The human habitats of the earth are facing great challenges in terms of energy, water and resource shortages, along with the global ecological challenges caused by climate change. KAIST is committed to solving problems involving Energy, Environment, Water and Sustainability (EEWS). The EEWS Initiative at KAIST is being conducted by the EEWS Research Center from a research-oriented university’s point of view.

In order to address these challenges, KAIST aims to research the fundamental problems of EEWS. The KAIST EEWS Research Center is conducting research projects in key categories every year, some of which are specifically selected as flagship projects. The research outcomes are exchanged with global researchers and industrial experts through the annual International Workshop on EEWS.

The EEWS research center seeks to integrate research, education, knowledge exchange and commercialization of EEWS to solve the problems of EEWS. Through this contribution, KAIST will be a global leader of the future. We at KAIST are open to cooperation with research institutions and industries that share this common vision.

Supplying talented and well-trained scholars is essential to enhance national and global EEWS research capability. For this purpose, the Graduate School of EEWS was established in cooperation with 14 academic departments to educate master’s and doctoral students in green technologies. The Graduate School of Green Growth was also established in the College of Business to educate experts in green business and policy.
Global EEWS Problems

**Energy**
The world will see further depletion of conventional and affordable fossil fuels in the 21st century and will need alternative energy sources that are clean and renewable. Without affordable energy, industrial operations and quality of life will deteriorate. It may also create new conflicts between regions and among countries. We need to develop new technologies and policies that will assure the supply of low cost energy from alternative sources. It is essential to develop key technologies and design an optimal energy portfolio plan with an appropriate policy.

**Environment**
The world is facing serious environmental problems that will vastly change the climate of the globe and degrade the quality of human life. Global warming, which is one facet of these problems, will require a major concerted effort to minimize its adverse effects through the collaboration of many nations and many institutions. There are scattered efforts in many institutions to solve environmental problems, but there are many outstanding challenges and opportunities in realizing the proposed and pursued ideas, i.e., reduction of carbon emission, carbon capture and sequestration, recycle of waste, creation of non-polluting cars, design of green buildings and cities, new city designs, restoration of forests through conventional processes and many others.

**Water**
The lack of portable and agricultural water will be as serious as the lack of energy. Lack of water has become a major problem in many parts of the world. One solution is desalination, since 97% of the earth’s water is in the ocean. We need to develop new technologies that can desalinate seawater or brackish water without excessive use of energy. We need better technologies that can remove NaCl than the current technologies that depend on evaporation, reverse osmosis or other energy intensive technologies.

**Sustainability**
The current human lifestyles and the use of natural resources cannot be sustained as more countries continue to develop. If China and India attain the living standards of the advanced nations, the world will be strained immensely due to the resource shortage. We need new technologies of manufacturing, new alternate materials, new lifestyles and new public policies that minimize the consumption of natural resources and recycle resources. There are some scattered efforts in many countries to deal with these problems, but we need to provide a more comprehensive solution.
Focus of EEWS Initiative

- **Research**
  - Exploring high impact research topics related to global solutions in EEWS
  - EEWS Research Projects
  - Flagship Projects
  - Management of Projects by World Records
  - Interdisciplinary Research

- **Education**
  - Human resource development in EEWS area for the next generation
    - Graduate School of EEWS
    - Graduate School of Green Growth
    - 14 Academic Departments
    - Executive Education through EEWS Forum

- **International Collaboration**
  - Establishment of international knowledge hub of EEWS through international collaboration
    - International Workshop on EEWS
    - Collaboration with OTU (Denmark Technical Univ.)
    - Collaboration with IIASA (International Institute of Applied System Analysis)

- **Creation of Green Growth Engine**
  - HHI-KAIST EEWS Research Center
  - Collaborative Research
  - Commercialization with industry
  - Joint Research with KIER (Korea Institute of Energy Research)
  - EEWS Business Model Contest
  - Green Business Case Development
  - Students’ Idea Festival

