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Overview in Japan

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Energy Conservation Technology Department

New Energy and Industrial Technology Development Organization

1. Overview of NEDO

2. Situation of energy conservation

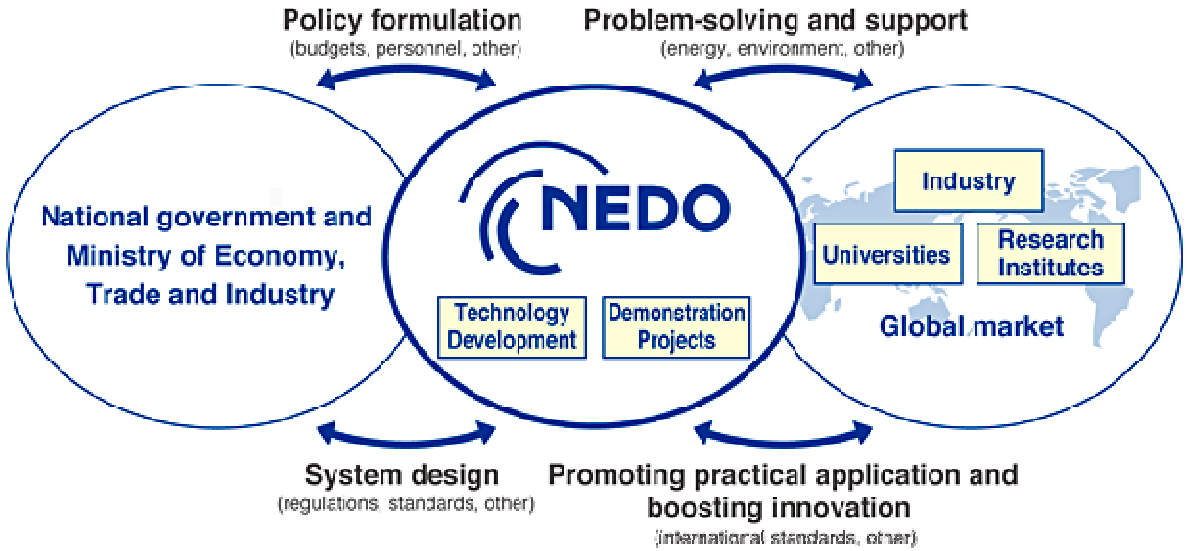
3. R&D Project on Innovative Thermal Management Materials and Technologies

1. Overview of NEDO

Missions

Two basic missions:

1. Addressing Energy and Global Environmental Problems
2. Enhancing Industrial Technology



History:

1980 New Energy Development Organization established

1988 “Industrial Technology” research and development added

2003 Reorganized as an incorporated administrative agency

Organization

Chairman
President
Executive Directors

Auditors

NEDO Head office
(MUZA Kawasaki Central Tower)

General Affairs Dept.
Personnel Affairs Dept.
Accounting Dept.
Inspection and Operational Management Dept.
Asset Management Dept.
Information and System Dept.
Evaluation Dept.
Public Relation Dept.
Kansai Branch Office
Overseas Offices

Technology Strategy Center

Innovation Promotion Dept.
Robot and Artificial Intelligence Technology Dept.
Internet of Things Promotion Dept.
Materials Technology and Nanotechnology Dept.

Energy Conservation Technology Dept.
New Energy Technology Dept.
International Affairs Dept.
Smart Community Dept.
Environment Dept.

