

Example 1: Upstream export gas from onshore oil & gas production center to national gas grid

1. Pipeline 10" ID, 5 Km total length, export natural gas in operative conditions (60-70 barg)
2. Onshore buried 4,5 Km from the Oil&Gas production Centre to the gas station connected to national grid, using compressor station.
3. Add technical info:
 - o Transporting natural gas fluid (i.e. 92% methane)
 - o Oil&Gas Centre with metallic fence (area 500x500 mq)
 - o Gas station with valve section, metering system and metallic fence (area 30x50 mq)
 - o Control room in the Centre manned by operative personals h24
 - o Gas station partially unmanned
 - o Compressor stations remotely managed by using a Digital Control System (DCS) to be connected at the local TLC facilities (WiFi, UMTS, wire cable, fiber optic, Radio)
 - o Power unit used electric network
 - o Pipe diameter 10", 12" ID; external coating Polyethylene (PE) in onshore section
 - o Pipeline trench deep 1.5 – 2.0 mt
 - o Operations involved are production, compression, transmission
4. Environmental background of pipeline routing:
 - ☒ Onshore Oil & Gas field
 - ☒ Mountain field area in South Europe
 - ☒ Carbonate base of geology for nearshore, submarine
 - ☒ Weather induced critical events (e.g. fires, flooding)
 - ☒ Exposure to other natural events (e.g. seismic event, storm)
 - ☒ Third party interferences due to local onshore (agricultural and civil activities)
 - ☒ National highway close to the pipeline, railway crossing sections
 - ☒ Potenzial cyber attacks and IT/OT threats for Telecom network, Digital Control System, Metering system

Example 2: Midstream gas transport from remote upstream fields to the European gas market

5. Pipeline ID 20", 100 Km total length, transporting natural gas at high pressure in operative conditions (80-100 barg)
6. Subsea pipeline section for 50 Km in medium-deep water (bathymetric profile < 300 mt) and buried section for 50 Km from the onshore arrival terminal to the gas station by connecting to national grid, using section valves and 2 pumping stations each at 20 Km.
7. Add technical info:
 - o Transporting natural gas fluid (i.e. 97% methane)
 - o Gas plant stations with valve section remotely controlled, metering system and metallic fence (area 500x500 mq)
 - o Control room manned by operative personals h24
 - o Remote stations partially unmanned
 - o Metering station at the onshore arriving terminal
 - o Compressor stations remotely managed by using a Digital Control System (DCS) to be connected at the local TLC facilities (WiFi, UMTS, wire cable, fiber optic, Radio)
 - o Power units used gas for electric generation (gas to power)
 - o Pipe diameter 20", 24"; internal/external coating Polyethylene (PE) in onshore section and external concrete in submarine area
 - o Pipeline trench deep 1.5 – 2.0 mt
 - o Operations involved are production, compression, transmission
8. Environmental background of pipeline routing:
 - ☒ North Africa gas fields (i.e. onshore, offshore)
 - ☒ Terminal located on South Mediterranean coast

- ☒ Sandstone base of geology for nearshore, submarine
- ☒ Weather induced critical events (e.g. fires, flooding, etc.)
- ☒ Exposure to other natural events (e.g. seismic event, tsunami, storm, hurricane);
- ☒ Third party interferences due to local onshore (agricultural and civil activities)
- ☒ Third party interferences due to offshore (shipping and fishing activities)
- ☒ National highway and railway crossing sections close to the pipeline
- ☒ Possible cyber attacks, IT/OT threats for Telecom network, Digital Control System, Metering system