EEWS Research Virtuous Cycle

- 17 Projects in 2008
- 24 Projects in 2009
- 30 Projects in 2010 (7 Flagship Projects)
- 14 Projects in 2011 (8 Flagship Projects)
- 22 Projects in 2012 (9 Flagship Projects)
- 25 Projects in 2013 (9 Flagship Projects)

- Co-Research with Hyundai Heavy Industries
  - HHI-KAIST EEWS Research Center
- Co-Research with Korea Institute of Energy Research
- Business Model Contest
- Students’ Idea Festival

- Graduate School of EEWS
- Graduate School of Green Growth
- EEWS Forum
  - 14 Academic Departments

- Korea-Danish Green Technology Research Center
  - BioSustainability Lab.
  - Integrated Water Technology Lab.
  - Offshore Wind Turbine Lab.
  - Batteries Lab.
  - Fuel Cell Lab.

- International Institute of Applied System Analysis

* HHI: Hyundai Heavy Industries

Korea-Danish Green Technology Research Center
- BioSustainability Lab.
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- Offshore Wind Turbine Lab.
- Batteries Lab.
- Fuel Cell Lab.

International Institute of Applied System Analysis

KAIST EEWS Research Center

EEWS Initiative

International Collaboration

Creation of Green Growth Engine

Education

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Graduate School of Green Growth

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Offshore Wind Turbine Lab.

Batteries Lab.

Fuel Cell Lab.
Example Projects of Year 2013 in 11 Categories

- **Category 1: Artificial Photosynthesis**
  1-A. Artificial Photosynthesis System to Generate Sustainable Fuels using Carbon Dioxide
  Prof. Jeung Ku Kang (Graduate School of EEWS)
  1-B. Fundamental Modification of Material’s Energy Absorption and Emission Properties through Manipulation of its Density of States
  Prof. Jonghwa Shin (Dept. of Material Science & Engineering)

- **Category 2: Solar Energy**
  2-A. Nano Organic Solar Cell Development for Next Generation Photovoltaic Industry
  Prof. Seung Hyup Yoo (Dept. of Electrical Engineering)

- **Category 3: Fuel Cells**
  3-A. Continuous Carbon Fiber Composite Bipolar Plate for PEMFC(Polymer Electrolyte Membrane Fuel Cell)
  Prof. Da Gil Lee (Div. of Mechanical Engineering)

- **Category 4: Batteries**
  4-A. Development of Next Generation High Power Lithium Rechargeable Batteries
  Prof. Do Kyung Kim (Dept. of Material Science & Engineering)

- **Category 5: LEDs**
  5-A. Eco-Friendly Highly Efficient Polymer Lighting Fabricated by All-Solution-Process
  Prof. Min-Yang Yang (Div. of Mechanical Engineering)
  5-B. InGaN Nano-structure Light-emitting Diodes for Phosphor-free White Light Sources
  Prof. Yong-Hoon Cho (Dept. of Physics)

- **Category 6: Bio Fuel**
  6-A. Custom-designed Microorganisms and Process Optimization for Mass Production of Bio-butanol
  Prof. Byung Swan Cho (Dept. of Biological Science)/Sang Yup Lee(Dept. of Chemical & Biomolecular Engineering)

- **Category 7: Safe Nuclear Energy**
  7-A. Safe Reuse of Spent Nuclear Fuel
  Prof. Jong-Il Yun (Dept. of Nuclear & Quantum Engineering)
  7-B. In-Service Monitoring System of Nuclear Power Plants
  Prof. Hoon Sohn (Dept. of Civil & Environmental Engineering)
  7-C. Development of Nanolayered Composite for Next Generation Nuclear Reactor Materials
  Prof. Seung Min Han (Graduate School of EEWS)
  7-D. Development of Portable Radioactivity Release Prevention System for Emergency Preparedness
  Prof. Man Sung Yim(Dept. of Nuclear & Quantum Engineering)