Project Activities

National Projects (128.7 billion yen)

Energy and Environmental Field

- New Energy
  (41.9 billion yen)
- Energy Conservation
  (10.1 billion yen)
- Rechargeable Batteries and Energy System
  (3.3 billion yen)
- Clean Coal Technology
  (15.3 billion yen)
- Environment and Resource Conservation
  (2.6 billion yen)

Industrial Field

- Electronics, Information, and Telecommunications
  (12.3 billion yen)
- Materials and Nanotechnology
  (12.5 billion yen)
- Robot Technology
  (10.9 billion yen)
- New Manufacturing Technology
  (3.2 billion yen)

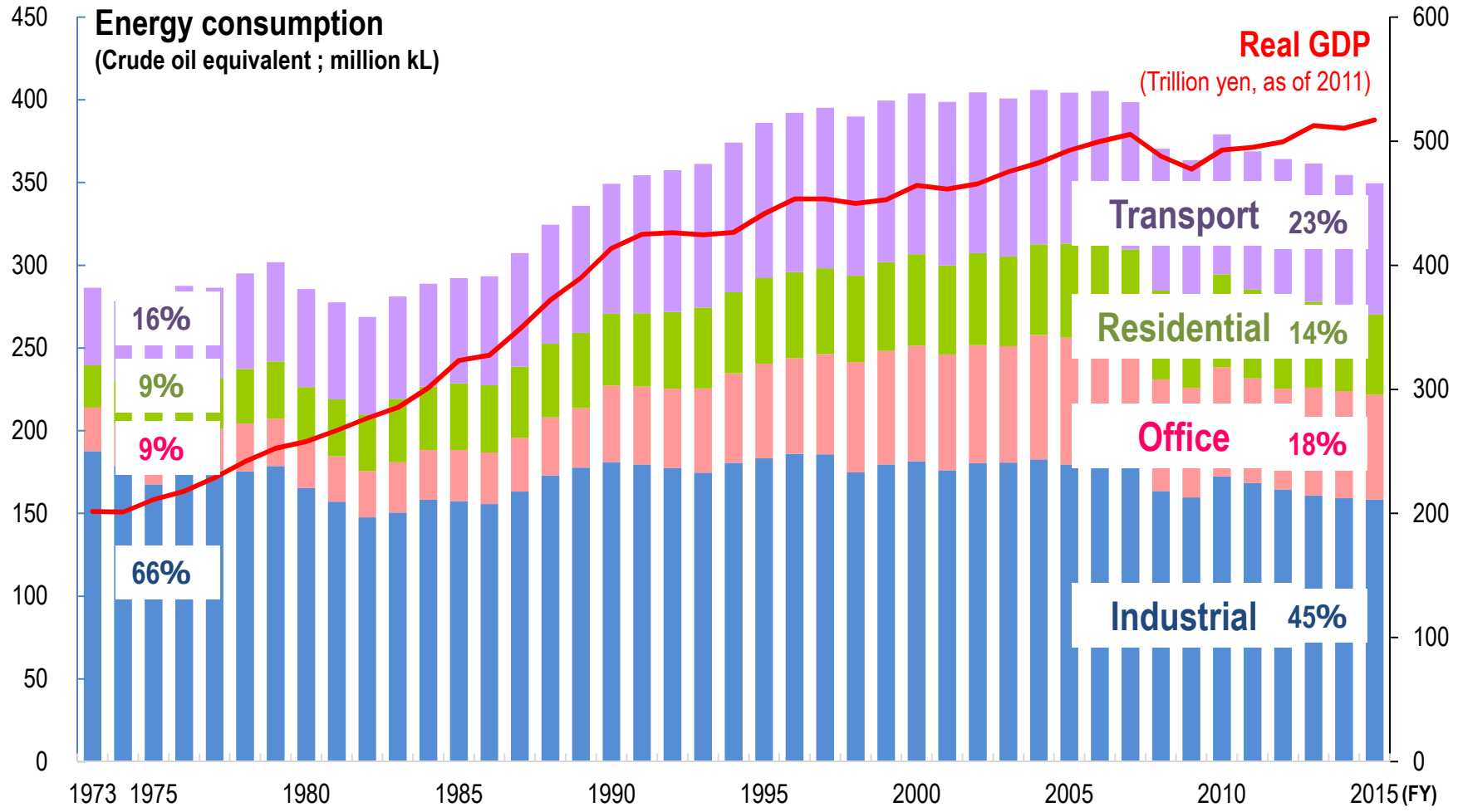
FY2017 Budget
139.7 billion yen

- International Demonstration Activities
  (16.6 billion yen)
- Public Solicitation for Proposal Activities (4.2 billion yen)

