Technology Forum: Sustaining Industrial Energy Efficiency in a Potentially Water-Short Future
June 19, 2013 – Brady’s Landing, Houston

Jim Quinn
World Energy Use

Global Industrial Energy Consumption

(Excludes energy conversion losses and petroleum feedstocks)

Source: International Energy Agency, Online Database (Energy Balances of OECD and Non-OECD Countries)
U.S. Energy Use per Unit of GDP, 1970–2010

Energy consumption if energy intensity were the same as in 1970 (adjusted for imports)

Note: Energy intensity is measured as quads per $ GDP

Reduction in energy consumption as a result of energy efficiency

Actual Energy Consumption

1970 Energy Consumption

Source: ACEEE analysis of data in EIA 2012a [AER] and BEA 2012
Trends in Industrial Energy Intensity

U.S. Chemicals Industry: Energy Intensity

U.S. Iron and Steel Industry: Energy Intensity

U.S. Cement Industry: Energy Intensity


Shale gas production increased by 1400% from 2005 to 2011.

By 2040, shale gas is projected to account for over 50% of all natural gas production.

Shale gas production increased by **1400%** from 2005 to 2011.

Source: Energy Information Administration (EIA) Annual Energy Outlook 2013
Gas availability and prices likely to be key driver for industrial decisionmaking

Henry Hub natural gas prices are projected to average between $4 and $6 per MMBtu throughout much of the projection.

Investments in new industrial facilities as well as retrofits likely to focus on natural gas as major supply source

Source: ICF Estimates, 2013
Re-shoring of U.S. Manufacturing

Rising production of shale gas makes prospect of U.S. manufacturing increasingly attractive:

*The Economist*¹:

“...lower American energy prices could result in 1 [million] more manufacturing jobs...”

“Companies such as Dow Chemical...and Vallourec [steel-tube producer]...have announced new investments in America to take advantage of **low gas prices** and to supply extraction equipment.”

The U.S. Government is tracking over $80 billion in planned manufacturing investments (fertilizer, chemicals, steel, assembly)

¹Source: The Economist, “Reshoring Manufacturing – Coming Home”
Demand for most resources has grown strongly since 2000, a trend likely to continue to 2030.

1  Only cereals.

SOURCE: Global Insight; IEA; UN Environment Program (UNEP); FAO; World Steel Association; McKinsey analysis
IIP at a glance....

Our Mission

To improve industrial energy efficiency and productivity by providing industry and government decision makers with best practices to implement effective policies, technologies, and financial approaches.

Who We Are

- A non-profit established by the ClimateWorks Foundation in 2010
- Strategically linked to a global network of groups addressing climate change
- Work in partnership with industries, governments, financial institutions, and other stakeholders
- Offices in Washington DC, Paris, New Delhi and Beijing
IIP’s Strategic Focus

- Industry
- Governments
- Financial Institutions
- Chemicals
- Cement
- Iron & steel
Integrated Strategies

IIP Network

Government

Work with governments to improve policy making

Industry

Team with industry to implement best practices and energy management systems

Global Resources

Develop resources and networks to mobilize action on energy and carbon

Financial organizations

Trade associations

Academia

Non-governmental organizations
U.S. Program Focus

- Develop consortium for managing/updating industrial energy efficiency decision tools
- Partner with gas and electric utilities to promote recognition of Energy Management System programs as valid energy efficiency measures under utility requirements
- Promote combined heat and power and efficient natural gas technologies in existing and new industrial facilities
Software Decision Tools for Energy Systems

Manufacturing Energy and Carbon Footprint
Sector: All Manufacturing (NAICS 31-33)

Onsite Energy Use: 15,494 TBtu
Onsite Combustion Emissions: 643 MMT CO₂e

Nonprocess Energy
- Facility HVAC: 81.0 TBtu
- Facility Lighting: 22.3 TBtu
- Other Facility Support: 37.8 TBtu
- Onsite Transportation: 13.3 TBtu
- Other Nonprocess: 1.8 TBtu

Process Energy
- Process Heating: 261.3 TBtu
- Process Cooling and Refrigeration: 43.3 TBtu
- Other Process Uses: 25.4 TBtu
- Electro-Chemical: 12.2 TBtu
- Machine Drive: 16.2 TBtu

Onsite Generation
- Conventional Boilers: 122.8 TBtu
- CHP/Cogeneration: 206.0 TBtu
- Other Electricity Generation: 1.9 TBtu

Fuel Types
- Natural Gas: 43%
- Biorefinery Fuels: 32%
- Coal: 6%
- Distillate and Residual Fuel Oils: 3%
- LPG and NGL: 3%
- Other Fuels: 4%

Electrical Use:
- Pump: 827 TBtu
- Fans: 348 TBtu
- Compressed Air: 199 TBtu
- Materials Handling: 308 TBtu
- Materials Processing: 699 TBtu
- Other Systems: 108 TBtu

Energy use data source: 2006 MECBS (with adjustments)
Last Revised: October 2012

Notes:
- Feedstock energy not included
- Energy values <0.5 TBtu shown as 0
- Values represent aggregate data
- Offsite generation shown on net basis
- * Onsite, renewable, non-combustion generation contributes 4 TBtu

Prepared for the Advanced Manufacturing Office (AMO) by Energetics Incorporated
Energy Management Systems

MANAGERIAL
PLAN:
• Policy/goals/targets
• Resources
DO:
• Training
• Communication
• Control equipment systems & processes
CHECK:
• Corrective/preventive action
• Internal audits
ACT:
• Management review

MANAGEMENT SYSTEM FOR ENERGY

PLAN

ACT

CHECK

DO

TECHNICAL
PLAN:
• Energy data management
• Assessments
DO:
• Energy purchasing
• Design
• Projects
• Verification
CHECK:
• Monitoring
• Measurement
ACT:
• System performance

Institute for Industrial Productivity

iipnetwork.org
CHP - Technical Potential of 130,000 MW

Existing CHP vs Technical Potential

Source: ICF International
IIP’s Best Practice Databases

Industrial Efficiency Technology Database
www.ietch.iipnetwork.org

Industrial Efficiency Policy Database
www.iepd.iipnetwork.org

Industrial Efficiency Finance Database
www.iipnetwork.org/databases/finance

Supply Chain Initiatives Database
www.iipnetwork.org/databases/supply-chain
The Energy-Water Nexus in Chemical Manufacturing and Refining

Current Practice: 67 to 92% of water used is for process cooling or steam systems (TxIOF 2013)

Future: What happens if there is a decrease in water available for energy systems?

Resulting in increase in energy use

- Substitute chillers for cooling water
- Substitute other cooling systems for cooling towers

Impacts on production

- Decreased production due to less efficient product recovery (not operating at optimum temperature) or
- Change processes to avoid energy/production penalty
Thank You!