- **Category 8: Water**
  8-A. Advanced Materials and Systems for Water Treatment and Desalination
  Prof. Mamadou S. Diallo (Graduate School of EEWS)

- **Category 9: Carbon Capture, Storage and Usage**
  9-A. Covalent Organic Polymers (COPs) for Effective CO2 Capture
  Prof. Cafer T. Yavuz (Graduate School of EEWS)
  9-B. Simultaneous Removal of Gaseous Pollutants in Furnace for Next Generation Green Power Plant System
  Prof. Sang Soo Kim (Div. of Mechanical Engineering)

- **Category 10: Green Building and Transportation**
  10-A. Optimal Design of Open Rotor with High Efficiency and Low Noise
  Prof. Duck-Joo Lee (Div. of Aerospace Engineering)
  10-B. Research of Green Gel Propellant Fabrication and Combustion Characteristics
  Prof. Seung-Wook Baek (Div. of Aerospace Engineering)

- **Category 11: EEWS Research Strategy**
  11-A. EEWS Research Portfolio Planning
  Prof. Jae Kyu Lee (Graduate School of Green Growth)
  11-B. Green Business Case Knowledge Platform
  Prof. Jae Kyu Lee (Graduate School of Green Growth)
## World Records at KAIST (As of Jan. 1st, 2014)

<table>
<thead>
<tr>
<th>Project</th>
<th>Target</th>
<th>Previous World Record</th>
<th>KAIST Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial Photosynthesis System to Generate Sustainable Fuels using Carbon Dioxide</td>
<td>CH₄</td>
<td>N/A</td>
<td>4.1 μmol/cm²/h</td>
</tr>
<tr>
<td></td>
<td>CH₃OH</td>
<td>1.4 μmol/g/h</td>
<td>3.2 μmol/g/h</td>
</tr>
<tr>
<td></td>
<td>CO₂ Conversion Effect</td>
<td>N/A</td>
<td>1.24 %</td>
</tr>
<tr>
<td>Nano Organic Solar Cell Development for Next Generation Photovoltaic Industry</td>
<td>Efficiency</td>
<td>9.2 %</td>
<td>9.34 %</td>
</tr>
<tr>
<td>Continuous Carbon Fiber Composite Bipolar Plate for PEMFC (Polymer Electrolyte Membrane Fuel Cell)</td>
<td>Bulk Electrical Conductivity</td>
<td>200 S/m</td>
<td>100 S/m</td>
</tr>
<tr>
<td></td>
<td>Contact Electrical Resistance</td>
<td>20 mg cm²/Ω1MPa</td>
<td>25 mg cm²/Ω1MPa</td>
</tr>
<tr>
<td></td>
<td>Bipolar Plate Cost</td>
<td>$17/kW</td>
<td>$20/kW</td>
</tr>
<tr>
<td></td>
<td>Bipolar Plate Weight</td>
<td>40 kgf/m²</td>
<td>8 kgf/m²</td>
</tr>
<tr>
<td></td>
<td>Flexural Strength</td>
<td>25 MPa</td>
<td>150 MPa</td>
</tr>
<tr>
<td>Development of Next Generation High Power Lithium Rechargeable Batteries</td>
<td>Capacity Retention Cathode</td>
<td>65 % (100/0.1C)</td>
<td>Cathode 81.1 % (100/0.1C)</td>
</tr>
<tr>
<td></td>
<td>Anode</td>
<td>23 % (0.1 to 10 A/g)</td>
<td>Anode 95.3 % (0.2 to 10 A/g)</td>
</tr>
<tr>
<td></td>
<td>Capacity</td>
<td>750 mAh/V</td>
<td>1615 mAh/V</td>
</tr>
<tr>
<td></td>
<td>Custom-Designed Microorganisms and Process Optimization for Mass Production of Bio-butanol</td>
<td>Butanol</td>
<td>5.0 g/L</td>
</tr>
<tr>
<td></td>
<td>ABE</td>
<td>11.0 g/L</td>
<td>21.1 g/L</td>
</tr>
<tr>
<td></td>
<td>Blended Alcohol</td>
<td>20.4~24.4 g/L</td>
<td>28.5 g/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project</th>
<th>Target</th>
<th>Previous World Record</th>
<th>KAIST Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light-emitting Efficiency</td>
<td></td>
<td>12.0 lm/W</td>
<td>10.0 lm/W</td>
</tr>
<tr>
<td>Water Vapor Transmission Rate</td>
<td></td>
<td>0.17 g/m²/day @ 90-100% RH (Inorganic thin film: PET/AlOx)</td>
<td>0.16 g/m²/day @ 90-100% RH (solution-processed gas barrier film)</td>
</tr>
<tr>
<td>Light-emitting Area</td>
<td></td>
<td>2,500 mm²</td>
<td>900 mm²</td>
</tr>
<tr>
<td>Resistivity of Ag NP Electrodes</td>
<td></td>
<td>20 μΩcm</td>
<td>20 μΩcm</td>
</tr>
<tr>
<td>Sheet Resistance of Ag NW Electrodes</td>
<td></td>
<td>100 Ω/sq (@ transmittance of 90%)</td>
<td>15 Ω/sq (@ transmittance of 90%)</td>
</tr>
<tr>
<td>Lifetime</td>
<td></td>
<td>32,000 hrs</td>
<td>27,000 hrs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project</th>
<th>Target</th>
<th>Previous World Record</th>
<th>KAIST Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Friendly Highly Efficient Polymer Lighting Fabricated by All-Solution-Process</td>
<td>CO₂ Capacity</td>
<td>2,870 mg/g (unstable - 55 bar, 25°C)</td>
<td>1,700 mg/g (@ 50 bar, 25°C (COP-B))</td>
</tr>
<tr>
<td></td>
<td>CO₂/N₂ Selectivity</td>
<td>310 at 40°C (Zeolite Na-X)</td>
<td>308 @ 50°C (COP-79)</td>
</tr>
<tr>
<td>Next Generation of Advanced Materials and Systems for Water Treatment and Desalination</td>
<td>System better than SWRO system</td>
<td>RO system: requires high pressure (e.g.70 bar), has low water recovery~50%</td>
<td>Developed 2 NFC ion-selective membranes (can reject 50~80% of monovalent/divalent ions using a pressure ~ 10 bar)</td>
</tr>
</tbody>
</table>

