



**A2EP – 2xEP Energy Productivity Summit**  
**04-05 April, 2017**  
**Australian National Maritime Museum**  
**Darling Harbour, Sydney**

**Session 02**

**2xEP by 2030 by sector - Manufacturing**

Michael Bellstedt

Carmel Gillies

Carl Duncan

*Denise Swink > presentation follows*

*Chair: Paul Orton*



*Doing more. Using less.*

2XEP PRODUCTIVITY SUMMIT,  
04-05 APRIL 2017, SYDNEY

MANUFACTURING PANEL, DENISE SWINK, CEO,  
SMART MANUFACTURING LEADERSHIP  
COALITION (SMLC)

[SMARTMANUFACTURINGCOALITION.ORG](http://SMARTMANUFACTURINGCOALITION.ORG)

# Who is SMLC



**SMLC**

SMART MANUFACTURING  
LEADERSHIP COALITION

- A leader in Smart Manufacturing with 60+ national members
- Industry-driven 501c6, lowering barriers to access
- Developing an open platform and marketplace for **Smart Manufacturing** industrial applications
- Providing industry with easy, affordable, low-risk access to real-time data through a **vendor-agnostic** platform...

*... when, where and in the form it is needed.*



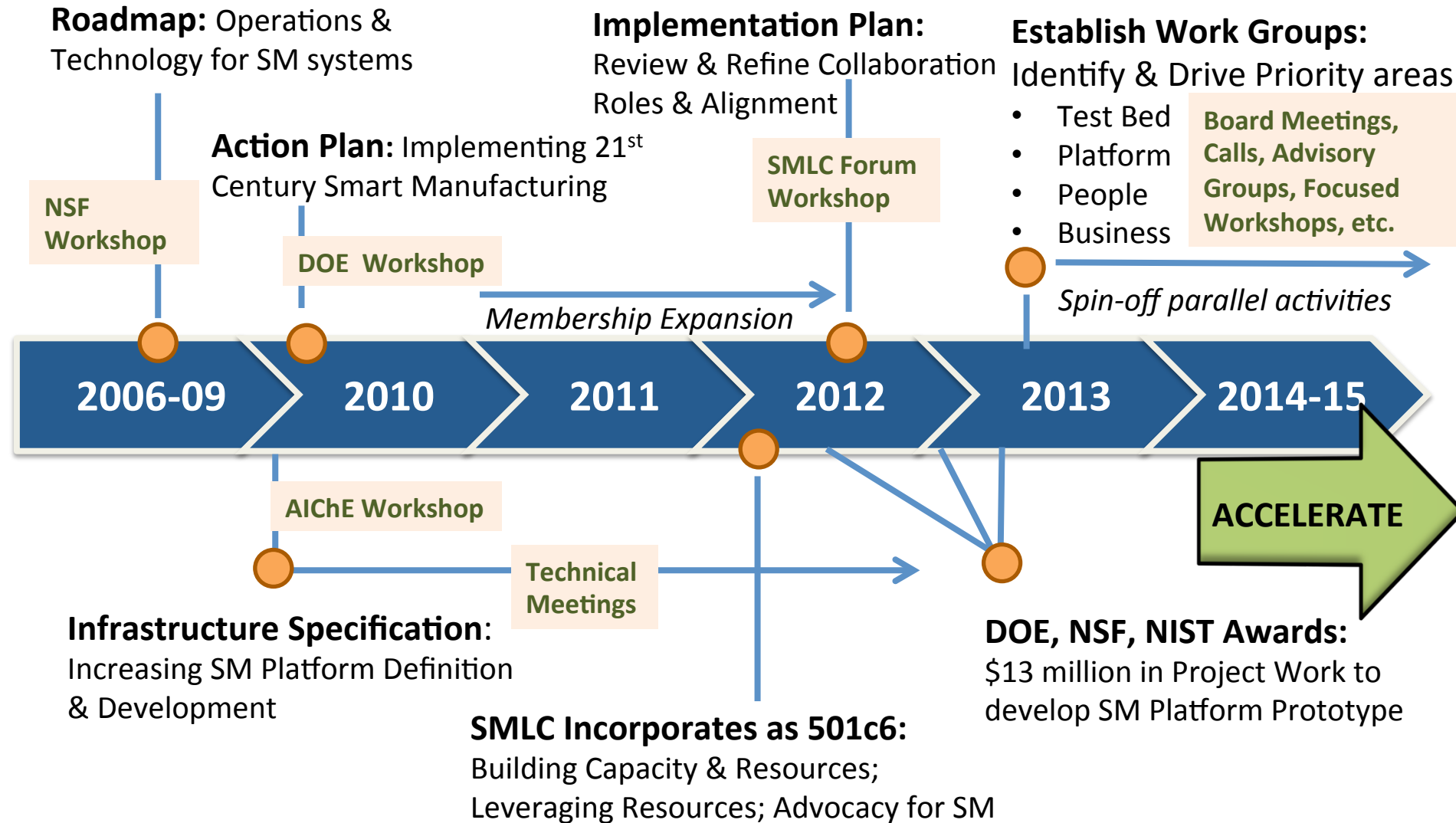
