Introduction of NF-Deepstar Joint R&D program

Deep Star連携R&D事業の紹介、今後の計画

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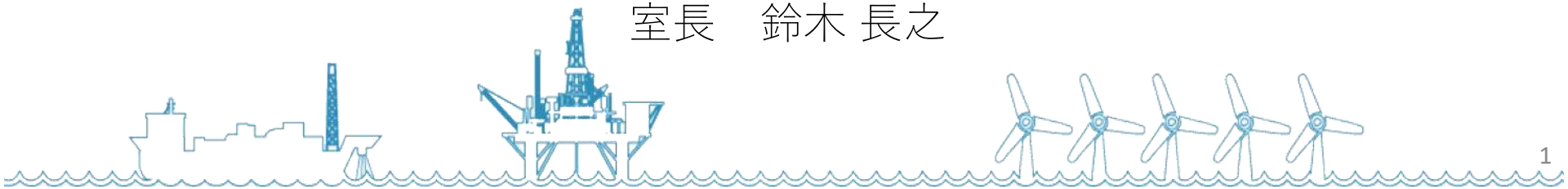
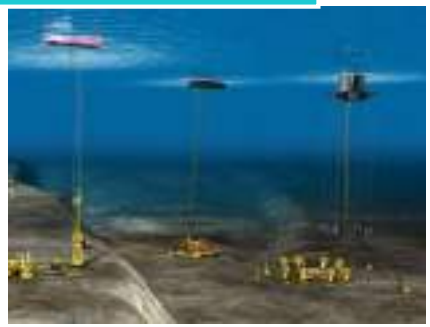


Background of Ocean Innovation Project

Offshore Energy Resources



Offshore Oil & Gas

Offshore Renewable Energy

Unconventional Resources

Capacity building of Japanese offshore engineers is indispensable to deal with the future market from mid- and long-term perspective .

The Nippon Foundation

May 2014 **Policy recommendation on HR in the offshore sector**

- Encourage students to be interested in Offshore sectors
- Establish curriculum based on industries' needs
- Give students chances to learn offshore engineering in actual fields

Japanese Government

July 2015 Speech by Prime Minister Shinzo Abe
(Grand Opening Ceremony for Special Events in Commemoration of the 20th Marine Day)

" In order to push forward **with cultivating engineers to develop marine resources** as an "all Japan" effort, we will institute .. **a consortium** made by government, industry, and academia."

Structure of Ocean Innovation Project

Human Resource (HR) Development

To nurture HR for next generation Ocean development

The Nippon Foundation
Ocean Innovation Consortium

Technological Innovation

To develop new technologies that will drive the future offshore Industry

Contribute to the development of Offshore industries around the world

Initiatives for HR development

Summer school / Internship

For university students

Orientation

For university students

Field Experience

For university students

Seminar

For young engineers

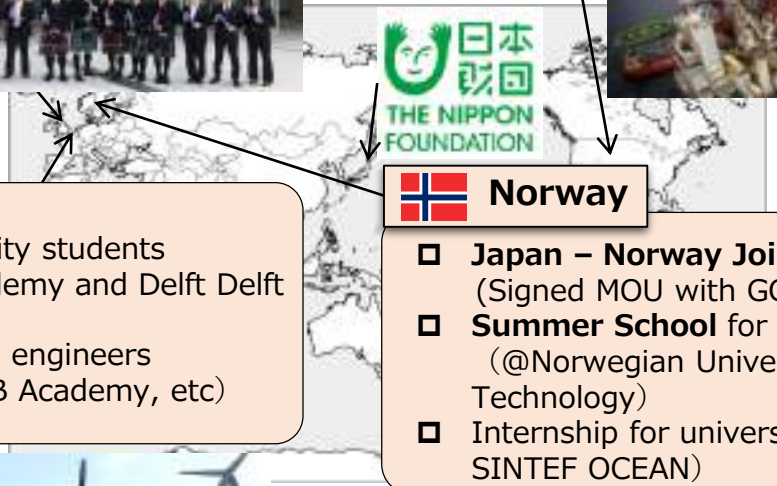
Overseas Cooperation

UK

- **Japan – Scotland Joint R&D Program**
  (Signed MOU with Scottish Enterprise)
- **Summer School** for university students
  (@Robert Gordon Univ.)
- Recurrent seminar for young engineers
  (Inviting lecturers from SeaRoc, etc)

US

- **NF- DeepStar Joint R&D Program**
  (Signed MOU with DeepStar)
- **Summer School** for university students
  (@Texas A&M Univ.)
- Recurrent seminar for young engineers
  (Inviting lecturers from ABS etc.)