## Cover Papers

![Cover Papers](http://eews.kaist.ac.kr)
Graduate School of EEWS

Faculty

Prof. Jeung Ku Kang
Hydrogen Technology

Prof. William A. Goddard
Materials Design

Prof. Jang Wook Choi

Prof. Sung-Yoon Chung
Materials Physics and Device Chemistry for Energy Storage

Prof. Younghan Jung
Advanced Materials High-Throughput Computational Design

Prof. Ali Coskun
Organic and Supramolecular Chemistry, Materials Science

Prof. Hyungjun Kim
Multiscale Modelling of Energy and Environmental Systems, Material Informatics

Prof. Mamadou S. Diallo
Environmental Engineering, Chemical Engineering, Chemistry

Prof. Yong-Hoon Kim
Nanostructures, Nanofaces and Nanointerfaces

Prof. Jai Young Lee
Materials for Hydrogen Storage, Batteries and Electronic Device

Prof. Galen D. Stucky
Nanomaterials

Prof. Jung-Yong Lee
Renewable Energy, Nanomaterials

Prof. Terasaki Osamu
Structural Chemistry

Prof. Jihun Oh
Nanomaterials, Solar Energy Conversion

Prof. Seong Min Jane Han
Mechanical Properties of Nano-Structured Energy Materials

Prof. Sungmin Kim
Multiscale Modelling of Energy and Environmental Systems, Material Informatics

