



*Samuel Neaman Institute  
Energy Forum, Haifa, Israel, March 3, 2015*

# **Opportunities and Barriers for Implementing CHP for Energy Efficiency – the U.S. Experience**

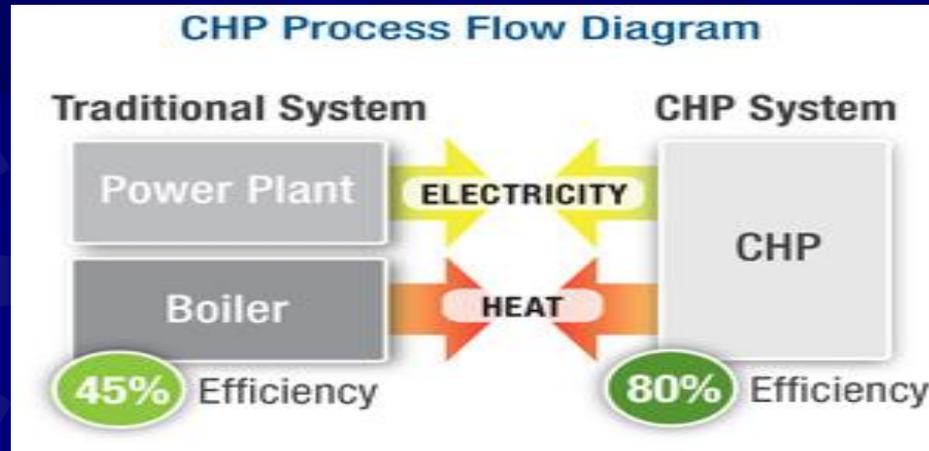
**Dr. Miriam Lev-On  
Dr. Perry P. Lev-On  
California, USA**



The LEVON Group, LLC  
Environmental Consultancy & Facilitation

# Combined Heat and Power (CHP) – Overview\*

- Combined heat and power (CHP) systems, also known as cogeneration systems, generate electricity and useful thermal energy in a single, integrated system.



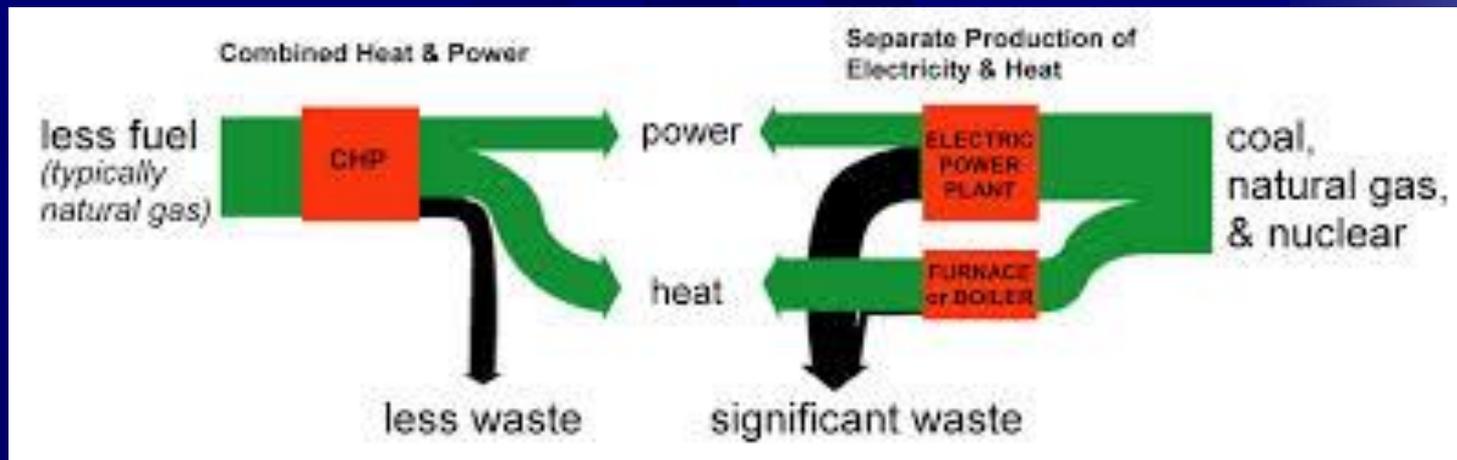
- Because CHP makes use of what would otherwise be wasted, the combined efficiency of these integrated systems is much greater than from traditional separate systems and, since power is produced on-site, transmission and distribution losses are also avoided.

