Longs tie-backs : new flow assurance strategy for cost cutting

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DEEPWATER DEVELOPMENT

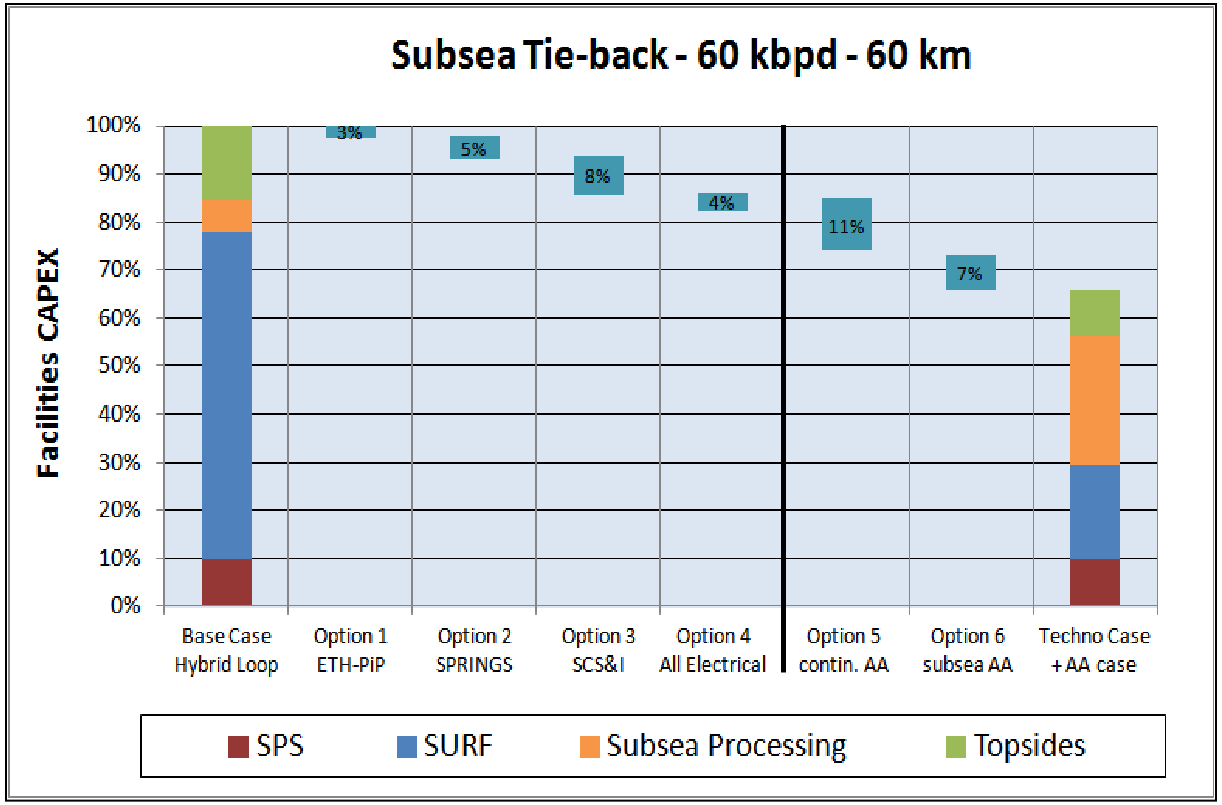
Introduction

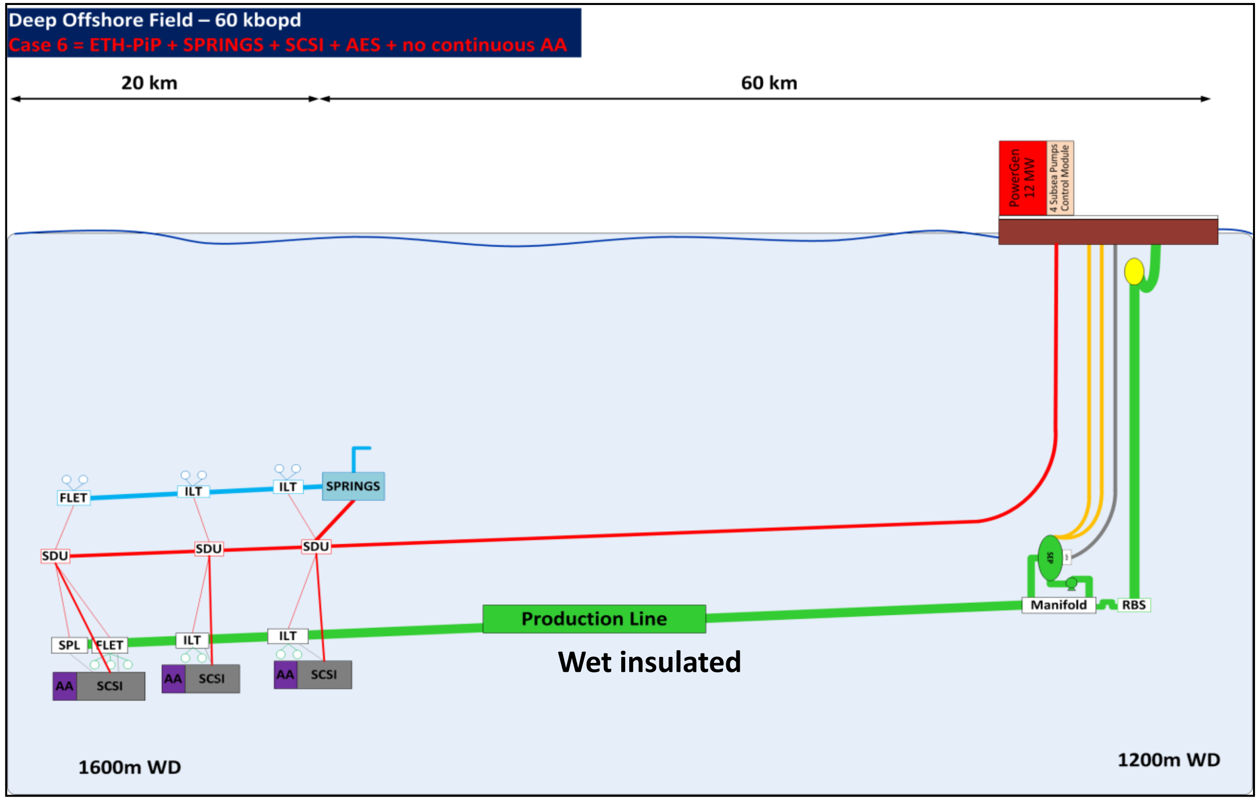
- Long-tiebacks : a solution for marginal fields in Deep Offshore, but cost reduction is mandatory

- MCEDD 2016 presentation on longs tie-backs:
  - technology allows cost cutting by 20%
  - extra cost cutting could be achieved by change of operating philosophy (wet insulated line instead of heated line)

- Today's presentation :
  - flow assurance calculation
  - operability

MCEDD 2016 in Pau (reminder)





- 18% cost reduction by replacing heated flowline by wet insulated line.
- Use of AA for planned shutdowns but what happens during unplanned shutdowns ?