**SMLC**

# SMLC Membership

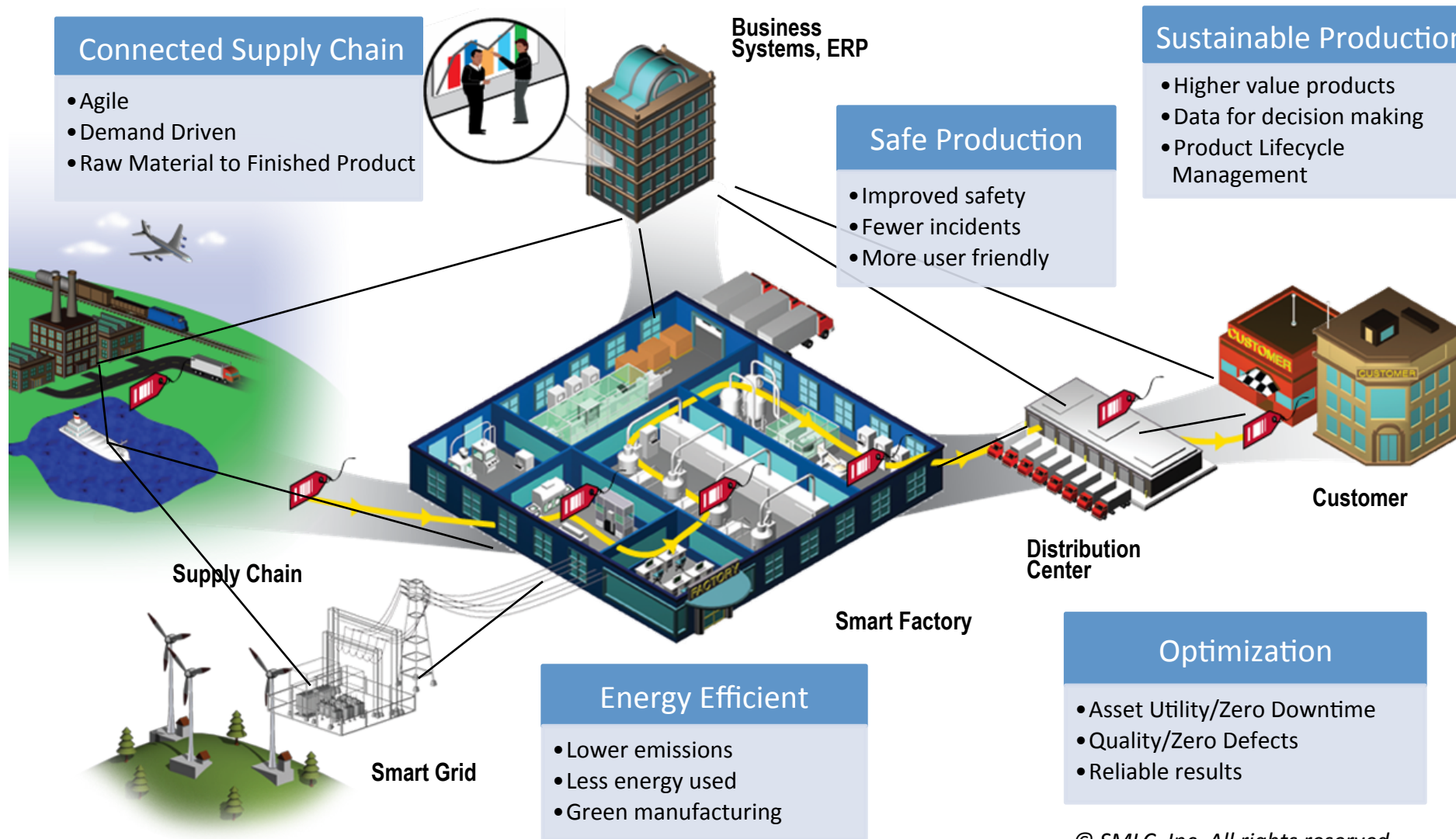
ACEEE	General Mills	Rockwell Automation
AMP Socal	General Motors	Rutgers University
Alcoa	Honeywell	Savannah Rivers National Lab
AIChE	Manufacturing Enterprise	Savigent Software
American Society of Quality	Solutions Association (MESA)	Schneider Electric
ArcelorMittal	MIT	SME
ARC	MT Connect	Southwest Research Institute
ASSERTI	NASEO	Sustainable Solutions
CMTC	NCSU	Texas A&M
Carnegie Mellon	Nimbis Services	Think IQ
Clear Peak	NIST	Tulane – PolyRMC
Conn. Ctr. for Advanced	NSF	United Technology Research
Technology	OSIsoft	Center (UTRC)
Corning, Inc.	Owens Corning	UC Berkeley
DOE	Pacific Northwest National Lab	UC Irvine
Danfoss Drives	Pfizer Inc.	UConn
Emerson	Praxair	UCLA
EPRI	Purdue University	USC - EDC
General Electric	RPI	UT Austin
		West Virginia University



# Industry-Driven Public-Private Partnership



# Affordable, Accessible, Innovative & Collaborative Network-Based, Smart Manufacturing





## *Smart Manufacturing:*

*Right Data, Right Time, Right Form  
Wherever Needed for the Business of  
Enterprise*

