



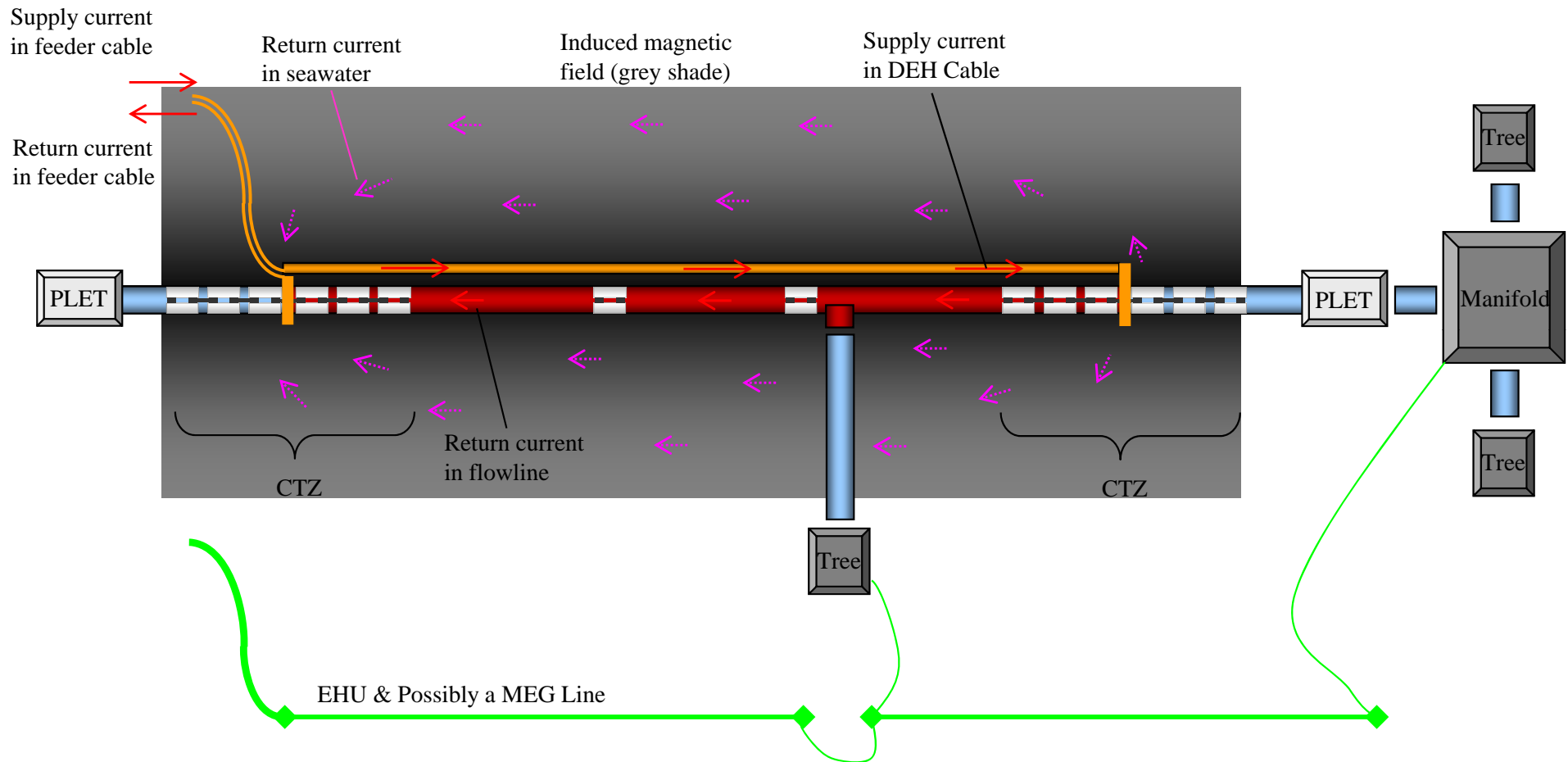
# DEH Development Case Studies

SUT Technical Evening 17<sup>th</sup> August 2011

Jesper Hoj-Hansen

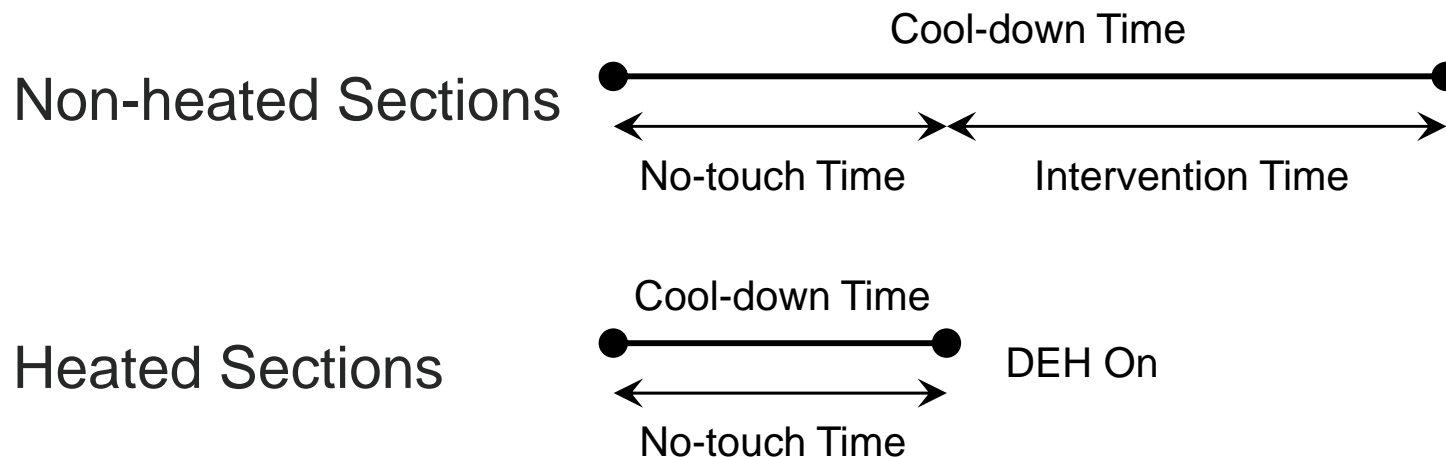
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# Generic Open-loop DEH



# DEH Operating Strategy

- **Normal operation** – insulate system to maintain flow outside of hydrate region. DEH Off.
- **Unplanned shutdown** – insulate system to provide sufficient no-touch and intervention time.



- **Planned shutdown** – as above or inhibit prior to shutdown.
- **Start-up** – DEH used to warm system up prior to start-up and kept on till arrival temperature sufficient to achieve required cool-down times.

