



## Lessons Learned from Mega Pipeline Projects: TANAP Case

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## Trans Adriatic Pipeline (TAP)

**Total Length:**  
870 km (Greece 545 km, Albania 211 km, Italy 8 km, Adriatic Sea 105 km)



### Shareholders



## Trans Anatolian Natural Gas Pipeline (TANAP)

**Total Length:**  
1850 km (Turkey)



### Shareholders



## South Caucasus Pipeline Expansion (SCPx)

**Total Length:**  
691 km (Azerbaijan 443 km, Georgia 248 km)



### Shareholders

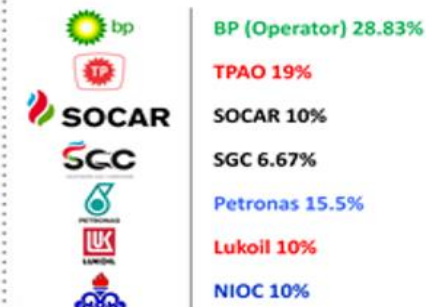


Technical Operator – BP, Commercial Operator – SOCAR

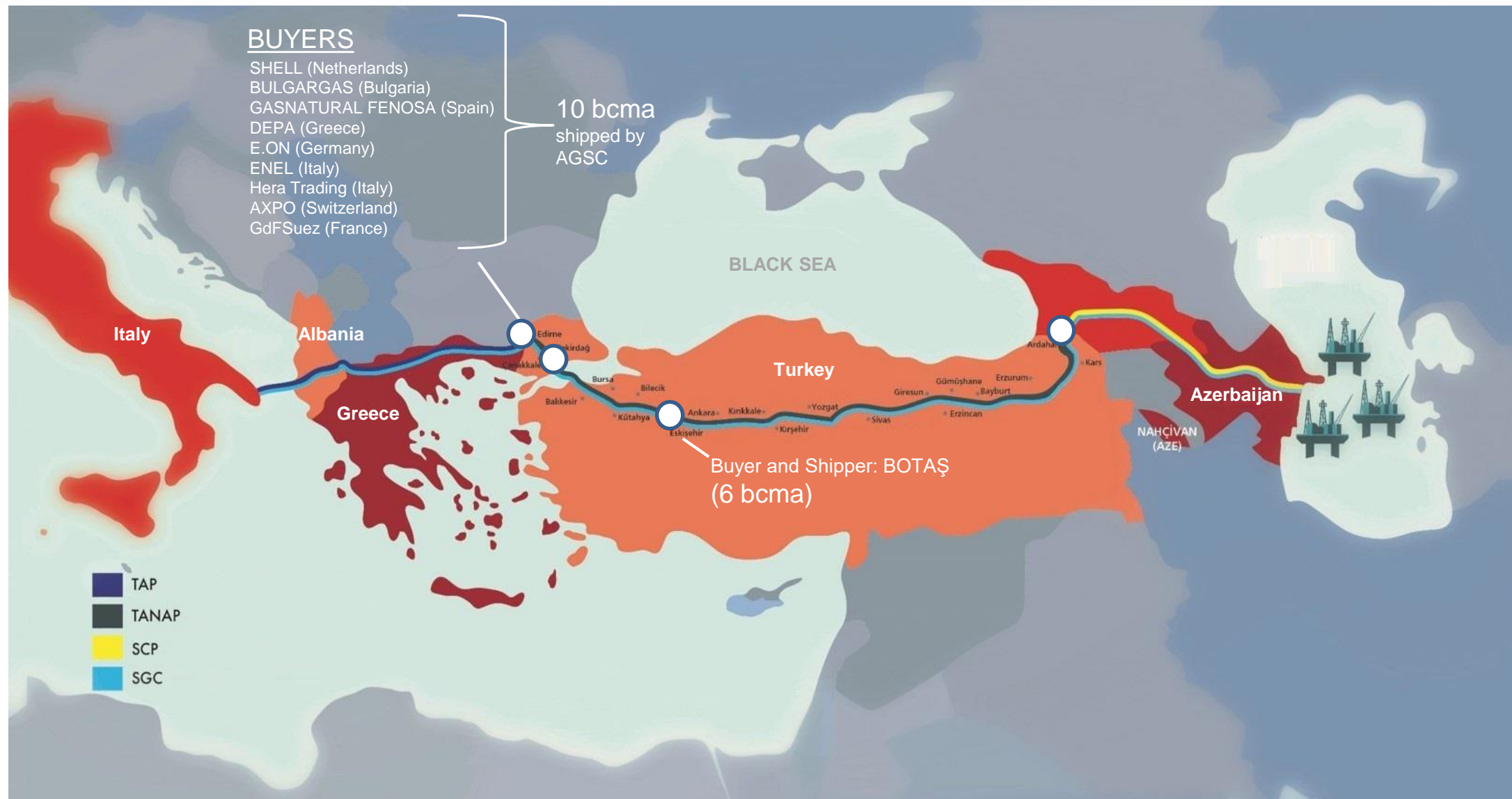
## Shah Deniz Consortium (SHD II)

