

### WIPO GREEN

#### A NOVEL SYSTEM FOR THE TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES

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##### Abstract

WIPO GREEN provides a database of Environmentally Sound Technologies (ESTs) and a global network of various types of stakeholders who have engaged in the technology development/transfer and thus aims to accelerate the expansion of ESTs to the world. WIPO GREEN was originally proposed by Japan Intellectual Property Association (JIPA) and, currently, is being developed by World Intellectual Property Organization (WIPO) and WIPO GREEN Partner organizations. Partners are from various geographical areas, including both of the developed and developing countries. JIPA is still a core member of WIPO GREEN and trying to make the system more efficient with the other Partners. Any organization that has some expertise in ESTs and/or technology transfer and agrees to WIPO GREEN Charter can join our project. We hope that more organizations will become WIPO GREEN Partners. Some examples of ESTs that have been registered to WIPO GREEN database from Japanese companies are also introduced.

patents relating to public issues, but rather on those for prospective potential for the collaboration of the Partner organizations towards the establishment of the effective system for the expansion of ESTs to the world.

Japan Intellectual Property Association (JIPA) has cooperated with WIPO Global Challenges Division from the very start of WIPO GREEN project as a core member and has participated in the construction of its basic concept and system architecture. We were very much honored that Mr. Francois Gurry, Director General of WIPO, kindly referred the contribution of JIPA to WIPO GREEN repeatedly at its official launch.

Through those official launch events, I came to be able to convince that WIPO GREEN will be a completely novel and promising solution for challenging the global climate change issues.

In this article, the background and the original concept of this project, the current status of WIPO GREEN and the issues and future prospect of WIPO GREEN will be described.

##### Introduction

WIPO GREEN is a novel mechanism for accelerating the transfer of Environmentally Sound Technologies (ESTs), which is being developed by World Intellectual Property Organization (WIPO) Global Challenges Division and Partners of WIPO GREEN.

WIPO GREEN was officially launched on 28th November last year after about two years of trial period. Currently, Partners of WIPO GREEN are 36 organizations and include various types of organizations, such as UN/international/national organizations, global mega-industries, SMEs and also private consulting companies. More impressively, those organizations were from various geographical areas of the world,

including the developed countries, emerging countries, developing and also least developed among developing countries.

On the WIPO GREEN launching day, in advance of the press release and the high level sessions, 41 persons that represent the Partners organizations joined at the conference room on the highest floor of the WIPO headquarter building and had dialogues on the future scope of WIPO GREEN together for several hours.

It seemed to be most important that the items discussed at this meeting were not on those of conventional IP issues, such as those relating to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) or the possible application of compulsory license to the

##### Background

###### Discussions on IP relating to ESTs

From 1990s, some of the developing countries had raised the opinion in that the Intellectual property rights owned by developing countries had been the barrier of the green technology transfer from developed countries to developing countries at the discussions in Conference of Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC). Further, some of the developing countries had proposed the compulsory license for green technologies shall be applied to use them by the developing countries. However, as noted by Doi (2010), these criticisms on the IP rights are not correct as considered from the following reasons:

- In most cases, patent applications have not been filed in developing countries; and
- In contrast, in some of the emerging countries such as China and India, a gross number of patents on green technologies are owned by the residents of those countries themselves.

As a protestation for such opinion, the establishment of systems for accelerating green technology transfer has been argued at the COP meeting in recent years and the establishment of “Climate Technology Center Network” was agreed. However, its detailed structure had not yet been determined until COP19 in Warsaw, Poland, November 2012.

WIPO GREEN has been proposed from the people who engaged in the Intellectual Property themselves and aims to be one of the solutions for such argument.

### Specific issues in the transfer of ESTs

In considering as the items for the technology transfer, ESTs have some specific futures.

In most cases, they are not the most advanced technology and need to change for fitting into the individual needs for each geographical area. In this sense, the key in the success of technology transfer of ESTs is the marketing for real needs and also the regulations by governmental organizations of the area. It is noted that the academic laboratories that studies real needs in the developing countries, such as D-Lab in Massachusetts Institute of Technology (MIT) and O-Lab in Singapore University of Technology and Design (SUTD), has been focused in recent years.

Secondly, most of the ESTs are not dependent only on patent rights. For the technology transfer, in addition to patent licensing, various other factors such as know-hows of operations, documentations, human resource trainings will be needed. Further, in some cases, there are no patents that belong to the technology. So, the packaging of those factors will be quite important and it will be ideal if the technology seeds are presented as a package of these factors.

### Previously existed mechanisms for the transfer of ESTs

Besides the individual projects for the transfer of ESTs performed by global companies and/or United Nations/International organizations, such as UNIDO, UNEP, there has been some established public mechanisms for transfer of ESTs. Some examples of various categories are given below:

- Eco Patent Commons, Environmental Law Institute — This provides the advanced ESTs of global companies with free-patent;
- Eco-Products Directory, APO — A large scale catalogue of eco-products that have been developed in Asia region presented by Asia Productivity Organization (APO);
- Technology Market, APCTT — This is not limited to environmental technology, but is an excellent database of technologies developed in Asia-Pacific region;
- AUTM Global Technology Portal — The website of Association for University Technology Managers (AUTM) in the United States and the latest US university technologies available for licensing worldwide can be found; and
- Innovators: A showcase of climate tech ideas, EACIN — This introduces the activities of innovators in East Africa

region by East Africa Climate Innovation Network (EACIN).