What got us here

Won't get us there

# Ecosystem of “Stuff”

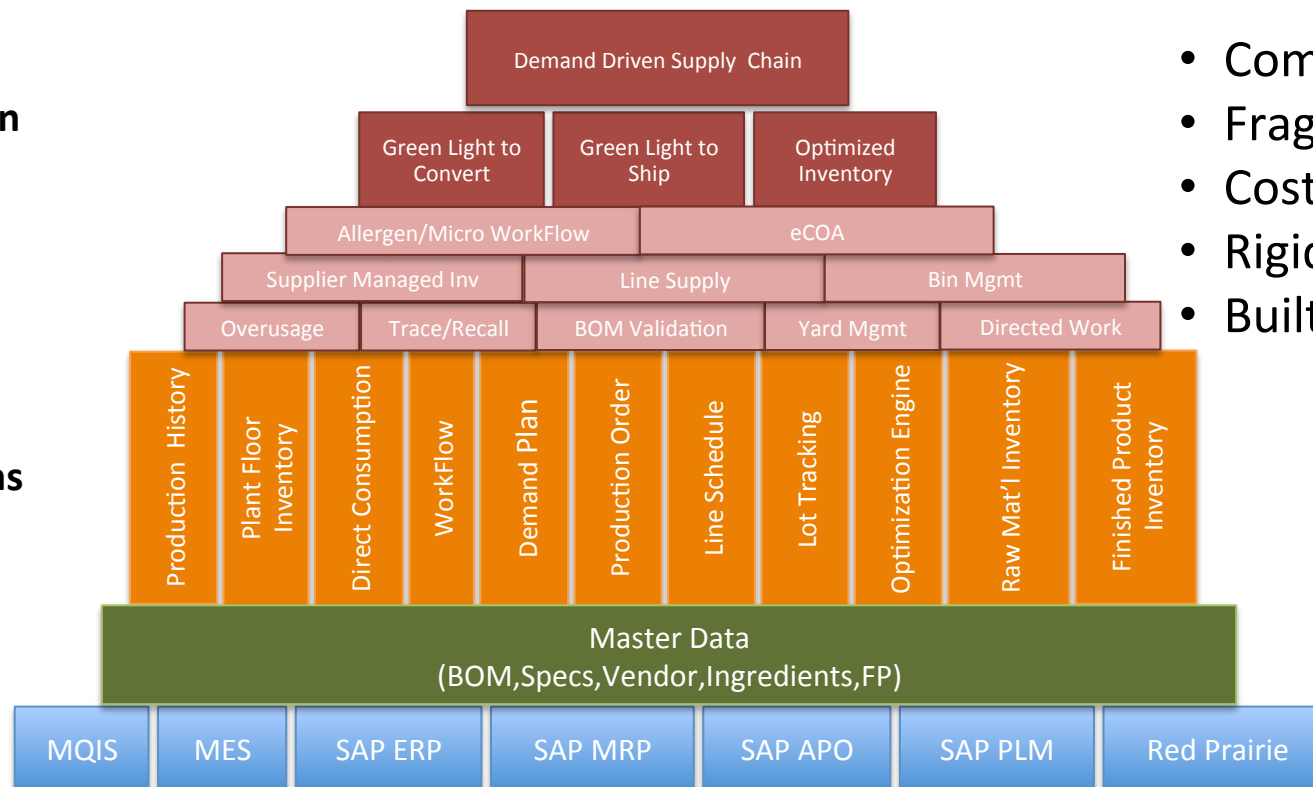
## Value Creation

## Business Applications

## Core Functions

## Core Systems

## Data Input



- Complex
- Fragile
- Costly
- Rigid
- Built for Purpose



# Layers of Interoperability

## Technology

- HW/SW
- Infrastructure
- Configuration
- Methodology
- Data
- Product
- Standards
- Systems
- Time
- Cyber attack
- Security

## Business

- Investment
- IP
- Risk
- Service Levels
- Systems integration
- Engineering
- Data/IP Security
- Time
- Cyber attack
- Security

## Ecosystem

- B2B
- Supply Chain
- Market
- Service Levels
- Systems Integration
- Collaborative Data
- Public/Private
- Owner management
- Tools
- Standards
- Cyber attack
- Security

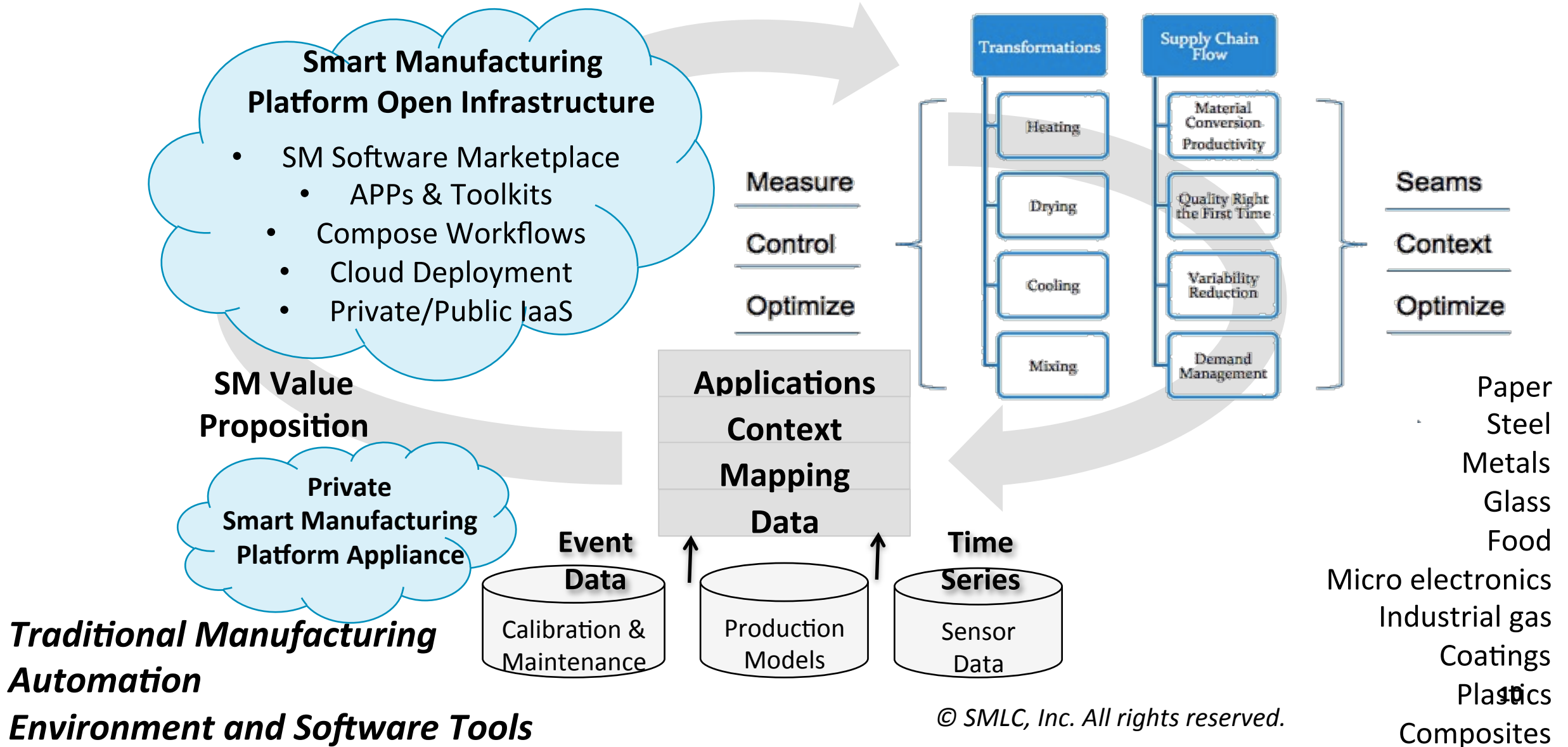
## People

- Organization
- IT/OT
- Trust
- Skills
- Change
- Roles
- Cyber attack
- Security