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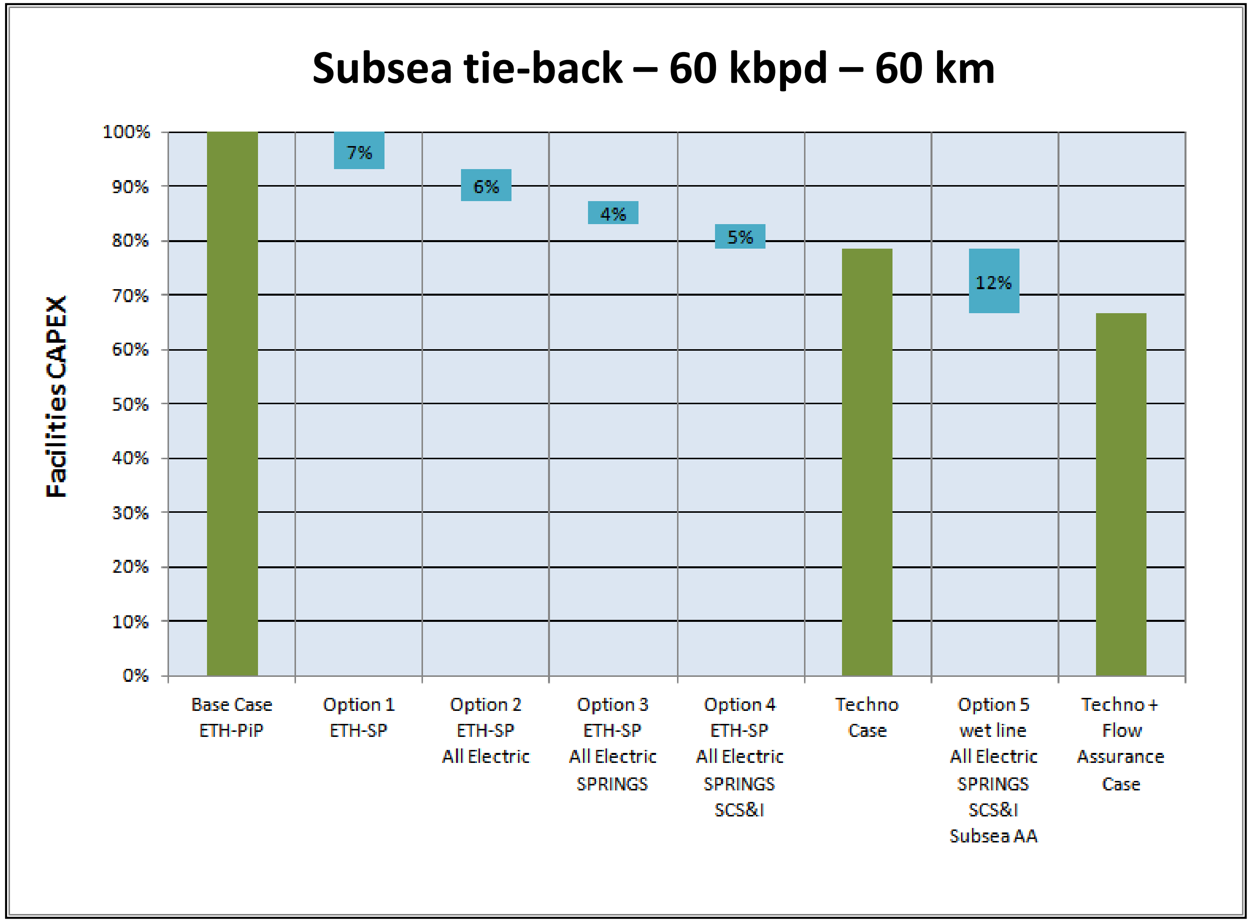
Update 2017



- Costs have been updated in 2017
- Integration of heated wet insulated flowline (ETH-SP) instead of heated PiP flowline (ETH-PiP) ; this techno should be available by 2020
- Still 12% cost reduction by replacing heated wet insulated flowline by wet insulated line + use of AA for planned shutdowns

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Study performed by STAT Marine