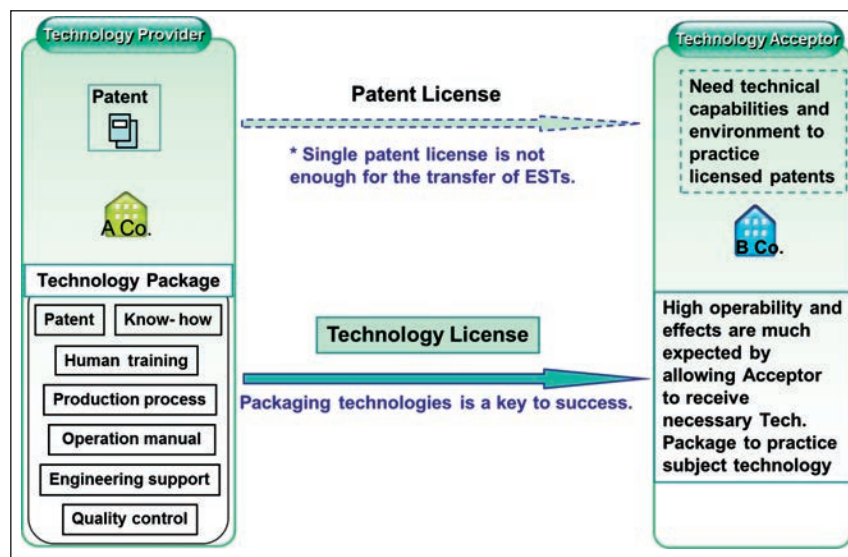
While those systems/databases have worked efficiently for each specified purpose, there has been scarcely the comprehensive mechanism for linking these activities and accelerating the transfer of ESTs between developed and developing countries.

### Original scope of the project in JIPA and WIPO

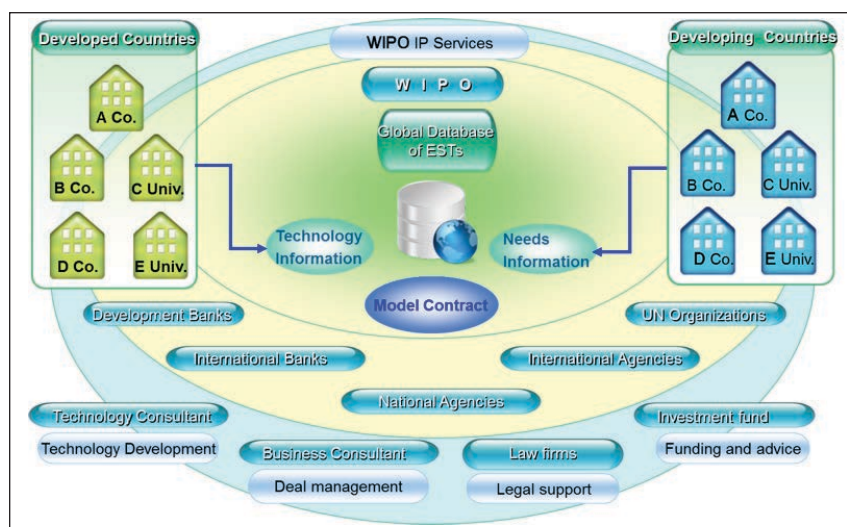
JIPA was established in 1938 and has a history of 75 years. It is a non-profit, non-governmental and largest IPR Industry Organization in the world. As of June 2013, number of Associate members is 324 and number of Regular members 916. JIPA aims at contributing to the business of its Members by endeavoring to make full utilization of intellectual property systems and to improve them. It also aims at contributing thereby to the sound progress of technology and development of Japanese industry.

Actually, WIPO GREEN project has originally started in JIPA as Green Technology Packaging Platform (GTPP) project more than five years ago.

The essence of the original idea of GTPP is depicted in Figure 1. When a technology provider grants a technology



**Figure 1: Essence of Green Technology Packaging Platform (GTPP)**



**Figure 2: Comprehensive image of WIPO GREEN**

acceptor a patent license for some technology without technical assistance, the technology acceptor would often have difficulty in implementing the technology. If the technology provider provides assistance in addition to a patent license, the technology could be implemented more easily. Such assistance would include the grant of a license for relevant know-how, the offer of consulting, guid-

ance, or other devices provided locally from the technology provider to the technology acceptor, the provision of parts and materials that are not easily available locally, and the provision of support for the establishment of infrastructure to promote diffusion of the technology. Consequently, the introduction and diffusion of ESTs would be promoted. Thus, the GTTP was unique in

that it enables to provide, to the extent agreeable by the technology provider, not only patent and technology licenses but also various resources needed by technology acceptors as “technology-package”, and thereby implements an unconventional platform to promote technology transfer.