# What are the main Challenges?

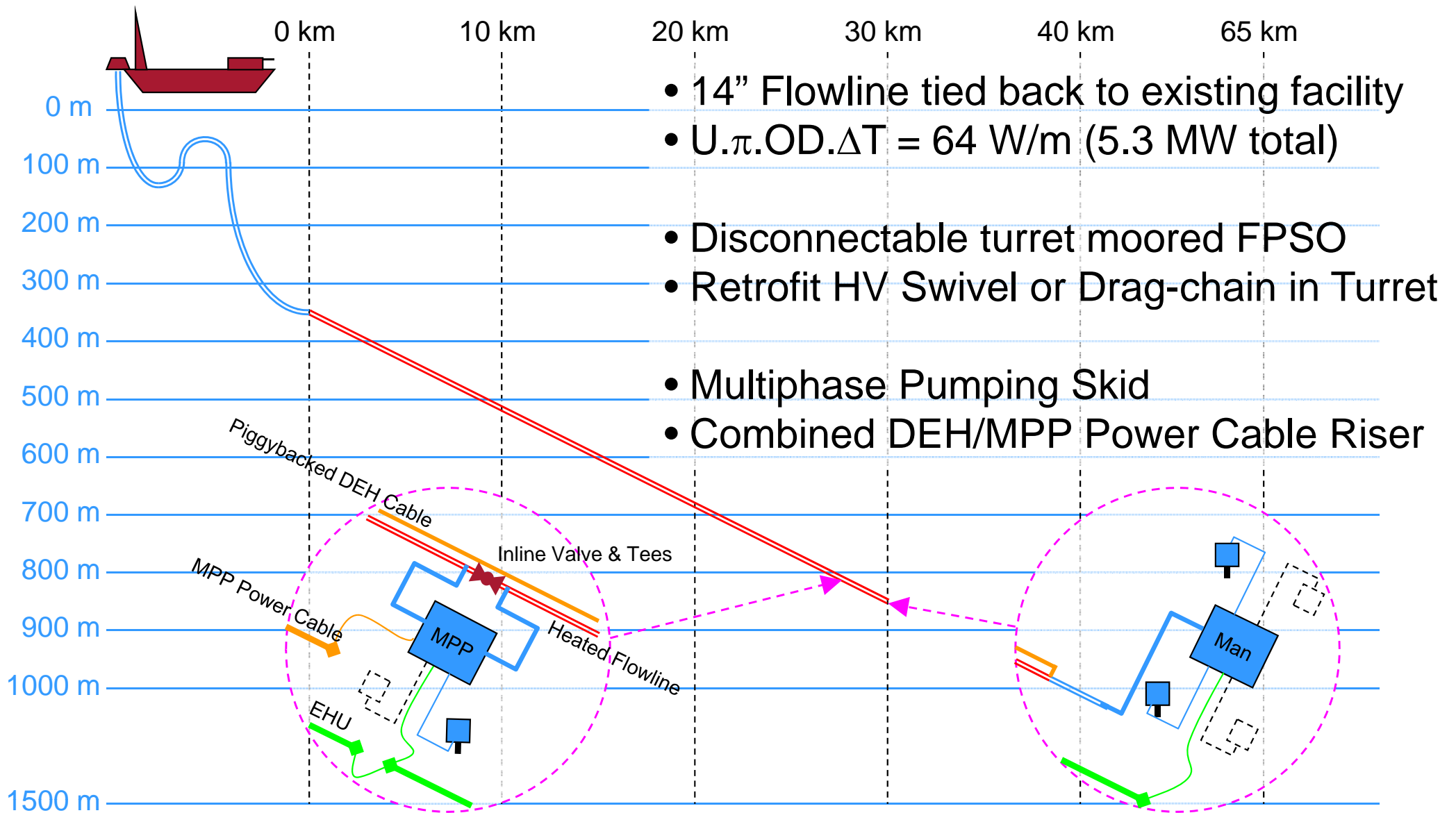
For generic Open-loop DEH systems:

- AC Corrosion?
- Electro Magnetic Interference with nearby systems e.g. EHU, SCM?
- Electrical Fault Detection along cable system?
- Hydrate Risk?
- System Reliability/Availability?
- System Flexibility?

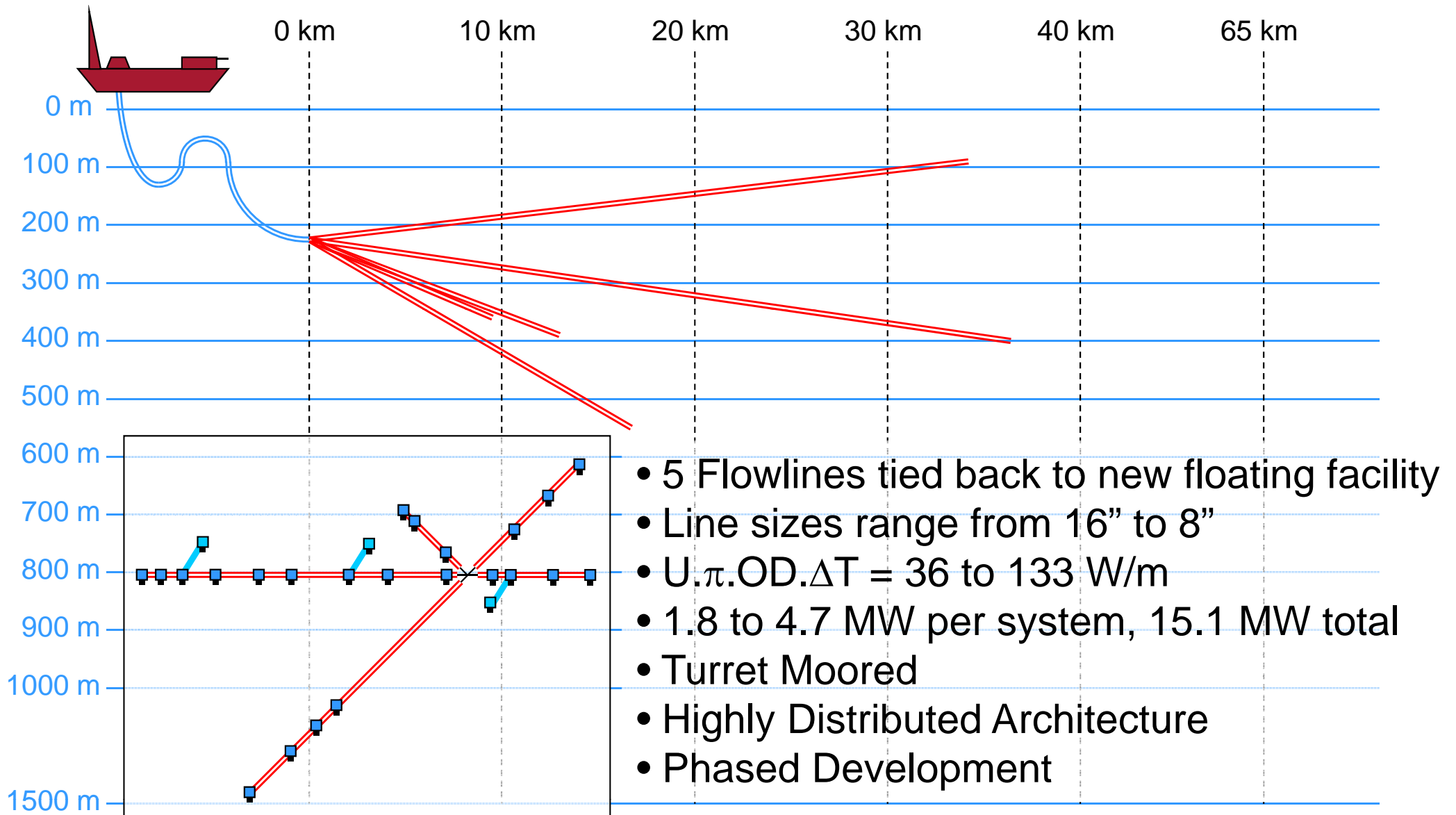
What are the limits for the technology?