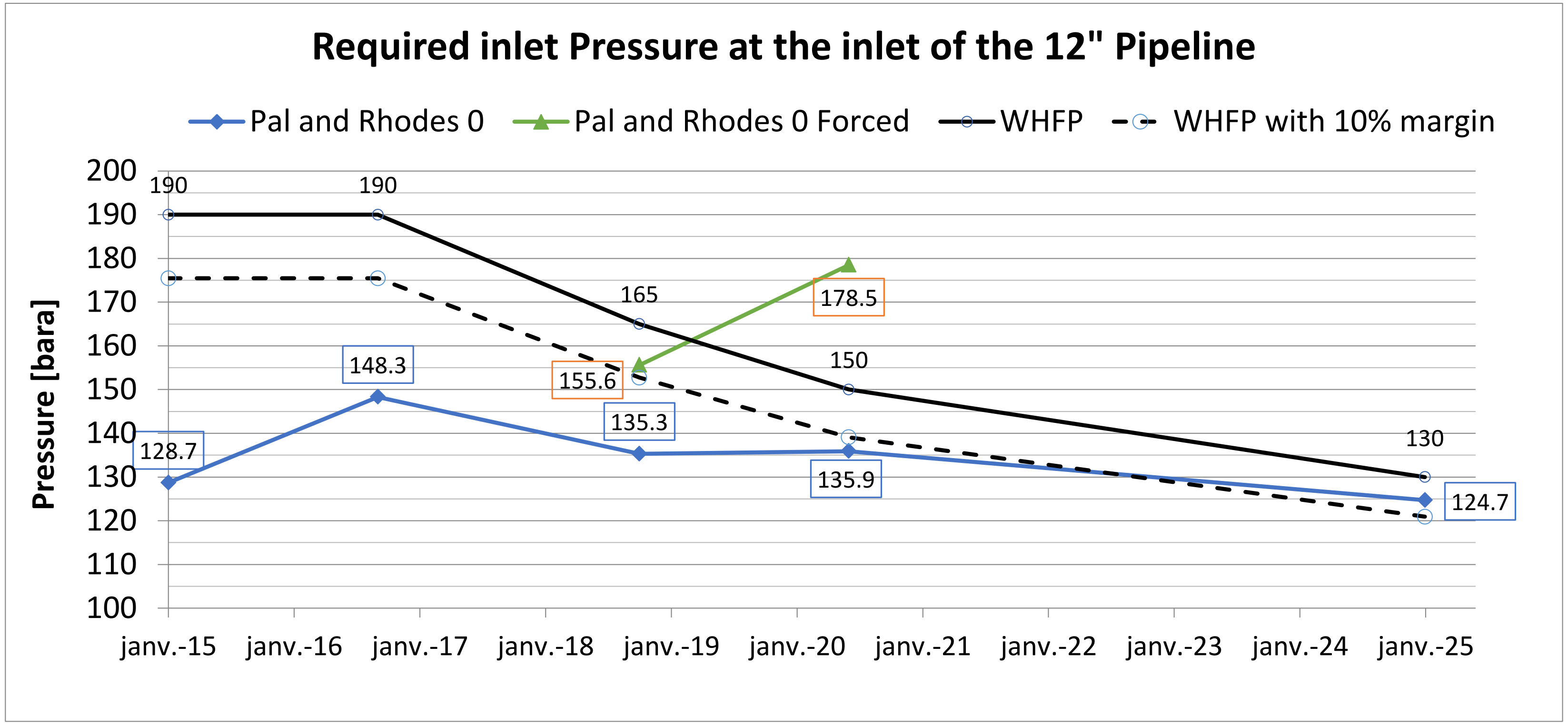
- Investigation of Flow Assurance issues
  - Flowline Sizing
  - Insulation required
    - In order to be outside the hydrate zone during production
    - Cooldown time calculation
  - Liquid surge volume at the separator placed at riser base
  - Wax management
  - Hydrate management
  - Sizing of risers after the SSU

- LedaFlow simulator used for simulations

LedaFlow®

Flowline Sizing

- Uncertainty due to emulsion formation
  - Long distance + small elevation → significant impact of the friction
- 14” has been retained for the diameter
  - Otherwise 12” could be challenged