\*Source: American Council for an Energy Efficient Economy (ACEEE) 'Combined Heat and Power Playbook', October 2014



# Advantages of Implementing CHP Projects

- ☀ Offer substantial economic, environmental and energy benefits including:
  - \* reduced overall energy costs
  - \* improved energy system reliability
  - \* reduced thermal energy consumption
- ☀ CHP technologies are a good fit for a variety of applications and are particularly well suited to applications in the municipal and public sectors





# More Advantages of CHP Projects

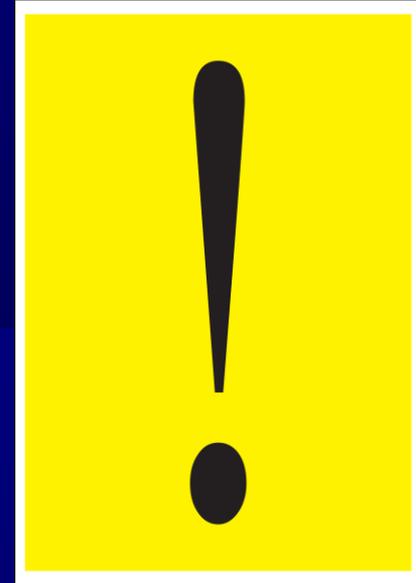
- ✦ CHP projects promote local economic development
- ✦ CHP projects do not depend on proximity to other power generating equipment thus are suited for both urban and rural locations
- ✦ CHP provides an immediate path to lower greenhouse gas (GHG) emissions, in many cases through increased energy efficiency
- ✦ CHP projects give communities control over their own energy use by aggregating electric demand via managing heating and cooling loads from municipal buildings and meeting the loads with locally appropriate energy generating options.





## Cautionary Notes

- ✦ CHP systems can be complex and involve many actors throughout the design process and during day-to-day operations after installation
- ✦ System designers must plan for many regulatory and hurdles they may encounter
- ✦ As with any complex equipment configuration, these systems can fail to produce their claimed benefits if are designed, constructed , or operated poorly
- ✦ It is important that prospective CHP users undertake due diligence to ensure that the new system is properly designed to meet local power needs and is constructed and operated as designed





# Barriers for the Implementation of CHP Systems

Technologies used in CHP systems have improved in recent years and CHP has become cost-effective in many applications

Significant hurdles remain limiting widespread deployment of CHP,

- ❖ A lack of **national business practice standards** for the interconnection of CHP systems to the local electric utility grid. This lack of uniform standards results in a patchwork of regulatory models that vary from state to state.
- ❖ The presence of **discriminatory standby rates** and prohibitive "exit fees" imposed by utilities to customers that implement CHP at existing facilities.
- ❖ The variety of current **emissions regulations** that act as a barrier to CHP systems because they fail to recognize the overall energy efficiency of CHP or credit the emissions avoided from the displaced centralized grid electricity generation.

Interconnection is the process of connecting a CHP system, or any distributed energy resource, to the transmission or distribution grid