Netherland

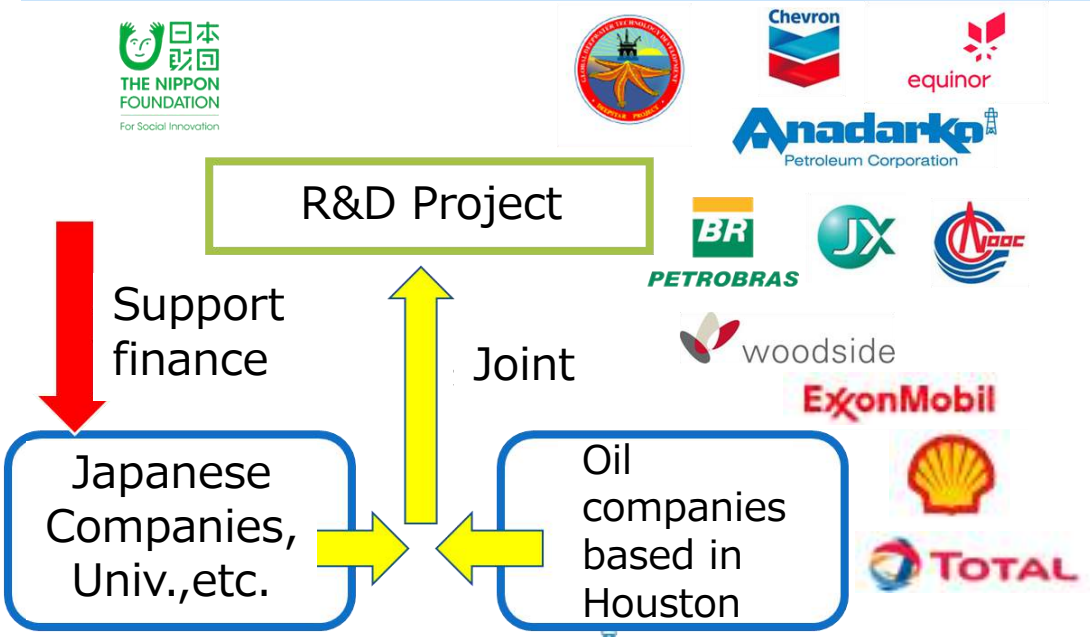
- **Summer School** for university students
  (Signed MOU with DOB Academy and Delft Delft University of Technology)
- Recurrent seminar for young engineers
  (Inviting lecturers from DOB Academy, etc)

Norway

- **Japan – Norway Joint R&D Program**
  (Signed MOU with GCE NODE and NORCE)
- **Summer School** for university students
  (@Norwegian University of Science and Technology)
- Internship for university students (@Equinor、SINTEF OCEAN)

NF- DeepStar Joint R&D Program

- **Signed MOU** for R&D between NF and DeepStar (May 1st, 2018)
- Conduct R&D in cooperation between Japanese companies and world oil companies (Super majors, etc.)
  - Budget : 10 million US$
  - Term : 2018～2022 (5Years)



MOU Signing (May 1st, 2018) in Houston

Terms & Conditions of NF- DeepStar Join R&D Program

2019.6 | 2020.6 | 2021.6 | 2022.5 | 2023.4

1st Call (2018)

1st Phase

No. of project:10

Funding (US$1.6 million in Total):
・≦US$200K/project (max support rate: 80% of total cost (including management fee))

Condition for funding:
・R&D should be supervised by DeepStar core member(s)

2nd Phase

No. of projects:4

Funding (US$3.4 million in Total):
・≦≒US$1milion/project (max Support rate: 80% of total cost by Japanese company(JC))

Condition for funding:
・JC should participate in the NF Ocean Innovation consortium
・R&D should be jointly conducted by DeepStar core members with their financial burdens

2nd Call (2019)

1st Phase

No. of project:6

Funding (US$1.5 million in Total):
・≦US$200K/project (max support rate: 80% of total cost (including management fee))

Condition for funding:
・JC should participate in the NF Ocean Innovation consortium
・R&D should be supervised by DeepStar core member(s)

2nd Phase

No. of projects:≦5

Funding (US$3.5 million in Total):
・≦US$1milion/project (max Support rate: 80% of total cost by Japanese company(JC))

Condition for funding:
・JC should participate in the NF Ocean Innovation consortium
・R&D should be jointly conducted by DeepStar core members with their financial burdens

NF – DeepStar Joint R&D Program

1st call 2nd phase projects (2019~)

