Umbilical-less Systems Engineering

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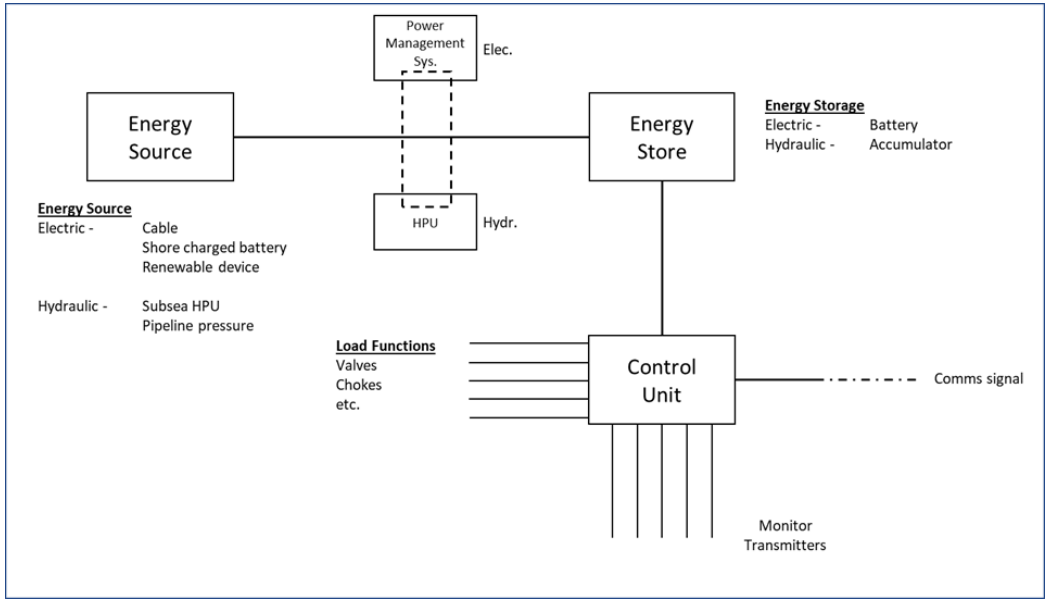
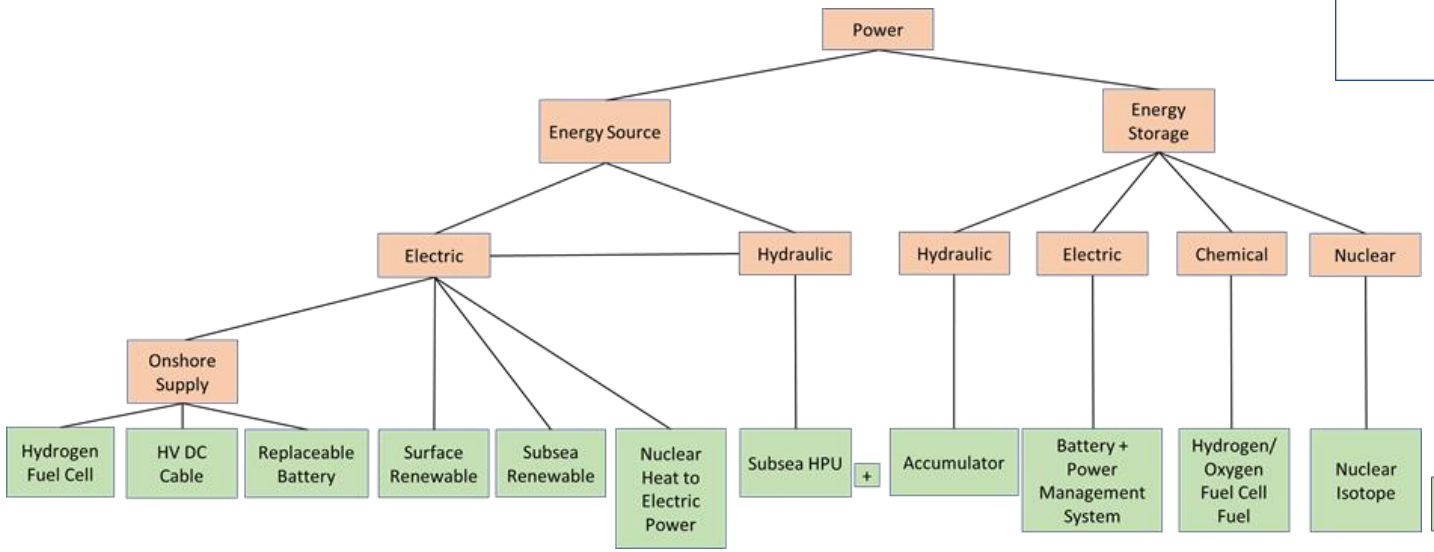
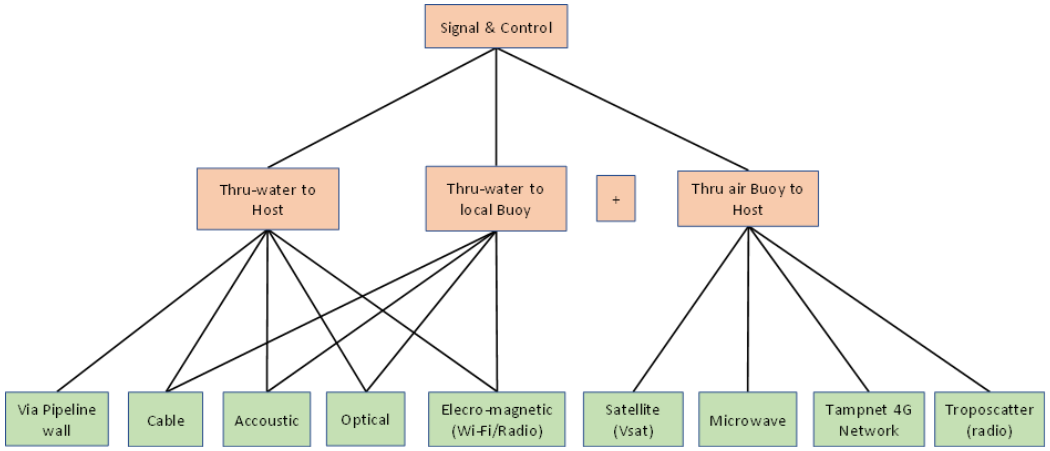
System view