Woodside is considering DEH for a number of Opportunities which stretch DEH beyond existing applications...

# Opportunity 1

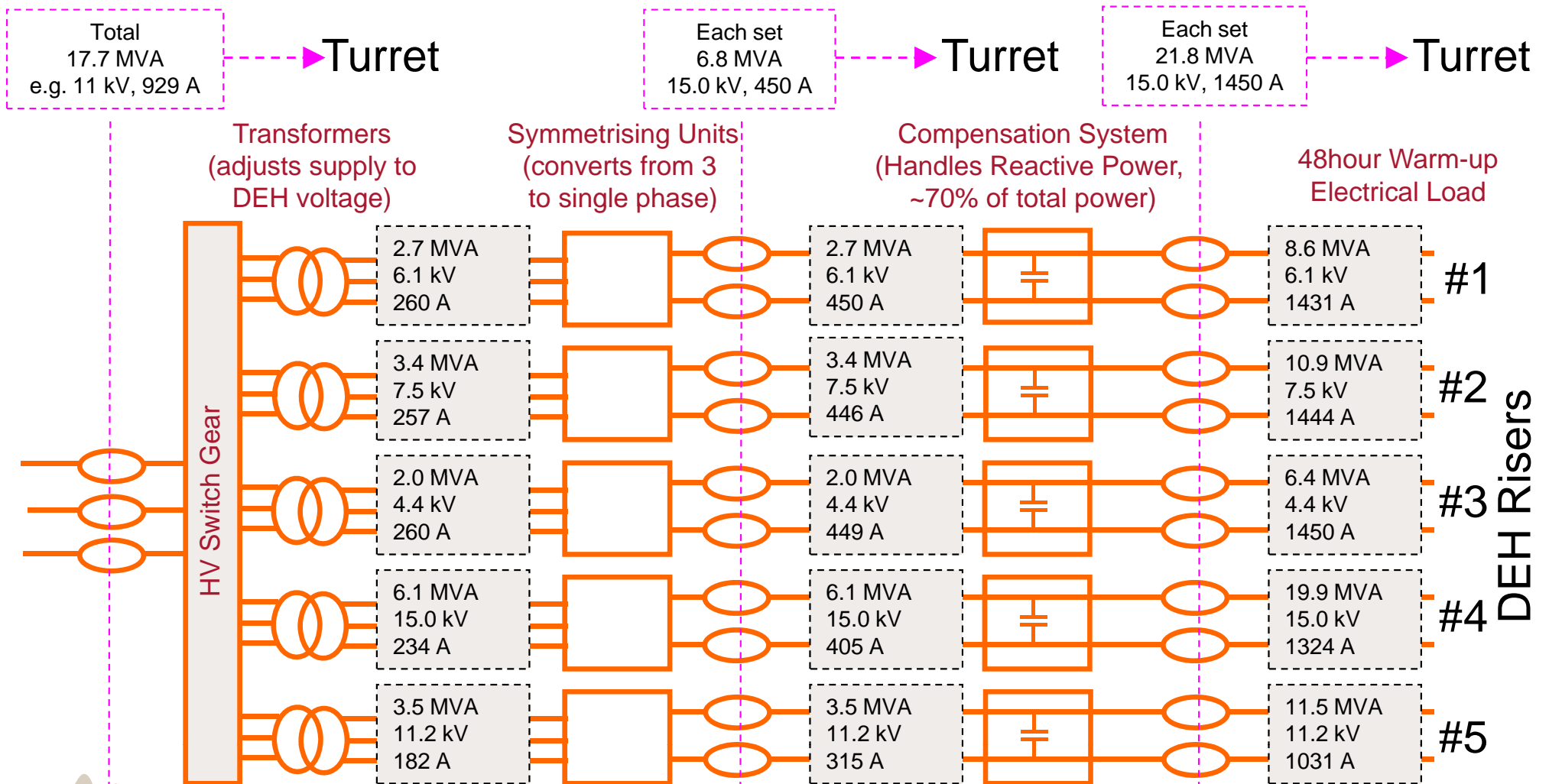


# Opportunity 2



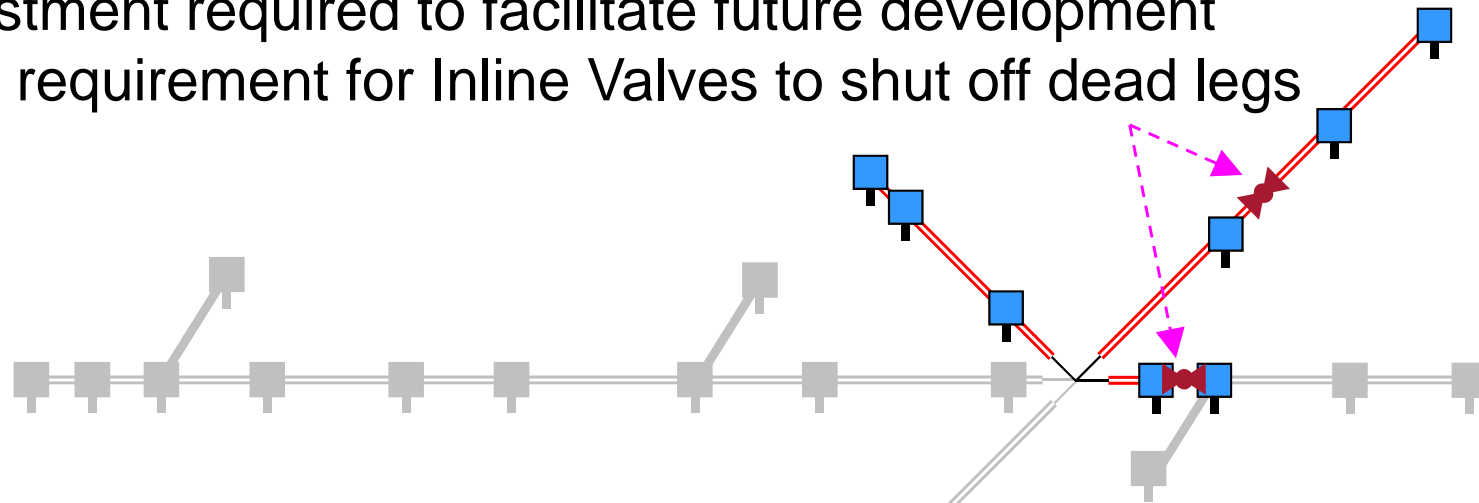
# Opportunity 2 – Topsides Hardware Configuration