# CHP Share of Total National Power Production - 2008

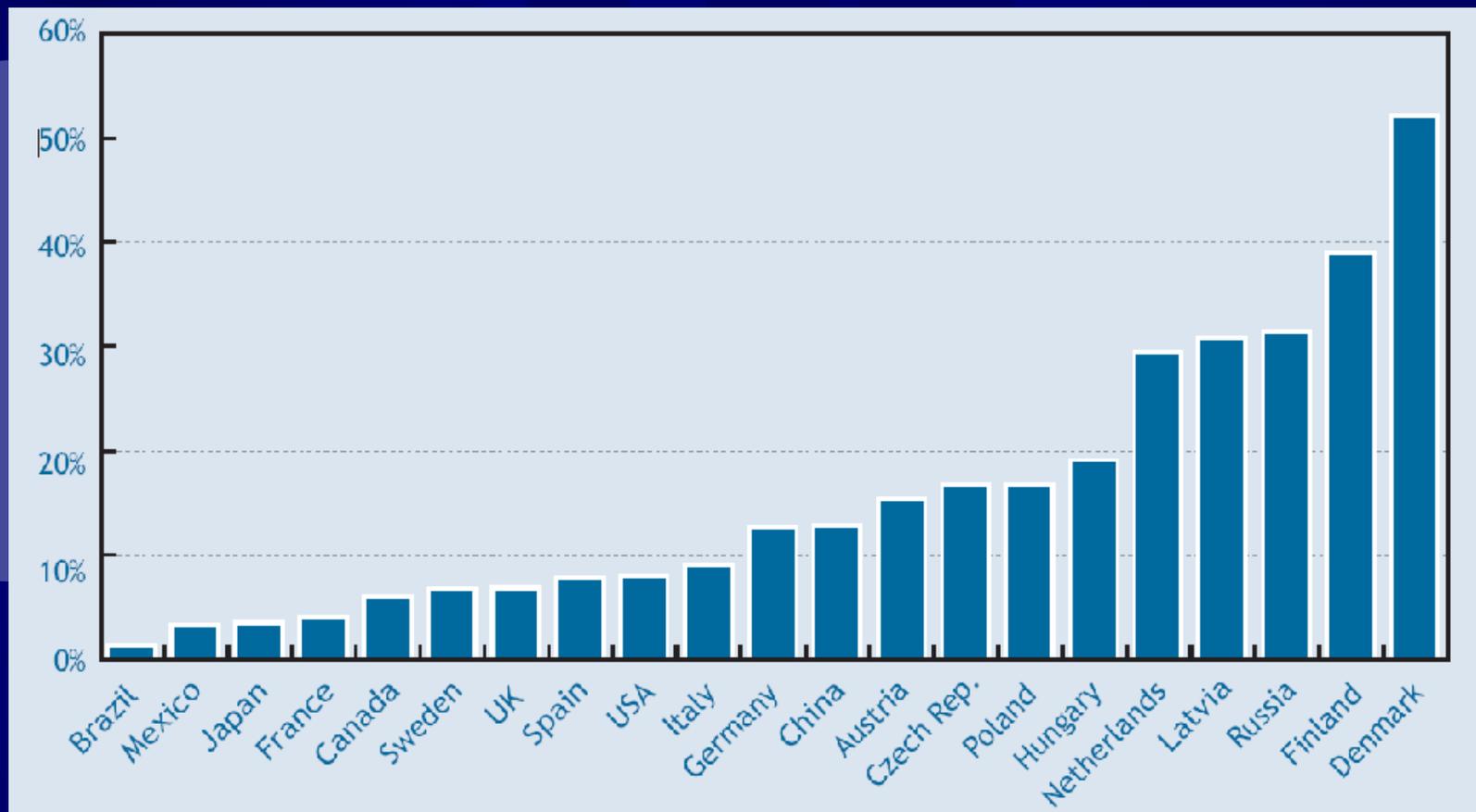
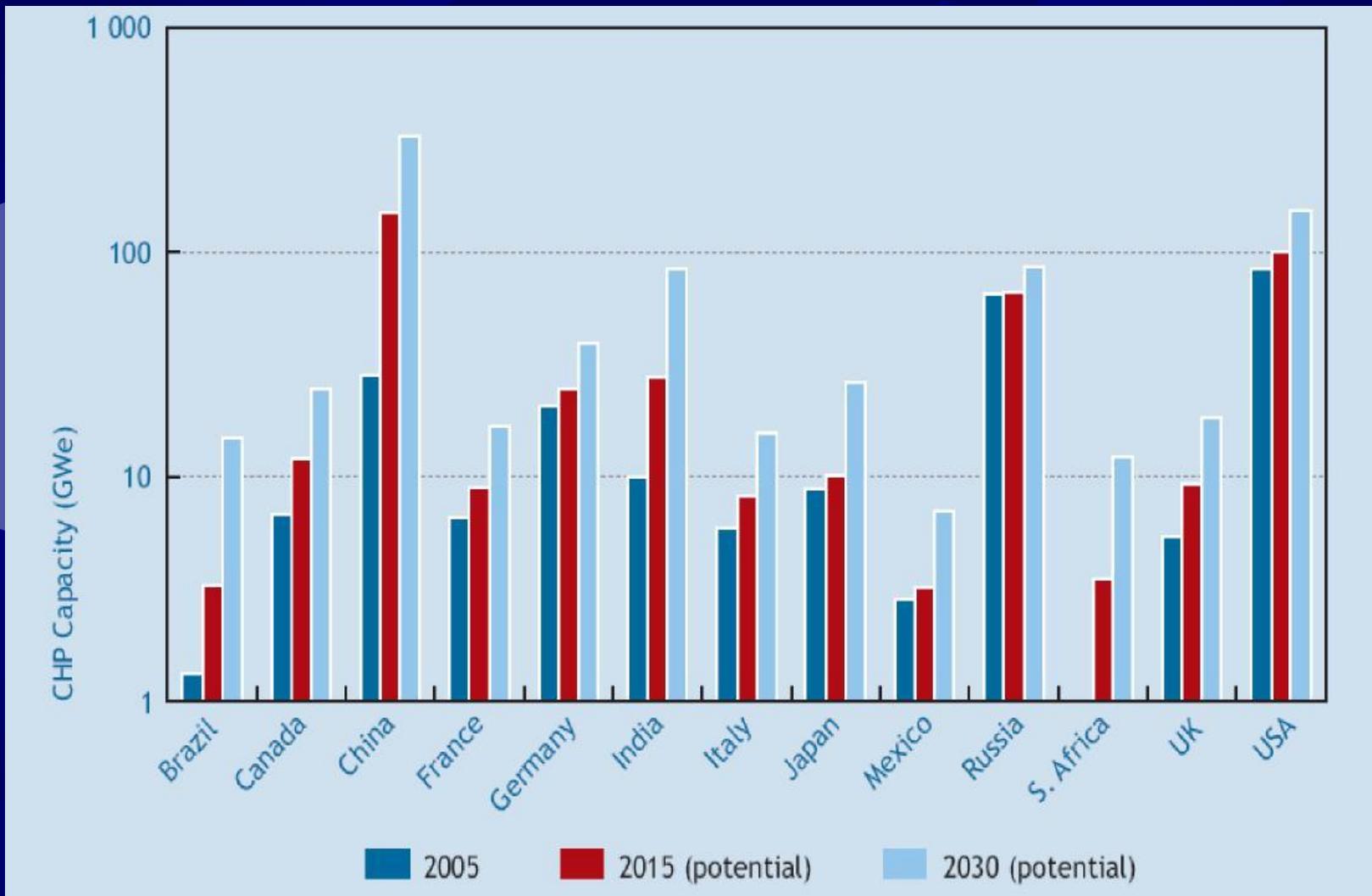


