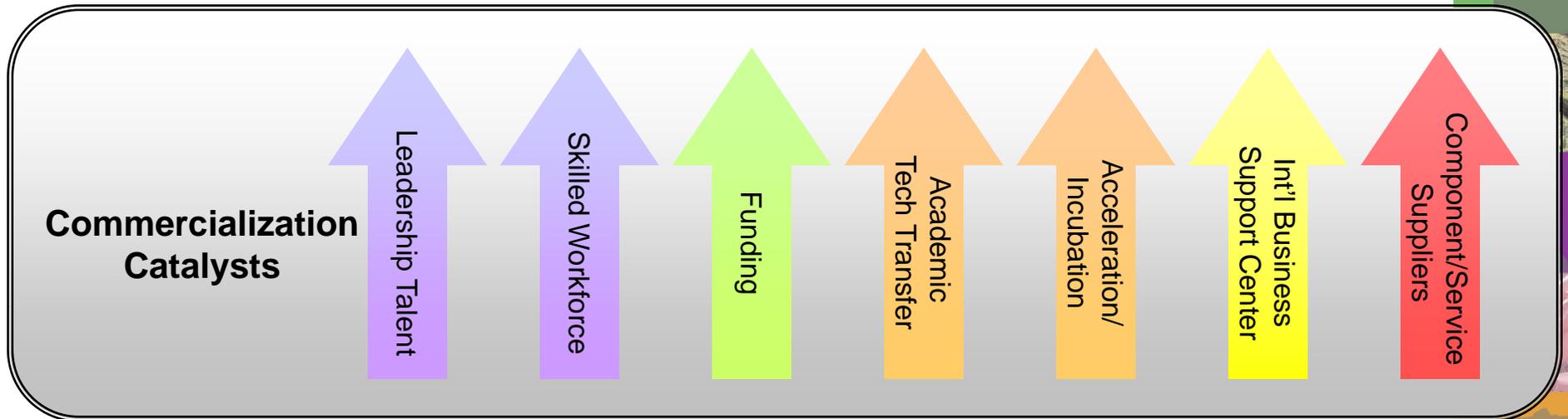


- **Engineering and end product production**





Projects: Commercialization Catalysts



- Funding Mechanisms: Seed through Syndication
- International Support Centers: Japan, Sweden, Ireland
- Acceleration/Incubation
- Leadership

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Projects: Enabling Knowledge Clusters



Enabling
Knowledge
Clusters

Catalysis &
Synthesis
(Biological &
Chemical)

NanoTech &
Materials
Science

Bio-
engineering
& Clinical
Capabilities

Bio-
informatics
&
Systems
Biology

Genomics,
Proteomics
& High
Throughput
Biology

Imaging /
Navigation

- Nanotechnology
- Bioinformatics
- Systems Biology
- Biomass

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Projects: Foundational Capabilities

Foundational Capabilities

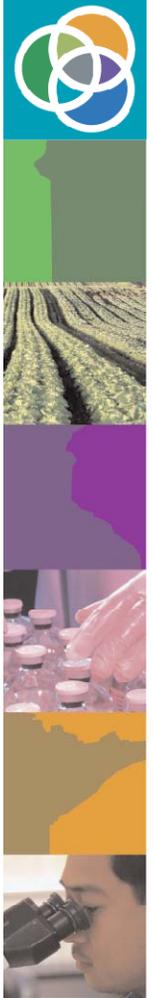
Education

Infrastructure

Policy

- Angel Tax Credits
- R & D Tax Credits
- Technology Spinouts
- Biosciences Education-Industry Partnership Council

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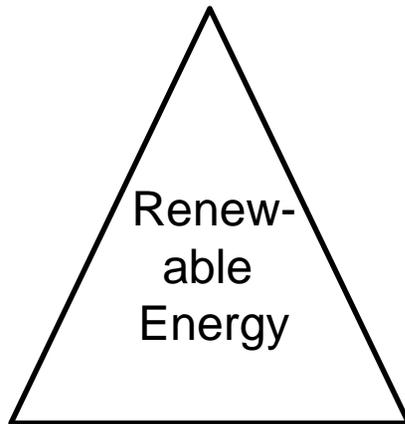
Phase III: Implementation

- *Projects*
- *Company Support*



Enriching Minnesota's Future through the Biosciences

MN's Opportunities: Biomass Cluster



Sustainable Biomass Management

Enriching Minnesota's Bioscience Future



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Sustainable Biomass Management

- MN's biomass value chain is evolving and becoming more complex, i.e. channels, use
- Diverse stakeholders with different ideas regarding strategic issues:
 - Sustainability and security of feedstocks
 - Standards for logistics and infrastructure
 - Scale and speed of production
 - Development capital
 - Transition costs versus value
 - Regulatory and legislative harmony



System Dynamics Modeling Process

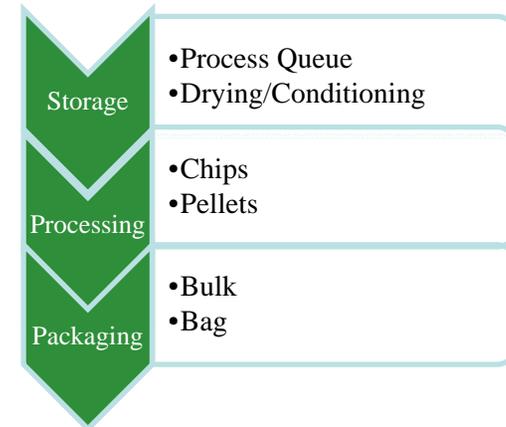
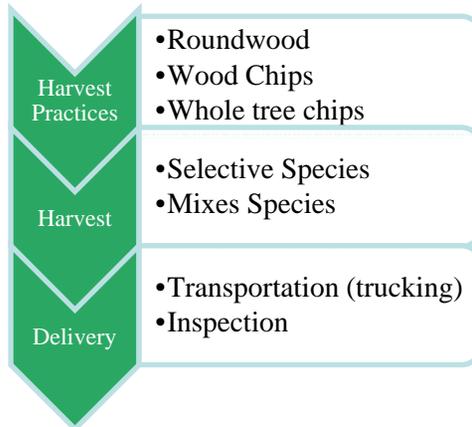
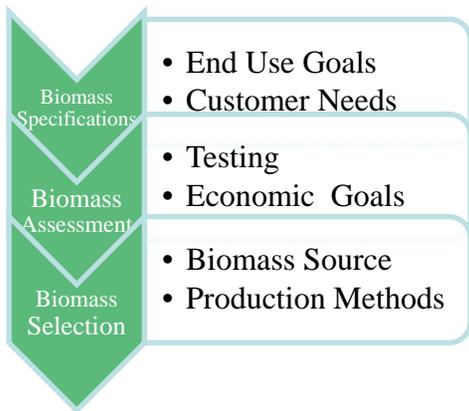
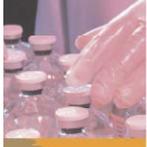
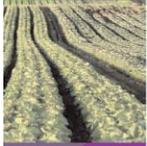
Minnesota Biomass Sustainability Value Chain Analysis

To use a model, you need a process:

1. Discussion to capture the diversity of opinions
2. Debate the issues until the team reaches agreement on a possible scenario (this becomes the “base case”)
3. Input the data and run the scenario
4. Analyze outcomes to understand the behavior



Ex: Solid Fuel Biomass Value Chain

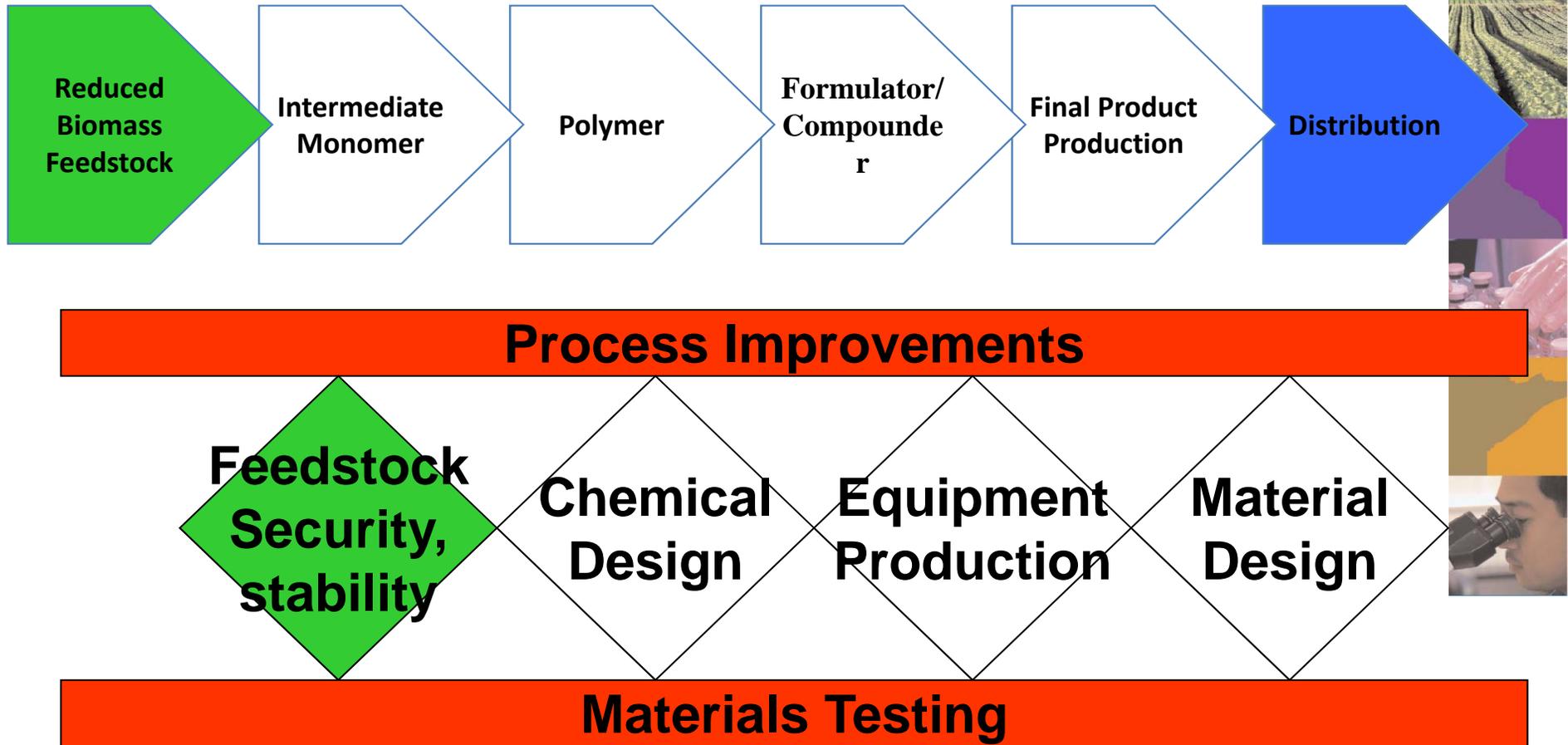


Solid Fuel Biomass Value Chain (cont'd.)



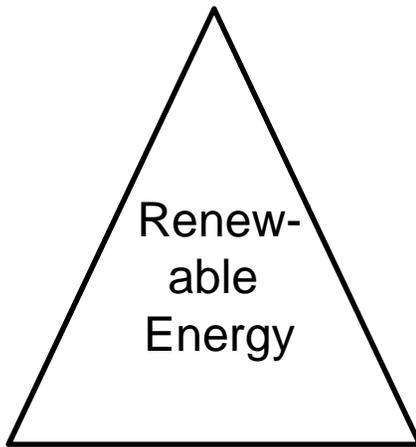
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Renewable Materials Value Chain



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MN's Opportunities: Biomass Cluster



Combustible Biomass Industry



District Energy St. Paul

- Serving **Saint Paul** customers since 1983
- **Minnesota's** leading biomass, renewable system
- **North America's** largest hot water district energy system
- **International** model for integration of biomass fuel, combined heat and power and a district energy system



Minnesota Energy & GHG Goals

Energy Goals

- Reduce per capita use of fossil fuel as an energy input by 1.5 percent per year through 2017 through increased reliance on energy efficiency and renewable energy alternatives
- Obtain 25 percent of the total energy used in the state from renewable energy resources by the year 2025

GHG Goals

- **2015:** Greenhouse Gas reduced by 15%
- **2025:** Greenhouse Gas reduced by 30%
- **2050:** Greenhouse Gas Reduced by 80%