- There are 3 main topsides components for a DEH system
- Turret moored facilities require a 4<sup>th</sup>, the HV swivel

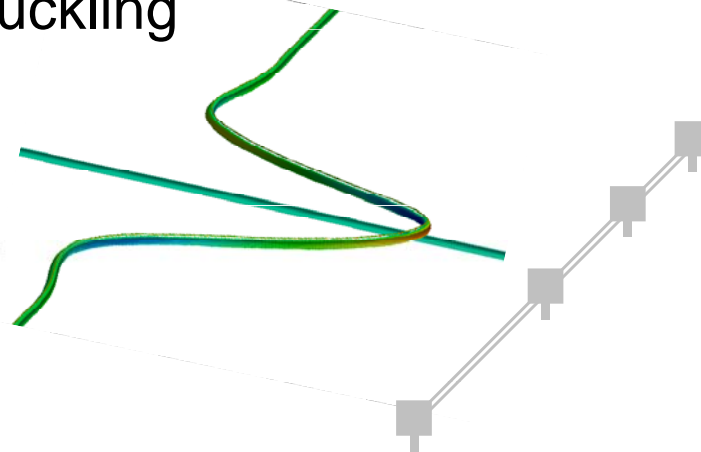


# Opportunity 2 – Phase 1

- Individual wells tied into Inline-Tees or PLETs
- Pre-Investment required to facilitate future development
- Potential requirement for Inline Valves to shut off dead legs

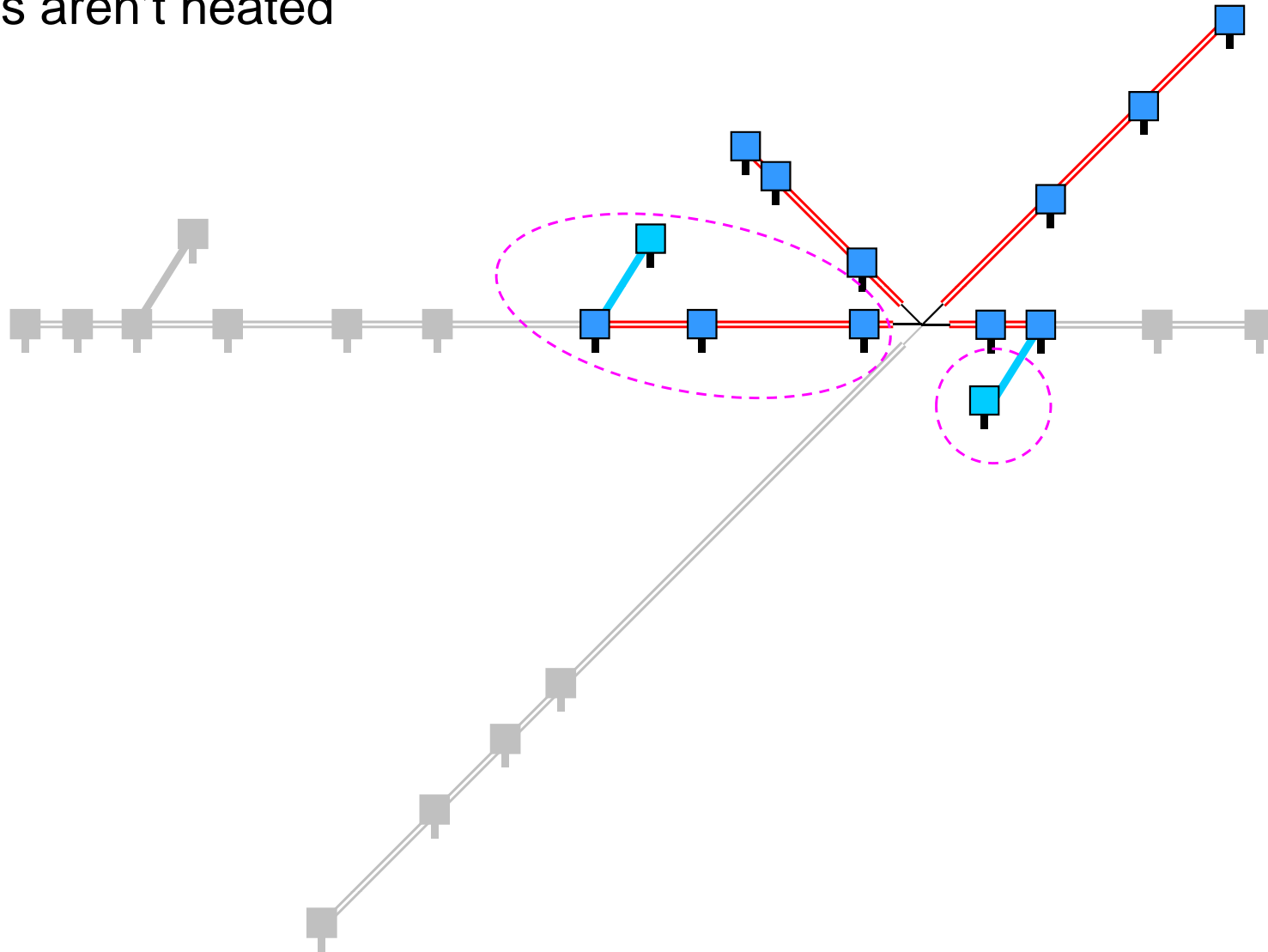


- 140°C Operating Temperature
- Sleepers used extensively to manage global buckling