In the former half of 2010, JIPA proposed its idea of GTTP to WIPO and, from that time, the cooperation between JIPA and WIPO started.

A comprehensive picture of the project at that time was drawn as depicted in Figure 2. At first a global database of the information of ESTs from developed countries and also that of technology needs from developing countries would be established in WIPO as the core of the project and then the network of the various participants would be developed. The participants would include the other IP services of WIPO, such as WIPO Academy, Arbitration and Mediation Center and so on, the other UN/International/National organizations, such as United Nations Environment Programme (UNEP), World Bank and so on, and further various skilled persons/organizations that have engaged in the transfer of ESTs, such as Technology/Business Consultants, Law Firms and so on.

The project was named as WIPO GREEN after the preexisted WIPO's global IP information databases, WIPO GOLD.

## Current status of WIPO GREEN

### Official launch

After about two years of its pilot stage, WIPO GREEN was officially launched on 28th November 2013 at WIPO Headquarters in Geneva, Switzerland. The photo of the main conference of the Official Launch is shown in Figure 3. Mr. Francis Gurry, Director General of WIPO, H.E. Ambassador Dilip Sinha, Ambassador and Permanent Representative of India to the UN offices and Mr. Takeshi Ueno, President of JIPA, took the rostrum. Video messages from Ms. Cristaina Figueres, Executive Secretary of UNFCCC, and Mr. Achim Steiner, Executive Director of UNEP, on their expectations toward WIPO GREEN as one of the solutions for the climate change were presented.



**Figure 3: At the WIPO GREEN official launch (from left to right) H.E. Ambassador Dilip Sinha, India, Mr. Francis Gurry, Director General, WIPO, and Mr. Takeshi Ueno, President, JIPA**



Also H.E. Ambassador Dilip Sinha gave his message that the innovations were essential in India and IP system would be one of the useful tools for achieving the innovations. At the end of the main conference, Mr. Takeshi Ueno addressed his message as “Japan is a leading innovator of green technologies, and WIPO GREEN provides a vital opportunity for Japanese companies to be at the forefront of global efforts to address climate change. JIPA is working to ensure its member companies can take advantage of WIPO GREEN to further their reach.”

At the same time with the official launch, WIPO GREEN website has also been renewed as shown in Figure 4.

### Principles

The principles of WIPO GREEN are presented in WIPO GREEN Charter as the following:

- Transparency in the marketplace leads to greater efficiency. WIPO GREEN, as a global repository of technologies, best practices and analyzes, contributes to a more open market;
- Partnerships are critical to achieving synergies and fostering the transfer of technologies, and, as appropriate, associated know-how. WIPO GREEN brings together the public and private sectors on a voluntary basis to facilitate collaborations and accelerate investments;
- A comprehensive understanding of needs is essential for effective deployment of green technology. WIPO GREEN offers a space for publicizing needs, allowing interested parties to respond to and offer solutions;
- IP rights are an important policy tool to encourage innovation. They provide economic incentives to develop new technology and help diffuse innovation, and structure relationships that underpin commercial transactions. WIPO GREEN encourages the exchange, sale and licensing of technologies and their associated rights; and
- The sustained deployment and uptake of technologies occurs when parties freely enter into a contract on mutually agreed terms. Agreements that