Prof. Omar M. Yaghi
Reticular Chemistry

Prof. Jeong Young Park
Surface Science and Catalysis

Prof. Cafer T. Yavuz
Nanotechnology, Material and Environmental Sciences

Prof. J Fraser Stoddart
Nano Science & Supermolecular chemistry

Prof. Sung Il Woo
Catalysis and Device for Sustainable Energy & Resource

Prof. Michael O’Keefe
Atomic and Electronic Structure and Properties of Crystalline Inorganic Solids

Prof. Omar M. Yaghi
Reticular Chemistry

Prof. Sung-Il Woo
Catalysis and Device for Sustainable Energy & Resource

Goal & Vision
- Global Hub for Research, Innovation and Education on EEWS
- MS and Ph.D Program in EEWS

Major Achievements
- Hybrid STM/AFM Sensing Current and Forces with a Shape Probe
  [Prof. Jeong Young Park, Materials Today, 2010]
- Directional Photofluidization Lithography for Nanoarchitectures
  [Prof. Jung-Ki Park, Nanoletters, 2009]
- Glycerol as a Bioderived Sustainable Fuel for Solid-oxide Fuel Cells with Internal Reforming
  [Prof. Seong Il Woo, ChemSusChem, 2009]
- Stable Single-nit-cell Nanosheets of Zeolite MFI as Active and Long-lived Catalysts
  [Prof. Terasaki Osamu, Nature, 2009]
- Core/Shell Structure of Nanoparticle–Nanotube Hybrid
- Thermally Stable Pt/Mesoporous Silica Core-shell Nanocatalyst
  [Prof. Jeong Young Park, Nature Materials, 2009]
- Fabricating Genetically Engineered High-power Lithium Ion Batteries
  [Prof. Kwak Kang, Science, 2009]
Graduate School of Green Growth
College of Business @Seoul Campus

Vision
To develop Global Experts in Green Growth
- To nurture global green policy experts who can work for international organizations
- To develop green technology management professionals or green entrepreneurs
- To develop researchers and professors who can systematize green business and policy
- To establish a green campus as a green growth knowledge hub
- To build an international collaboration with GCF, GGGI, and GTC

Curriculum
MS in Green Policy
- Global Expert Development Program on Green Policy
- Scholarship
  - Tuition exempted for every admitted student
  - Prescribed research support expenses will be provided

MS & PhD in Green Business
- Global Researcher Development Program
- Taking a track from the Management Engineering (Accounting, Finance, IT Management, Marketing, Operations Strategy and Management Science, Organization and Strategic Management)
- Scholarship
  - Tuition exempted for every admitted student
  - Prescribed research support expenses will be provided

Green MBA
- Green Business Entrepreneur Development Program
- Double major with Techno-MBA is mandatory
- Scholarship
  - A prescribed scholarship will be provided
※ Green MBA is ranked as Global Top 6

Faculty
Prof. Sang-hyup Kim
Green Growth Principles; International Green Collaborations

Prof. Kwangwoo Park
Green Finance

Prof. Zong-Tae Bae
Green Innovation and Business

Prof. Jae-Hyeon Ahn
Risk Analysis for Green Projects

Prof. Jiyong Eom
Green Technology; Green Policy

Prof. Yeoung Yoon
Green Marketing

Prof. Jae Kyu Lee
Green Business and Green Technology

Prof. Jaywon Lee
Green Accounting

Prof. Dae-Chul Jang
Green Policy
International Collaboration

International Workshops on EEWS

<table>
<thead>
<tr>
<th>Year</th>
<th>Slogan/Theme</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>Effectiveness of EEWS as a Growth Engine</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Creating New Industries with EEWS</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>Findings from KAIST EEWS Flagship Projects (8 workshops)</td>
<td></td>
</tr>
</tbody>
</table>

From Green Technology to Green Business (12 workshops)
- Current Status of Low Energy Nuclear Reaction
- Integrated SMART Groundwater Management Technology
- KAIST-DTU Joint workshop on Offshore Wind Energy
- Biosustainability
- Green Technologies in Aeronautics
- Sustainable Water Reuse and Desalination
- Carbon Dioxide Capture and Separation by Porous Solids
- Advanced Technology of Next Generation Energy Storage System
- Photocatalytic Conversion of CO₂: Artificial Photosynthesis for Green Growth
- Innovative Nuclear Energy System
- Organic Solar Cells
- Fuel Cell and Hydrogen Energy