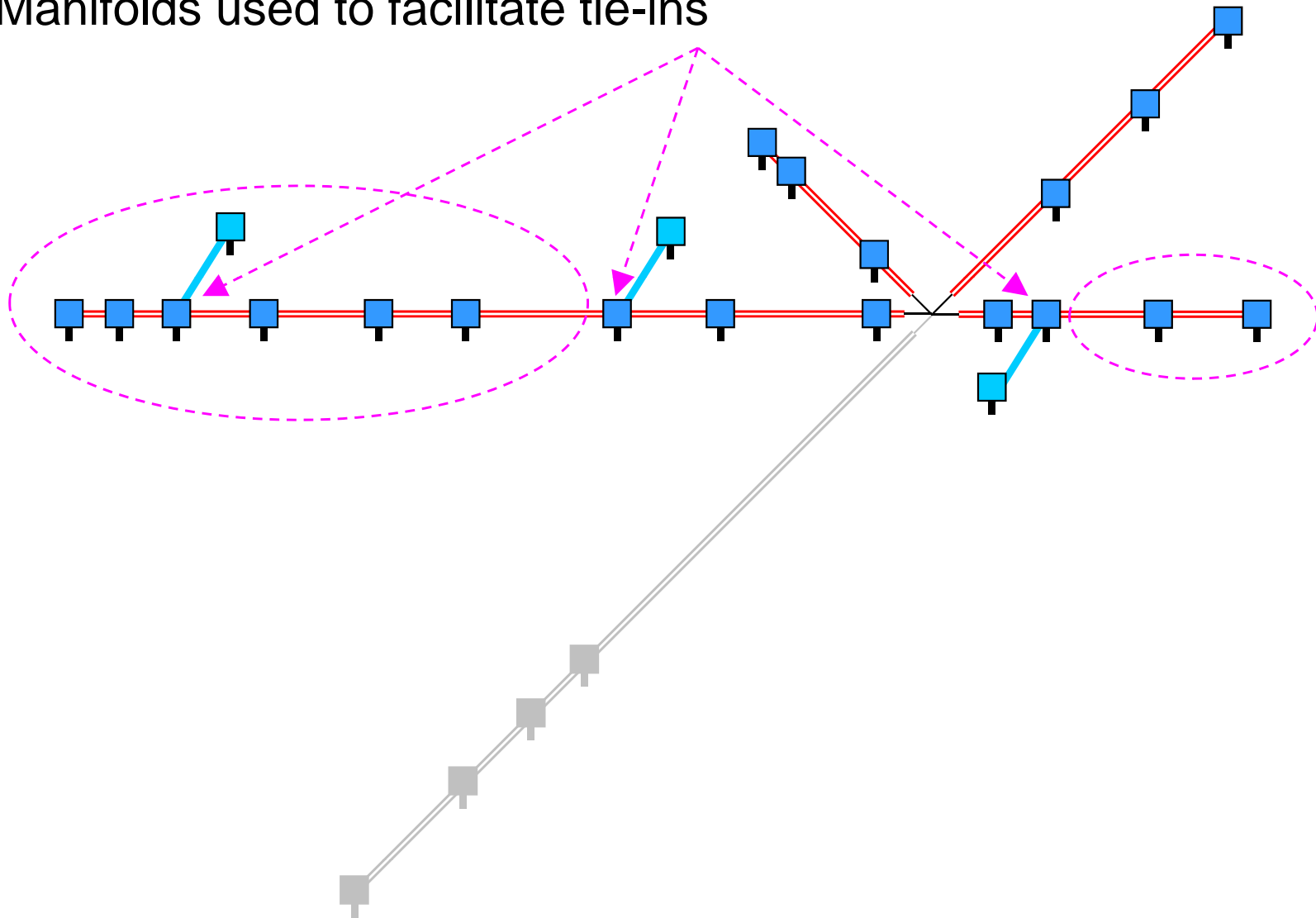
# Opportunity 2 – Phase 2

- Additional DEH System and 2 Spur Lines added
- Spur lines aren't heated

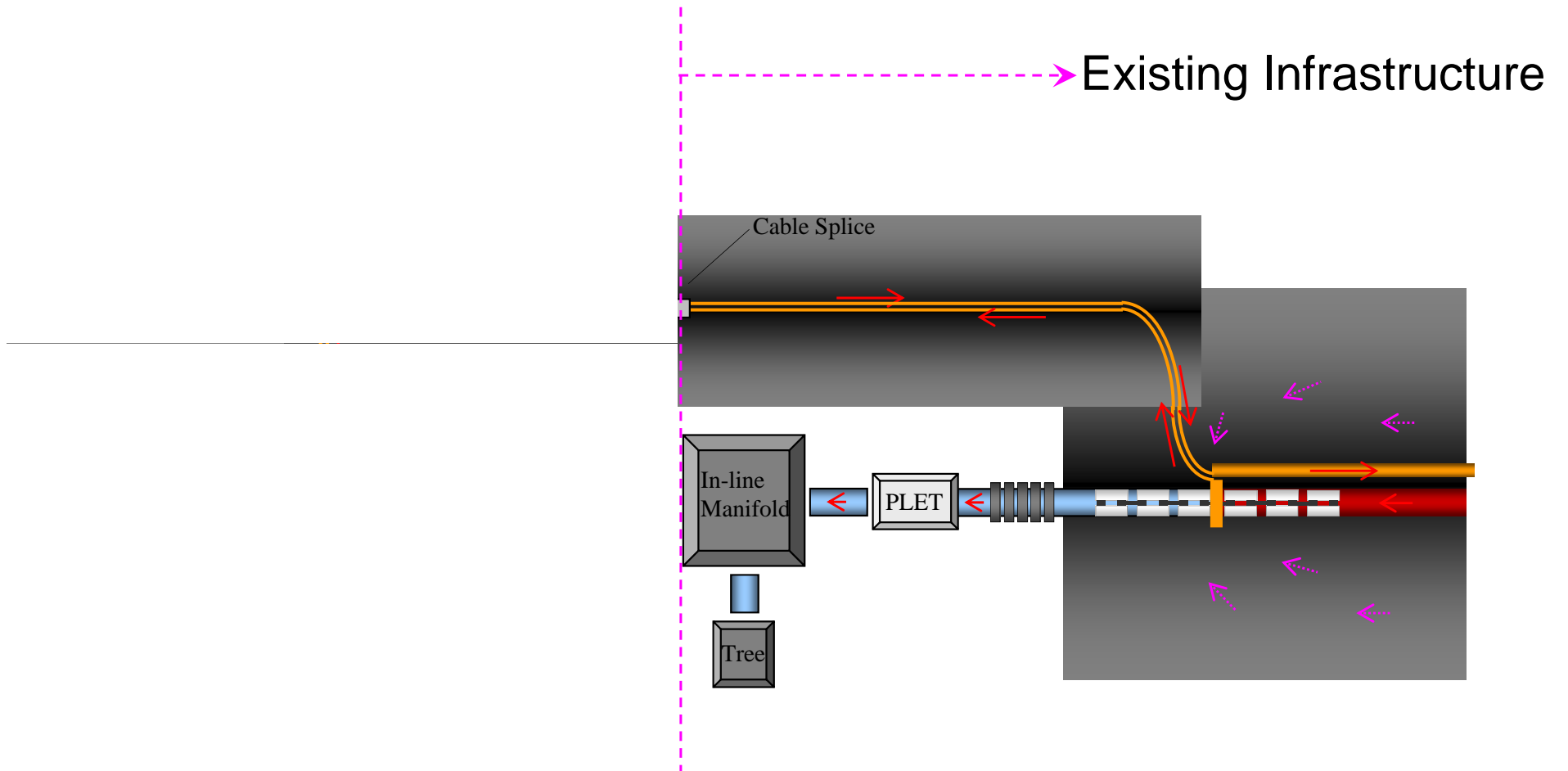


# Opportunity 2 – Phase 3

- DEH Systems Extended