**Reserves:**  
1.4 trillion cubic meters (tcm)

### Shareholders



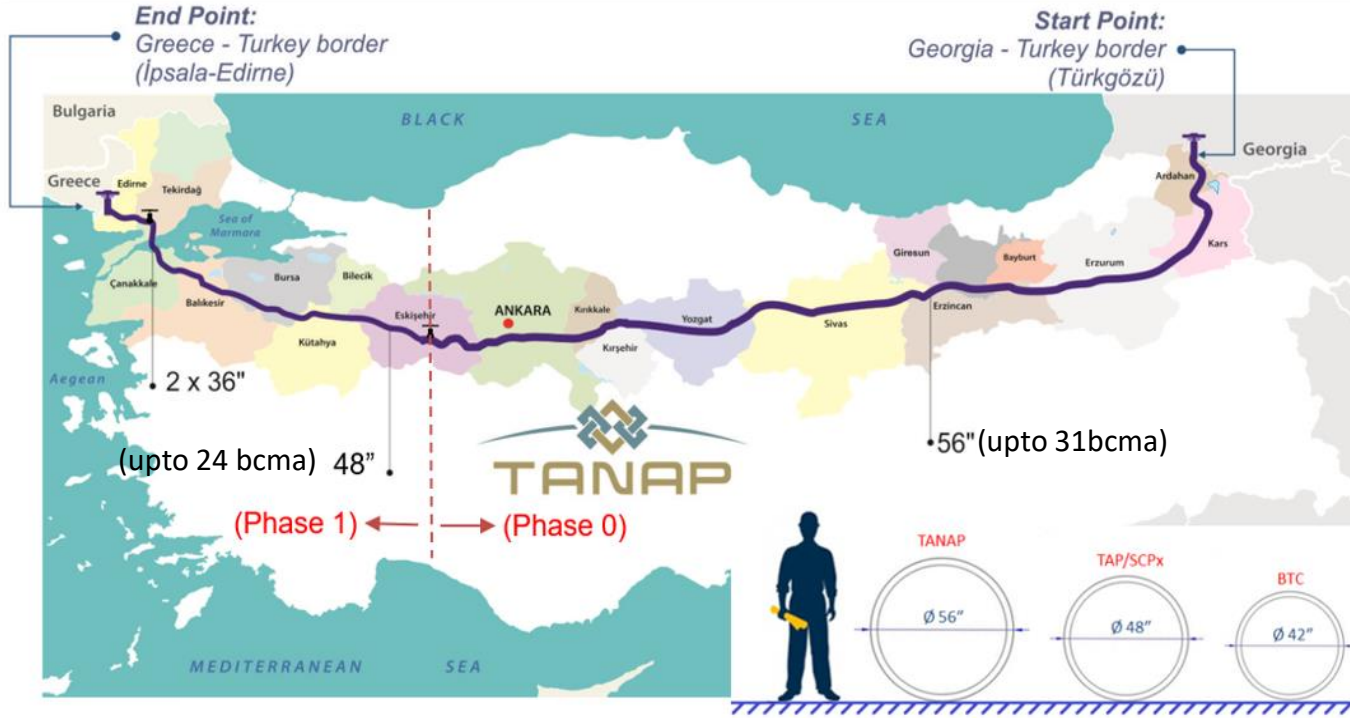
- **For Azerbaijan:** Creating stronger economic and political ties with EU, having access to new consumer markets to ensure demand security and diversity, creating revenues from gas exports to sustain economic growth and being 2<sup>nd</sup> biggest gas supplier to Turkey
- **For Turkey:** enhancing supply security and diversity, reducing investment needs for expansion of local gas transmission network, social and economic benefits (spill over effects, e.g. new jobs and business opportunities for local people, contractors and vendors, social and environmental investment programs to foster regional development, tax revenues etc.
- **For Europe:** reducing high import dependence of the South East European Countries on a single source (RF) by diversifying not only supplies but also supply routes, development of crossborder gas interconnectors and transmission networks with neighboring countries such as Monte Negro, Croatia, Bosnia and Herzegovina
- **For Turkey and Europe:** fostering gas-to-gas competition among existing and potential suppliers, increased bargaining power against existing suppliers, increased volume of gas trade, reduced energy bills and increased consumer surplus.
- **For TANAP Shareholders:** Significant revenues from gas transportation for a period of 15 years and onwards











