Global COE Program
“Energy Science in the Age of Global Warming”
-Toward CO2 Zero-emission Energy System

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Global COE Program
“Energy Science in the Age of Global Warming”
-Toward CO2 Zero-emission Energy System

Kyoto University
Graduate School of Energy Science
Institute of Advanced Energy
Department of Nuclear Engineering
Research Reactor Institute
Securing energy and conservation of the environment are the most important issues for the sustainable development of human beings.

The energy problem cannot be simply labeled as a technological one, as it is also deeply involved with social and economic elements.

It is necessary to establish the “Low carbon energy science” in the interdisciplinary field adding the social science and the humanities to the natural science.
2. What were we promoting?

(21st COE Program “Establishment of COE on Sustainable Energy System” From 2002 to 2006)

【Research Programs】
- Solar Energy System (solar cell, solar power satellite/station and plasma energy)
- Hydrogen Energy
- Bioenergy
- Total Energy

【Educational Program】
- International Energy School
- Publication of textbooks

【Development of the Platform】
- International Platform (Kingdom of Thailand)
- Establishment of SEE Forum
- Symposium (International and Domestic)
- Industry-government-academia cooperation
- Energy information and Related policy.

Over 1000 Academic Papers
110 Books
184 Keynote Lecture
124 Patents

Congress of ASEAN COST+3
Asian CORE

Turned out researchers at Universities(8), Public Research Institute(16), Industry(8), and PD(33)
2. What were we promoting?

(Demand and Supply of Energy in 2030)

Reduce the CO2 emission by half in 2030.

The amount of CO2 in the atmosphere decrease only when the emission become zero. “CO2 Zero-Emission”
2. What were we promoting?

(Motivation)

Breakthrough to foster human resources toward a CO2 zero-emissions.

The amount of CO2 in the atmosphere decrease only when the emission become zero. “CO2 Zero-Emission”
International Education and Research Platform

We foster educators, researchers, and policy makers who can develop technologies and propose policies for establishing a scenario toward a CO2 zero-emissions society no longer dependent on fossil fuels, by the year 2100.

Scenario planning in “Energy Science” Education

Students will acquire the faculty to survey the whole “energy system” through participation in scenario planning and interaction with researchers from other fields, and apply it to their own research.

Energy Science Research for no CO2 emission

- Renewable Energy (Solar Energy and Biomass Energy)
- Advanced Nuclear Energy (Fission and Fusion)
- Socio-economic Study of Energy
3. What are we doing?
(Full Picture of the Platform)

Information transmission
Policy proposal

Scenario Planning Group
CO2 Zero-emission

GCOE Unit for Energy Science Education
Curriculum that includes basic energy science and advanced research results

Advanced Research Cluster
Research into Energy Science

Evaluation
Advisors from home and abroad
3. Why

(Scenario Planning Group)

Information transmission
Policy proposal
Plan
Evaluation

Advanced Research Cluster

Forecasting possible technology

Research into Energy Science
3. What are we doing?

(Group of Energy Scenario and Strategy Study)

Scenarios Planning Group

CO2 Zero-emission

Government and Industries

Evaluation

Advisors from home and abroad

Information transmission
Policy proposal

Plan
Action
Check

Advanced Research Cluster

Research Cluster

to Energy Science
3. What are we doing? (Advanced Research Cluster)

Information transmission
Policy proposal

Scenario Planning Group

CO2 Zero-emission

Check

GCOE Unit for Science Education
Curriculum that includes basic energy science and advanced research results

Research into Energy Science
- Socio-economic study of energy
- Solar energy
- Biomass energy
- Advanced nuclear energy

Advanced Research Cluster

Do

Evaluation

Advisors from home and abroad

Action
3. What are we doing?
(Outline of the Research Tasks)

Information transmission
Policy proposal

Scenario Planning Group
CO2 Zero-emission

Advanced nuclear energy research
Socio-economic research
Productivity improvement
Energy supply and demand analysis
Investigation of resources
Supply and demand scenario

CO2 inventory
Zero CO2 emission energy scenario planning

Renewable energy research
Solar energy research
Biomass energy research

Solar Energy
Solar energy
Solar energy

Solar energy
Energy use
Solar energy
Chemical use
Woody biomass
Energy use
Woody biomass
Material use