- **Subsea Omni Directional Optical Wi-Fi System**

SHIMADZU Excellence in Science

Shell

Chevron

TOTAL

- **Acid Gas Removal (AGR) and Re-injection Project**

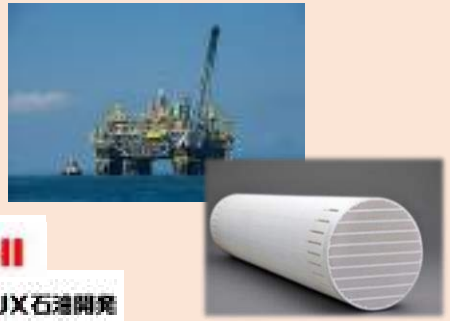
JGC

Chevron

PETROBRAS

Shell

JX石油開発

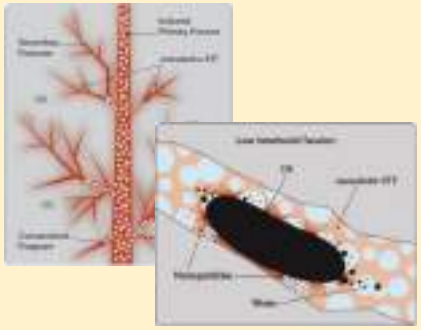


- **nanoActive Enhanced Flowback Technology (EFT) for Offshore Application**

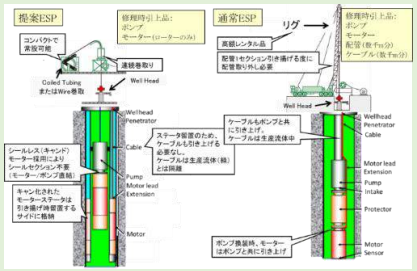
Nissan Chemical CORPORATION

Woodside

Chevron



- **ESP with Magnetic Drive System (MDS) for Deep Water**



Shell

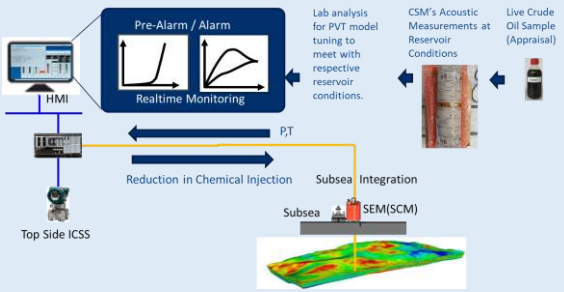
equinor

Chevron

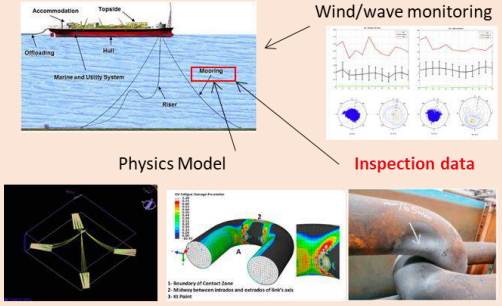
MITSUBISHI HEAVY INDUSTRIES

NF – DeepStar Joint R&D Program
2nd call projects (2020~)

- **Prevention and Remediation of Asphaltene Deposition and Hydrate Formation at Field Conditions - Assessment and Modeling**

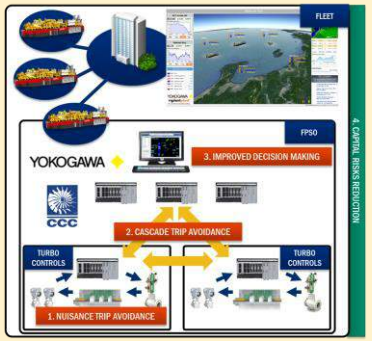


- **Standardization of Inspection to Enable Digital Twin**



洋上生産設備向けデジタルツインによる設備管理

- **Reducing operational and capital risks through unified FPSO process & turbomachinery automation solution development**



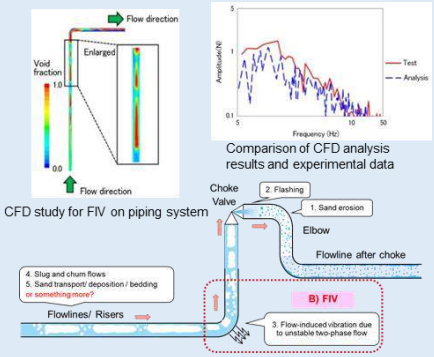
NF – DeepStar Joint R&D Program
2nd call projects (2020~)

- **Flow-Induced Vibration Predicting Method Study for Subsea Flowlines/Risers**

MITSUBISHI HEAVY INDUSTRIES

Chevron

TOTAL

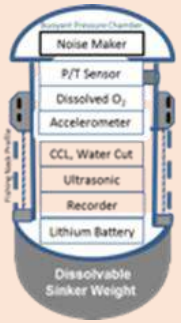


- **Establishment of cost effective monitoring method for HPHT reservoir and downhole by using P-T sensor equipped flowable ball**

長野計器

Chevron

Shell

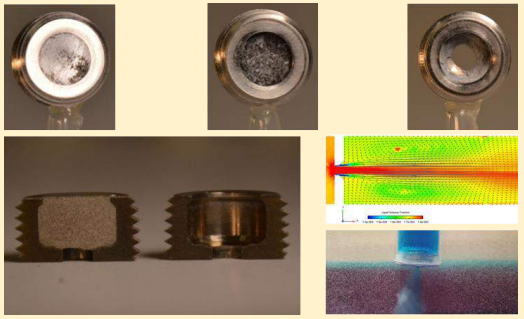


- **Smart Dissolvable Plugged Nozzle Assemblies (DPNAs) to be Installed on Limited Entry Liners with Tracer Release Capability for Extended Reach Deviated Wells**

DAIDO STEEL

Shell

Chevron



Next Step…?

DeepStar- NF new pillar

The current pillar of the DeepStar scope

- Subsea Systems Engineering
- Flow Assurance
- Floating Systems & METOcean
- Drilling, Completions & Interventions

DeepStar- NF new pillar

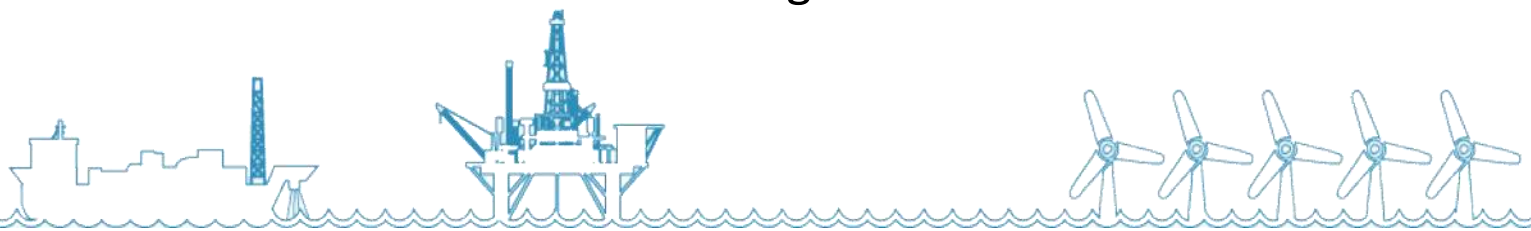
- Eco amicable innovation technology

i.e. de-carbonization, renewable energy, green house gas reduction, marine pollution prevention, and etc.