## Gas Transmission Capacity

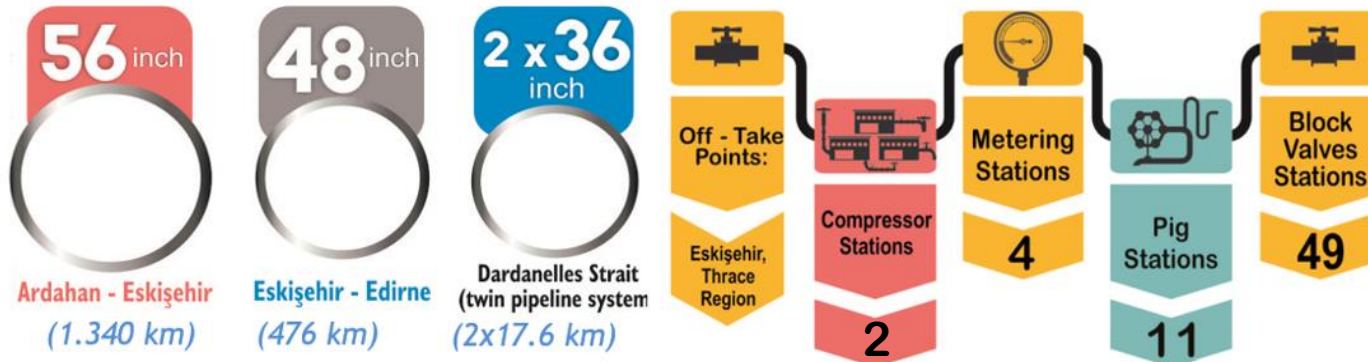


## Pipeline Route



Pipeline (1.850 km)

Stations (for 16bcma)



### Gas Transportation Agreements (TANAP vs BOTAS & TANAP vs AGSC)

- ✓ Single Entry Point (Turkey-Georgia Border, FMS owned and operated by TANAP on Turkish side )
- ✓ Exit Points
  - Exit Points for Turkey (Eskişehir and Thrace): BOTAS is Shipper, FMSs owned and operated by TANAP
  - Exit Point for Europe (Turkey-Greece Border): AGSC is Shipper, FMS owned and operated by TAP on Greek side
- ✓ No connection to any underground storage facility
- ✓ No backflow structure at interconnections
- ✓ Point to Point (distance-based) Tariff based on 100% Capacity Payment
- ✓ Tariff model based on Annual and Daily Reserved Capacity
- ✓ Capacity reservations on volumetric basis
- ✓ Daily nomination and allocation schemes
- ✓ Line pack owned and fuel gas supplied by Shippers.
- ✓ No balancing provisions: imbalances are reflected in stock accounts