# Cloud & Enterprise Virtualization Services

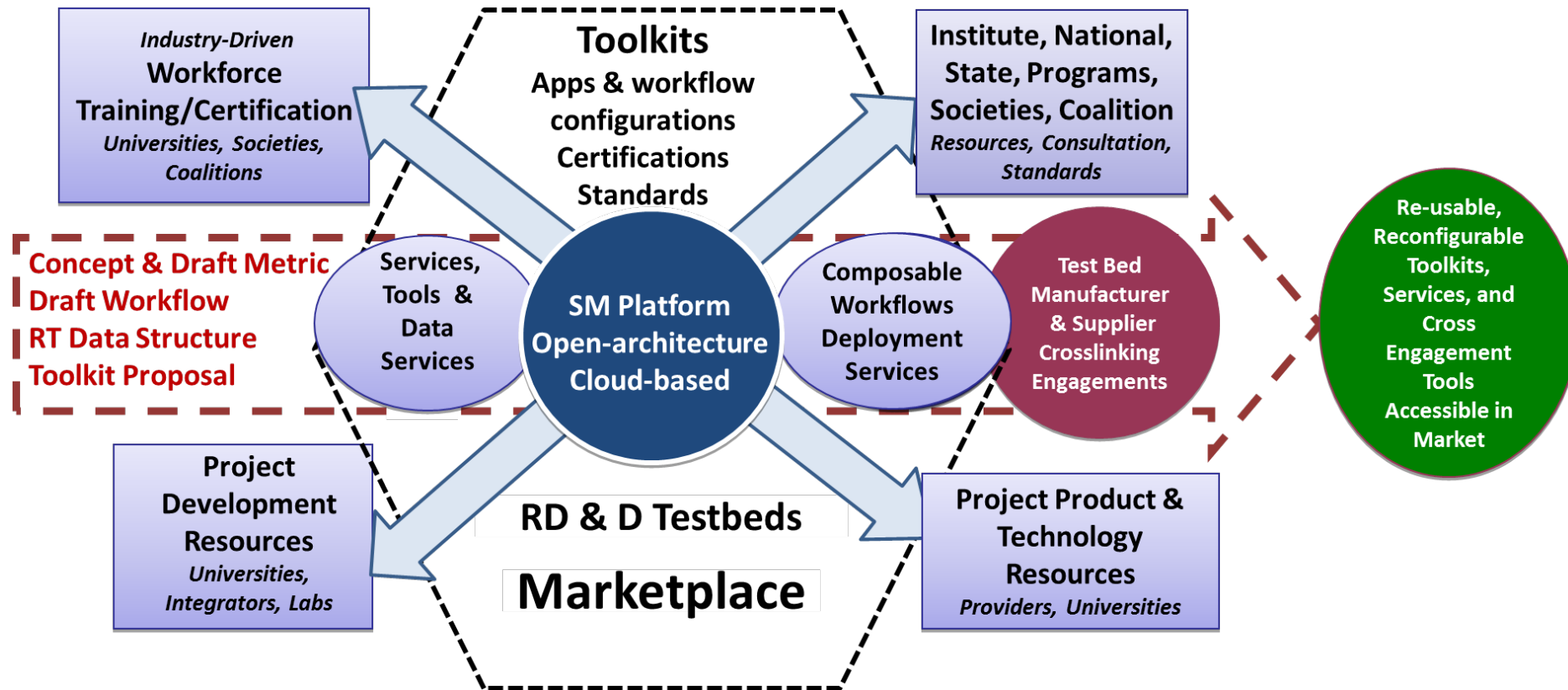
## Data to Applications

### Physical & Cyber reusability





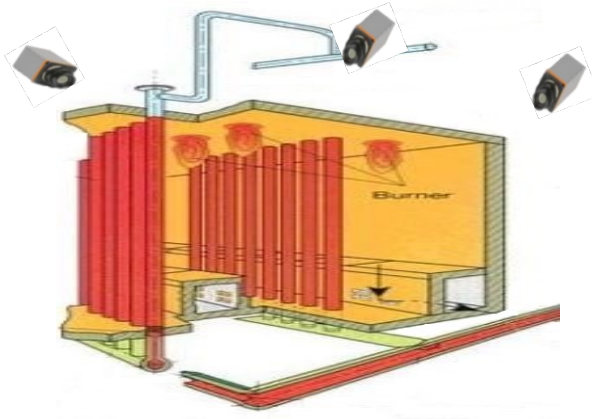
# Industry Hosted Test Bed Structure



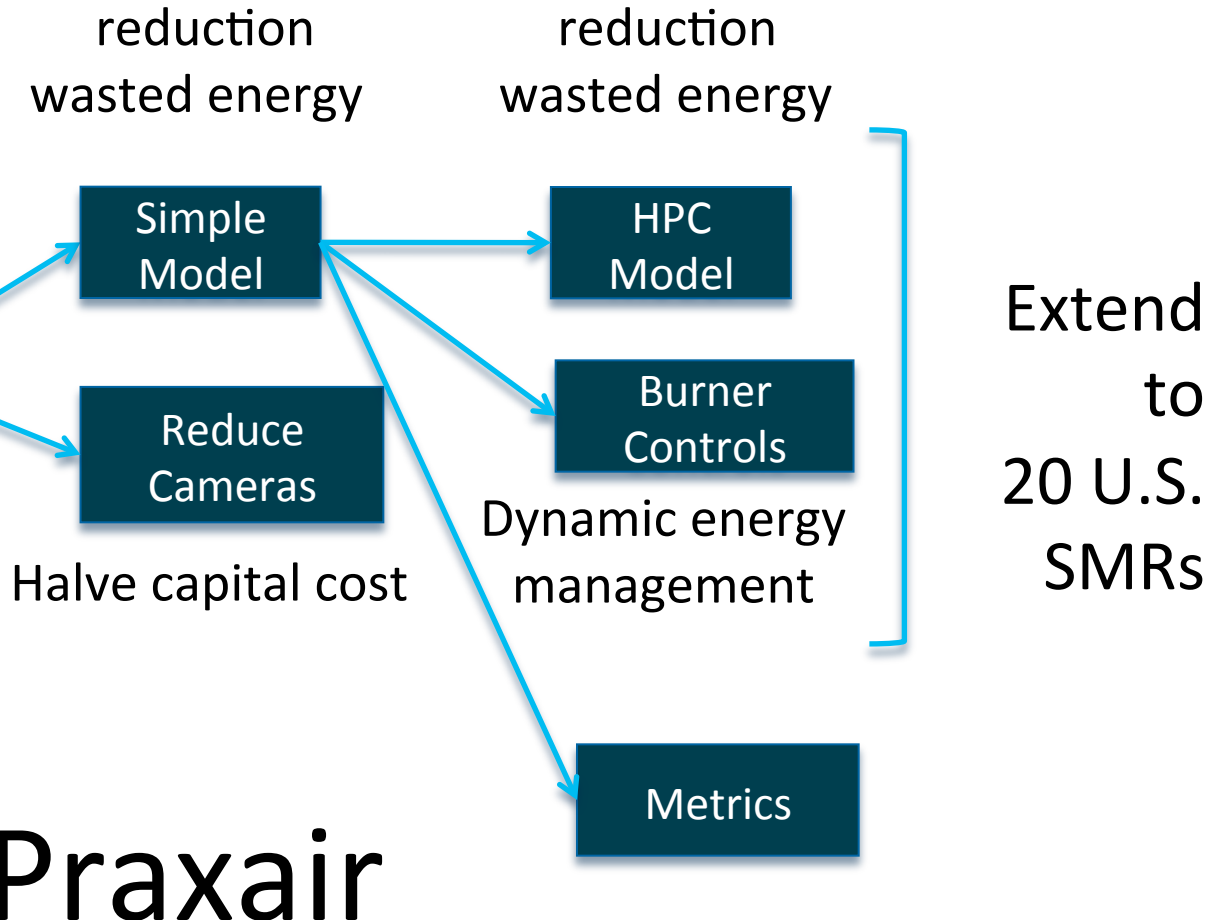


# Intensification through Measurement & Operational Integration

## First Steam Methane Reformer Furnace *Port Arthur, TX*



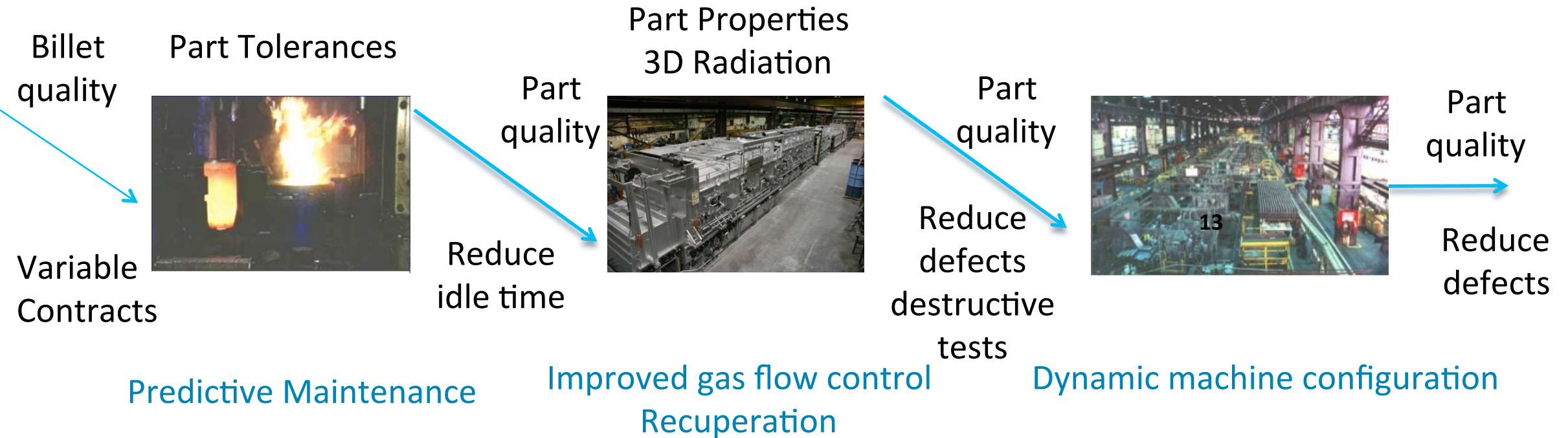
- Already efficient
- Distributed sensing
- Distributed actuation (96 burners)
- High fidelity model & reduced order models



# Qualification, Production on Demand, Intensification

## General Dynamics Scranton, PA

Integrated line management of part precision, materials/metallurgical properties,  
dynamic part movement, defect reduction, energy management →