Bringing new eco amicable technology and support the dynamic change of the deepwater E&P through DeepStar – The Nippon Foundation Framework

Themes for next Program

1. Geothermal generation by using high temperature in preserver (renewable energy)
2. Wind power/Ocean current power generation to supply offshore oil & gas production facilities (renewable)
3. Cost reduction technology for flammable gas removal and re injection at production facilities (global warming)
4. Establishment of oil spill drift forecast simulation method by using local ocean current monitoring by aerial drone (marine environment)
5. Hydrogen related technologies
6. Safety related techs including NUF (normally unattended facilities) and robotics
7. Water treatment related technologies

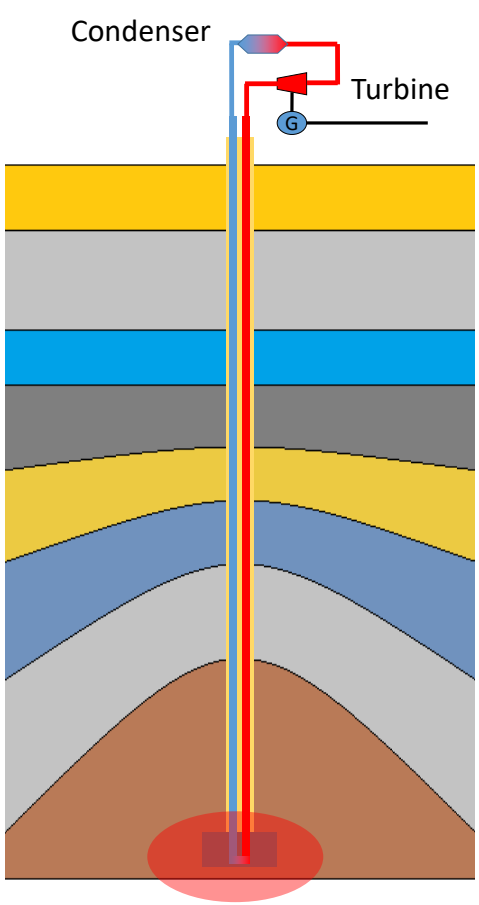


Themes for next Program

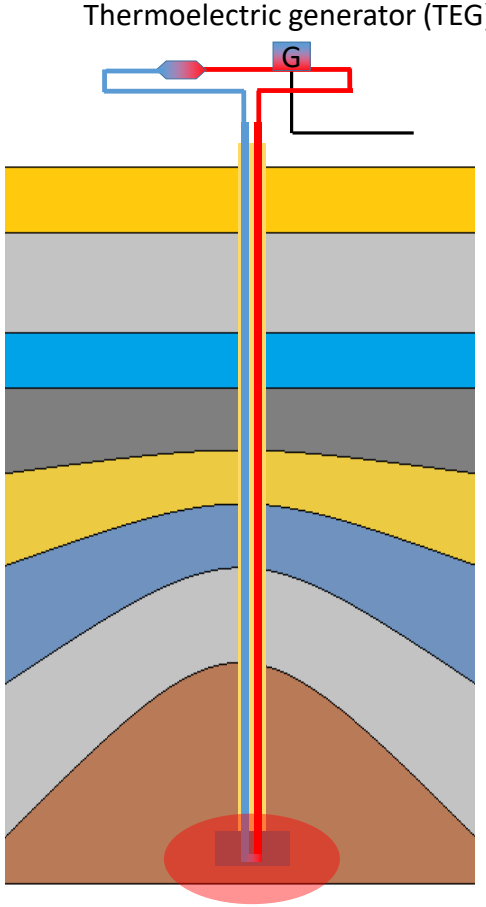
1. Geothermal generation by using high temperature in preserver

Concept design:

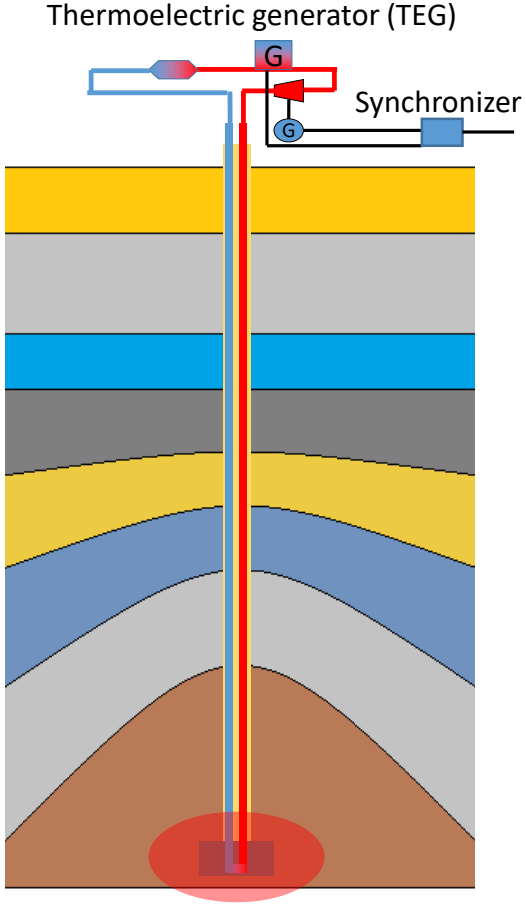
Concept 1: Turbine



Concept 2: TEG



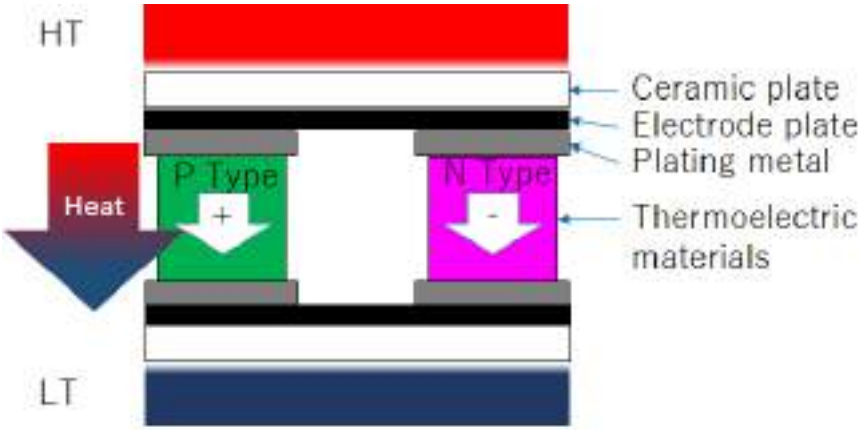
Concept 3: Combined

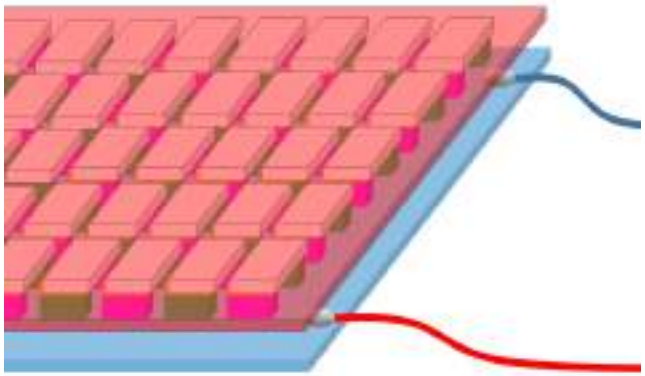


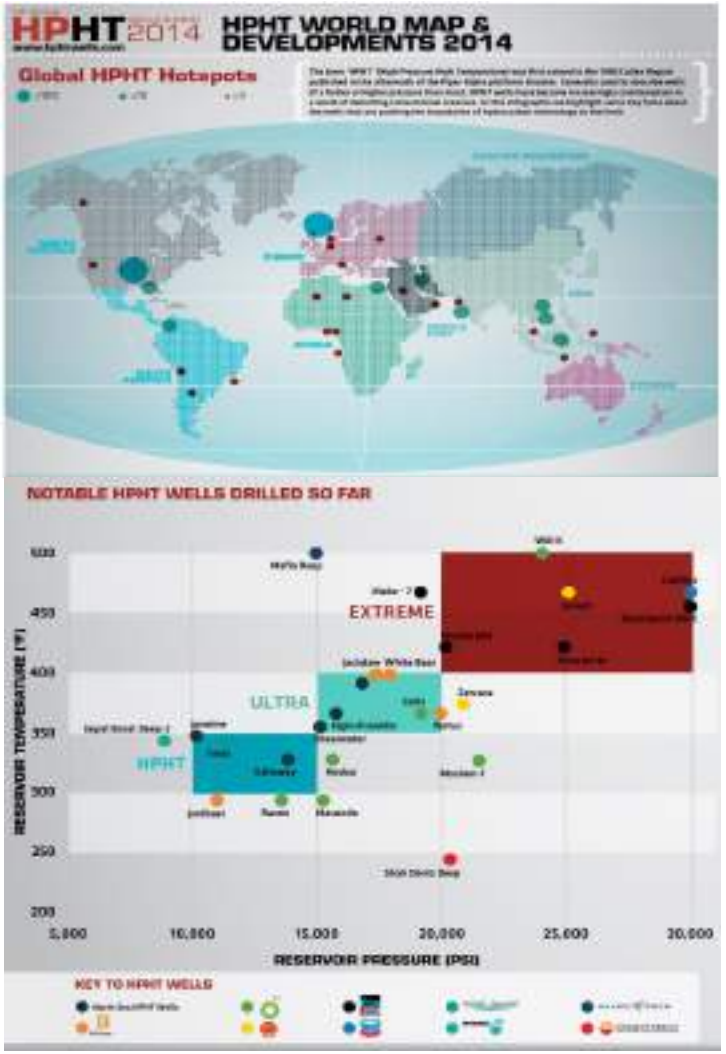
Using the abandoned HT wells' heat to generate electricity.
Reducing cost of plugging the abandoned wells and reuse them.