** Due to budget sharing, individual budget amounts shown above do not equal the total.*

2. Situation of energy conservation

Status of energy consumption in Japan



[Source] Total Energy Statistics, National Accounts Annual Report, EDMC Energy and Economic Statistics

Energy efficiency measures ~2030

With 2030 as a goal, Japan is aiming to achieve an energy consumption efficiency improvement of 35%.

Energy consumption efficiency: The final energy consumption amount/Real GDP

Energy efficiency measures

- **Transport:** Next-generation vehicles, Fuel consumption improvement, Efficiency of traffic systems, Automatic driving.
- **Residential:** Energy efficiency of housing, HEMS: Energy visualization/management.
- **Office:** Energy efficiency of buildings, BEMS: Energy visualization/management.
- **Industrial:** Commitment to a Low Carbon Society, Energy management in factories.

Outlook on NESTI 2050

NESTI 2050: National Energy & Environment Strategy for Technological Innovation towards 2050

Out of 30 billion tons of CO2 reductions that are necessary to meet the "2 ℃ target" referred in COP21, several billion to 10 billion tons or more of reductions are expected through NESTI 2050.

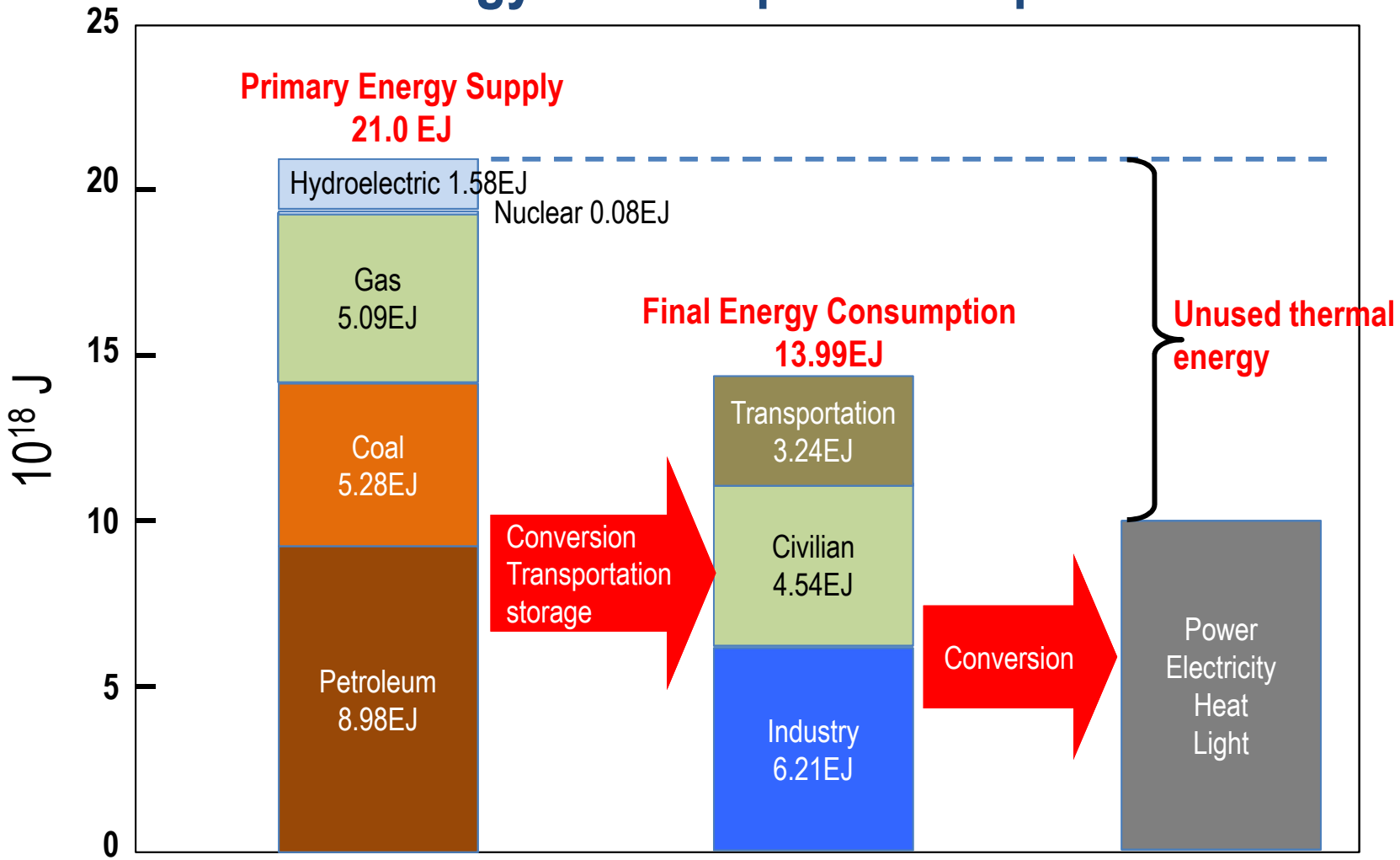
Innovative technologies

Energy saving:	1. Production process 2. Structural material
Energy storage:	3. Storage battery 4. Hydrogen
Energy generation:	5. Photovoltaic 6. Geo-thermal
7. Capture and effective usage of CO2	