Figure 1. CHP share of total national power production. © Organization for Economic Co-Operation and Development/International Energy Agency, 2008 (IEA 2009).



# Global CHP Potentials 2015 and 2030



Source: IEA, CHP Potentials, 2015 and 2030 (2008)





# 'SEE Action'

## The State and Local Energy Efficiency Action Network

- ❖ SEE Action is a state and local effort facilitated by the U.S. federal government that helps states, utilities, and other local stakeholders take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.
  - ❖ SEE Action published in March 2013 a Guide to Successful Implementation of State Combined Heat and Power Policies designed to provide information about the benefits, costs, and implications of greater use of CHP.
- ✓ Currently, 82 gigawatts (GW) of CHP capacity are in use at more than 4,100 sites in the U.S.
  - ✓ Although 87% of CHP is in manufacturing plants around the country, a growing number of facilities from other sectors are considering its use.
  - ✓ Estimates indicate the technical potential for additional CHP at existing industrial and commercial/institutional facilities is more than 130 GW.
- ❖ A 2009 study by McKinsey and Company estimated that 50 GW of CHP in industrial and large commercial/institutional applications could be deployable at reasonable returns with then-current equipment and energy prices.





# Locations of existing CHP capacity in the U.S. - 2013



Source: CHP Installation Database, ICF International, [www.eea-inc.com/chpdata/index.html](http://www.eea-inc.com/chpdata/index.html)





# U.S. Department of Energy (DOE) CHP Technical Assistance Partnerships (TAPS)\*

- ❖ Highlighting the benefits of CHP as an energy resource, Executive Order 13624 established a national goal of 40 GW of new CHP capacity by 2020.
- ❖ In support of this goal, the U.S. DOE Advanced Manufacturing Office's CHP Deployment Program provides stakeholders with the resources necessary to identify CHP market opportunities and support implementation of CHP systems in industrial, federal, commercial, institutional, and other applications.
- ❖ DOE's CHP Technical Assistance Partnerships (TAPs) provide national coverage to assist in the fulfillment of this goal.
- ❖ DOE's CHP TAPs promote and assist in transforming the market for CHP, waste heat to power, and district energy with CHP throughout the U.S.

\* <http://energy.gov/eere/amo/chp-technical-assistance-partnerships>





# TAPS Key Services

- ❖ **Market Opportunity Analyses** – Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors.
- ❖ **Education and Outreach** – Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, energy end-users, trade associations and others.
- ❖ **Technical Assistance** – Providing technical assistance to end-users and stakeholders to help them consider CHP, waste heat to power, and/or district energy with CHP in their facility and to help them through the project development process from initial CHP screening to installation.





# CHP Investment Considerations

- ✦ Energy Costs (electric, gas, standby rates, demand charges)
- ✦ Value Proposition for the Customer (reduce energy costs, increase reliability, emission compliancy, power quality – impact on bottom line)
- ✦ Value Proposition for the Utility (why should they be interested?)
- ✦ State Policies have a Large Impact (interconnect standards, permitting, portfolio standards, financing, rate structures)
- ✦ Developers follow the path of least resistance



# Examples of CHP Implementation in Several Regions of the United States

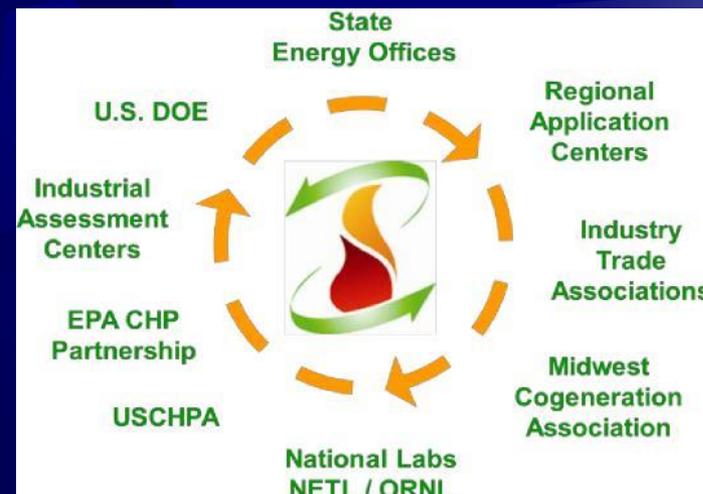
## U.S. DOE Midwest Clean Energy Application Center

☀ **Mission:** Promote and assist in transforming the market for combined heat and power, waste heat recovery, and district energy technologies and concepts throughout the 12 State Midwest Region.