Themes for next Program

1. Geothermal generation by using high temperature in preserver







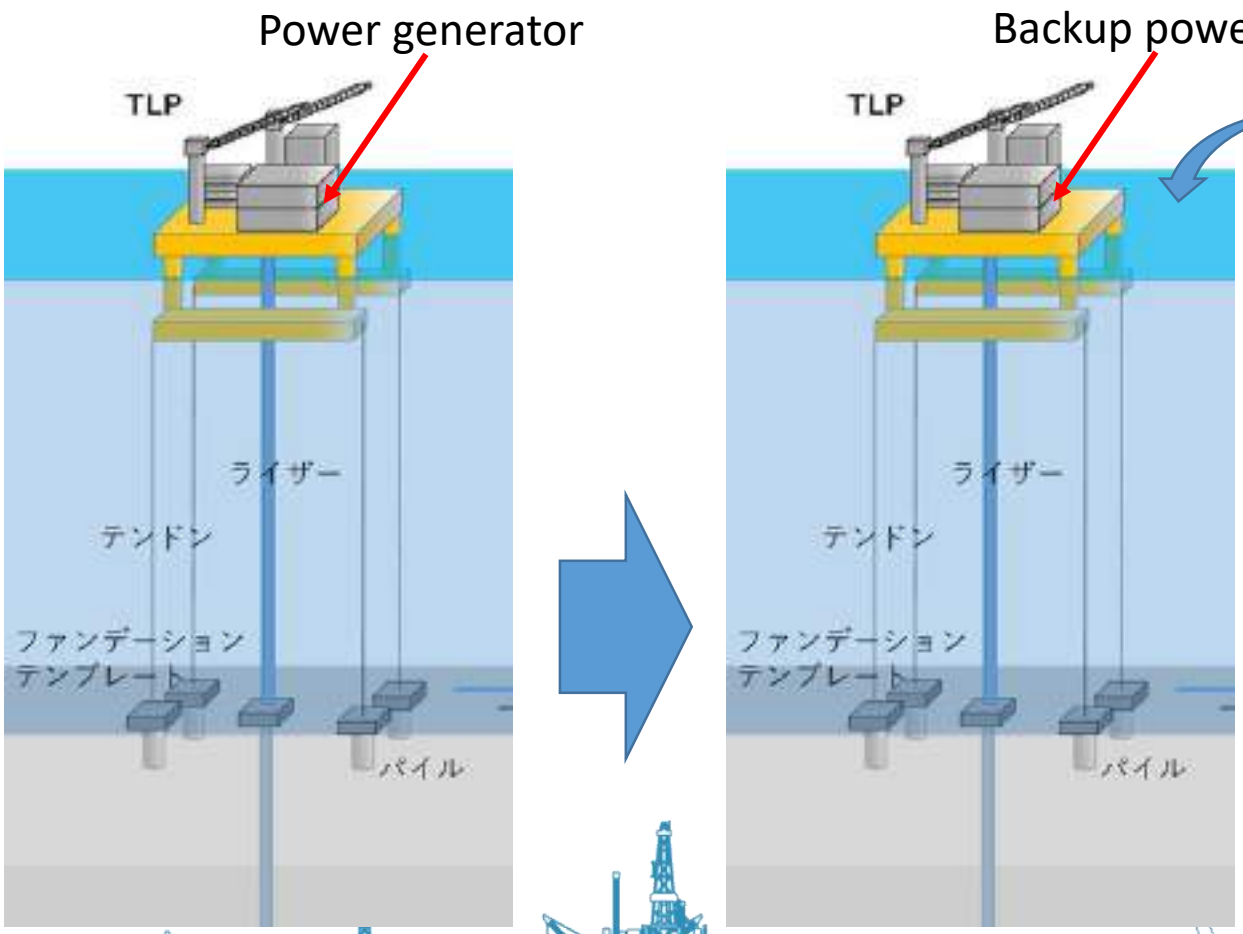
Source：HPHT Wells Summit 2014

Expected benefit

- Cost reduction of decommissioning
- High capacity factor as the renewable energy
- Might be Applicable to geothermal in Japan

Themes for next Program

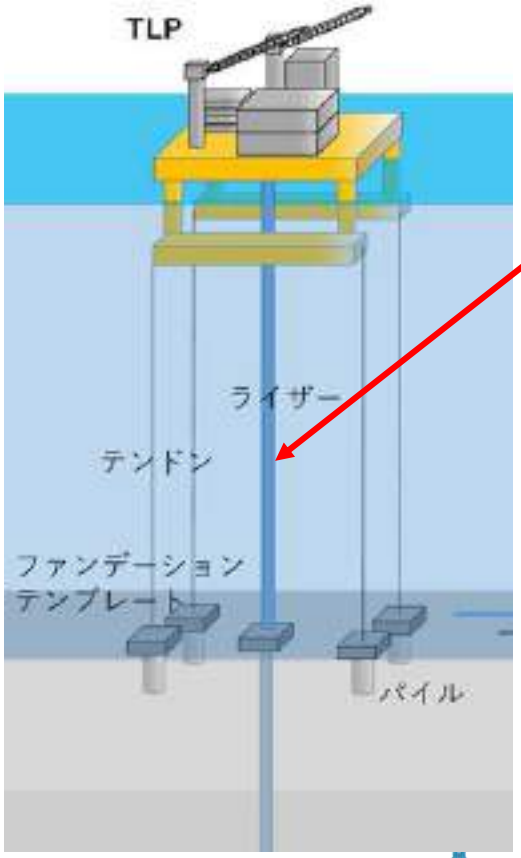
2. Wind power/Ocean current power generation to supply offshore oil& gas production facilities



As much as possible, wind turbine supply electricity, and 50% capacity factor is expected.