3. R&D Project on Innovative Thermal Management Materials and Technologies

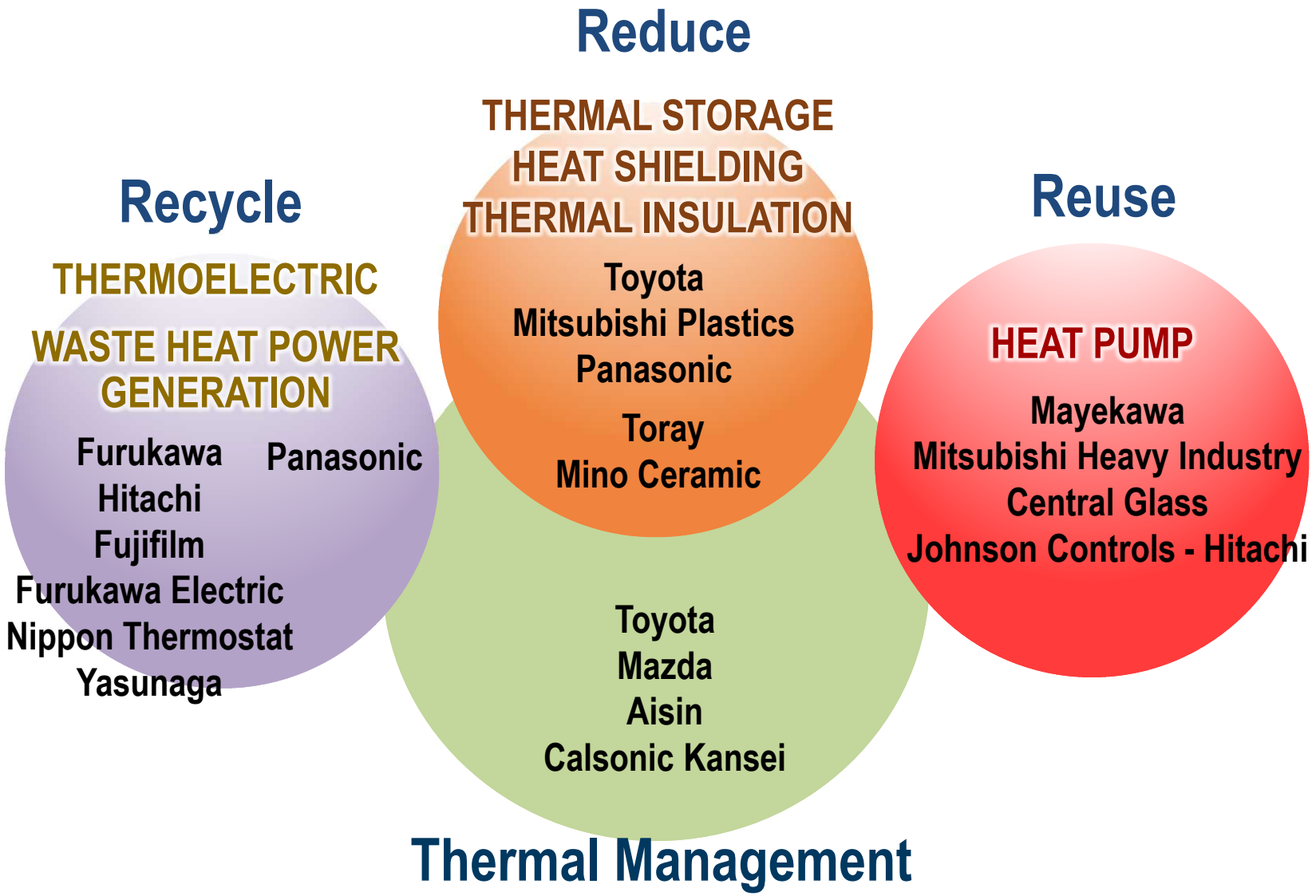
Background

Energy Consumption in Japan



[Source] METI Data, 2013

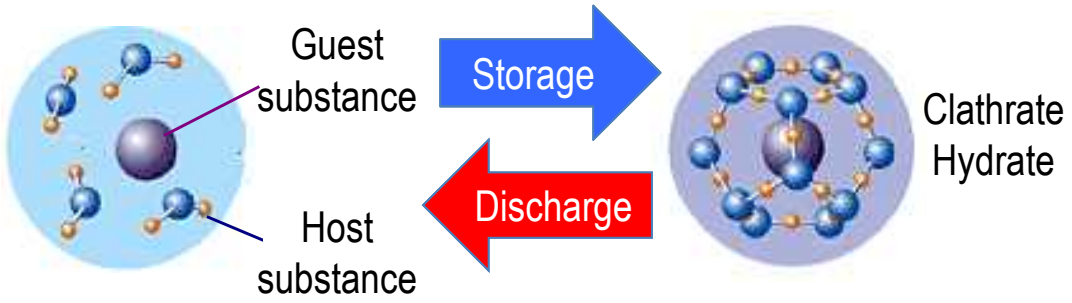
Structure of TherMAT Project



Thermal Storage

Recent progress:

- Found candidates of guest substance of the clathrate hydrate to achieve both of high thermal storage density and appropriate operating temperature.
- Investigated high thermal storage density and low operating temperature of thermal storage module for automobile.



Cold storage by Clathrate Hydrate

Heat Shielding

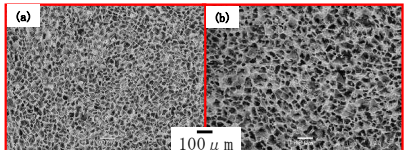
Recent progress:

- The transparency of heat shield film was improved and we achieved intermediate target of the project.

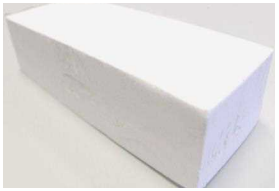
Heat Insulation

Recent progress:

- Industrial kiln having high energy efficiency was fabricated by high performance porous ceramics and other developed materials.