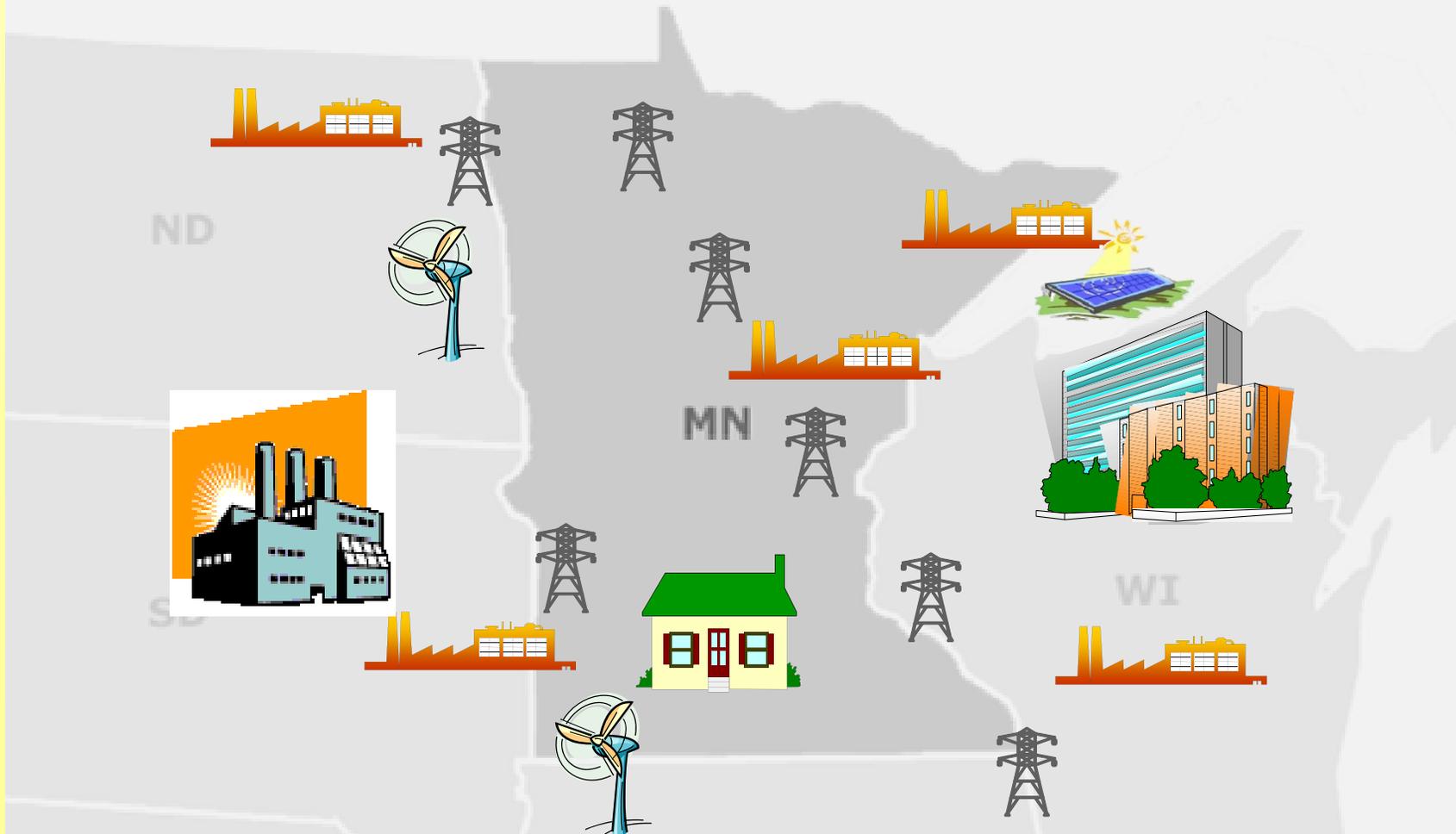


Gap Assessment

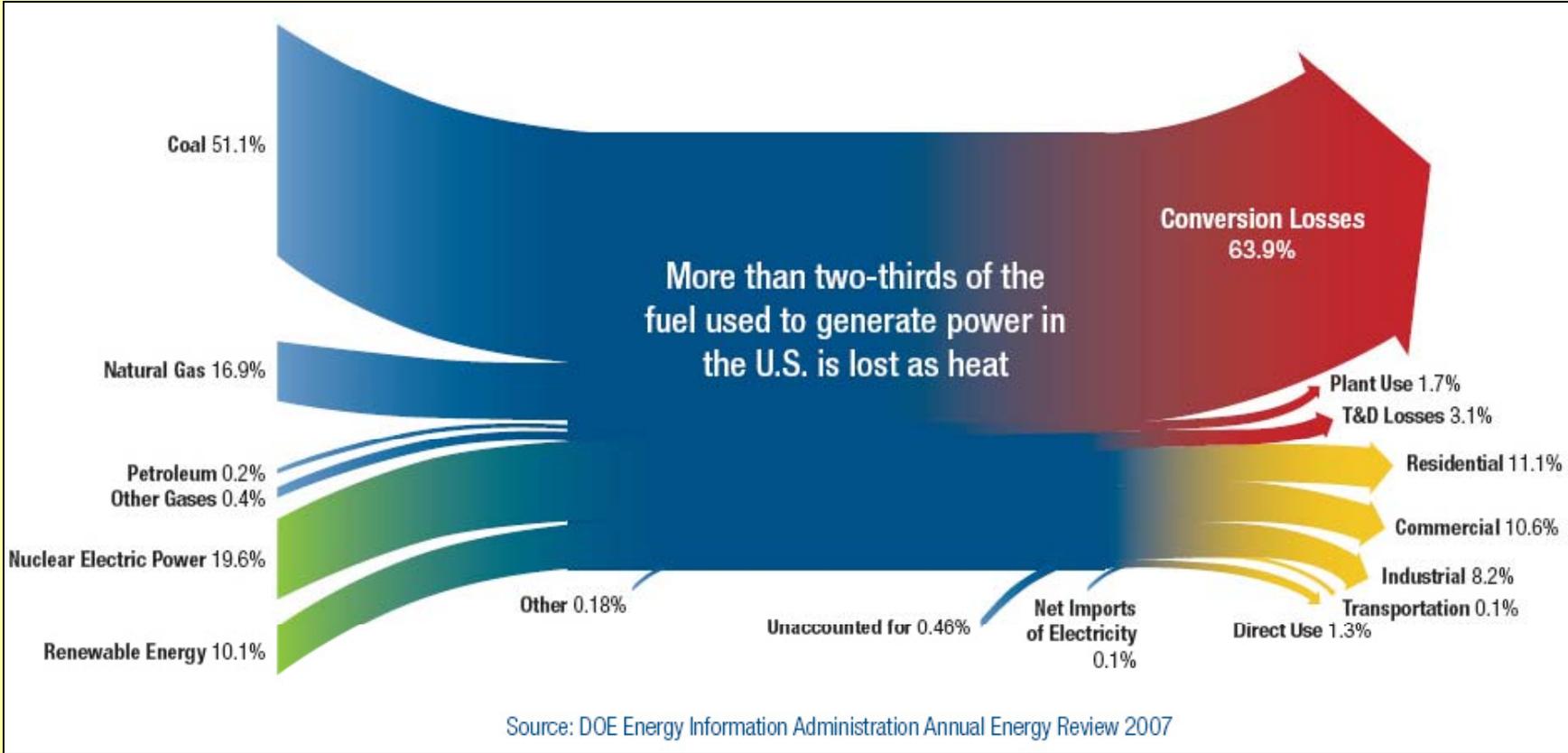
- Achieving long term efficiency, renewable and GHG reduction goals requires transformation of the energy system
- Current efforts are mostly focused on segments of the system
- Emphasis remains on electricity and transportation, with minimal thermal planning