☀ **Regional Strategy (Focus):** Provide an outreach and technology

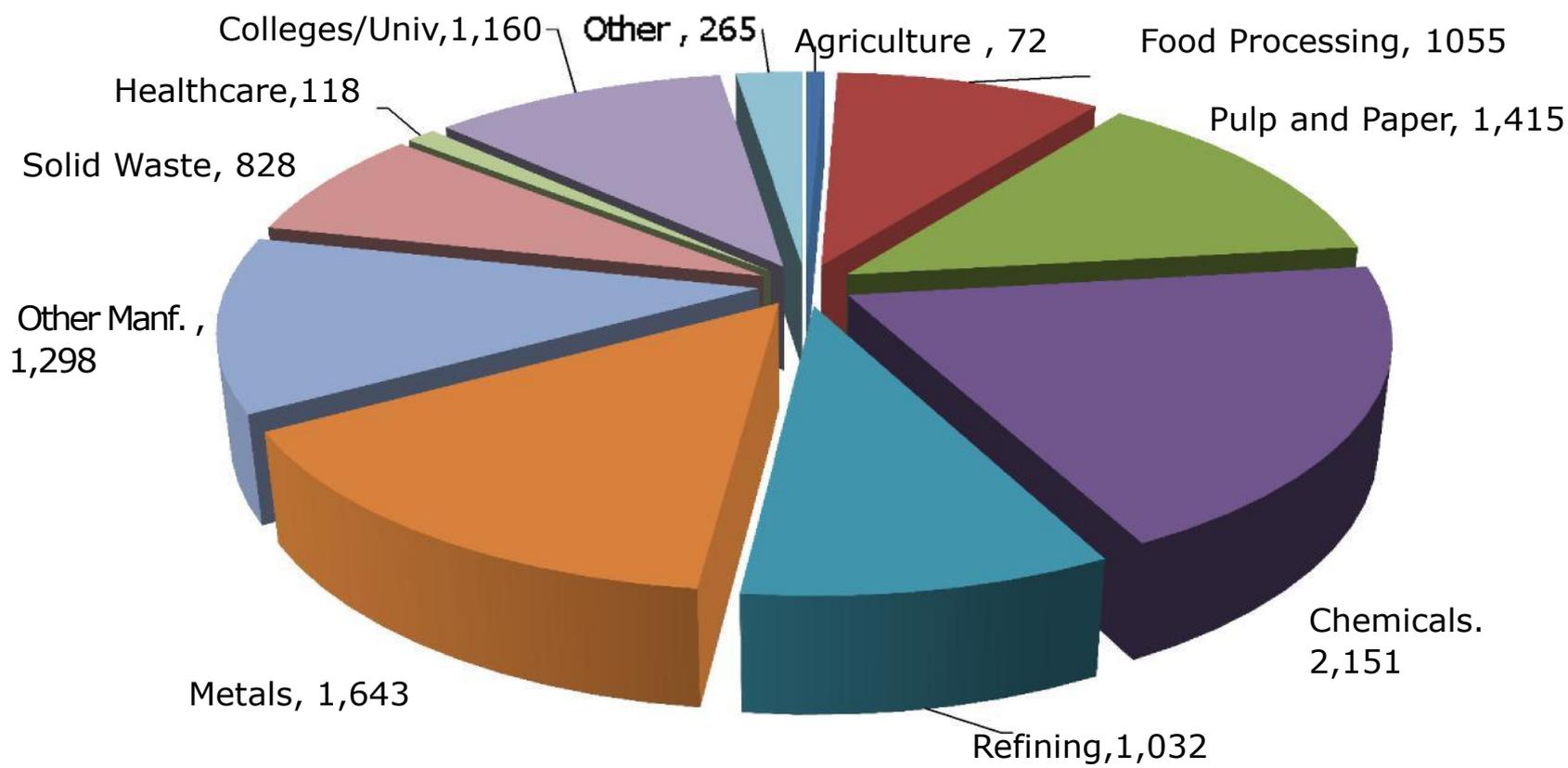
deployment program to end users, policy, utility, & industry stakeholders aimed at:

- \* **Education and Outreach**
- \* **Market Assessments**
- \* **Technical Assistance (project support)**