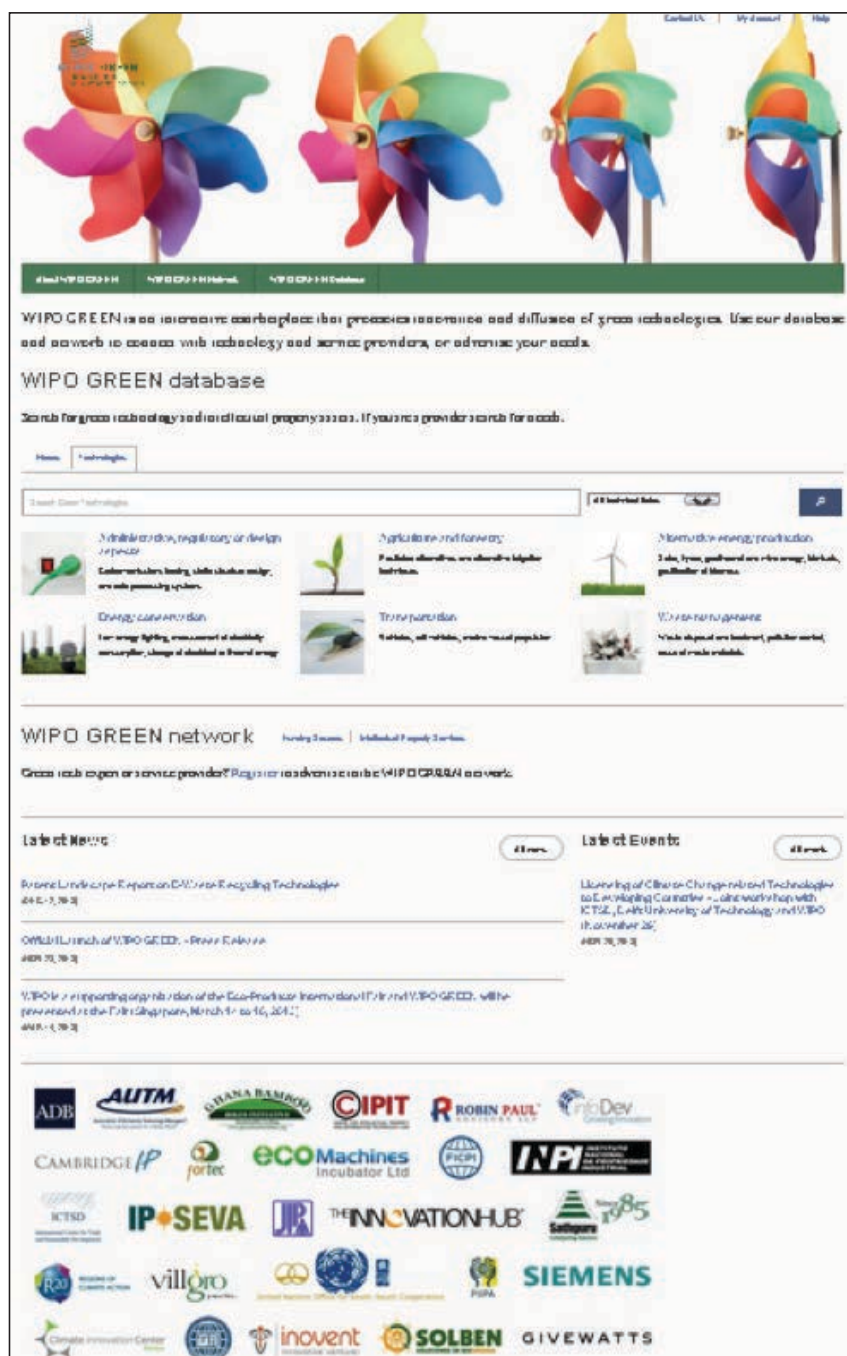


Figure 4: New website of WIPO GREEN

originate through the use of the WIPO GREEN are the responsibility of the contracting parties.

It should be noted that the technology transfer that will be achieved through WIPO GREEN, is not necessarily dependent on the IP rights owned by the technology providers. It is because, as previously mentioned, in many cases ESTs are not the

advanced technologies, so the IP rights are not so important, but other factors, such as the know-how of the operation and human training, are more important.

### System architecture

From the aspect of the system architecture, WIPO GREEN has two components, the WIPO GREEN Database and the WIPO GREEN Network.

WIPO GREEN Database is freely accessible with certain details of the users upon registration. It was originally designed to gather technology seeds from developed countries and needs from developing countries. In this context, technology seeds are not only the patent information, but a range of IP assets including inventions, technologies, know-how and services and a catalogue of expressed needs.

The technologies cover six fields as defined in the international patent classification (IPC) Green Inventory:

- Administrative, Regulatory or Design aspects;
- Agriculture and Forestry;
- Alternative Energy Production;

- Energy Conservation;
- Transportation; and
- Waste Management.

WIPO GREEN database started from 2011 and, during its pilot stage, it has already gained more than 1000 uploads of the ESTs.

On the other hand, WIPO GREEN Network serves as a global platform that connects users, fosters partnerships and provides a marketplace for green inventions, technologies, know-how and services. It includes:

- A roster of WIPO and third party services, including links to funding information and training and networking opportunities; and

- Case studies that illustrate technology transfer and collaboration projects.

### Members

As for its participants, WIPO GREEN Members include Partners, Users and the WIPO Secretariat. Partners are public or private institutions that support WIPO GREEN and/or provide advice, that facilitate transactions directly or indirectly, and that contribute their expertise, integrate WIPO GREEN in specific activities, or act as regional or national focal points. Partners agree in writing to WIPO GREEN Charter and specify their contributions to WIPO GREEN.

As of November 2013, 36 organizations had already signed as Partners of WIPO GREEN as listed in Table 1. They