Solar energy
Integrated process design
Woody biomass
Integrated process design

Technological establishment for integrated process
Practical scenario for advanced industrial complex

Future nuclear system
Concept
Advanced nuclear system
Design
Advanced materials
Beam driven reactor

Economic evaluation
Socio-economic system design

Economic evaluation
Socio-economic system design

Zero CO2 emission
Energy supply
Zero CO2 emission
Socio-economic system
Zero CO2 emission
Energy system
Zero CO2 emission
Energy supply
Zero CO2 emission
Material supply

Scenarios to zero CO2 emission energy system
3. What are we doing? (Full Picture of the Platform)

- Scenario Planning Group
- CO2 Zero-emission
- GCOE Unit for Energy Science Education

Curriculum that includes basic, interdisciplinary science and research, and dissemination of results.

- Advisors from home and abroad
- Exchanging ideas
- Gather feedback on the scenario, education, and research.

- Advanced Research Cluster
- Research into Energy Science

Information transmission
Policy proposal
3. What are we doing? (Fosterage of Human Resources)

Plan

GCOE Unit for Energy Science Education

Curriculum that includes basic energy science and advanced research results

Advanced Research Cluster

Research into Energy Science

Evaluation

Advisors from home and abroad

Action

Scenario Planning Group

CO2 Zero-emission

Information transmission

Policy proposal

Do
• Who has comprehensive ability to have a profound knowledge regarding the energy and environmental issues, to understand both the social and human scientist and the natural scientist, and to carry out collaborative work.

• Who has independence to organize a research group for the intended research, and to perform the research cooperating with other researchers.

• Who has internationality to have an international perspective, a communication ability, and a world-class standard research ability.

• Who has potential to contribute in solving the energy and environmental issues which relate deeply to the sustainable development of human beings.
3. What are we doing? (Education Program)

Graduate School of Energy Science

Department of Nuclear Engineering

GCOE Unit for Energy Science Education

(compulsory) "Open Recruitment Group Research" containing both the social and the human science and the natural science toward a CO2 zero emission
(compulsory) "Advanced Research"
(compulsory) "Field Training"
(compulsory) "Research presentation"

Course in English, International Internships

Foreign Students

Self-Support backup for Young Researcher (Career Path Support)

Education

GCOE Assistant Professor
PD

International Leader

Research and Training at International Organization
Accept Students from International Organization

16/18
3. What are we doing? (Education Program)

Graduate School of Energy Science

Department of Nuclear Engineering

GCOE Unit for Energy Science Education

(compulsory) “Open Recruitment Group Research” containing both the social and the human science and the natural science toward a CO2 zero emission (compulsory) “Advanced Research”

Course in English, International Internships

● RA
● TA

Graduate School of Energy Science
Department of Nuclear Engineering

GCOE Unit for Energy Science Education

Self-Support backup for Young Researcher (Career Path Support)

International Leader

Research and Training at International Organization
Accept Students from International Organization

Foreign Students

International Leader
3. What are we doing?
(Education Program)

Graduate School of Energy Science

Department of Nuclear Engineering

GCOE Unit for Energy Science Education

(compulsory) “Open Recruitment Group Research” containing both the social and the human science and the natural science toward a CO2 zero emission

(compulsory) “Advanced Research”

(compulsory) “Field Training”

(compulsory) “Research presentation”

Course in English, International Internships

Foreign Students

Education

Self-Support backup for Young Researcher (Career Path Support)

GCOE Assistant Professor

PD

International Leader

Research and Training at International Organization

Accept Students from International Organization

○RA・TA
compulsory) "Open Recruitment Group Research" containing both the social and the human science and the natural science toward a CO2 zero emission

(compulsory) "Advanced Research"

(compulsory) "Field Training"

(compulsory) "Research presentation"

Course in English, International Internships

Self-Support backup for Young Researcher (Career Path Support)

GCOE Assistant Professor

PD
Open Recruitment Group Research

Field Training

Research presentation

Course in English, International Internships

Self-Support backup for Young Researcher (Career Path Support)