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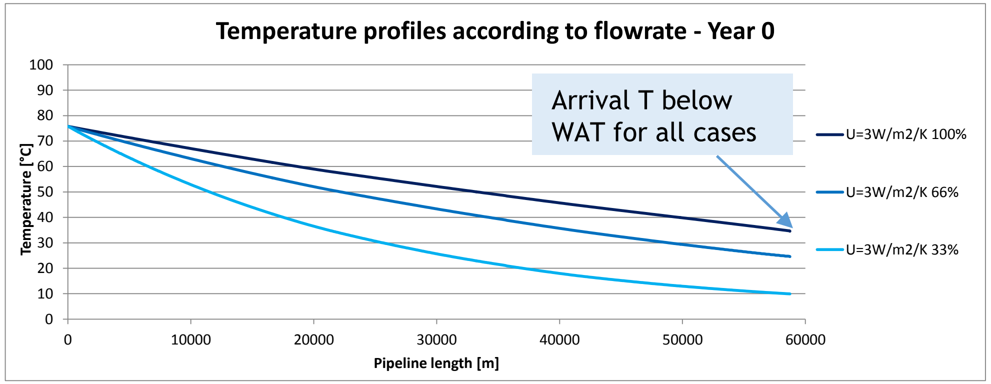
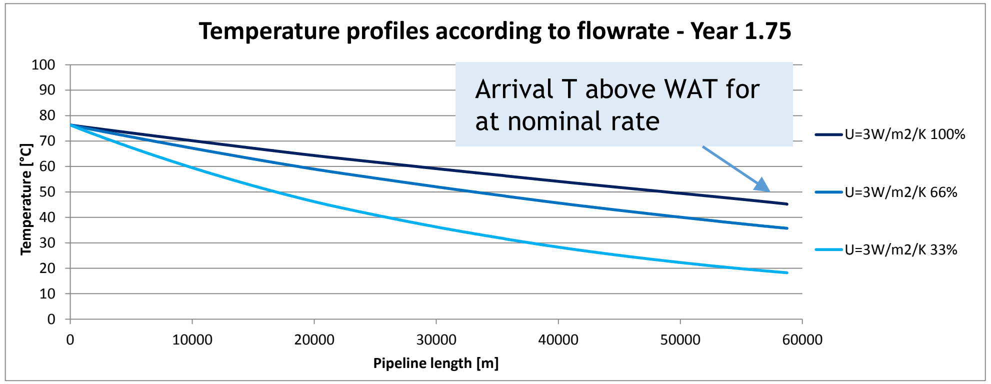
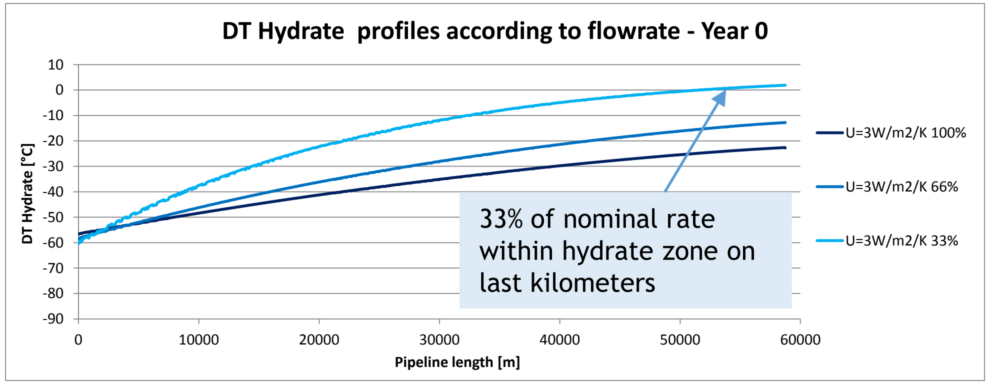
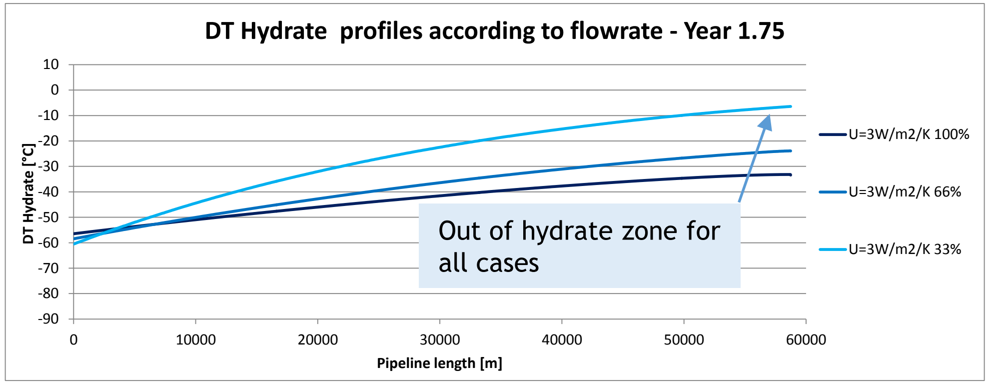
Flowline insulation

- U Value = 3 $W/m^2.K$
  - Can be achieved with foam insulated layers
  - Enable transport outside the hydrate zone even under degraded conditions
  - Wax deposition only at early field life
    - Operational pigging for wax removal









