



# **Government Policies to Accelerate Technology Development & Market Deployment of Industrial Decarbonization Strategies**

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# Areas to be addressed by policies

- Research into new technologies, processes, practices, materials and products
- Encouraging corporate investments that lead to a reduced carbon footprint
- Creating a trained workforce & address transition equity issues

# Technologies and practices

- Cross cutting RD&D

- Focus on cross cutting technologies such as smart manufacturing, electrification of process technologies,
- Industry advised, co-funded academic research initiatives
- Leverage government, industry & private sector funding

- Industry-specific RD&D

- Focus on key industry-specific processes or material issues
- Co-Funded by government, industry and private sector
- Government involvement with trade associations address antitrust
- Industry targets research to critical topics that respond to challenges and involvement allows them to accelerate adoption of new technologies
- *IOF* model demonstrated to make substantive impacts, cost effectively with short time to market



# *Manufacturing USA*

- DOE has established 14 manufacturing RD&D institutes to double energy productivity by 2030, with two-thirds of Fortune 50 represented and public/private match at 2-to-1:
  - **Clean Energy Smart Manufacturing Innovation Institute (CESMII)** - enabling smart manufacturing through integration of sensors, controls, platforms, and models with operational technologies
  - **Rapid Advancement in Process intensification Deployment (RAPID)**- improve energy efficiency & energy productivity through modular chemical process intensification
  - **Reducing Embodied-energy & Decreasing Emissions Institute (RADEI)**- apply early stage R&D to drive down energy & cost of recover, reuse, remanufacture, and recycle four classes of materials: metals, fibers, polymers, and e-waste
- Intent is for institutes to continue with private sector funding after 5 years of government seed funding

# *Industries of the Future Program*

Starting in 1994 DOE sponsored industry-specific R&D with trade associations and their members to improve the energy efficiency, resource utilization, and competitiveness of participating industries. The research was conducted by universities.

- As of 2008, 127 projects has been initiated and over \$161 million
- Industry more than matched federal and private funds
- Trade associations aggregated the funds
- Industry participation enabled:
  - Research that focused on key issues for industry
  - Familiarity with ongoing research allowed firms to implement result in on average 7 years

# Demand side policies

- Focus on what we purchase
- Government & private sector purchasing specifications based on:
  - Carbon intensity
  - Recycled content & recyclability
  - Product life
- Public education & awareness
  - Labeling for sustainability by government, industry & NGOs
  - Publicity of case studies
  - Actionable consumer guidance

# Material substitutions & feed stocks

- Support of research on material & product substitutions
  - Alternative material choices by integrator companies (e.g., construction, automotive)
  - Using ICT to reduce carbon intensity or extend product lives (e.g., streaming music, cloud-based control systems)
- Promote recycled feedstocks
  - Institute recycling practices that produce higher quality feedstock
  - Encourage design for recyclability
  - Research to address technical challenges in using recycled feedstocks
- Alternative feedstocks
  - Research into less carbon intensive feedstocks (e.g., bio-based materials)
  - Look for material substitutions with similar or better performance properties and reduced carbon (e.g., non-Portland concretes)

# Encourage investments in modernization

## *Policies options:*

- Industrial modernization fund
  - Revolving loan fund for industrial process investments
  - Loan-loss reserve or other credit enhancement for private sector leading
- Favorable tax treatment
  - Recent tax reforms have largely made this policy ineffective
- Recycling of carbon revenues to support process investments by industry

## *Policy considerations:*

- Most firms have access to capital, but allocation issue
- Need to be sensitive to capital investment cycles
- Need to address stranded-asset issues

# Corporate & industry commitments

## *Voluntary commitment approaches:*

- Company investor-lead, science-based GHG reduction commitments
- Trade association, industry wide voluntary GHG reduction commitments

## *Considerations:*

- Targets need to be intensity and capacity utilization adjusted
- Opportunity to make participation as prerequisite for access to private or public resources
- Most firms find scope 3 emissions challenging due to complex nature of supply chains

# Economic policies

## *Policies to provide price signal:*

- Pricing carbon
- Cap and trade
- Tax incentives

## *Policy considerations:*

- Need to address impacts on energy-intensive trade exposed industries
- Tax incentives may be ineffective in current environment
- Need to understand industrial capital investment cycles
- Impact of workforce & rural community impacts



# Workforce

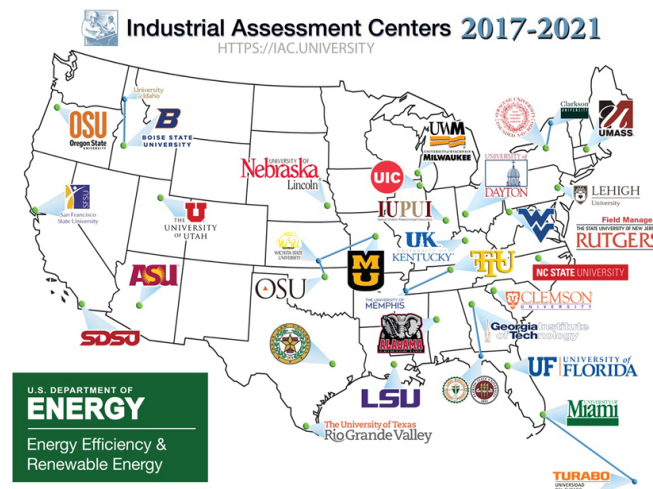
Aging workforce primary challenge for industry today—need to create next generation of industrial workers with appropriate skills:

- Engineering & technical training
  - Expand and extend the technical scope of IACs program
  - Extend model to community colleges, trade schools& union training programs
  - Extend model other disciplines (e.g., building sciences, agriculture)
- Establish apprenticeship programs
  - Expand university coop programs
  - Academic/industry partnerships
  - Engage trade unions in partnerships

# Examples of workforce training

## Industrial Assessment Centers:

- Established in 1976
- Centers at 28 Universities conduct assessments of small & medium manufacturers using faculty & students
- IACs train the next-generation of energy savvy engineers, more than 60 percent pursue energy-related careers upon graduation.



## Apprenticeship initiatives:

- **The Bosch Mechatronics Apprenticeship:** Bosch & Trident Technical College in Charleston, SC partnered to offer a full-time training program. Apprentices will complete education and training assignments for a 2 year Mechatronics program and be placed into a skilled labor position
- **Samsung Apprenticeship:** Austin Community College students with degree specialization in Electronics and advanced technologies are eligible for paid part-time work while completing their degree and eligible for fulltime technician positions after graduation

# Conclusions

- Industry is unique in that emissions are driven by customer demands
- No single solution exists — need to address all aspects of industrial GHG emissions
- Costs will be significant, but benefits can be large
- Industries already making major investments in modernization – incremental investments may not be as significant
- Need to be proactive on addressing equity issues—”Just Transition”

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