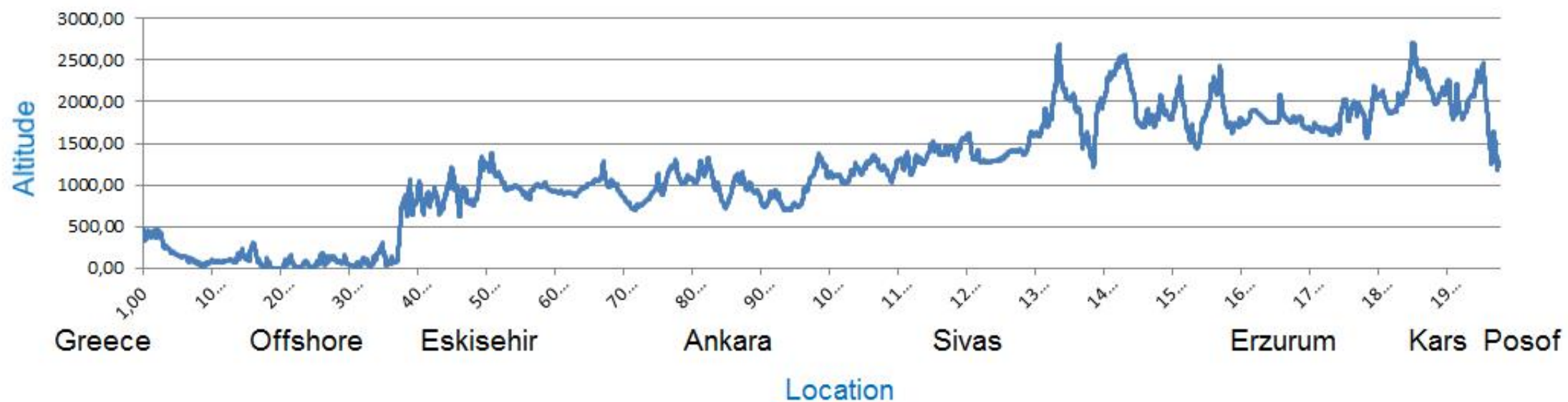
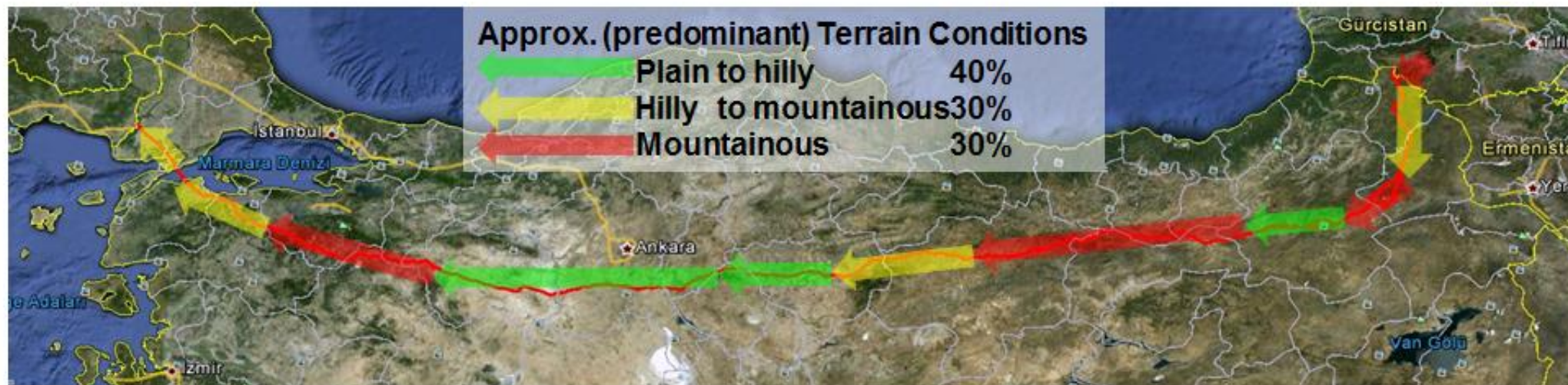
## Technical Interfaces and Interoperability Issues

- Three different pipelines operating under three different regulatory regimes in the gas supply chain,
- GTAs with two initial shippers, BOTAŞ and AGSC are in force. Existing 16 bcma transportation capacity is fully booked by these shippers.
- Operations Agreement with the first shipper, BOTAŞ is in force. Negotiations with AGSC are ongoing as the commercial operation date of TAP expected in the first quarter of 2020 .
- Main challenges for developing harmonised operational terms are related with different gas days and management of line pack.
- Complicated provisions for nominations and allocations among the parties