Microstructure of mullite heat insulator

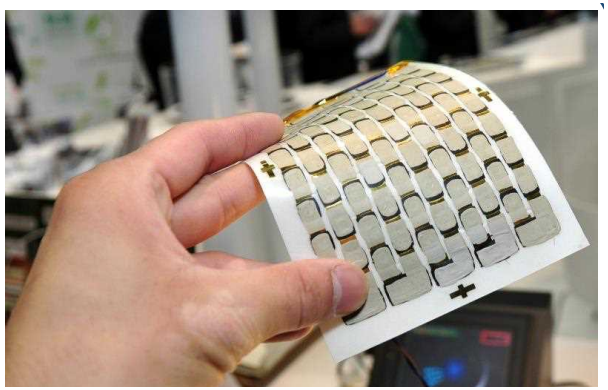


High Strength Light Weight heat insulator

Thermoelectric Materials and Devices

Recent progress:

- Achieved large power factors of 154microW/mK2 in PEDOT:PSS-CNT in hybrid films, and over 600microW/mK2 in SWCNT-polystyrene composites.
- We developed p-type skutterudite materials whose heat resistant temperature reached 600℃.
- Towards the target of ZT=2, we successfully increased the power factor in the MnSi1.7/Si-Ag multilayer.
- The basic process of assembly was established in flexible thermoelectric modules.
- R&Ds to increase the figure of merit of polycrystalline clathrate compounds were performed.



Flexible thermoelectric module

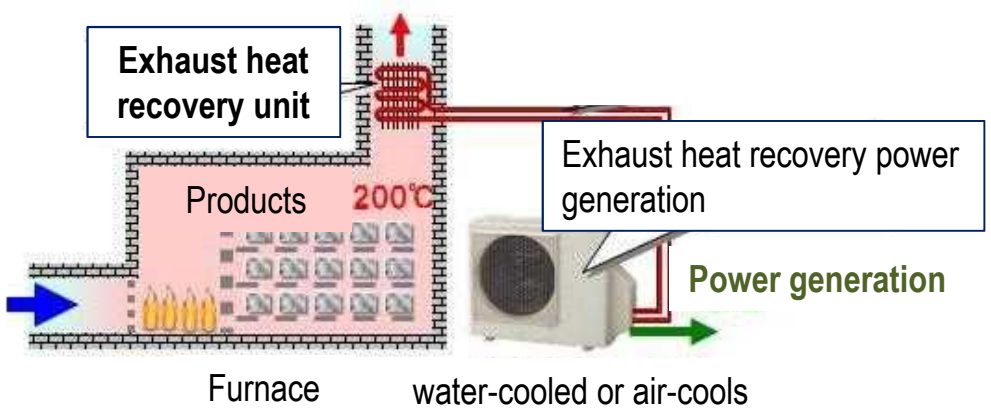
- Large size silicide pellets (~φ100mm) were sintered, with deviation in in-plane electrical and mechanical properties < 5%..

Power Generation Utilizing Waste Heat

Recent progress:

- The generation efficiency of 10.5% was achieved in 1 kW class waste heat power generation system using low GWP refrigerant..

Organic Rankine Cycle (ORC) System



Heat Pump

Recent progress:

- The simulations on 300kW class heat pump system were performed and compressor and heat exchanger for that system were tested.
- Started to measure the operation data in actual plants for planning installation of heat pumps.
- Air-cooled double-lift test was conducted and 7℃ chilled water was obtained...

Thermal Management

Recent progress:

- The heat transport amount 1.5kW under a 2m-distance and a 30cm-difference of ups and downs was achieved in loop heat pipe systems.
- As a new technology for enhancing the heat transfer performance, a motor cooling concept utilizing the phase-change was establish.
- Based on thermo-physical properties, new absorbents to absorption refrigerators for automobile use was discussed.
- Succeeded to reduced 65% of the system volume of the adsorption cooling system.

Thank you for your kind attention.

http://www.nedo.go.jp/english/index.html