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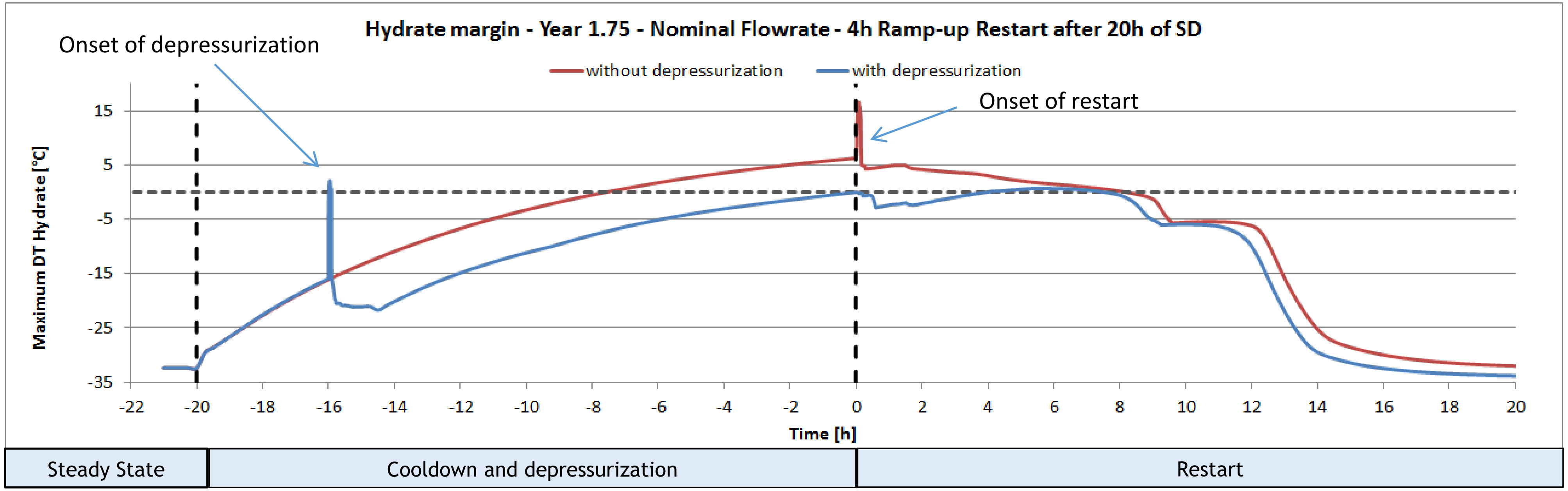
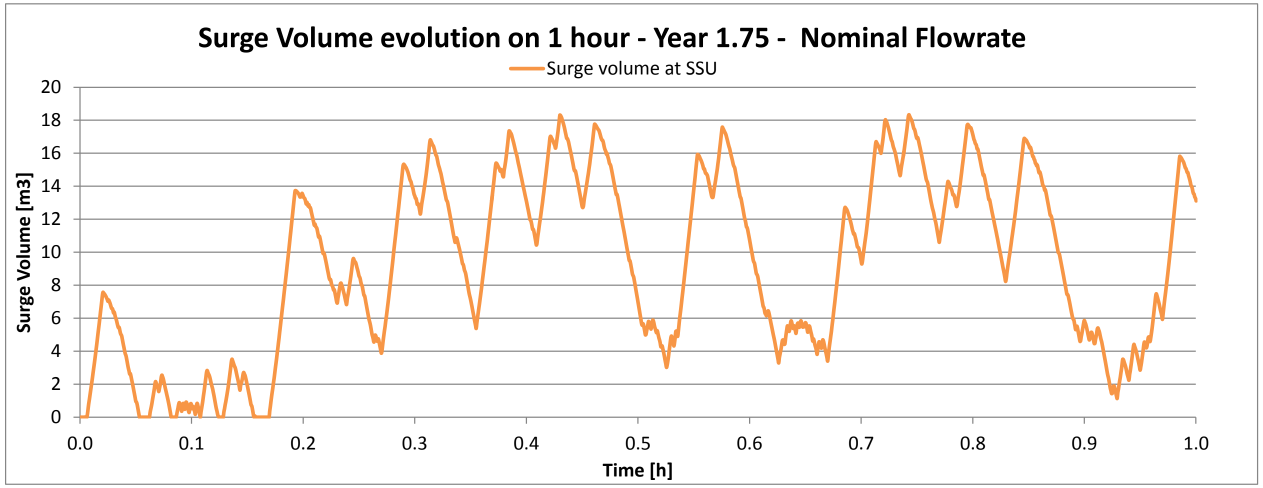
Shutdown & Cooldown time