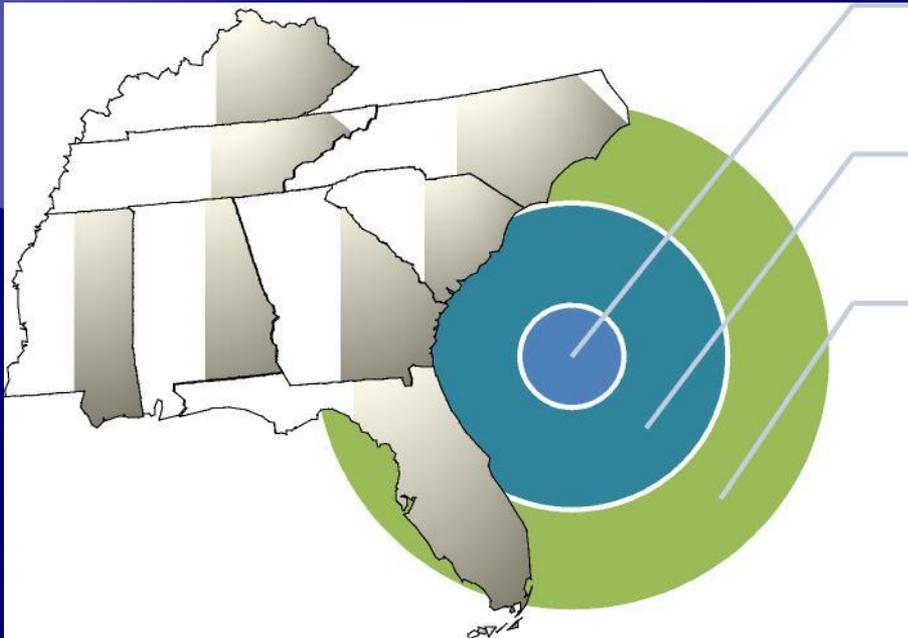
# Midwest Installed CHP Generation Capacity by Market Sector (11,000 MW)





## U.S. DOE Southeast Clean Energy Application Center

- ❖ Promotes and assists in transforming the market for CHP, waste heat to power, and district energy technologies and concepts throughout the region.
- ❖ Key services to energy end-users, policy, utility, & industry stakeholders include:



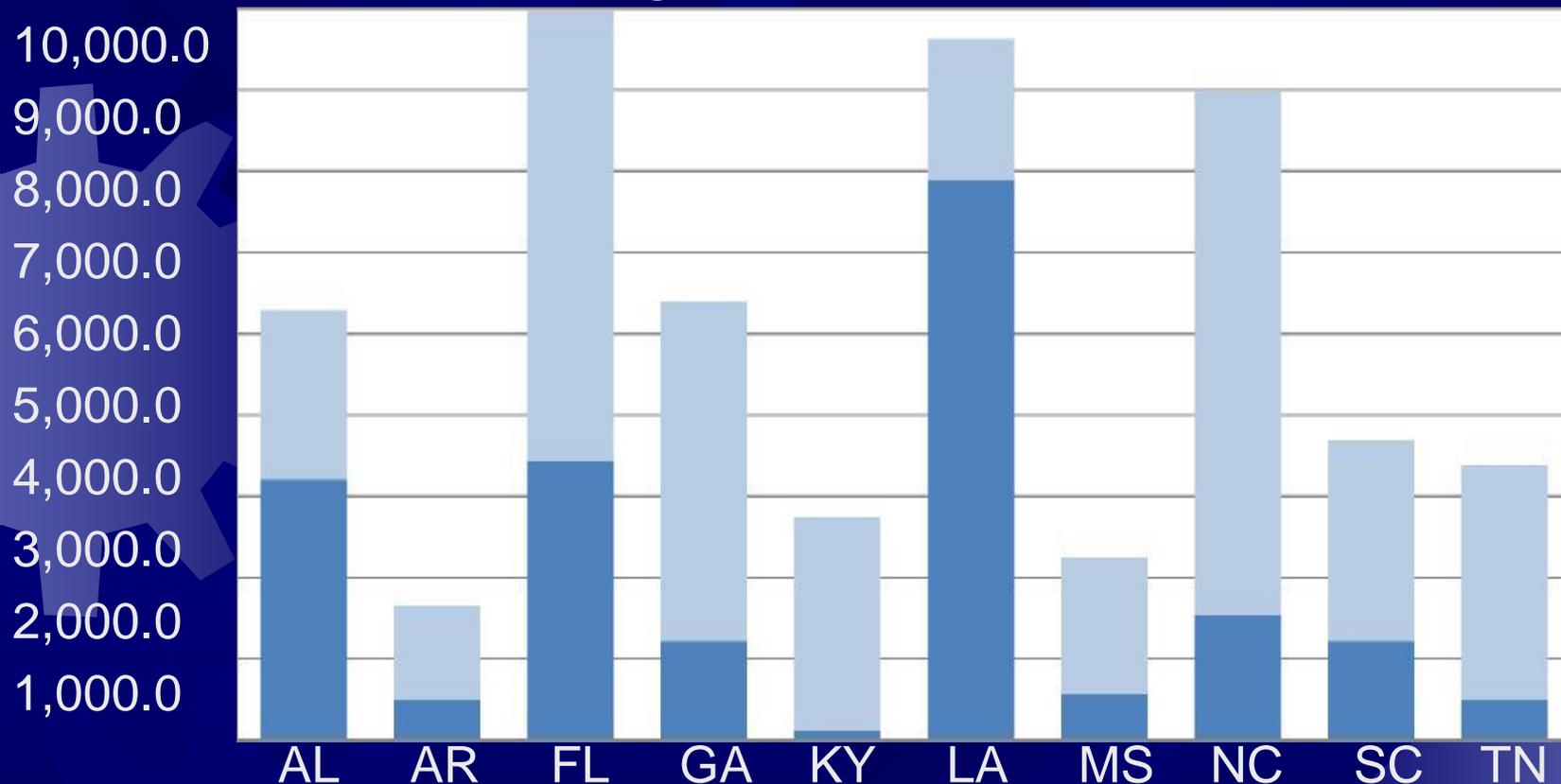
- Technical Assistance
- Education and Outreach
- Market Assessments





# U.S. DOE Southeast Clean Energy Application Center

## Southeast US Existing CHP and Onsite Technical Potential



(LB) Total CHP Technical Potential (MW) (B) Existing CHP (MW)

Total Existing CHP = 19,200 Megawatts

Tech Potential = 30,735 Megawatts



# Combined Heat and Power in California

- ✦ Due to potential benefits of CHP, California has set ambitious goals for developing CHP resources
- ✦ The California Air Resources Board's (ARB) Climate Change Scoping Plan has set a target of 4,000 megawatts (MW) of additional CHP capacity by 2020
- ✦ Assembly Bill 1613, the Waste Heat and Carbon Emissions Reduction Act, creates a feed-in tariff to incentivize the development of small CHP (no larger than 20 MW)
- ✦ Governor Jerry Brown's Clean Energy Jobs Plan calls for an additional 6,500 MW of new CHP capacity by 2030
- ✦ California also directly supports CHP development through the Self Generation Incentive Program (SGIP), which provides financial incentives for a variety of small-scale distributed energy resources – including both conventional- and renewable-fueled CHP





# In Summation

## ☀ Benefits of CHP for U.S. businesses

- Reduces energy costs for the user
- Reduces risk of electric grid disruptions and enhances energy reliability
- Provides stability in the face of uncertain electricity prices

## ☀ Benefits of CHP for the United States

- Improves U.S. manufacturing competitiveness
- Offers a low-cost approach to new electricity generation capacity
- Provides an immediate path to lower GHG emissions through increased energy efficiency
- Lessens the need for new transmission and distribution (T&D) infrastructure and enhances power grid security
- Uses abundant clean domestic energy sources





**Thank You for Your Attention**

*For further Information:*

**The LEVON Group, LLC  
California, USA**

[levon@levongroup.net](mailto:levon@levongroup.net)