# The Flow of Oats

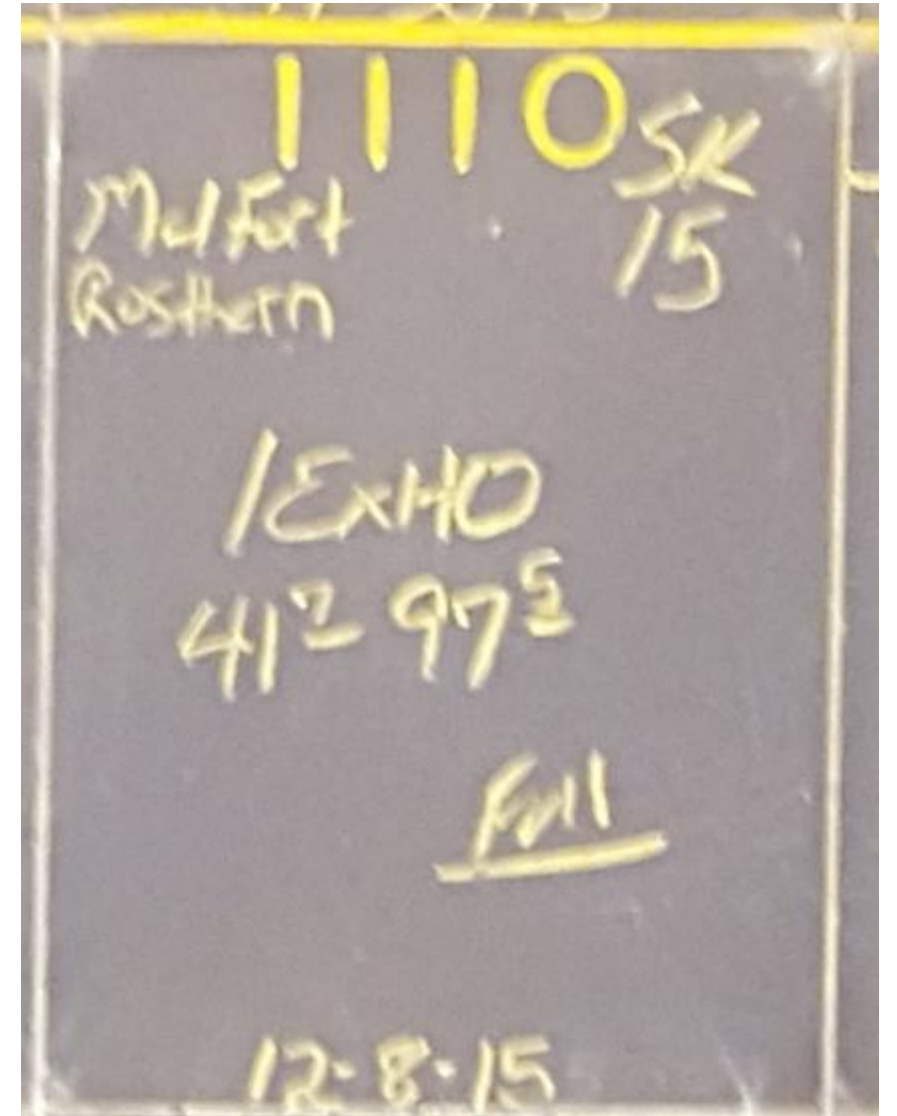




# Multiple Sources of Information

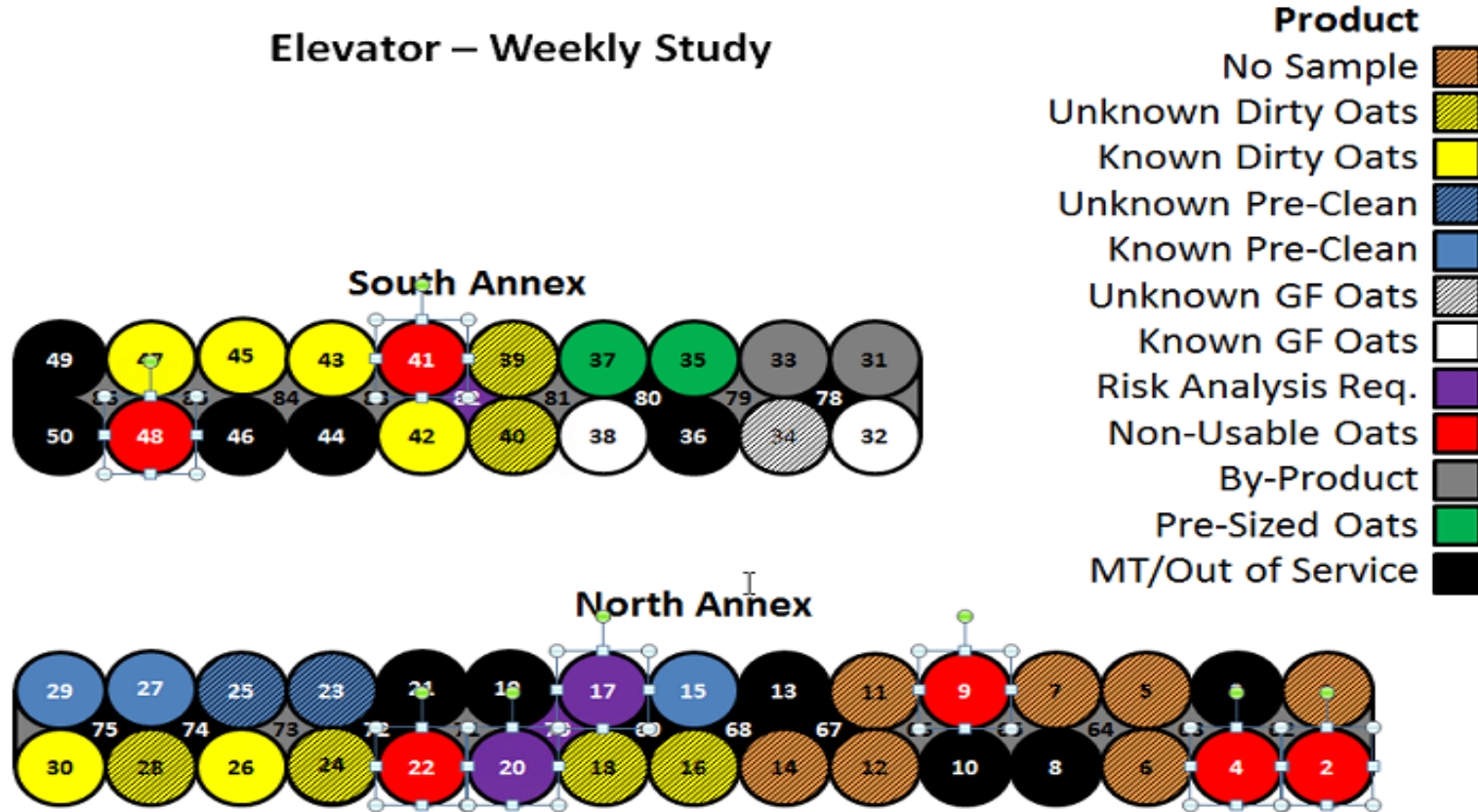
People, Sensors, Suppliers,  
Transportation

- Bin Number
- Grain Type
- Grain Quality
- Bin Fill
- Time Filled
- Rail Car
- Grain Source