**Table 1: List of WIPO GREEN partners (as of 28th November, 2013)**

<ul style="list-style-type: none"> <li>• Asian Development Bank (ADB), Philippines</li> <li>• Association of University Technology Managers (AUTM), United States of America</li> <li>• Bamboo Bikes Initiative, Ghana</li> <li>• Brazilian Forum of Innovation and Technology Transfer Managers (FORTEC), Brazil</li> <li>• Brazilian Institute of Industrial Property (INPI), Brazil</li> <li>• Cambridge IP, United Kingdom</li> <li>• East Africa Climate Innovation Network (EACIN), Kenya</li> <li>• Ecomachines Incubator, United Kingdom</li> <li>• GIVEWATTS, Switzerland</li> <li>• infoDev, Climate Technology Program (World Bank), United States of America</li> <li>• Innovation Insights, Switzerland</li> <li>• Inovent Innovative Ventures, Turkey</li> <li>• Intellectual Property for Sustainable Energy Ventures (IP*SEVA), Germany/Japan</li> <li>• International Centre for Trade and Sustainable Development (ICTSD), Switzerland</li> <li>• International Chamber of Commerce (ICC), France</li> <li>• International Federation of Intellectual Property Attorneys (FICPI), Switzerland</li> <li>• Japan Intellectual Property Association (JIPA), Japan</li> </ul>	<ul style="list-style-type: none"> <li>• Kenya Climate Innovation Centre (CIC), Kenya</li> <li>• Licensing Executives Society International (LESI), United States of America</li> <li>• Public Interest Intellectual Property Advisors (PIIPA), United States of America</li> <li>• R20 Regions of Climate Action, Switzerland</li> <li>• Robin Paul Advisory LLP, Malaysia</li> <li>• Sabanci University, Turkey</li> <li>• Sathguru Management Consultants, India</li> <li>• Siemens, Germany</li> <li>• SOLBEN, Mexico</li> <li>• South-South Global Assets and Technology Exchange (South-South GATE), China</li> <li>• Strathmore University, Kenya</li> <li>• The Innovation Hub, South Africa</li> <li>• United Nations Environment Programme (UNEP), Kenya; including the Climate Technology Centre &amp; Network (CTCN)</li> <li>• United Nations Global Compact (UNGC), United States of America</li> <li>• United Nations Office for South-South Cooperation (UNOSSC), United States of America</li> <li>• Villgro Innovations Foundation, India</li> <li>• World Business Council on Sustainable Development, (WBCSD), Switzerland</li> </ul>
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include various organizations, such as UN organizations, inter-governmental organizations, multinational companies, SMEs, academics and also technology/funding consultants.

On the other hand, Users of WIPO GREEN include public or private institutions that upload technologies or identify needs and/or provide services. Users may also be Partners.

Upon registration and acceptance of the WIPO GREEN Terms and Conditions, Users may upload technologies and/or outline needs in the database of WIPO GREEN and/or list their services on the roster of the WIPO GREEN Network. Partners can be also Users and Users may also be Partners.

There will be possibilities for WIPO GREEN Members to use various supporting services and documents relating to IP rights offered from WIPO, such as IP Training, Series of case studies, Support from WIPO Arbitration and Mediation Center, Model clauses for different types of agreements, Materials on negotiating agreements, and so on and so forth.

### Contributions from JIPA to WIPO GREEN

As noted in the former part, all of the partners need to clarify their contributions to WIPO GREEN. JIPA has assigned its contributions to WIPO GREEN as follows:

- To promote participation of Japanese companies who have green technologies;
- To support propagating the green technologies to countries and industries who need them; and
- To engage in advisory board to further develop and shape the platform.

In accordance with this statement, JIPA WIPO GREEN project in JIPA has already performed various activities as follows.

Members of GTPP project have introduced WIPO GREEN intensively to Japanese companies, universities, public institutions and governments. Consequently, the registrations of ESTs have come from the following JIPA member companies:

- Honda Motor Co. Ltd.;
- Hitachi Ltd.;
- Fujitsu Ltd.;
- Teijin Ltd.;
- JGC Corporation;
- Panasonic Corporation; and
- Sony Corporation.

And also the following Japanese companies or organizations have been already registered:

- Waseda Environmental Institute;
- Rural Environment Research Association;
- Quantum Design Japan, Inc.; and
- Seabell International Co. Ltd.

Some examples of ESTs registered from Japanese Companies to WIPO GREEN database are introduced as Appendix of this article.

As for the networking activity, I myself participated in the WIPO Regional Forum in Colombo, Sri Lanka, in 2012, and WIPO Green Workshop in Nairobi, Kenya last year, and introduced WIPO GREEN and the technology seeds registered from Japanese companies to WIPO GREEN database. I also have contacted with major US universities to ask them to join WIPO GREEN and consequently, the registrations of several technology seeds from MIT TLO and Stanford University TLO have been done. Further, I and the other JIPA members made a promotion in The International Eco-Products Fair 2013 in Singapore and presented a lecture in AUTM Asia2013 meeting held in Kyoto.

Interestingly, as a result of these promotions, some inquiries on the registered technology seeds have been sent to us from various countries globally.

### Current issues and the future scope of WIPO GREEN

As previously mentioned, WIPO GREEN has been successfully launched late 2012, but it was just the beginning and there are a lot of things to be considered

toward the effective mechanism for the transfer of ESTs. Among those issues, the following three points seemed to be most important:

- How can we know real needs in developing countries?
- How can we connect various types of members to realize the transfer of ESTs?
- How can we reach the state in that both of the people in developing countries and that of developed countries can share the value and benefit from IP system?

### How can we know real needs in developing countries?

Pilot version of WIPO GREEN database has been opened from October 2011. In spite of that more than two years have passed and until now about 1,000 technology seeds have been registered to WIPO GREEN database, and there are only a few registration of needs information from developing countries. There are already various types of technology databases existing but almost no database of the needs information in developing countries. Needs are quite specific to each geographical area, easily changing with time and government regulations.