Good Efforts... But Mostly In Isolation



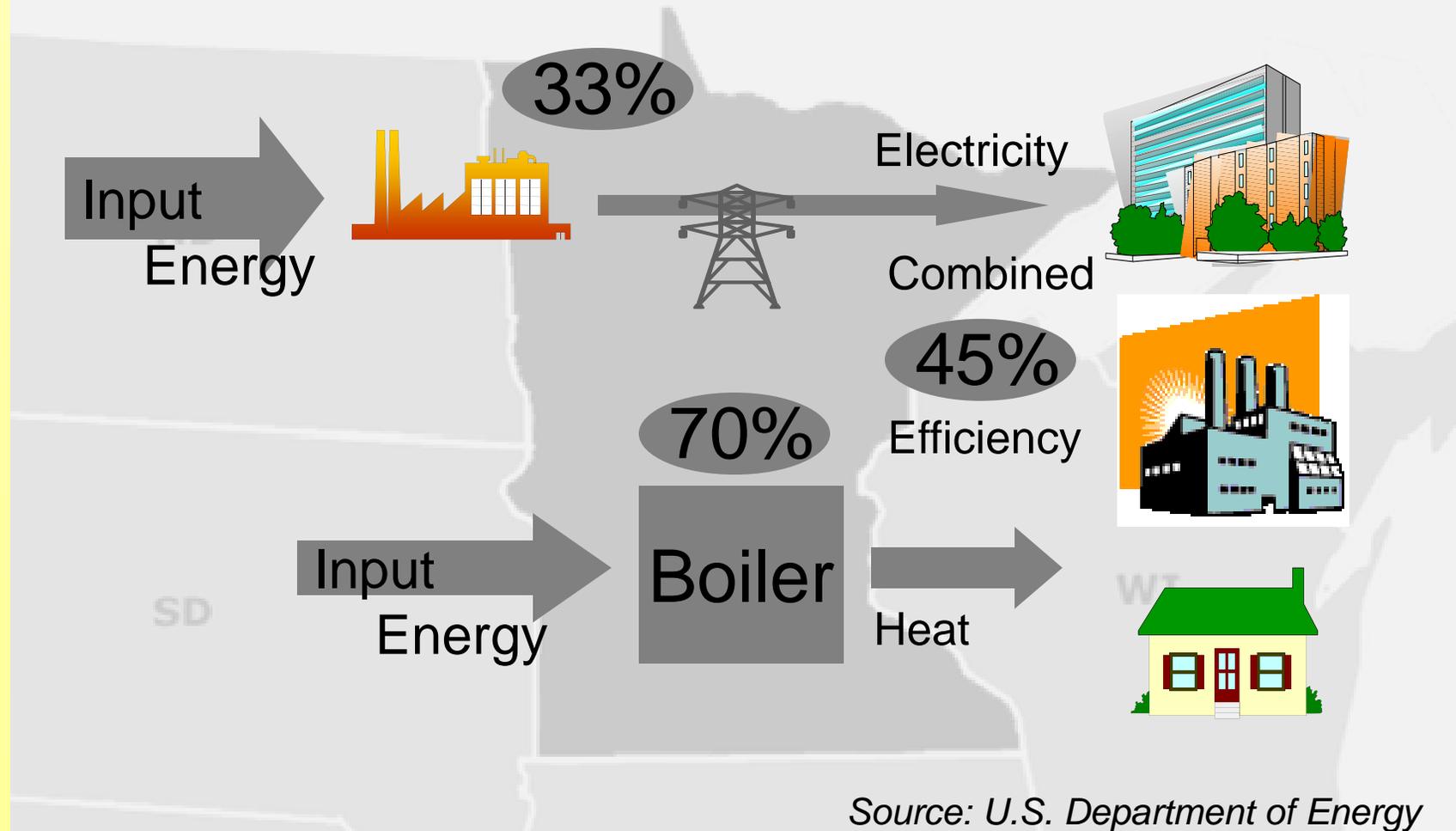
Isolated Systems Suffer From Inefficiencies



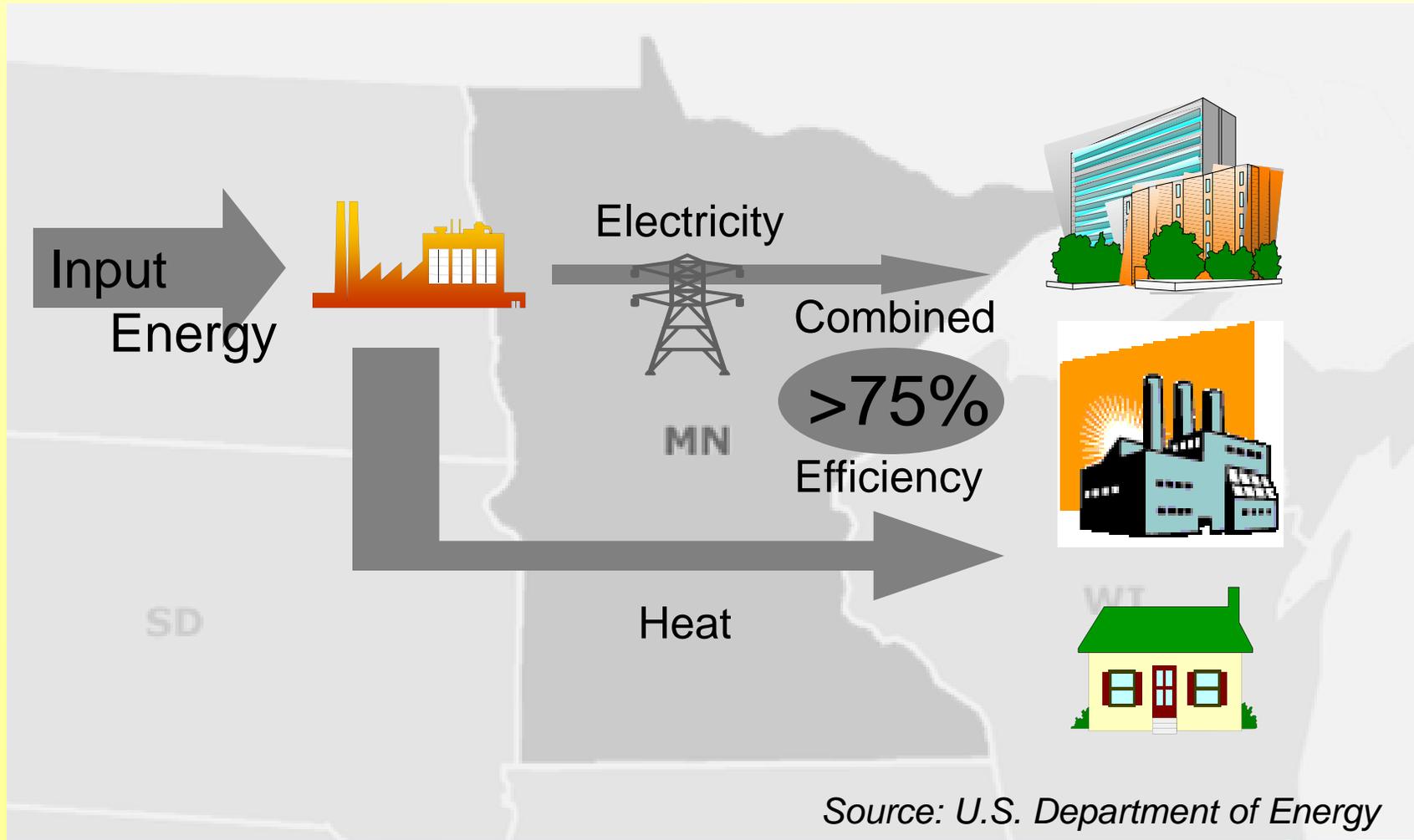
The energy lost in the United States from wasted heat in the utility sector is greater than the total energy use of Japan. *U.S Dept of Energy*



Today's System Inefficiencies



Combined Heat & Power Solutions



Benefits of Integrated Solutions

- Combined Heat & Power Generation
 - Efficiently meet electric and thermal demands
 - Fuel flexible
 - Proven and available technology
 - Increased energy security
- Achieve GHG Goals
 - Earlier results
 - Economically competitive