GCOE Assistant Professor

PD

Research and Training at International Organization

Accept Students from International Organization

International Leader Education

20/18
“Open Recruitment Group Research” containing both the social and the human science and the natural science toward a CO2 zero emission

“Advanced Research”

“Field Training”

“Research presentation”

Course in English, International Internships

- RA
- TA

Graduate School of Energy Science

Department of Nuclear Engineering

GCOE Unit for Energy Science Education

Self-Support backup for Young Researcher (Career Path Support)

- GCOE Assistant Professor
- PD

■ Research and Training at International Organization
■ Accept Students from International Organization

Foreign Students

Education

International Leader

The 3rd Kyoto-Erlangen Symposium on Advanced Energy and Materials

Report of Overseas Study

GCOE Unit for Energy Science Education

Kyoto University Global COE Program

Energy Science in the Age of Global Warming
—Toward CO2 Zero-emission Energy System—

September 3-4, 2009
@University of Erlangen-Nuremberg, Germany
3. What are we doing? (Education Program)

Graduate School of Energy Science

Department of Nuclear Engineering

GCOE Unit for Energy Science Education

(compulsory) “Open Recruitment Group Research” containing both the social and the human science and the natural science toward a CO2 zero emission
(compulsory) “Advanced Research”
(compulsory) “Field Training”
(compulsory) “Research presentation”

Course in English, International Internships

Self-Support backup for Young Researcher (Career Path Support)

- GCOE Assistant Professor
- PD

Education

Foreign Students

International Leader

- Research and Training at International Organization
- Accept Students from International Organization

RA・TA
3. What are we doing? (Education Program)

- GCOE Unit for Energy Science Education
- Self-Support backup for Young Researcher (Career Path Support)
- Research and Training at International Organization
- Accept Students from International Organization

Graduate School of Energy Science
Department of Nuclear Engineering

- Open Recruitment for the human science and the natural science toward a CO2 zero emission
- Advanced Research
- Field Training
- Research presentation

Course in English, International Internships

- GCOE Assistant Professor
- PD
3. What are we doing?
(Transmission the Achievement)

(1) Information transmission through website.

(2) Publication of Annual Reports, quarterly newsletters, Books, Self-Inspection and Evaluation Reports, in English and Japanese.

(3) Hosting domestic and international symposiums and activity report meetings.

(4) Hosting of an industry-government-academia collaboration symposium and citizen lectures.

(5) Co-hosting related meetings domestic and international such as SEE (Sustainable Energy and Environment) forum and so on.
3. What are we doing?
(Transmutation of the Achievement)

(1) Information transmission through website.

(2) Publications, books, and reports.

(3) Hosted seminars and activities.

(4) Hosted collaboration.

(5) Co-hosted seminars and events.

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**What's New**

- The 2nd GCOE International Symposium  Aug. 19-20, 2010, Kyoto, Japan  detail
- This Website is Renewed! Results in Fiscal year 2008 and 2009 are Shown!!!
- GCOE Annual Report 2009  pdf file
- Industry-University Cooperation Symposium  Dec. 14, 2009, Kyoto Terra  detail
- Sixth GCOE Energy Seminar  Oct. 26, 2009  detail
- 6th SEE Forum Meeting  Nov. 2009, Yogyakarta, Indonesia  detail
- 5th GCOE Forum Seminar  Oct. 6, 2009  detail

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**EMSES NEWS**

- 8th EMSES Web Site is Opened!!!  detail

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**Closeup**

The 2nd GCOE International Symposium
3. What are we doing?
(Transmission the Achievement)

(1) Information transmission through website.

(2) Publication of Annual Reports, quarterly newsletters, Books, Self-Inspection and Evaluation Reports, in English and Japanese.

(3) Hosting symposiums and activity

(4) Hosting collaboration

(5) Co-hosting international Energy and Environment
(1) Information

(2) Publications

(3) Hosting domestic and international symposiums and activity report meetings.
(4) Hosting of an industry-government-academia collaboration symposium and citizen lectures.

(5) Co-hosting related meetings domestic and international such as SEE (Sustainable Energy and Environment) forum and so on.
3. What are we doing? (Transmission the Achievement)

(1) Information transmission through website.