To solve this issue, we must consider on not only the increase of the registration of the technology needs, but also the construction of the human network and the systems that enable concurrent exchange of opinions of the skilled persons who are actively working in the developing areas, such as engineers, technology consultants, funding advisors and so on. It should be noted that the technology seeds information that has been developed in the developing countries are also the technology needs information. The case studies of "Reverse Innovation" and the activities of academics, such as D-Lab in MIT and O-Lab of SUTD, as previously mentioned, can be useful examples of this concept.

### How can we connect various types of members to realize the transfer of ESTs?

Practical utility of the system that depends too much on the website and/or database is very low, and so an architecture that compensates such a digital system is required. The active value chain of technology transfer that include not only technology providers and acceptors, but also mediators, such as consultants for technology transfer, funding and other supporting services, for establishing the real business should be constructed.

Also, organizations of various types, such as public sector, private sector and nonprofit sector must work together. I suppose that the concept of "Social Marketing" should be applied. Kotler and Lee (2009) noted that the principles for successful partnerships between those various sectors for "Social Marketing" as the following:

- Agreement on common goals;
- Clear roles and responsibilities;
- Mutual respect and appreciation;
- Negotiation and compromise;
- Open communication; and
- System for accountability.

I believe that the Partners of WIPO GREEN must have known these principles and we will be able to establish the successful collaboration.

### How to share the value and benefit from IPR systems between developing and developed countries?

As mentioned at the earlier part of this article, there has been a conflict between developing countries and developed countries as for the role of IPR for the public issues, including that of ESTs.

I would like to emphasize that, currently, we should change our focus from such arguments to the establishment of the effective mechanism for the transfer of ESTs. However, I also believe that the final

goal of WIPO GREEN is to share the value and the benefit of IP system between people of both the developed countries and the developing countries.

As described, a lot of services relating to IP can be provided from WIPO and these will support the WIPO GREEN Users from developing countries to know well and utilize the IPR system in their businesses. Govindarajan (2012) described that, from the aspect of "Reverse Innovation", in order to succeed in emerging markets, people must build new products and services starting from scratch and the innovation in developing countries can transform global markets. It implied that IPR system will be beneficial not only for the industries in developed countries, but also for the innovators in developing countries.

Also, there may be the points that the IPR system itself should be modified. Kaskus (2012) suggested, as the factors that should be considered for the expansion of ESTs, in addition to the access mechanism and global cooperation, the modifying patenting conditions, such as the differentiation of patent terms.

I strongly hope that we, Partners of WIPO GREEN, will be able to have fruitful dialogues together from these aspects in the future.

Further, as described in the former part, any organization that has some expertise in ESTs and/or technology transfer and agrees to WIPO GREEN Charter can join our project. We hope that more organizations will become WIPO GREEN Partners.

### Acknowledgements

The contribution of JIPA to WIPO GREEN described in this article has been owed much to the following persons:

The previous GTPP project leaders in JIPA, Mr. Naoto Kuji and Mr. Yuichiro Kawamura, previous Secretary Generals of JIPA, Mr. Takashi Nakayama and Mr. Hideo Doi, and other project members. Especially, Mr. Kuji was the originator of this project

and, currently, he still supports our project as Executive Managing Director of JIPA with Secretary General, Mr. Nobuhiko Nishilo.

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## APPENDIX — Environmentally Sound Technologies (ESTs) from Japanese companies in WIPO GREEN database

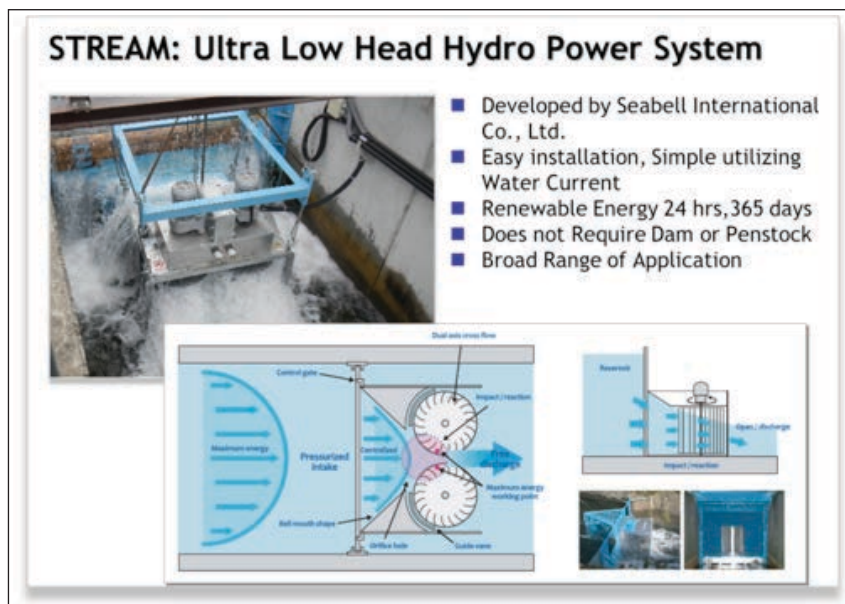
Examples of ESTs that have been registered by Japanese Industry for the following four categories are shown below:

- Alternative Energy Production;
- Energy Conservation;
- Transportation; and
- Waste Management.

