

Cold Water Pipe

Life cycle considerations:

Manufacturability, operability,
reliability, logistics, scalability

Baseline Parameters for Workshop OTEC Discussions

- **Offshore**
- **Floating**
- **Moored**
- **Cable to shore**
- **5-10 MWe scalable to commercial scale**
- **Potentially relocatable**

Manufacturability

1. Fabrication: Variety of methods currently available to fabricate up to 12 m I.D. pipes
 - 1.1: Some methods commercially available
 - 1.2: Some methods under validation
2. Deployment: Variety of methods available
 - 2.1: On shore manufacture of CWP tow to platform for installation
 - 2.2: In-situ manufacture of entire CWP

Manufacturability

3 Installation: attachment to platform

3.1 Scalable Method which was demonstrated in OTEC 1 (Gimbal required)

3.2 Aerospace technologies applied to conceptual method to create a strong and robust termination

3.3 Oil field technologies can be applied

Manufacturability

4 O & M

- Bio-fouling is not a concern on the interior
- Smooth surfaces on exterior address most concerns with bio-fouling
- Existing technologies in coatings and additives to inhibit exterior bio fouling

Operability

Monitoring component performance

- Existing well understood technologies will be applied such as fiber optics
- Repair at depth is a proven capability for like materials and structures based on oil field experience

Decommissioning

- Within understanding based on offshore industry experience-no technological challenges

Reliability

- Within the technological capability to design a pipe that matches the design life of the plant
- There are known testing methods to address the combined effects of ageing, saturation, and fatigue

Logistics

- See manufacturability

Scalability

- Able to scale to 10-12 m I.D. pipe using physics based, well understood engineering practices

Risks

	On Shore	In-situ
Fabrication	Low	Medium
Assembly	Low	Low*
Deployment-Towing	Medium	N/A
Deployment-Upending	Low	N/A
Deployment-attachment	Med.-Low	Low
Operations	Low	Low
Planned Detachment	Low	Low
Reattachment	Med.-Low	Med.-Low
Recovery after failure	High	High
Relocation	High	High
Decommissioning	Low	Low

Cost Drivers/Potential savings

	On Shore	In-situ
Fabrication	Materials, labor	Materials, labor
Assembly	Labor/equipment	
Deployment-Towing	Requires flotilla	
Deployment-Upending		
Deployment-attachment	Analytical tools	Analytical tools
Operations		
Planned Detachment		
Reattachment		
Recovery after failure		
Relocation		
Decommissioning		

Question 4 and 5

- Technologies are viable for the CWP
- Economic factors: Refer to cost drivers
- Hurdles: OTEC & CWP validation
- Hurdles: needs a minimum of one year operational record with plant that is big enough to be scaled to commercial size plants