# Not knowing...creates Gridlock

## Elevator – Weekly Study





S-X

SOO

ELT

FRIDLEY

Equipment

System

Grading

Material

FAQs

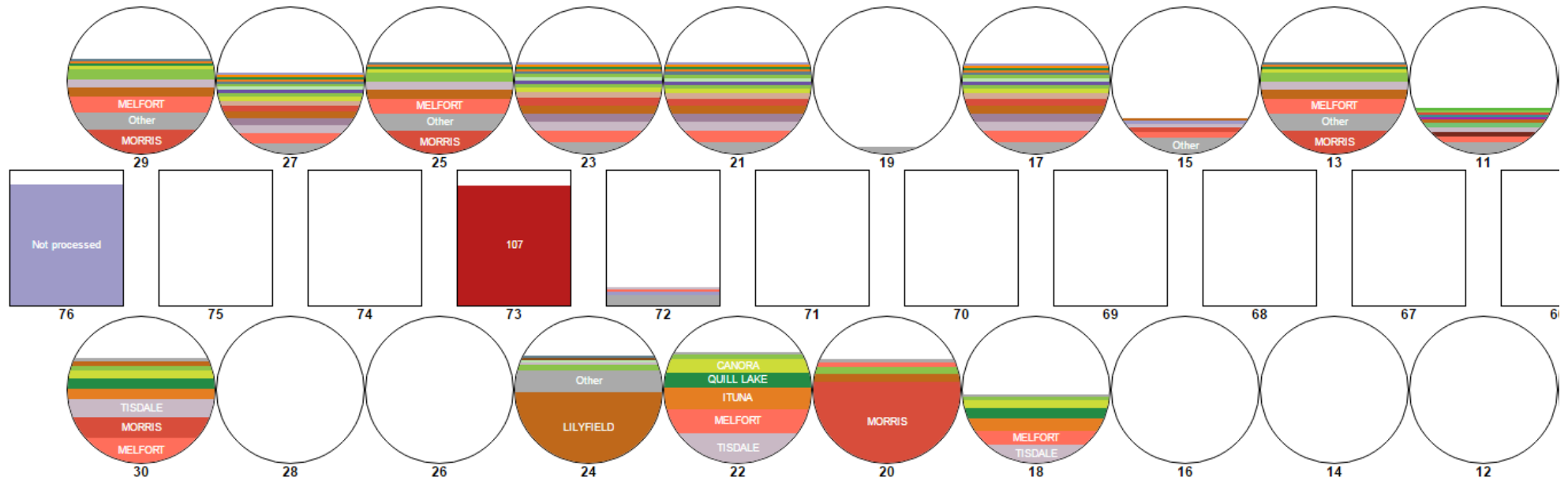
## FRIDLEY Bins at End of Day on

Feb 16, 2017

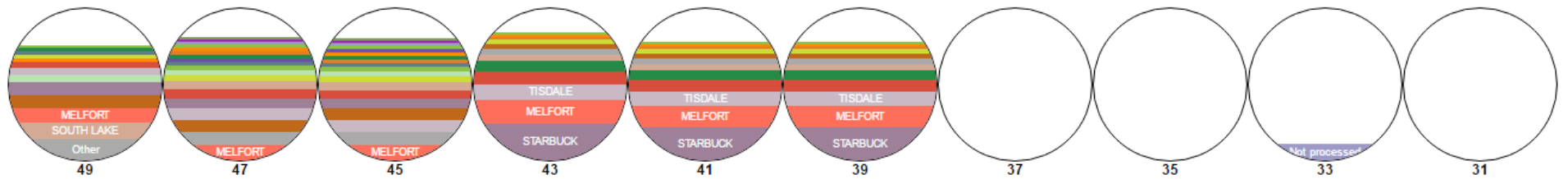


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## North Annex



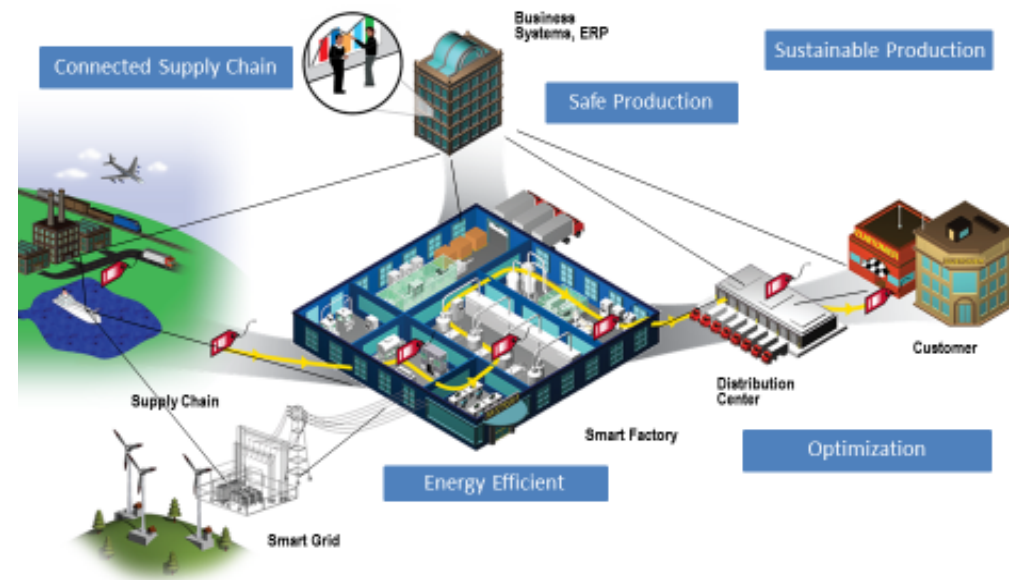
## South Annex



**MISSION:** Radically save time and costs of improving US manufacturing performance – developing and deploying tool sets of advanced sensors, controls, analytics and information technologies – supplying a highly skilled workforce – serving companies of all sizes.