Themes for next Program

3. Cost reduction technology for flammable gas removal and re-injection at production facilities



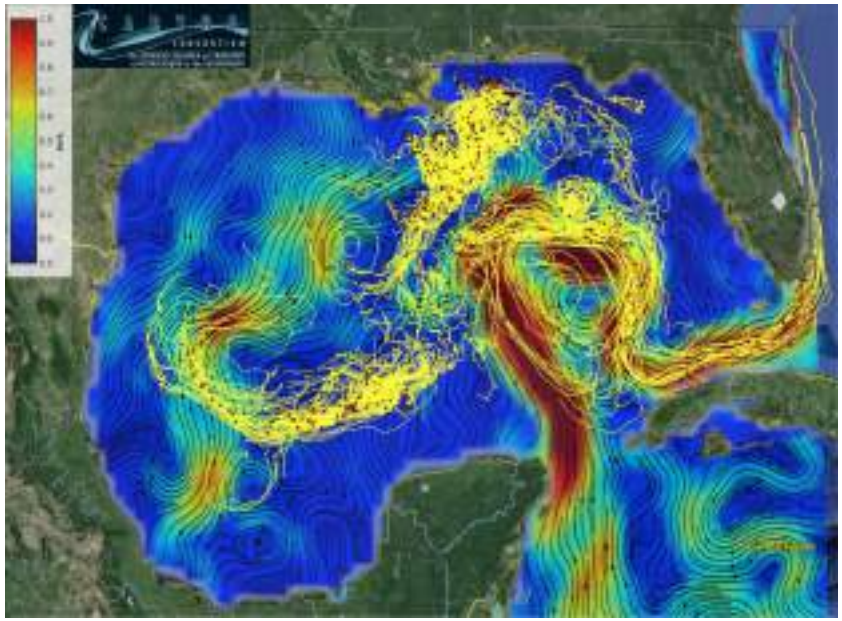
Oil/ Water/ Methane/CO2/ H2S

Now:
Still some facilities flaring methane and release CO2

Future:
Capturing all methane and CO2, then inject into the reservoirs

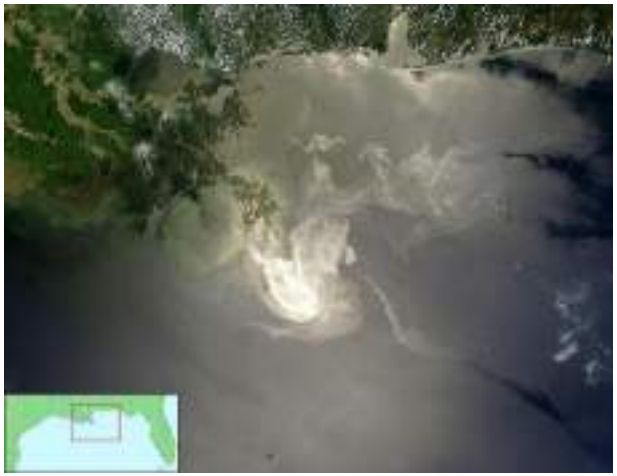
Themes for next Program

4. Establishment of oil spill drift forecast simulation method by using local ocean current monitoring by aerial drone (marine environment)



The currents of the GOM are complex and change from moment to moment

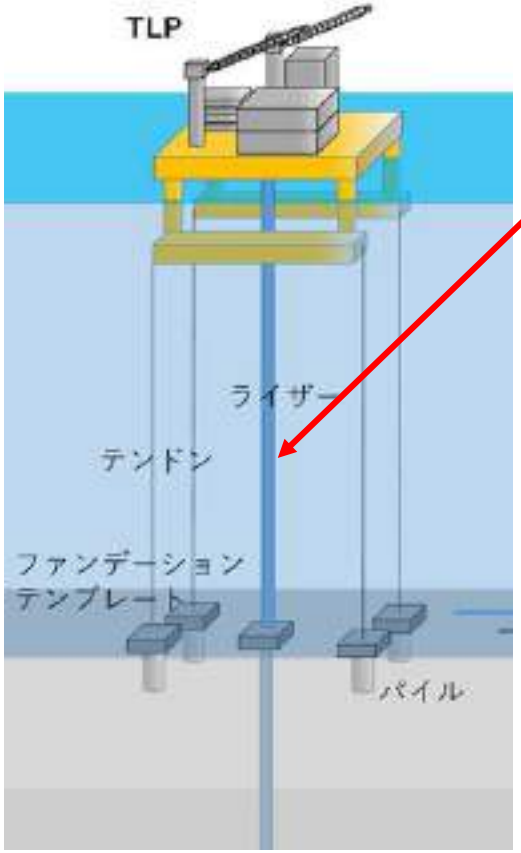
Continuous monitoring of ocean currents by drone