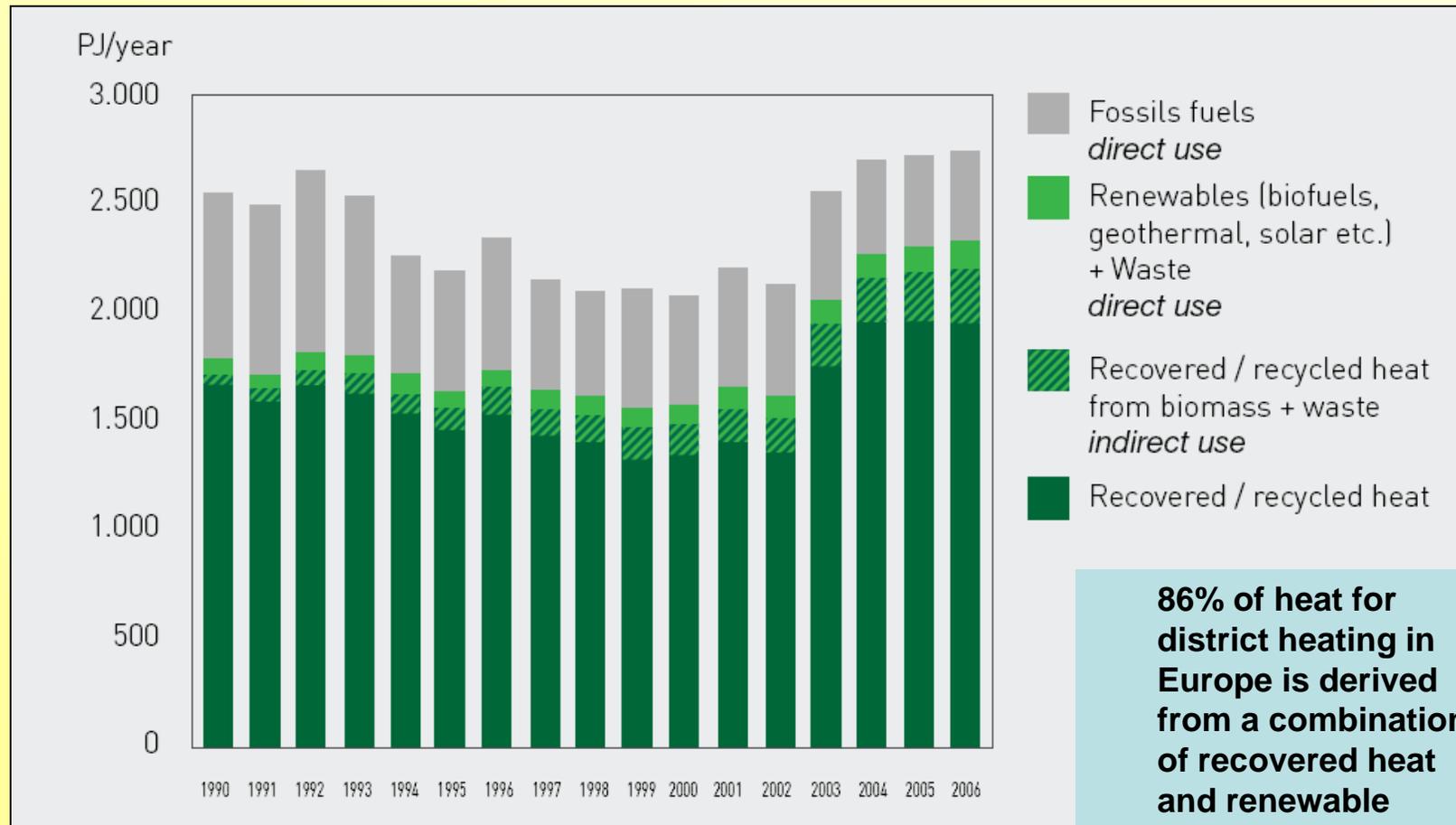


Benefits of Integrated Solutions

- Achievement of Renewable Goals
 - Increased market penetration
 - More flexibility
- Biomass Opportunity
 - New industry for collecting and processing wood
 - Money funneled into local economies
 - Create and sustain good paying jobs
 - Careful planning, sustainable results



Integrated Solutions: European Union

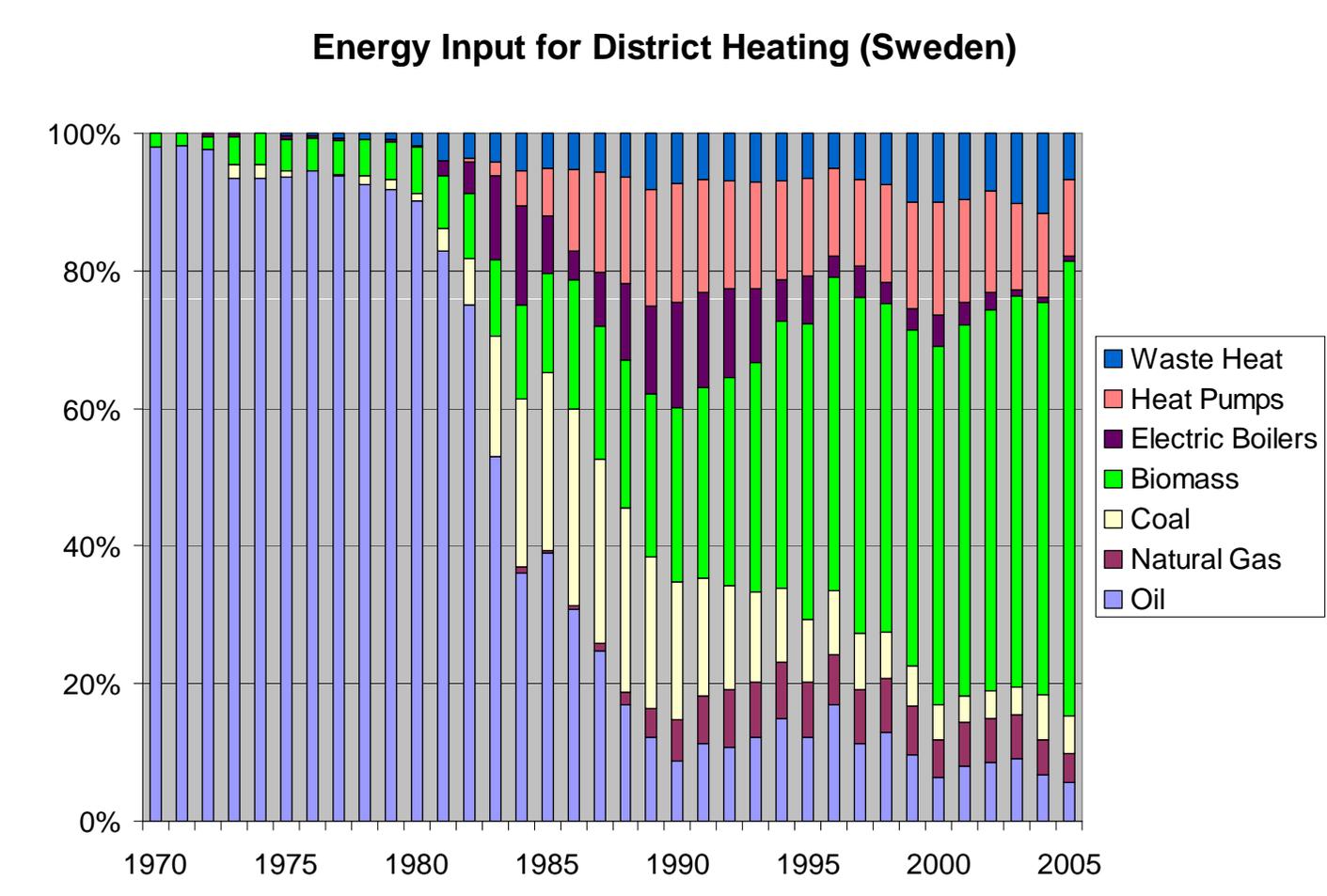


Heat Sources for District Heating for EU27

86% of heat for district heating in Europe is derived from a combination of recovered heat and renewable energy resources