2012

Green Technology Research with Business Partners
- Sustainable Manufacturing Technologies for Opto-electronic Devices
- Advanced Battery Technologies
- Carbon Dioxide Capture and Separation by Porous Solids
- Frontiers in Biosustainability
- Technology Innovation for Next-Generation Solar Energy Conversion
- Green Aviation and Safety
- Next Generation Green Oxy-PC Power Plant for CCS System
- Safety and Sustainability of Nuclear Energy in the Future

2013

Joint Research Labs
- Biosustainability Lab: Led by Prof. Sang Yup Lee
- Integrated Water Technology Lab: Led by Prof. Woon Jin Lee
- Offshore Wind Turbine Lab: Led by Prof. Yeunwooo Cho
- Batteries Lab: Led by Prof. Do Kyung Kim
- Fuel Cell Lab: Led by Prof. Dai Gil Lee

Korea-Danish Green Technology Research Center
- Korea-Danish Green Technology Research Center (GTRC) was launched at KAIST on October 11, 2011 under the Korean-Danish Green Growth Alliance.

Korea-Danish Green Technology Joint Workshop

<table>
<thead>
<tr>
<th>Theme</th>
<th>Date</th>
<th>Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosustainability</td>
<td>2011.11</td>
<td>KAIST</td>
</tr>
<tr>
<td>Water Technology</td>
<td>2011.11</td>
<td>KAIST</td>
</tr>
<tr>
<td>Integrated SMART Groundwater Management Technology</td>
<td>2012.08</td>
<td>COEX</td>
</tr>
<tr>
<td>Development of Resource Circulated Integrated Water Technology with a Novel Reactor</td>
<td>2012.09</td>
<td>KAIST</td>
</tr>
<tr>
<td>Offshore Wind Turbine</td>
<td>2012.09</td>
<td>DTU</td>
</tr>
<tr>
<td>Biosustainability</td>
<td>2012.10</td>
<td>DTU</td>
</tr>
<tr>
<td>Advanced Technology of Next Generation Energy Storage System</td>
<td>2012.11</td>
<td>KAIST</td>
</tr>
<tr>
<td>Fuel Cells and Hydrogen Energy</td>
<td>2012.12</td>
<td>KAIST</td>
</tr>
<tr>
<td>Water Technology</td>
<td>2013.05</td>
<td>DTU</td>
</tr>
<tr>
<td>Advanced Battery Technologies</td>
<td>2013.09</td>
<td>DTU</td>
</tr>
<tr>
<td>Frontiers in Biosustainability</td>
<td>2013.10</td>
<td>KAIST</td>
</tr>
</tbody>
</table>
Research Activities

**Business Models from EEWS Research Outcomes**

1. EEWS Business Model Contest

   The EEWS Business Model Contest aims to encourage the commercialization of research in green fields and discover creative talent. KAIST faculty, alumni, graduate/undergraduate students, and EEWS researchers are eligible to apply.

   - **Contest Reports by Year & Business Start-up Status**

     **Year 2010**

     - Green Manufacturing of Micro-Patterns using Femtosecond Pulse Lasers
       [Platinum Prize, 2010]  
       KAIST Prof. Seung-Woo Kim (Business started by Prof. Kim)

     - Solid State Electrochemical CO₂ Sensor and Applications
       [Gold Prize, 2010]  
       Dr. Junwoong Kim, CIOS Co., Ltd. (Business started by Dr. Kim, a KAIST alumnus)

     - Development of Wireless Power Transfer in Consumer Electronics Applying Magnetic Field Optimization Technology
       [Silver Prize, 2010]  
       KAIST Prof. In-Soo Seo