- Inline Manifolds used to facilitate tie-ins

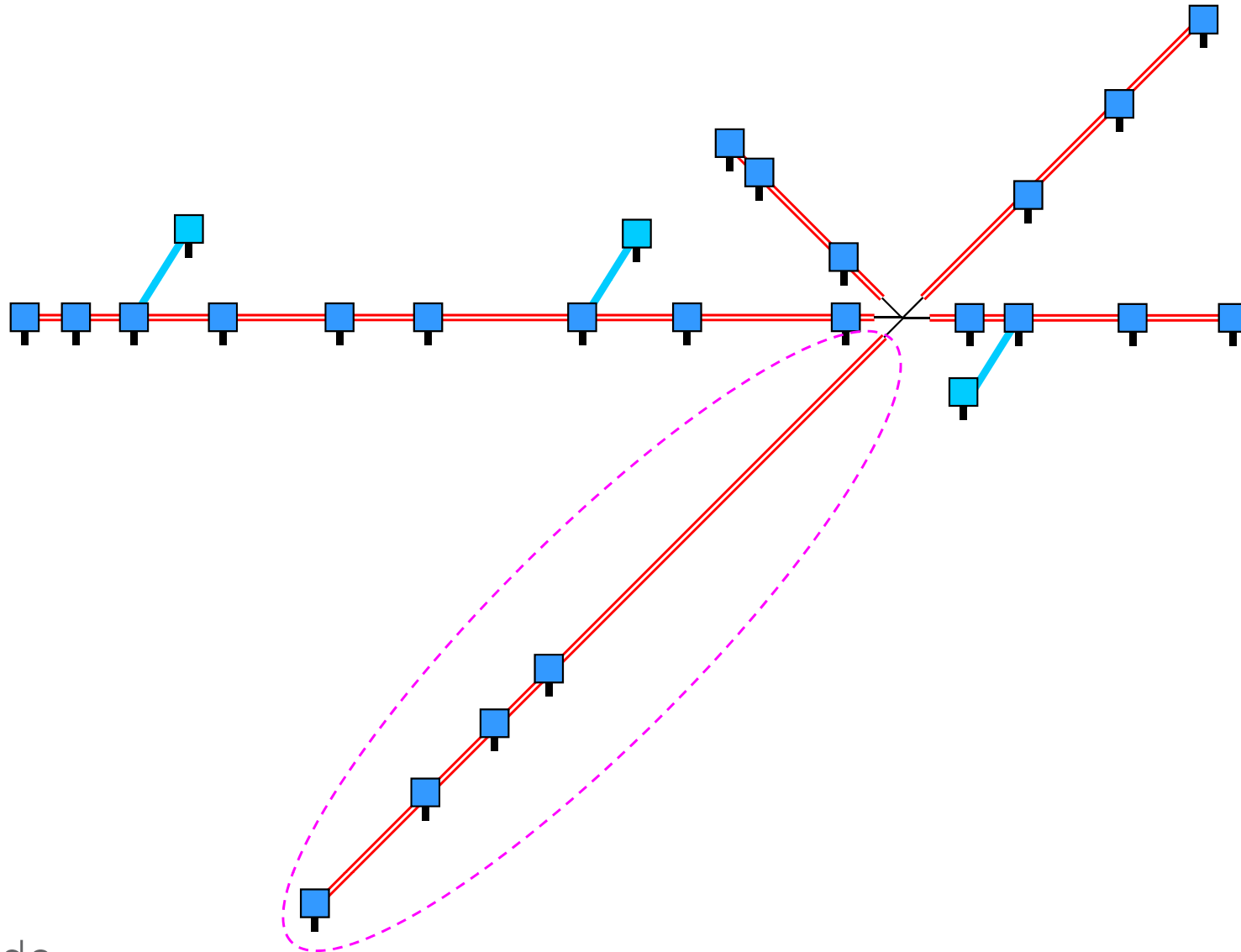


# Opportunity 2 – Manifold Bypass

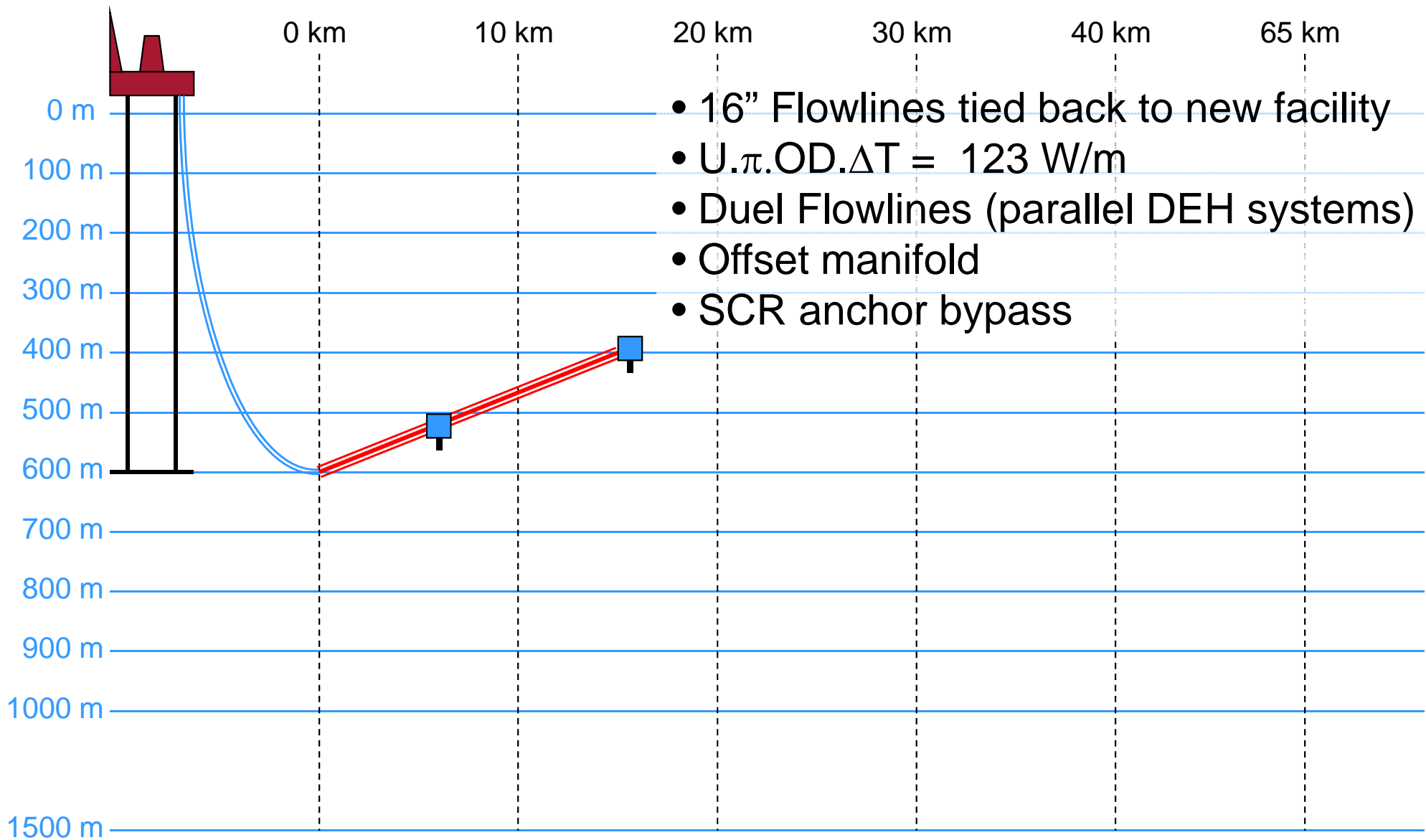


# Opportunity 2 – Phase 4

- Additional DEH System

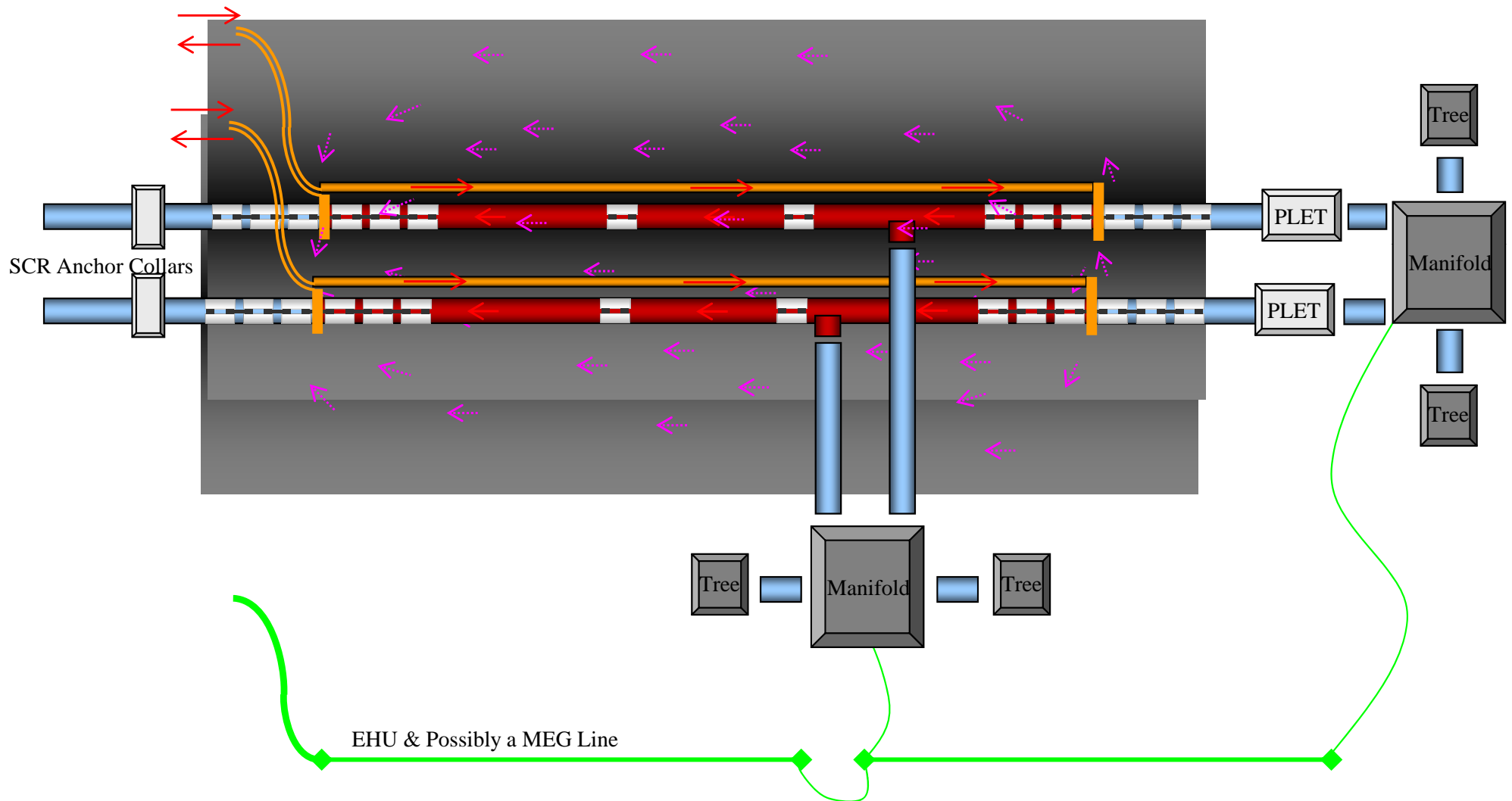


