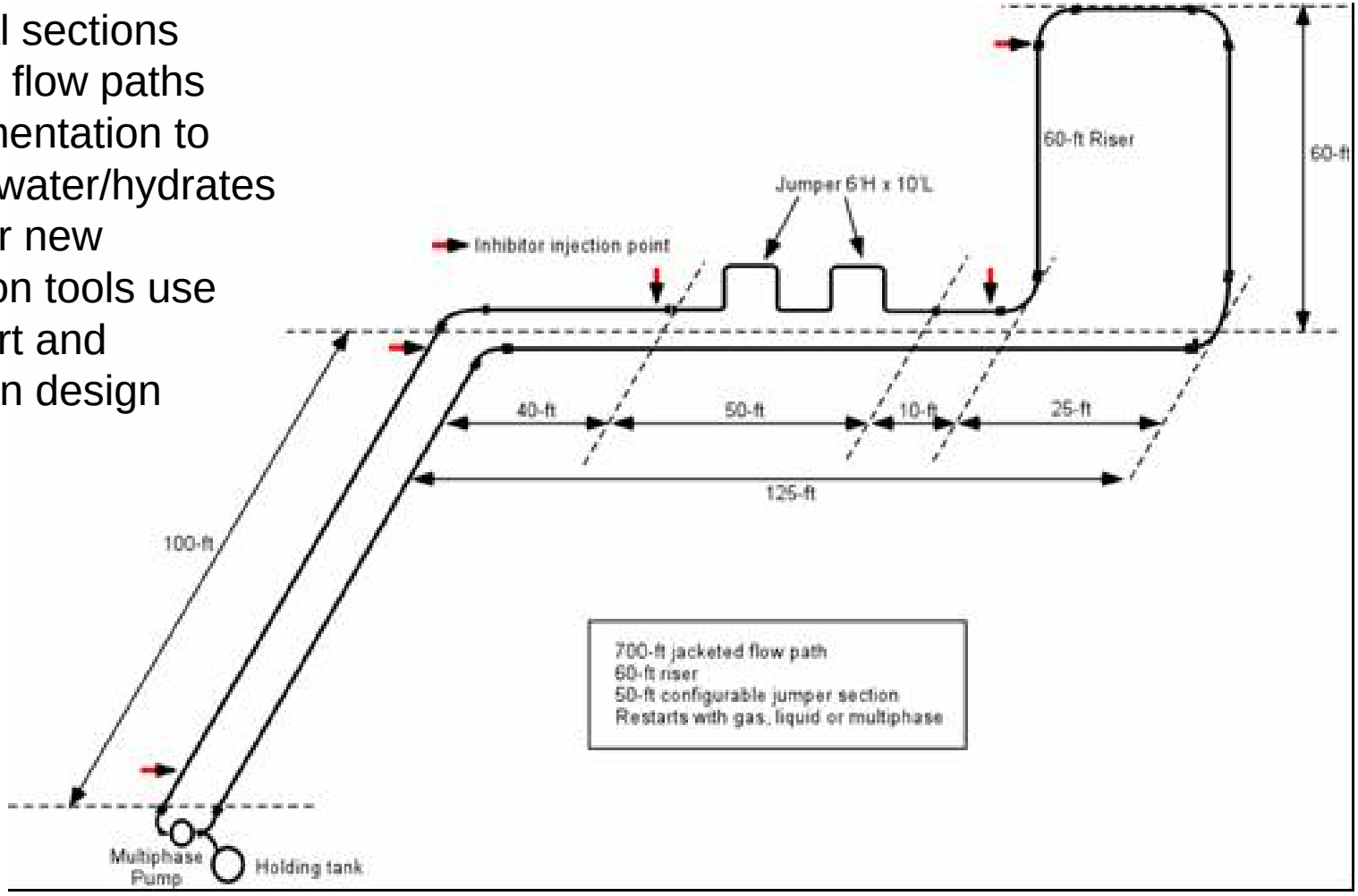
Hydrate Risk Management Upon Restart

Business Incentive

- Key development issue: Shut down and restart of Deepwater systems with hydrate potential
- Hydrate management upon restart
  - Little work especial in vertical systems
  - Better understanding and management of risk is required
  - Large potential cost savings
    - Avoid hot oil circulation
    - Understand correct procedure for inhibitor dosage
    - Understand blockage remediation and plug formation
- No existing facilities with long vertical test sections for hydrates

Realistic Production System

- Vertical sections
- Longer flow paths
- Instrumentation to monitor water/hydrates
- Test for new simulation tools use for restart and shutdown design



Expected Outcome

- **Better understanding for better Engineering**
  - Importance of water location and amount for hydrate plugging during restart
  - Risk associated with:
    - Gas and liquid dominated restarts
    - Effect cool down and residence time (well and riser)
    - Inhibitor deployment strategies (manifold, well and riser)
    - Hydrate potential during gas lift operations
- **Evaluation of shut-in/restart strategies**
  - What is necessary and not necessary for restart