- Cooldown time
  - No hydrate formation for 20 hrs of shutdown with depressurization + Restart
  - Longer safe period could be expected by considering hydrate-related fluid properties
    - Simulations performed by using the Hydrate module in LedaFlow
    - Strong impact of input parameters

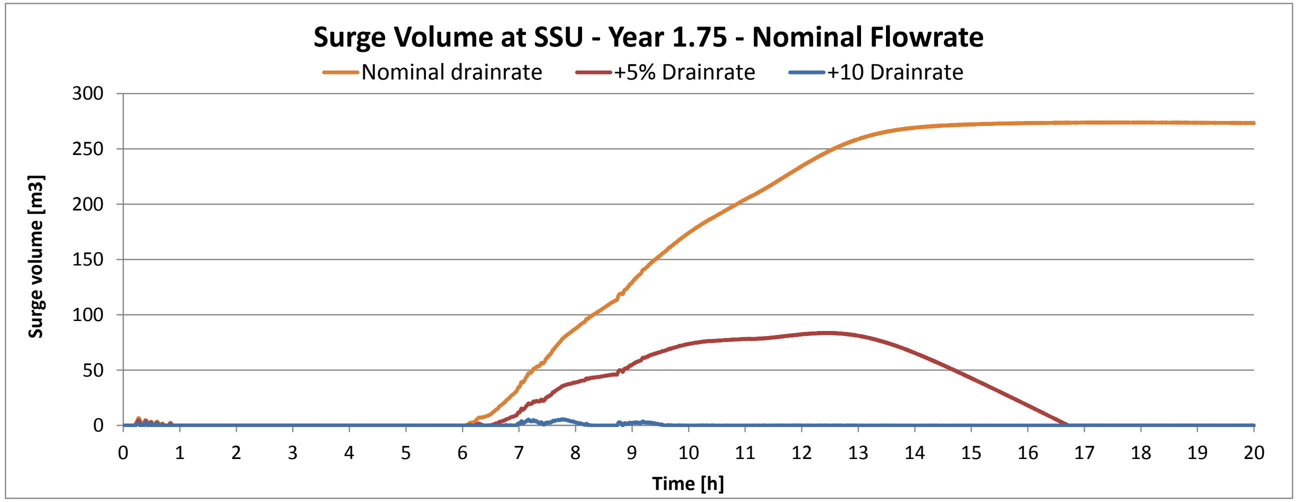


Slugs calculation

- Liquid surge volume at the SSU
  - Limited to 20 m^3 during steady state conditions → OK



- 270 m^3 during restart
  - Could be overcome by increasing the drain rate by 10%



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Risers sizing downstream SSU

- Gas line downstream SSU
  - 2 x 6" lines (U Value = 8 $W/m^2.K$)
    - SSU must be operated at P > 30 bar at beginning of field life
    - Hydraulic turn down = thermal turn down = 30% - 50% nominal rate
    - Hydraulic turn down → not an issue with 2 lines
    - No incursion in the hydrate zone above the turn down
    - Does not require continuous injection of Methanol
- Oil line downstream SSU
  - 12" diameter has been retained (U Value = 3 $W/m^2.K$)
    - Close to flow line diameter (14") for pigging purpose
    - Pump differential pressure ~ 100 bar
    - Cool down time: 50 hrs

Conclusions

- Large cost reduction confirmed by replacing heated flowline by wet insulated flowline
- Operability with respect to flow assurance issues has been shown, thanks to the SSU placed at the riserbase
- 20 hours of shutdown can be achieved without risks
- New hydrate management philosophy has to be developed :
  - Batch injection of AA-LDHI for degraded conditions and planned shutdowns
  - ‘Do Nothing’ for unplanned shutdowns (more than 20 hours happen very seldom)

THANK YOU FOR LISTENING

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