### Alternative energy production

#### STREAM: Ultra low head hydro power system (registered by Seabell International)

SEABELL'S STREAM is a micro-hydropower generating system that can generate electricity in ultra-low head with on/off-the-grid source. The pondage created by the controlling sluice gate prior to the inlet regulates the potential energy thereby controlling the kinetic energy that eventually passes through the runner chamber. Its patented vertical dual axis runner structure and bell mouth-shaped inlet leading to the orifice optimizes input energy at the center maximizing the intake. Simple and compact design enables relatively quick and easy installation utilizing the existing infrastructure without altering the surroundings. Unlike conventional small hydro power schemes/power channel/power house and penstock delivery are not necessary eliminating vast amount of civil work from the project. Its output range — currently 0.5 kW–44 kW range — has been tested to ensure stable power output in various terrains and conditions. Due to compact and ease in installation the system is especially suited for decentralized power generation. Characteristic also concludes to ease in routine maintenance and relatively low off-time operation. Common installations are in agricultural irrigation canals as well as waterways with regulated water discharge such as those in water treatment plants or power plants. It has been identified as a viable solution to rural electrification where grid is not readily available. It will initially act as a quick fix to such regions. Due to its dual on/off grid features once the grid



is in place it can act as permanent source of electricity generation whilst retaining its independence and possibly local ownership. STREAM can reduce CO<sub>2</sub> with clean reproduction energy generated by hydraulic power. The generated electricity by STREAM will assist people living in non/weakly electrified areas to process foods such as fruits and to produce farm products or to produce distinctive crafts and to develop the industry furthermore it will increase the employment. Under the lights people can receive medical treatment as well. People can eat the fresh fish or keep flowers fresh with power supply to the cold storage. For the electrified area STREAM can be used for the IPP business model also as power supply at the time of disasters. STREAM is a registered trademark of Micro Hydro Turbine System of Seabell International Co. Ltd.

#### High throughput and high efficiency extraction column (registered by JGC Corporation)

JGC's extraction column called WINTRAY displays the features of high performance and low cost and is applicable to all liquid — liquid extraction systems such as organic compounds extraction. The requirements for extraction columns are: (1) High throughput, (2) High efficiency, and (3) Resistance to fouling. These qualities can be attained by newly installed columns, or by replacing existing trays or packing in existing columns

with the WINTRAY system. This new type of extraction column is characterized by its unique structure, created by installing two different types of trays alternately, each with a vertical plate having one or two openings (WINDOWS), resembling windows. In the new type of column, a dispersing liquid (heavy liquid) accumulated on the trays forms into dispersion droplets while flowing out each opening in the form of a liquid column. These dispersion droplets are larger than those formed in conventional extraction columns, and the volume of space available for the process of transition from the dispersion to the coalescence of the liquid droplets is smaller than that available in conventional extraction columns. This increases the frequency of dispersion and coalescence of liquid droplets in the extraction section. Consequently, this new type of extraction column can satisfy the above-mentioned three requirements at the same time, and in particular, its throughput can be set at a rate two to five times higher than that of perforated tray towers or agitated type extraction columns, both of which are typical forms of extraction columns presently in use.

### Energy conservation

#### BESCON — energy savings at low cost (registered by Quantum Design, Japan)

BESCON® improves the performance of air-conditioner and promises longer life.



## WINTRAY: High-Throughput and High-Efficiency Extraction Columnstem

■ Developed by JGC Corporation

### High Extraction Performance applicable to Dirty Service

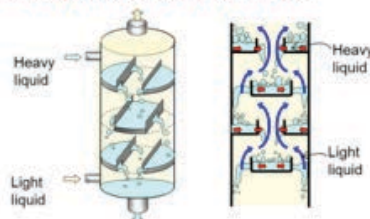
#### Features

- WINTRAY® consists of **trays** and **weirs with windows**.
- For revamping:  
Throughput ups two to five times greater than from conventional column.
- For new installation:  
Tower diameter reduced to 1/2 to 1/3 of conventional column.

#### Application

##### General liquid-liquid extraction operations

- Aromatics extraction
- Chemicals extraction
- Process performance intensification



#### Reference

Licensed to projects of

- Aromatics: 2 units
- Chemicals: 10 units

Boost up ability of air-conditioner and save power consumption: easy installation, reduction of electricity bill and CO<sub>2</sub>, best solution to an irregular stop caused by high pressure. With our accumulated knowledge, the stable energy conservation has been realized. The existing air-cooled conditioner capability is improved, and energy saving and a longer operating life are realized.

1. Two-stage condensing system made by adding BESCON® as a second con-

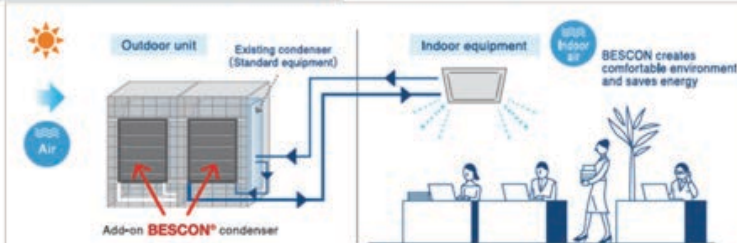
denser, promotes condensation of refrigerant gas. 5 to 10 percent reduction of power consumption is confirmed.