Integrated Solutions: Sweden

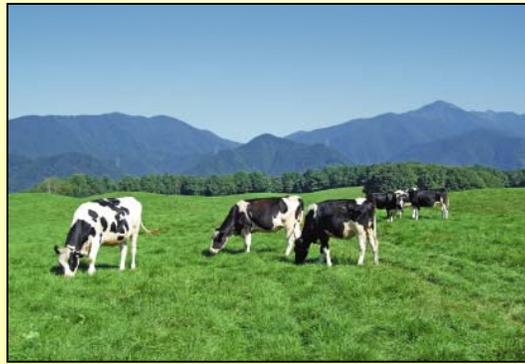


Source: Swedish Energy Agency

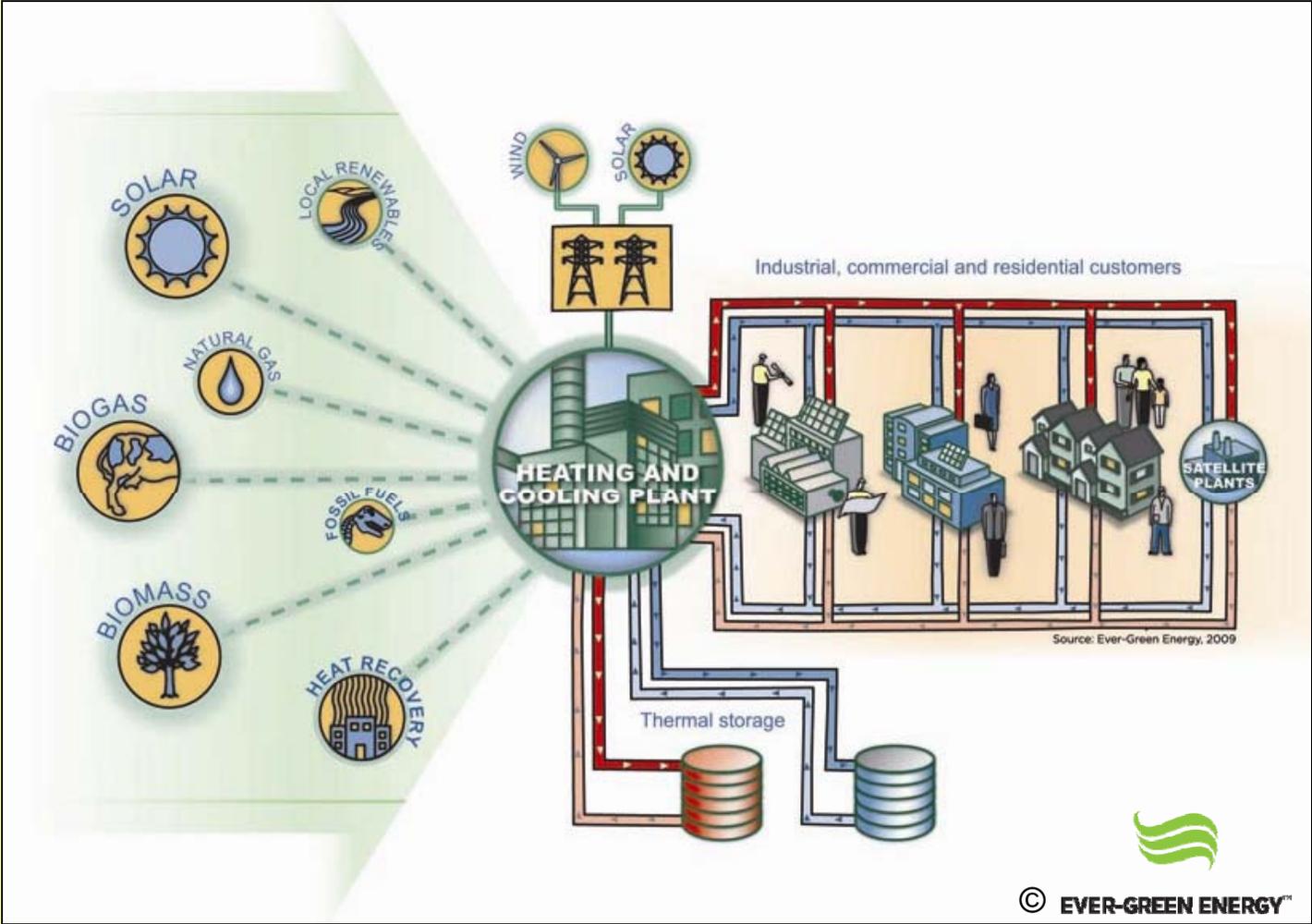
~ 55 TWh of load in 2005



Integrated Solutions: Minnesota's Potential



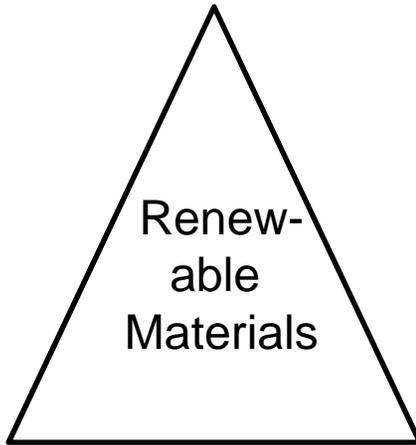
Integrated Energy Solutions



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MN's Opportunities: Biomass Cluster



**Engineering and End Product
Production**



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**The BioBusiness Alliance
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Transforming the Chemicals Industry with Novel Renewable Materials



Brian Tockman
Business Development Manager
763.795.7247
brian_tockman@segetis.com



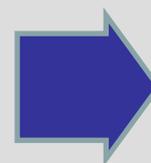
Who is Segetis?