# Opportunity 3

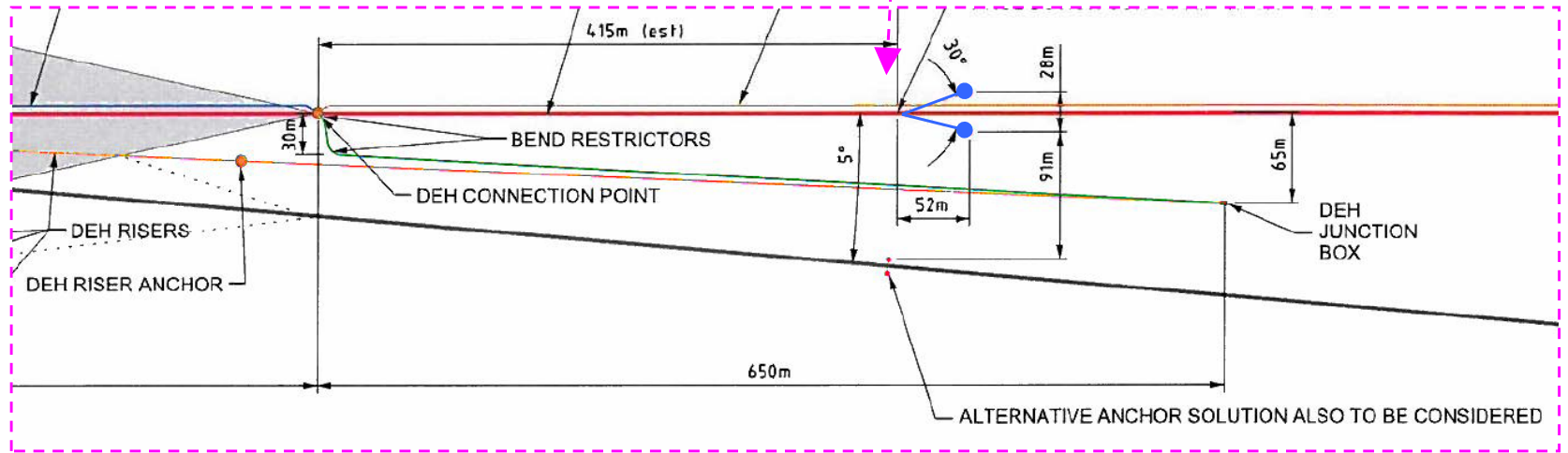
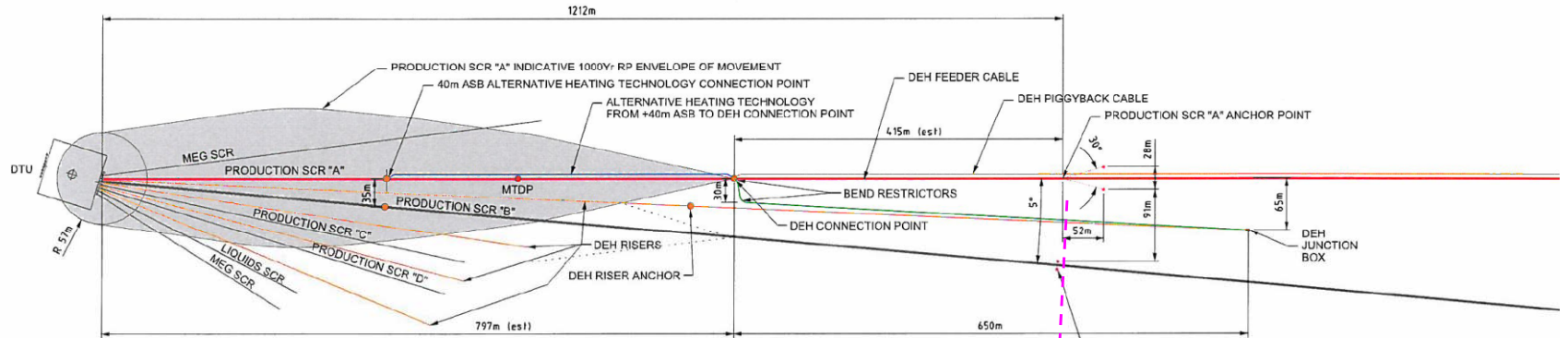


- 16" Flowlines tied back to new facility
- $U \cdot \pi \cdot OD \cdot \Delta T = 123 \text{ W/m}$
- Duel Flowlines (parallel DEH systems)