Enables effective oil spill response by improving simulation accuracy

Themes for next Program

5. Hydrogen related technologies



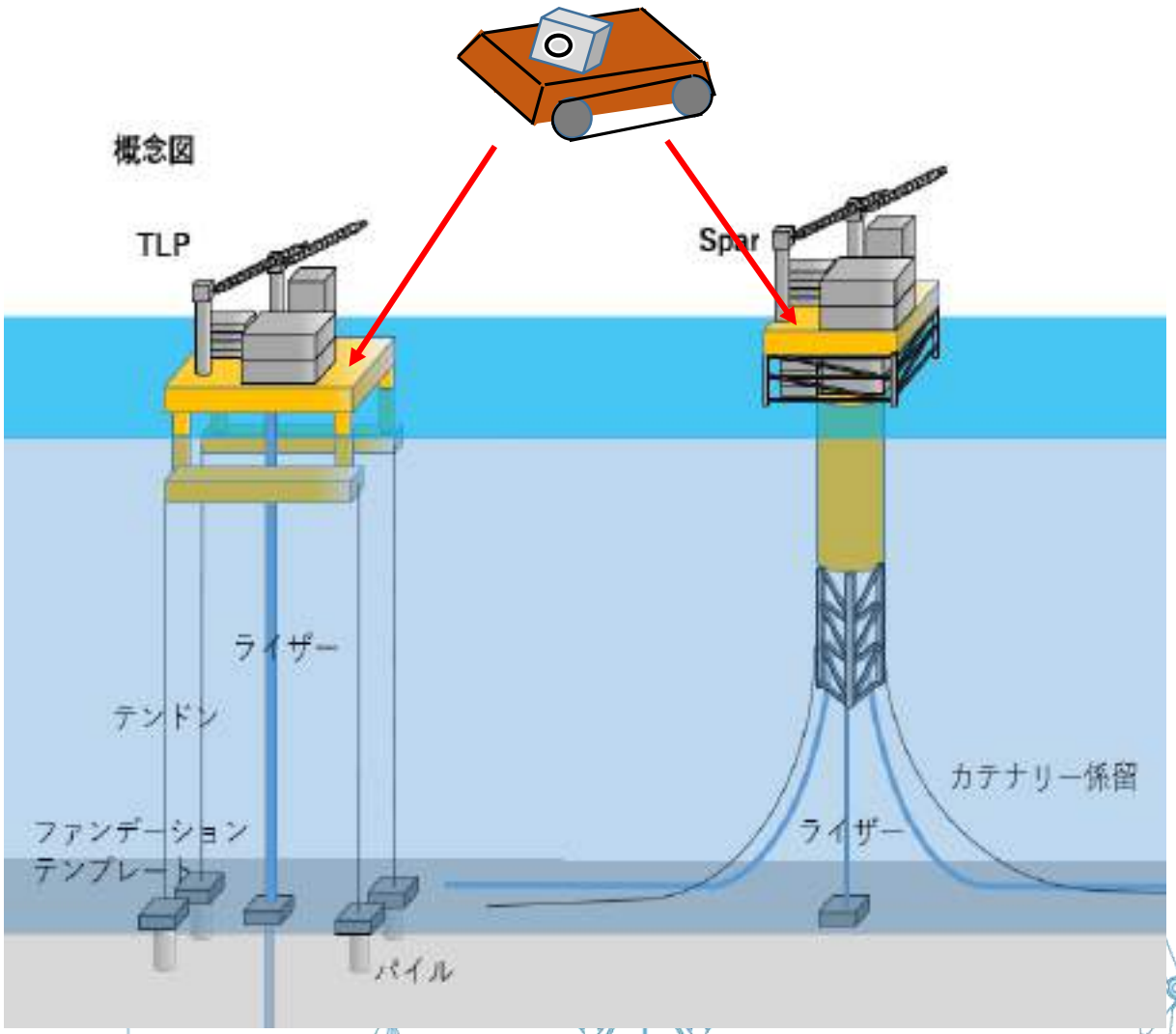
Oil/ Water/ Methane/CO2/ H2S

Now:
Still some facilities flaring methane and release CO2

Future:
Reforming Methane into Hydrogen and CO2, then utilize Hydrogen and inject CO2 into the reservoirs

Themes for next Program

6. Safety related techs including NUF (normally unattended facilities) and robotics

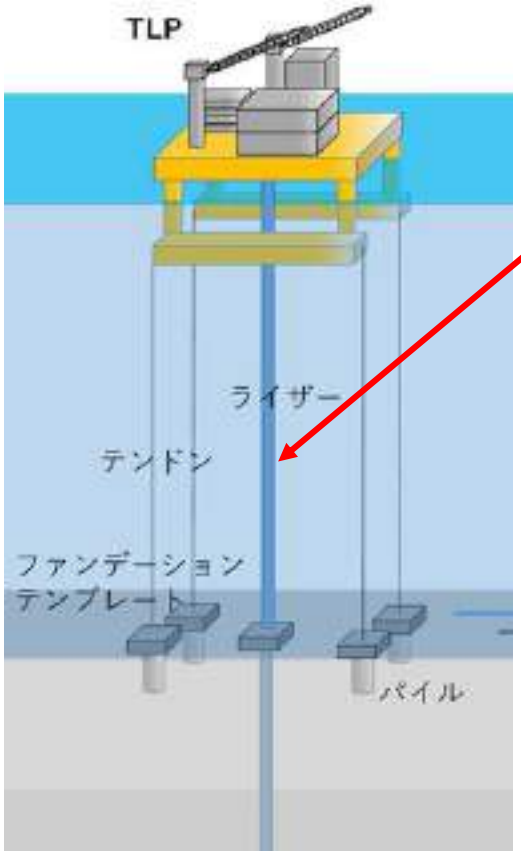


Even in environments where explosive gases are generated, periodical inspections are conducted by operators

Place an explosion-proof robot to minimize the burden on operators and contribute to ensuring safety

Themes for next Program

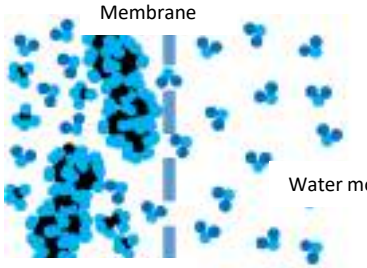
7. Water treatment related technologies



Associated water from Oil & Gas Field

Utilizing filtration device, then make associated water very clean

Filtration device



Ceramic membrane

Thank You for your attention!

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