2. By replacing Refrigerant R-22 to HFC134a, additional substantial reduction of power consumption is achieved. 15 to 25 percent reduction.
3. Prevents high-pressure cut-out due to a high outdoor temperature.
4. The energy-saving effect is demonstrated in air-conditioning of summer and heating of winter.

## BESCON®, great energy saving at low cost



- Registered by Quantum Design Japan (originally developed by TEIJIN Engineering Ltd.).
- An average of 20% reduction in overall power usage.
- We introduced the expert of tech transfer in China to QDJ and is currently arranging their collaboration.



## Transportation

### ULV, ultra lightweight vehicle, ultra lightweight small mobility (registered by Waseda Environmental Institute)

The expectation for the next generation mobility is growing in the measure about low carbonation and the smart community of a transportation section. The super lightweight small mobility ULV which made it the concept 'to be under an automobile more than a bicycle' is developed. The number is acquired by category of mini car and a street-legal is possible. Although the development as EV is made to enhance from social requirements now, the designed concept of assumed Multi-PM (Prime Mover) which made compressed air, gasoline, hydrogen, etc. the energy source is introduced. Moreover, the point is soliciting the 'local production for local use type' business model which co-operated with the small and medium-sized enterprises are also the feature.

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## Waste management

### MSABP; Multi-stage activated biological process wastewater treatment system (registered by TEIJIN LTD.)

MSABP is a registered trademark of Aquarius Technologies Inc.

MSABP is a water purification technology based on a revolutionary biological treatment process in which a special biological carrier provides immobilization of microorganisms in a multi-stage aeration tank. Principles of treatment are as follows:

1. The effect of multi-stage changes the biota in each tank in an orderly manner, thereby forming a food chain;
2. The biological carrier provides an environment in which microorganisms remain active and are able to treat highly concentrated effluent and hard

to decompose effluent. MSABP can be used for the following applications:

- (a) Sewage treatment;
- (b) Treatment of chemical effluent with high COD content in chemical plants, pharmaceutical plants, cosmetics plants, etc.;
- (c) Treatment of hard to decompose effluent such as antiseptics and insecticides; and
- (d) Reduction in excess sludge from easy to decompose effluent such as effluent from food manufacturing plants.

Teijin's goal is to develop wastewater treatment solutions for a variety of global applications, including through incorporation of advanced processing technologies such as MSABP and multi-stage ozone treatment system with hydrogen peroxide. It is hoped that these solutions will contribute to wastewater reuse, energy conservation and reduced emissions of CO<sub>2</sub>. The MSABP system has already been used in facilities that need advanced wastewater treatment, including chemical, dyeing and food manufacturing plants in Indonesia and China. Teijin has also participated in a field test of MSABP in the Yixing area of Jiangsu Province, China, where it will be used to provide sewage infrastructure to the local farming community.

**ECO CIRCLE™: Approach for environmental impact reduction by Teijin's polyester technologies (registered by TEIJIN LTD.)**

ECO CIRCLE™ is a circulating-type recycling system for polyester products. ECO CIRCLE™ recreates new fiber from used fiber and other products without degrading the quality. This makes it possible to reduce the amount of garbage, oil consumption, and greatly reduces CO<sub>2</sub> emission and energy consumption. The Meaning of 'recycling' is changing. Imagine if all of the PET bottles were melted down and recycled into new ones. We will realize that they were once thrown away. Expecting a recycled product to be different in quality and have variations has become second nature to us. After textile products are collected, they are broken down and processed to create new polyester fiber with no compromises in quality or variations. You will also participate in perpetual recycling.

### ULV, Ultra Lightweight Vehicle



- Developed by Waseda Environmental Institute.
- Effectively utilized in the suffered area of the huge earthquake in east Japan



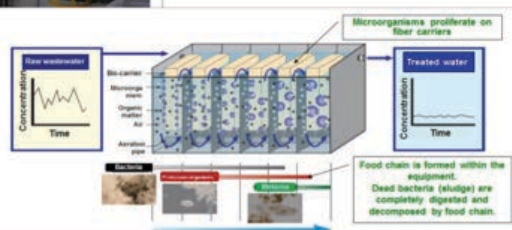
### MSABP™

#### - Multi-Stage Activated Biological Process Wastewater Treatment System



MSABP™ is a registered trademark of Aquarius Technologies Inc. (US)

- Developed by TEIJIN in Japan and China.
- Based on a revolutionary process in which a biological carrier provides immobilization of microorganisms in a multi-stage aeration tank.
- Sludge-less, so greatly reduced sludge disposal cost.



### ECO CIRCLE™



- Established by TEIJIN in early 2000's first in the world.
- Circulating type recycling system for polyester products.
- Currently developed in China through one of partnerships between the China Chemical Fibers Association (CCFA) and TEIJIN.

#### Highly Advanced Chemical Recycling Process