(2) Publication of Annual Reports, quarterly newsletters, Books, Self-Inspection and Evaluation Reports, in English and Japanese.

(3) Hosting domestic and international symposiums and activity report meetings.

(4) Hosting of an industry-government-academia collaboration symposium and citizen lectures.

(5) Co-hosting related meetings domestic and international such as SEE (Sustainable Energy and Environment) forum and so on.
SEE Forum is an Asia-Pacific academic forum for global climate and energy security issues of common concern among an Asia-Pacific region.

Objective: To promote “New Energy Initiatives*1” and to seek academic networks that will contribute to solving the global climate and energy security issues.

**Participating members**

- **Kyoto University (Chair), Japan**
- **Joint Graduate School of Energy and Environment (Co-chair), Thailand**
  - TIT, AGU, KIT, Osaka Univ., Saga Univ., Kumamoto Univ., AIST, NIAES, etc.
  - <ASEAN>
- **ASEAN University Network (AUN);**
  - 22 Participating Universities, RUA, UM-Sabha, etc.
  - <China, Korea, India>
    - Peking Univ., Ajou Univ., IIT-D

More than 40 academic & research organizations

**Activity**

- **Information exchange**
  - 3rd SEE Forum
    - Pattaya, (Nov. 2007)
  - 5th SEE Forum
    - Bangkok, (May. 2009)
  - 6th SEE Forum
    - Yogyakarta (Nov. 2009)
  - 7th SEE Forum
    - Hanoi (Sep. 2010)

- **Research Collaboration**
  - Establishment of Network of Excellences (NOEs)
  - Human Capacity Building (NECSE)
  - Journal Publishing (JSEE)
5th SEE Forum in Bangkok
International Symposium on Sustainable Energy & Environmental Protection 2009

in conjunction with
Indonesian Catalysts Society (MKI) Meeting
The 6th Sustainable Energy and Environment (SEE) Forum Meeting

November 23 - 26, 2009
Grha Sabha Pramana - Gadjah Mada University
Yogyakarta - Indonesia

6th SEE Forum in Yogyakarta
Eco-Energy and Material Science and Engineering Symposium (EMSES)

MOU signing ceremony for JST joint research between Japan and Thailand
Nuclear Energy Seminar in Thailand
Nov. 7 - Dec. 19, 2009 at RMUTT, Thailand

Sponsored by Kyoto University Global COE program, “Energy Science in the Age of Global Warming”
Co-sponsored by Energy and Materials Science and Engineering Symposium (EMSES)
Co-sponsored by Nuclear Forum Thailand
4. What shall we accomplish?
(Expected Results and Social Significance and Spillover Effect)

• **Fosterage of Human Resources**
  Academic Researchers, Industrial Researchers, Policy Makers, Strategist who will support an International Organization

• **Social Value and Pervasive Effect**
  - Contribution toward Realizing CO2 Zero-emission and Policy Proposals
  - Spread of Energy Science and New Approach for Education and Research
  - Establishment of Information Channel, Human Exchange Path and Education System
  - Contribution to Utilization of Nuclear Power
  - Contribution to Prevention of Global Warming and Energy Security
  - Spread of Effective Achievements to the South-east Asian Nations through International Cooperation, Activities at Platform Universities and so on.
4. What shall we accomplish?
(Action after the Global COE)

- Organization of “Education and Research Unit for Energy Science”
  - Development of System for Human Resources Cultivation and Advance of Energy Study
- Formation of Network including Southeast Asian Nations.
  - Global Network and NOE (Network of Excellence)
- Concept of CO2 Zero-emission
  - Global Policy and Technology
NOE Roundtable Meeting  2009.11.23
4. What shall we accomplish?
(Action after the Global COE)

- Organization of “Education and Research Unit for Energy Science”
  → Development of System for Human Resources Cultivation and Advance of Energy Study
- Formation of Network including Southeast Asian Nations.
  → Global Network and NOE (Network of Excellence)
- Concept of CO2 Zero-emission
  → Global Policy and Technology
Energy Science in the Age of Global Warming
— Toward CO2 Zero-emission Energy System — “

Thank you for your kind attention