**VISION:** Smart Manufacturing is manufacturing in 2030

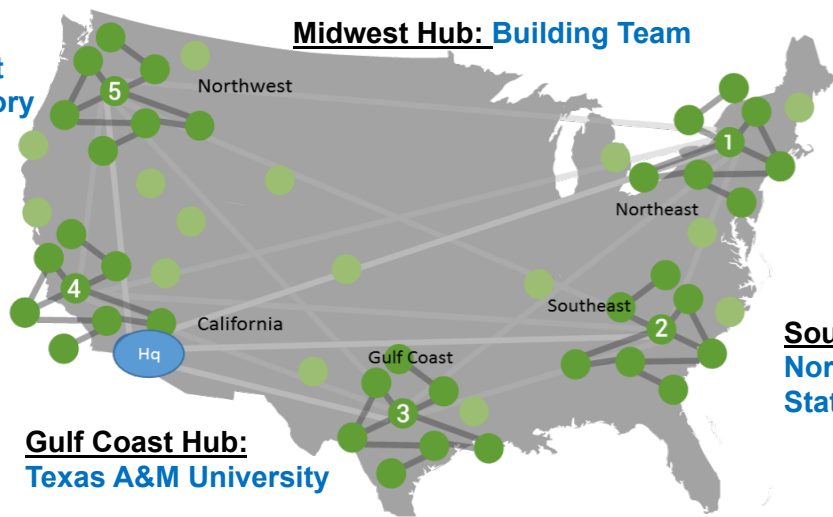
**Strategy:** Bringing the institute to the manufacturers



**Northwest Hub:**  
Pacific Northwest  
National Laboratory

**HQ:** University  
of California  
Los Angeles

**California Hub:**  
California  
Manufacturing  
Technology  
Consulting



**Midwest Hub:** Building Team

**Northeast Hub:**  
Rensselaer  
Polytechnic  
Institute

**Southeast Hub:**  
North Carolina  
State University

**Gulf Coast Hub:**  
Texas A&M University

### Key Metrics for CESMII:

- **First of kind live commercial test beds in the US.**
- **Cost and time to develop and deploy solutions halved.**
- U.S. energy productivity doubled every 10 years
- **US SM workforce capacity increased five-fold by 2030.**
- **40% ↗ in SM supply chain participation by 2030**

• **~200 partners from industry, academia, NGOs and state/local : \$70M federal funding, more than matching from partner's cost share.**

# Focused Efforts

## Key Markets



### Energy Intensive Markets

- Petroleum Refining
- Chemicals, Plastics, Rubber
- Wood Pulp and Paper
- Primary Metals
- Food Processing
- Glass and Cement

### Energy Dependent Markets:

- Solar PV, Carbon Fiber Composites, Light Emitting Diodes, Electro-Chromic Coatings & Corrosion resistant alloys, Advanced textiles for fashion, Exotic materials for space, Nano materials for healthcare, Membranes, Computers & Electronics, EV Batteries, Multi-material joining, Other Industries that have a 25% or greater cost of energy as part of the total cost of manufacturing

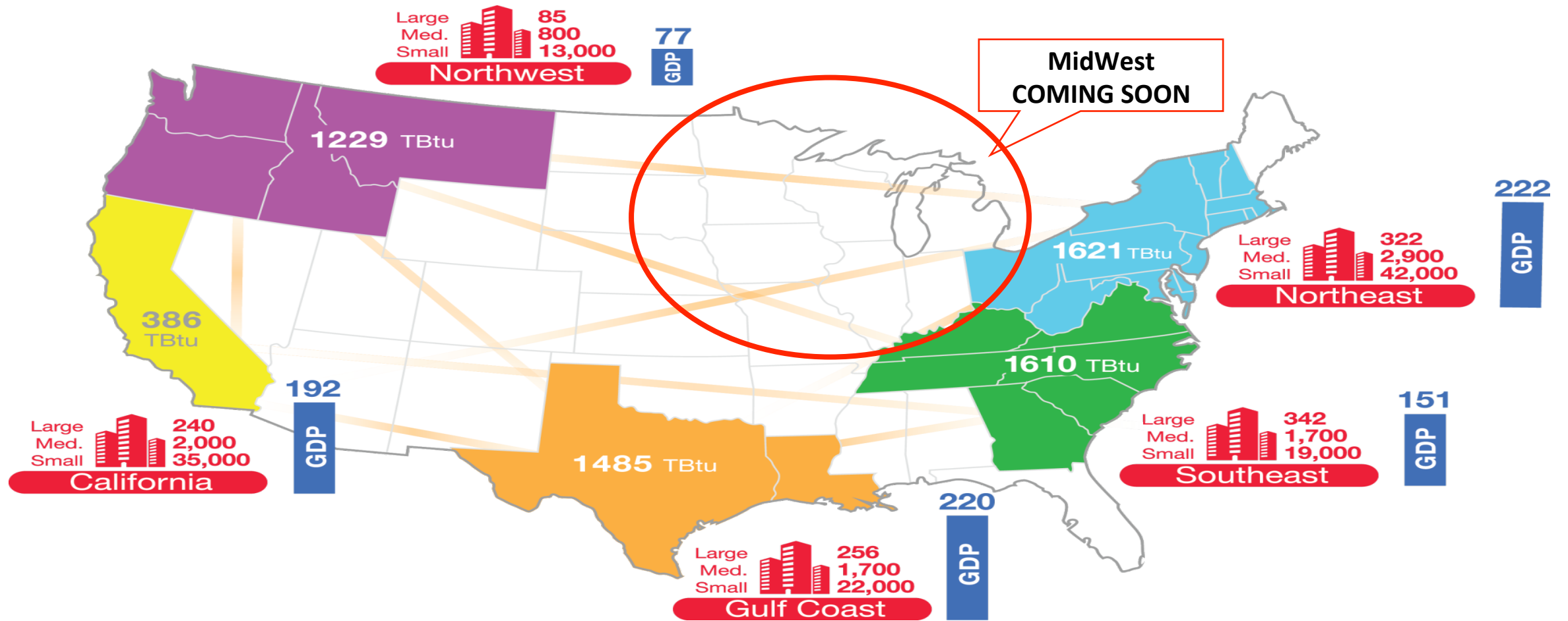






# Regional Manufacturing Centers

## We followed the data



## CESMII PERFORMANCE METRICS

To achieve what end results?

*CESMII Performance Metrics include:*

- Energy Productivity - in U.S. manufacturing will double every 10 years
- Energy Efficiency - a 15% improvement in energy efficiency in first of a kind Testbeds will be achieved within 5 years
- Deployment Costs - of SM systems will be reduced 50% relative to state of the art within 5 years
- Adoption Costs - of SM systems will be recovered from improved energy use in less than 10 years
- Workforce - SM workforce will be increased two-fold by 2020, and five-fold by 2030
- Supply Chain - value and participation will increase over 40% by 2030