- Technology– enabled **Green Chemistry** company meeting industry's need for innovative materials that deliver new functionality with equal or better economics
 - Founded in late 2006 by Sergey Selifonov (Inventor of Segetis technology) and Olga Selifonova in Minnesota, USA and funded by Khosla Ventures in January 2007
- Segetis is delivering new to the world molecules that are cost effective chemical building blocks that harness the power and reliability of renewable feedstocks

Novel
monomers



Clean and green
chemicals and plastics



Multi-Billion
\$\$\$ market
opportunity

Markets:

- Construction
- Automotive
- Packaging
- Consumer durables
- Footwear



Segetis

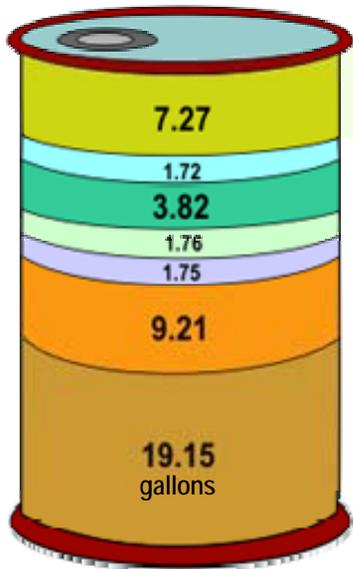
Segetis and Minnesota

- All operations currently based in Minnesota
- 30+ employees, several contractors and consultants
 - 10 employees relocated from outside of Minnesota
- Initially located at UEL, now growing in Golden Valley
- Semi-works plant at main office
 - Proved ability to scale up, provides capacity to supply initial customer test quantities and orders
 - Went online in February
- Emerging Biobased Products “cluster” in Twin Cities
 - Natureworks, Cargill BiOH, Segetis



The opportunity

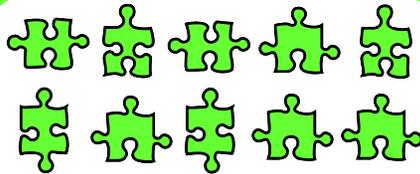
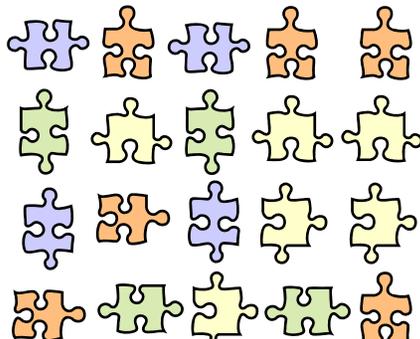
Petroleum



- Other Products (non-fuel)
- Liquefied Petroleum Gases (LPG)
- Jet Fuel
- Heavy Fuel Oil (Residual)
- Other Distillates (Heating Oil)
- Diesel
- Gasoline

Source: US Energy Information Agency

Chemistries



Segetis

- Renewable feedstocks
- New functionality
- Competitively priced
- Sustainable chemistry