- Offset manifold
- SCR anchor bypass

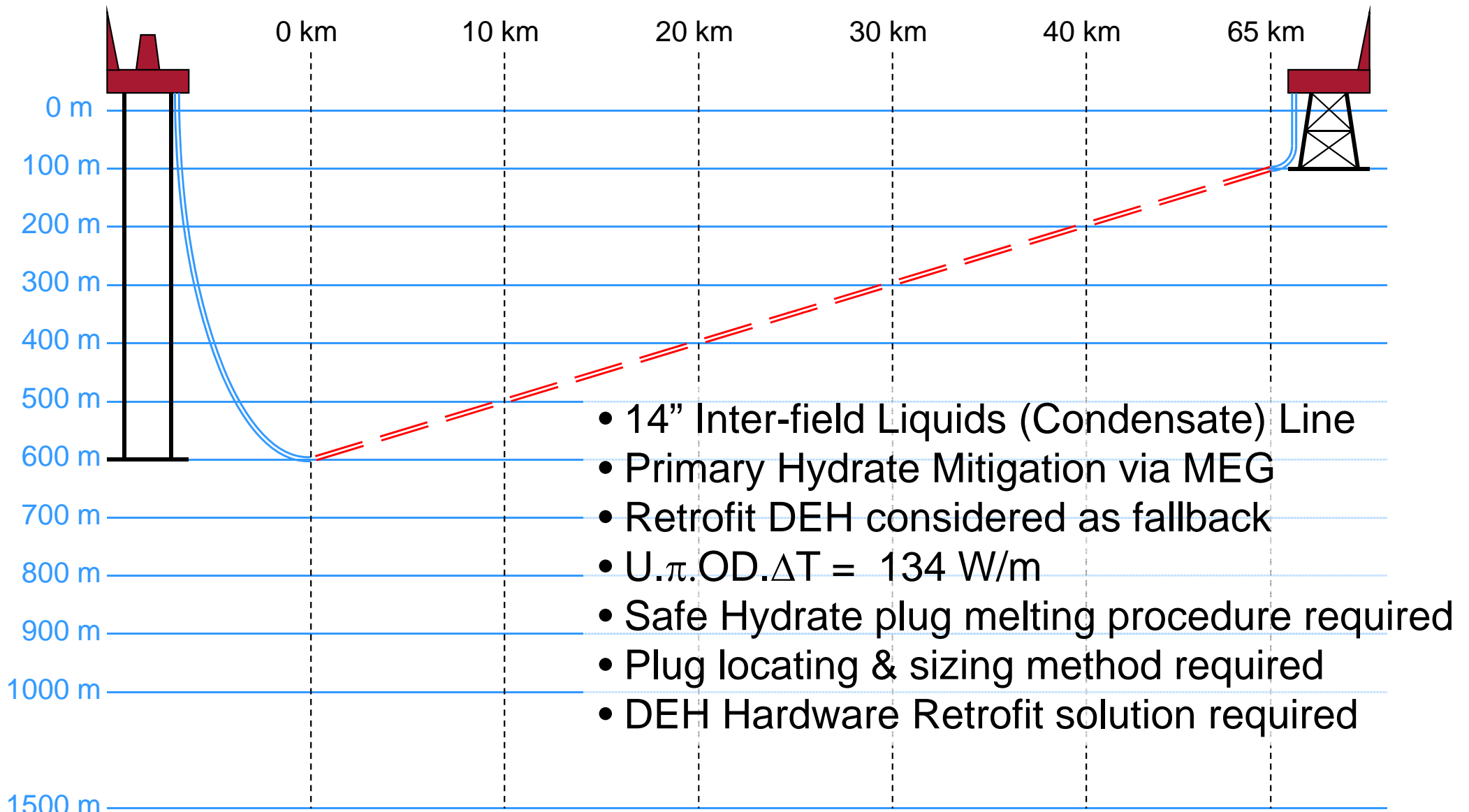
# Opportunity 3 – Parallel DEH & Offset Manifold



# Opportunity 3 – Extending DEH past SCR anchor



# Opportunity 4



# Beyond these 4 Opportunities

