It happened 3 years ago

Looking for Sustainable Energy
&
Starting for Algae Biomass
Japan Algae Industry Incubation Consortium

• Established in June, 2010

• JAIIC Objectives

  AIIC contribute to the actualization of low-carbon society, which the Japanese government is promoting, by sharing information and improving technology about algae and encouraging growth and mutual development of various algae industries.
JAIIC Mission

- Objective of the Consortium is the early establishment of algae industry by researching on industrial utilization of algae and related technological development subjects, collecting, providing, and exchanging domestic and foreign study and information regarding algae and activities including technological development with the participation of member enterprises.
JAIIC Members (over 100 members)

TOYOTA CENTRAL R&D LABS., INC.

DENSO Japan

MAZDA

HITACHI

Canon
Great East Japan Earthquake

- Accrual Date / March 11\textsuperscript{th}, 2011 (2:46 P.M.)
- Epicenter / 70 Km east of Sendai City, Seabed of Pacific Ocean
- Earthquake Size / 9.0 Moment Magnitudes

** The biggest earthquake based on weather observation history in Japan
Actual Damage

- Death 15,887
- Missing 2,615
- Injured 6,150

(The biggest cause of death is Tsunami)

Total damage of amounts / 25 trillion yen
Fukushima Nuclear Plant

- Fukushima Power Plant got damage by Tsunami and all 6 reactors stopped without cooling water.

The height of the tsunami that struck the station approximately 30 minutes after the earthquake. A: Power station buildings B: peak height of tsunami C: Ground level of site D: average sea level E: Sea Wall to block waves.
• Total Reactor number 54 but all shut down

• Total Output Kw 488.5 M Kw as of 2010
Government Energy Policy

• Nuclear power was basic energy of Japan before Earthquake.

1. Underlying vulnerability of the energy supply system by relying heavily on the resources of overseas
2. Changes in energy demand structure medium-to long-term population decline, due to technological innovation, etc.
3. Destabilization of resource prices due to the energy demand of the emerging countries
4. Increase of greenhouse gas emissions in the world
Public Sentiment, especially people in Fukushima

Over 60% of people in Japan say NO to Nuclear Power.

People are looking for Sustainable, Renewable energy resources.
Thermal Power Plant

Map of Thermal Power Plant in Japan

Production of electricity from Thermal Power Plant
Over 80% are fossil fuel
Increasing Import Energy Cost

• The proportion of Nuclear and Thermal power in the total power generation capacity

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Power Generation (100 million kWh)</td>
<td>9,550</td>
<td>9,408</td>
</tr>
<tr>
<td>Thermal Power</td>
<td>78.9 %</td>
<td>88.3 %</td>
</tr>
<tr>
<td>Nuclear Power</td>
<td>10.7 %</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

• LNG is main raw material (billion US$)
  
2011 / 2,070  2012 / 4,511 (over 200% increase)

Japan has slipped into trade deficit country
Restoration of disaster areas by government

• Financial Resources
  ① add Corporate Tax (3 years from 2012.04.01) 10%
  ② add Personal Income Tax (25 years from 2013.01.01) 2.1%
  ③ add Residence Tax (10 years from 2014.01.01) 1,000 Yen

  The forecast of total will be 11 trillion yen (US$ 10,720 Billion)

• Total amount corrected by the end of 2012 & 2013
  2012 / US$5,300 Million
  2013 / US$10,720 Billion
Approach to renewable energy of Japanese government

• Before big disaster, Japan was low carbon country compared to GNP and doesn’t believe to introduce renewable energy for the time being. Solar & Wind generations had priority.

• After disaster, people’s concern is Sustainable & Renewable
Agency for Natural Resources and Energy (ANRE)

• ANRE is a government agency under the jurisdiction of (nuclear, solar, wind, smart community, etc.) policy energy conservation and new energy and stable supply of energy policy.

• ANRE and Fukushima Pref. Would like to bring new concept of industry into Tsunami affected area because farmers lose their jobs.
The Key Concept for Fukushima Algae Project

• Utilize Abandoned Farmland by Tsunami

• Use Fukushima Local Strain

• Explore any opportunities not only FUEL but other products in order to help farmers lose jobs.

• Make new future industry in Fukushima
Overview of Fukushima Project

• Total Amount of Government grant
  US$ 11,000,000 (2013/1MM, 2014/5.0 MM, 2015/5.0 MM)

• Term
  April 1st, 2013 to March 31st, 2015 (3 Years)

• Purpose
  Same as Key Concept
The land government prepared

Fukushima local government prepared 4 locations from 1.5ha to 2.3 ha in Minami Soma County
Land Selection

侯補地1（11,000㎡）
侯補地2（12,000㎡）
侯補地3（20,000㎡）
候補地4（23,000㎡）
How to determine Algae Strain

• Government Requirement
  1. Use local strain in Fukushima
  2. High growth rate
  3. If possible, one strain for year around
  4. Not only for energy but high value rapid in it
Field Research of local strain

2013 Research & early 2014

First : 2013.09.09
3 construction candidate sites

Second : 2013.11.05 to 06
South Soma City & Minami Soma city
14 reservoirs

Third : 2013.12.18
Minami Soma City
9 reservoirs

Fourth : 2014.02.28
Demo Facility site

Total 29 points & 72 samples
The way of correcting samples

Plankton net, water sampling, mud sampling and so on.
We also checked and monitored Cesium Concentration, just in case.

September 2013

Demo facility
Cs137: 18−689Bq/Kg

Other near place
Cs137: 5.4-165Bq/Kg

Measured by Tsukuba University

A: Demo facility site
B:
C:
D:
E:
F:
Some major algae strains collected Minami Souma City (Nov. to Dec.)

a. *Botryococcus braunii*

b. *B. braunii*

c. *Euglena sp.*

d. *Staurastrum dorsidentiferum*

e. *Trachelomonas volvocina*

f. *Dinobryon divergens*

g. *Mallomonas caudata*

h. *Botridiopsis sp.*
Established cultures

Almost 400 cultures done in 2013

陸水域から淡水産・汽水産，海産微細藻類を分離
広義の緑色藻類，ユーグレナ藻，珪藻，金色藻，シヌラ藻，クリプト藻，渦鞭毛藻などの培養株を確立
The part of cultures established in this project

Selecting high growth strains

✓ Check strains show good growth that can be a candidate
✓ Some strains died by feeding carbon dioxide and agitation
Determined the cultivation method

- Adopted an open pond system for cultivation, which is a type of photosynthesis most of the algae species that have been collected in the demo facility.

- Consider the installation of a cover over the pond at the thought of winter climate at demonstration facility.

- Consider also temperature control equipment in the culture tank.

- LED light also consider in the winter time for daylight hours is less.
Demonstration Facility

- Demonstration pond: 3 X 1,000 m² open pond
- In order to separate the algae in the season, providing the Cultivation Area
  - 3.5 m² X 6
  - 20 m² X 4
  - 100 m² X 3
- Covered Seeds Pond X 2
- Planning to use Hydroliquification method as extraction process
- As fuel suppliers, negotiating with Tohoku Electric Power
Blue Print
Time Schedule

1. **Cultivation Area**
   Seeds Room : 2014.10
   Seeds Ponds : 2014.11

2. **Ponds Area**
   Small Ponds : 2014.10
   Medium Ponds : 2014.12
   Demo Ponds : 2015.04

3. **Harvest Area**
   Dewatering, Centrifuge : 2015.07
   Dryer : 2015.07
   Extraction : 2015.07

4. **Warehouse** (Raw Materials, Products)

5. Operation Start : **2015.10**
Thank you for your attention and ...