- A variety of systems are possible
- Variety of component suppliers and technologies
- Need to be integrated into a working system
- The challenges are different from a conventional umbilical system







Power and consumption

Power Demand

Intermittent

- Open valves/chokes – power consumption (kW to move)

Continuous

- Hold open valves

  (small amounts of power over a long period of time – often the driver)

Variation between valve designs & between hydraulic vs electric/ different suppliers

Energy Consumption

- How often will open valves be opened?
  - Number of shut down/re-starts
  - Minimum time between shut downs/start ups
- How many valves are (need to be) held open

Chemical injection delivery can be power hungry (function of injection pressure and flow rate and duration of flow)

Range of pump sizes and technology available to match the service

Higher concentrations, less flow

Is heat a better option?

Available Power & Energy

- How much power does device produce in the environment?
- What's the seasonal variation in energy production?
- How much annual energy?
- What's the uncertainty?
- Different devices produce different amounts in different environments

A given application may be on the cusp of what one device can produce, so costs can jump 100% with a slight increase in demand (or uncertainty).

- Local energy devices at the well or larger devices centrally and distribute power

Storage

- Energy storage capacity
- Power delivery
- Re-charge time after a big demand
- Limits to discharge
- Low temperature effect on retaining charge
- Deterioration over time/ useable life before replace

Drive to minimise energy consumption:

- Minimise Chem. Inj.
- Optimise well schematics
- Minimise start-up/shuts downs
- Accept no-restart periods after a shut down.

Other Observations (1)

Industry standards – may need to be re-thought

- Topside accumulation requirements designed with short time power outage in mind (e.g. "sufficient accumulation (topside energy storage) to open all the valves on one well or hold all the valves on well open for 24 hours.")
- For a local energy subsea system with a battery the more critical issue is how much needs to be done with a single charge and how quickly can the battery be re-charged.
- Also differences in how emergency shut down would be managed (Conventionally fail-as-is on loss of comms). If power delivered locally, loss of comms means no ability to make safe (unable to cut power)
- Implies a higher shut in and re-start frequency or alternatively a high reliability communications system.
- A system which provides a wait time after loss of comms to give the signal time to be re-established before shutting in wells could also be envisaged.

Other Observations (2)

CAPEX and OPEX

- CAPEX & OPEX distribution is different
- Less initial CAPEX in a phased development.
- Uncertainty over OPEX; limited field experience.
- Batteries/ renewable devices/ chemical pumps may have shorter design life than the well.
- Replenish consumables (chemicals / hydraulic fluid). How much & how often?
- Integrate OPEX demands (activities and frequencies) to optimise costs.
- More subsea components; potentially more to fail
- Redundancy and contingency planning

Design for reliability and reliability qualification become more important

Summary

Variety of systems, components and suppliers

Existing standards not necessarily applicable

Different system engineering challenges

Complex & dynamic power demand, consumption & storage landscape

More equipment on the seabed
More installed care/ OPEX

How can Crondall help?

- Independent engineering consultancy
- High quality creative individuals
- Technology savvy
- High value/ fresh approach

Whole system understanding

Experienced

Technology Savvy

Independent Service

Operator View

"Best for Field"

"They are operator engineers – they venture an opinion rather than just doing what they're told which is what we need."

"High quality work. They're not big but the guys are experienced. They are specialists supported by a younger team."

"They are very responsive and professional in their approach. Quality work."

"I would recommend them. They're good at what they do."

Contact locations

For more information go to

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