- Ethylene
- Propylene
- Toluene
- Xylenes
- Others

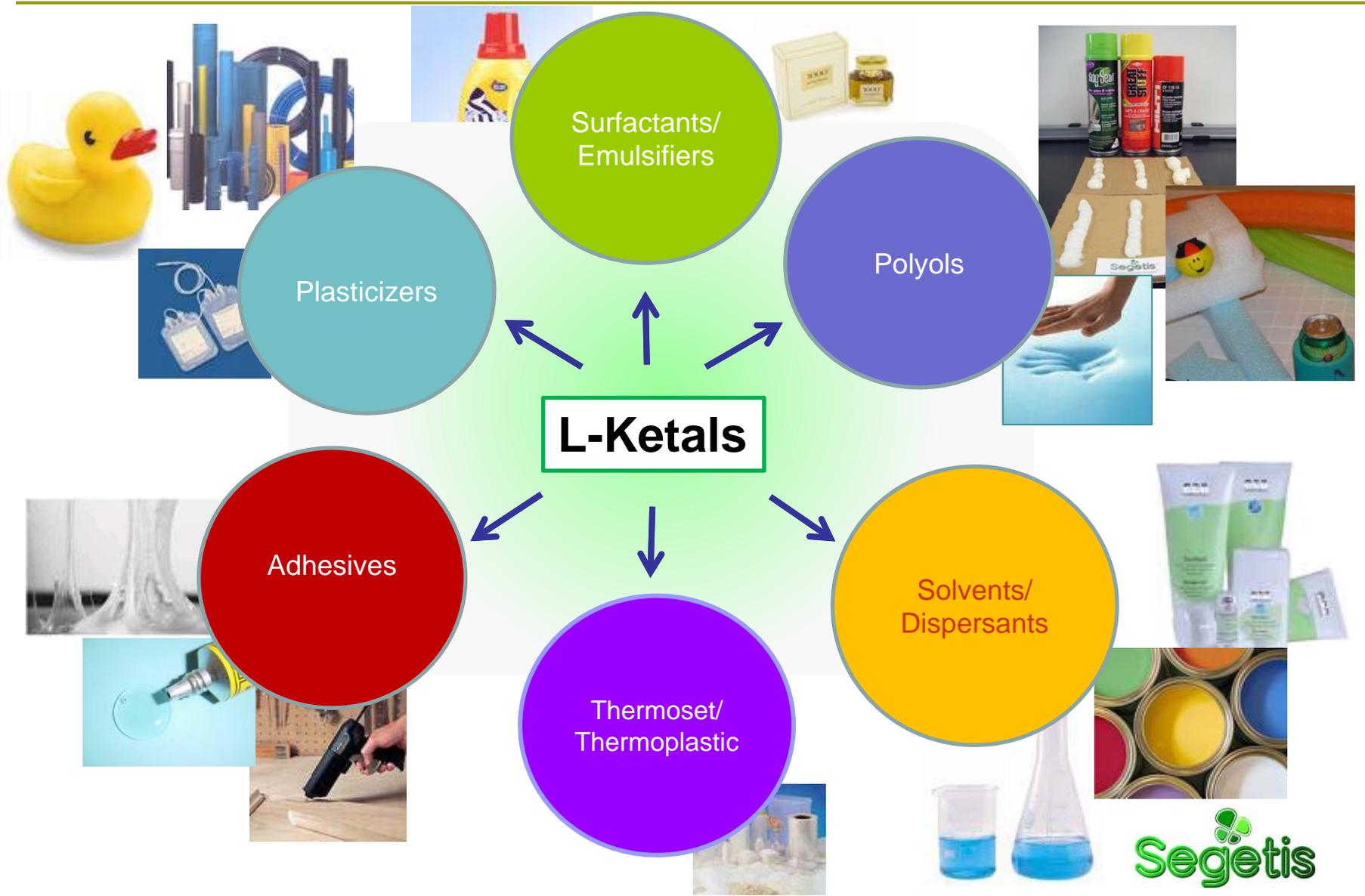
\$2 trillion/year

Embedded petroleum

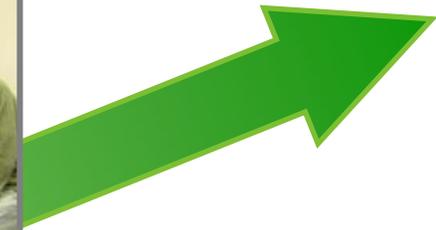


Segetis

L-ketals: platform and markets



Segetis growth



Semi-Works
Plant

The Beginning



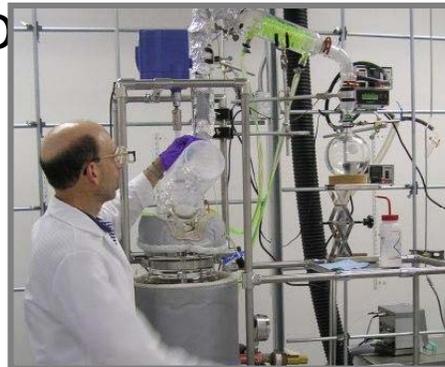
2006

New Wet-Lab



2007

Multi-Kilo Lab



2008



Feb 2009

Segetis



Segetis Business Needs

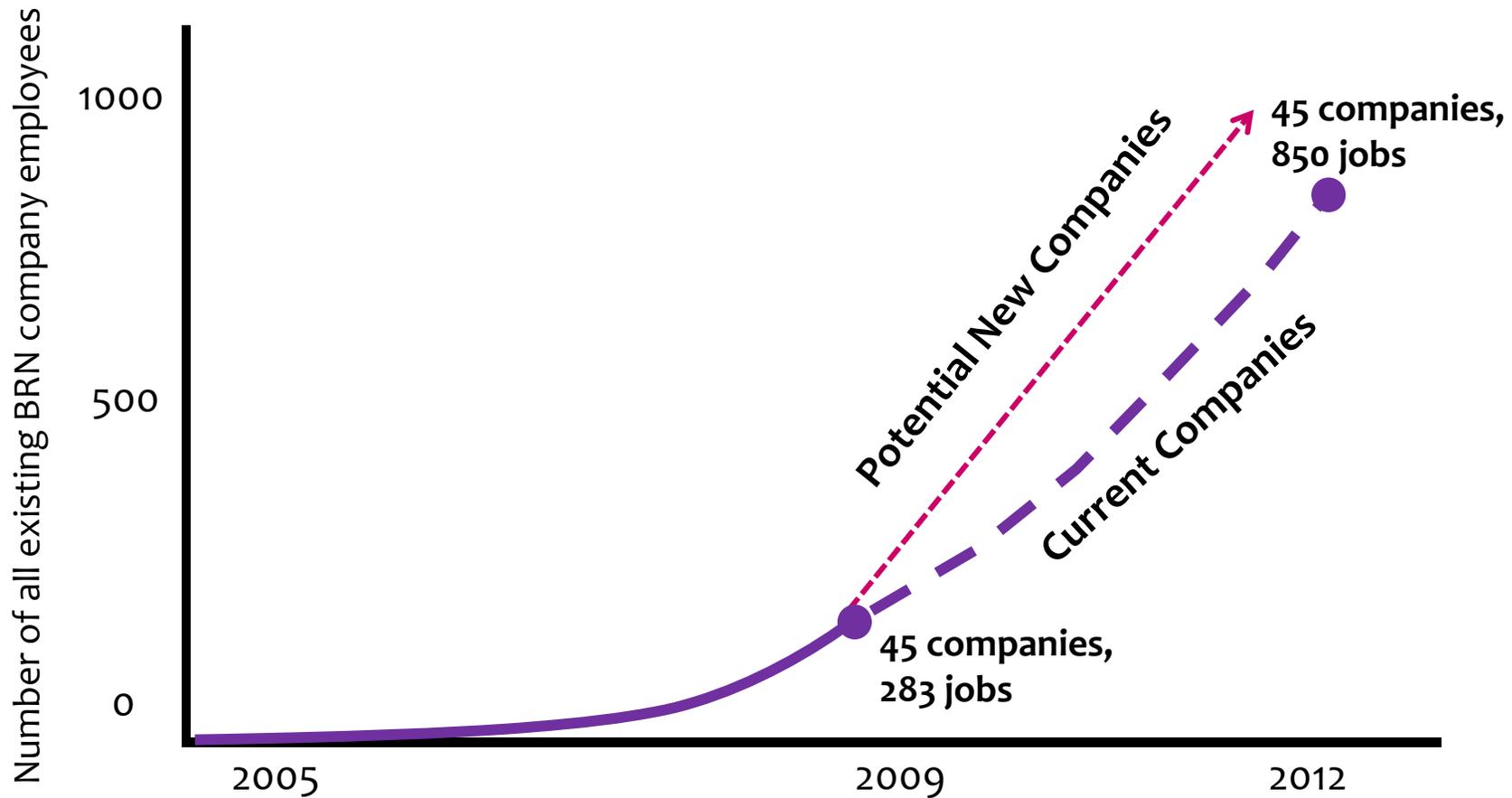
- Growth capital to achieve world scale production
- Reliable raw materials sourcing:
 - Preference for domestic supply
- Public policy support for bio-based products industry:
 - R&D Investment
 - Producer Tax Credit
 - Favorable economics for plant location
 - Loan Guarantees
 - Cap & Trade
- Talent acquisition



Segetis Value Propositions

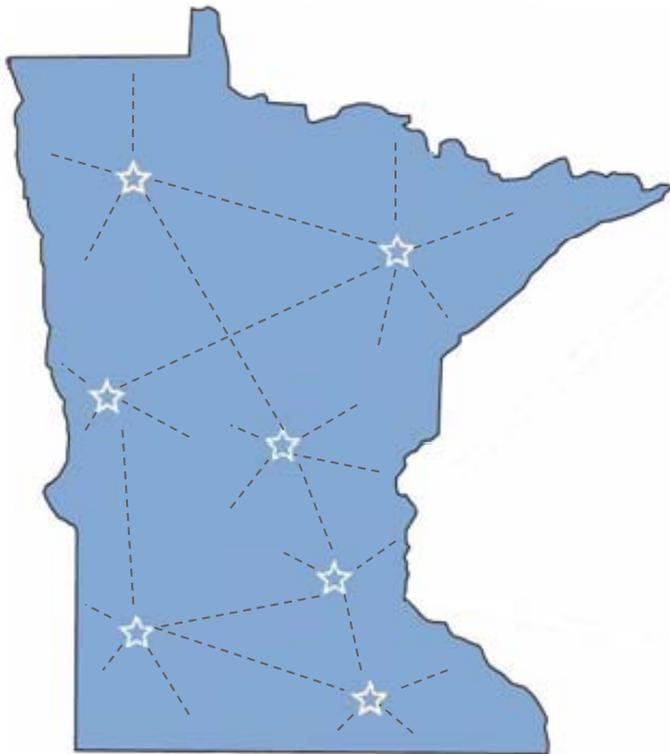
- No compromise on cost or performance
- Unique platform technology with applications in multiple \$1B markets
- Clean, green products that address safety and toxicity concerns
- Strong IP with over 100 inventions covered & composition of matter
- Management team with >150 years industry experience
- Thermo chemical conversion enables speed to market unmatched by fermentation methods
- Capital-light business model that leverages existing assets
- 100 ton/yr semi-works plant is operational as of Feb '09

In Summary: Job Creation



Minnesota Life Science Community

Mission: Drive growth of a knowledge based economy



Critical Components:

- **CHAMPIONS** with significant technical and industry knowledge
- Inventoried **strengths and capabilities**
- **Academic support** for work force, research, technology
- Acceleration capability (**money, management, technical know-how**)
- Appropriate **policies**
- A **strategy** and **community** that supports it



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Thank You!

dwahlstrom@biobusinessalliance.org

gmast@biobusinessalliance.org

952.756.3847

www.biobusinessalliance.org