     **Year 2011**

     - Eco-friendly Hydrogen Fuel Cell Business
       [Business Plan Platinum Prize, 2011]  
       KAIST Prof. Joongmyeon Bae (Business started by Prof. Bae)

     - NOx Sensing Technology for Clean Diesel Vehicle
       [Business Plan Gold Prize, 2011]  
       Dr. Jinsu Park, CIOS Co., Ltd. (Business started by Dr. Park, a KAIST alumnus)

     - Thermally Resistant High Refractive Index Hybrimer Resin for LED Encapsulant
       [Business Technology Platinum Prize, 2011]  
       KAIST Prof. Byeong-Soo Bae (Business started by Prof. Bae)

     - ITO-free Touch Screen for Smartphone
       [Business Technology Silver Prize, 2011]  
       KAIST Prof. Min-Yang Yang

     **Year 2012**

     - Global LNG Infrastructure for LNG-Fuelled Ship Propulsion
       [Business Plan Platinium Prize, 2012]  
       KAIST Prof. Daejun Chang (Business started)

     - Green Box Technology for On-site Bio-gas Production in Buildings and Urban Blocks
       [Business Plan Gold Prize, 2012]  
       KAIST Prof. Heekyung Park (Under the demonstration project)

     - Dissolved Hydrogen-measuring Instrument for Molten Al (AlproH®)
       [Business Technology Platinum Prize, 2012]  
       KAIST Prof. Chong-Ook Park (Business will be started)

     - An Advanced Redox Flow Battery for Energy Storage System
       [Business Technology Gold Prize, 2012]  
       KAIST Prof. Dai Gil Lee (Business started by a KAIST alumnus)

     **Year 2013**

     - Wireless Power Transfer System for Electric Train
       [Business Technology Gold Prize, 2013]  
       Dr. Gu Ho Jung (Wireless Power Transfer Technology Research Center, KAIST)
**HHI-KAIST EEWS Joint Research**

- HHI (Hyundai Heavy Industries) and KAIST EEWS Research Center established ‘HHI-KAIST EEWS Research Center’ for joint development on EEWS research and commercialization.

- HHI-KAIST EEWS Research Center conducts EEWS research projects of common interest between HHI and KAIST EEWS Research Center.

- 11 Projects are fully funded by HHI since 2013.

**KIER-KAIST Joint Research**

- KAIST and KIER (Korea Institute of Energy Research) signed a strategic alliance to encourage joint research projects of common interest.

- Typical Projects of Cooperation in 2014
  - Design of Magnetic Particles for Microalgae Harvesting
  - Development of High Performance Electrode for Lithium Ion Battery using Rice Husk Originated Silicon
  - Development of Supporting System Concept for Floating Ocean Wind Turbine

**Green Business Case Development**

Green business cases exploited by green technologies are developed to demonstrate business issues.

- Shihwa tidal power plant: World’s largest tidal plant
- Geothermal power generation: Nationally largest application in university campus
- Hanwha solar: Acquisition of Q-Cells
- Taebaek windfarm development: The first wind power plant developed through a consortium
- FEMS (Factory Energy Management system): Eco-friendly management system in manufacturing
- Heejung photovoltaic power generation in Busan: facilitated in parking lot and operated by individuals
- S-Energy’s photovoltaic power generation in US: Build-Operation-Transfer applied model
- Toray Advanced Materials’ water business: Total solution and new technology business of water
- World’s first DTD service: Distinguished recycling platform
- GS E&C’s greenhouse gas mitigation case
- LG’s refrigerator CDM business at India: Controlling carbon emission
Mass production of bio-butanol using DNA scaffold

On-line Electric Vehicle in the Seoul Grand Park

Advanced Optical and Electrical Performances in Polymer Solar Cells with Nanostructures

Unit-cell Design for 200W Stack and Actual Produced Anode Bipolar Plate for PEMFC

Hybrid System for Photovoltaic Power Generation and Heating

On-line Electric Vehicle using Wireless Power Transfer System

 KAIST EEWS Research Center

Seoul Campus