Industrial Energy Innovation in California

NASEO-NARUC Joint Forum on Industrial Demand Flexibility
Energy Research and Development Division
California Energy Commission
June 11, 2024
Industrial Sector Contributes Second Highest GHG Emissions

Source: CARB
Carbon Neutrality in California by 2045

Source: CARB
Load Flexibility and the Industrial Sector

Opportunities
- Electric grid benefits
  - Maximize use of surplus renewable energy
  - Increase grid reliability
  - Be a key electricity supply resource
- Cost savings
- Support new load flexibility technologies

Challenges
- Value proposition not well-defined
  - Few viable control strategies
  - Unclear business case
  - Risk averse
- Lack of data on industries with most load shifting potential

Source: CalFlexHub, LBNL (lbl.gov)
California Demand Flexibility Policy

New CEC Load Shift Target: 7 GW by 2030*

- Require **hourly-varying electric rate options** (CEC Load Management Standards)
- Publish a machine-readable database of time-varying rates (CEC MIDAS)
- Require certain devices to **adjust demand in response to dynamic signals** (CEC Flexible Demand Appliance Standards)**
- Demonstrate **customer response to dynamic price signals** (CPUC CalFUSE Framework)

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*Senate Bill 846 Load-Shift Goal Report, California Energy Commission (2023)
** California Energy Commission, Flexible Demand Appliance Standards Docket Log
CEC’S Grant Programs: Fostering Innovation Across the Energy Sector

Core mission: strategically invest funds to catalyze change and accelerate achievement of policy goals

✓ Electric Program Investment Charge (EPIC)
✓ Gas Research and Development Program
✓ Industrial Decarb and Grid Support Program (INDIGO)
✓ Food Production Investment Program (FPIP)
Antora Energy - Long Duration Thermal Storage

- **1500 Wh/L**: Energy density of carbon – Antora’s thermal storage medium
- **1500°C**: Temperature Antora’s system can deliver to industrial customers
- **>40%**: Conversion efficiency of Antora’s thermophotovoltaic heat engine
- **5 MWh**: Capacity of Antora’s pilot-scale system
Load Flexibility in Industrial Cold Storage

- University of California, Santa Barbara
  - Harnessing the Potential of AI in Industrial Refrigeration Systems

- Electric Power Research Institute
  - IndFlex – Demand Flexibility in Industrial Refrigerated Warehouse

- Prospect Silicon Valley
  - Dynamic, Grid-Flexible Cold Storage Refrigeration with Advanced CO2 Heat Pump, Thermal Storage and Defrost Controls

- Amy's Kitchen
  - Thermal Ice Energy Storage in Food Processing

Source: Amy's Kitchen
Load Flexibility in the Water Sector

• University of California, Davis
  • Statewide simulation of 700+ water systems
  • Smart pumping has the statewide potential to:
    • Shift energy demand by up to 1,000 GWh annually, and
    • Reduce peak demand by up to 321 MW.

• Moulton Nigel Water District
  • Developed and demonstrated WaterWatch software to optimize energy use and demand & enable load shift program participation
  • Reduced average energy demand by 4.2%, annual energy use by over 311 MWh and annual carbon dioxide emissions by 48 million MT
  • Response limited by tank storage capacity, pumping capacity, water demands and energy rates
Opportunities
New CEC Funding for Industrial Projects (INDIGO)

- Industrial facilities and others
- Examples of eligible technologies
  - process heat electrification
  - non-thermal separations
  - alternative processes
  - energy efficiency
  - load flexibility
- Priority population benefits

GFO-23-313
Proposed Funding Amount: $46.2M
Deadline: 06/17/24
New CEC Funding for Food Processing Facilities (FPIP)

• Food processors
• Examples of eligible technologies
  • energy efficiency
  • refrigeration optimization
  • industrial heat pumps
  • waste heat to power
  • wastewater treatment
  • renewable energy microgrids
  • fuel switching
  • grid support

GFO-23-305 Proposed Funding Amount: $36M Deadline: 05/09/24
Industrial, Agricultural, and Water Flexible Load Research Hub*

- Estimated 2 GW of average annual load shifting potential
- Research needed to increase operational load flexibility
  - Address technical barriers and develop technologies to advance flexible demand management
  - Inform future load flexibility policies
  - Respond to GHG and price signals
  - Shed loads during peak hours plus reduce operating costs

* EPIC Investment Plan Initiative 17

| Solicitation Number: TBD | Proposed Funding Amount: $17M | Deadline: TBD |
VPP Approaches for Load Flex (VPP-FLEX Solicitation)

- Demonstrate VPPs as long-term, reliable grid resources
- Ensure the resource creates a net benefit to the grid and participants
- Partner with local government or non-profit entities to increase participation by and engagement with customers
- Demonstrate automated load shifting

GFO-23-309  
Funding Amount: $21M  
Deadline: 07/01/24
Additional Information

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Web Resources
• Find a partner and other resources:
  • https://www.empowerinnovation.net/

Funding opportunities
• https://www.energy.ca.gov/funding-opportunities/solicitations

Project database
• https://www.energizeinnovation.fund
Thank You!