	SCPC	TANAP	TAP	BOTAS (Turkey's TSO)
<b>Regulatory Framework</b>	No 3 <sup>rd</sup> Party Access	Negotiated 3 <sup>rd</sup> Party Access	EU Rules, Exemption for Booked Capacity	Regulated 3 <sup>rd</sup> Party Access
<b>Gas Day</b>	CET + 2 (08.00 am to 08.00 pm local)	CET + 2 for Turkish Exit CET + 1 for Greek Exit	CET + 1 (07.00 am to 07.00 pm local)	CET + 2 (08.00 am to 08.00 pm local)
<b>Balancing Provisions</b>	Not applicable	No	Yes	Yes
<b>Tariff</b>	Distance-based	Distance-based	Distance-based	Entry - Exit



Scale & Complexity	<ul style="list-style-type: none"> <li>• coordination across different borders</li> </ul>
Economics & Politics	<ul style="list-style-type: none"> <li>• Market and price volatility, ensuring government's support, compliance with local legislation (permits, working hours etc.), security risks</li> </ul>
Timing & Schedule	<ul style="list-style-type: none"> <li>• Project duration, seasonal and geographical constraints etc.</li> </ul>
HSSE	<ul style="list-style-type: none"> <li>• transportation and construction site risks, communities, human resources</li> </ul>
Financing	<ul style="list-style-type: none"> <li>• Securing timely financing with favorable terms</li> </ul>
Resources	<ul style="list-style-type: none"> <li>• mobilization of competent manpower and fit-for- purpose equipment</li> </ul>
Delineation of Roles and Responsibilities	<ul style="list-style-type: none"> <li>• structuring the relationship with project participants: project owner, contractors, subcontractors and vendors</li> </ul>
Technical and Contractual Challenges	<ul style="list-style-type: none"> <li>• tight design specs, construction environment, engineering changes on the way, variable performance from EPCM, contractors &amp; vendors</li> </ul>
Project Governance	<ul style="list-style-type: none"> <li>• decision-making, ownership, financing methodology, client/contractor relations, stakeholder management, ethics &amp; compliance</li> </ul>
Unwavering Commitment	<ul style="list-style-type: none"> <li>• the success of mega projects depends on people who execute it</li> </ul>









Onshore P/L with BVSs and PSs was split into 4 Lots and each Lot to 2 Spreads:

- LOT-1 (56"): KP 0 to KP 375
  - Spread-1 KP 0 to KP 185
  - Spread-2 KP 185 to KP 375
- LOT-2 (56"): KP 375 to KP 825
  - Spread-3 KP 375 to KP 585
  - Spread-4 KP 585 to KP 825
- LOT-3 (56"): KP 825 to KP 1.340
  - Spread-5 KP 825 to KP 1.070
  - Spread-6 KP 1.070 to KP 1.340
- LOT-4 (48"): KP 1340 to KP 1810
  - Spread-7 KP 1.340 to KP 1.575
  - Spread-8 KP 1.575 to KP 1.810

- Phase 0 – Gas to Turkey ✓
- Phase 1 – Gas to Europe



TANAP Inauguration Ceremony (Phase 0), 12 June 2018

Offshore P/L (36"): (2x17.6 km)

SCADA/Telecom System

Stations (CS1, CS5-CS5L, MS1, MS2, MS3 & MS4)

- ✓ TANAP have supplied 24 “free issue materials” to construction contractors for performance of the works including:
  - 36” / 48” / 56” line pipes and hot bends externally & internally coated
  - Gas turbine driven turbo compressor packages
  - 36” / 48” / 56” block valves and actuators
  - Pig traps including pig trolleys and jib cranes
  - All actuated/motor operated valves with diameter of 10” and greater
  - Interlock systems
  - All tagged field instrumentations
  - Prefabricated SCADA container buildings
- ✓ No Incoterms used in supply contracts. All deliveries made to a ‘Delivery Point’ in Turkey. Customs clearance done by vendors.

## Challenges

### *Road Safety*

- Risks for people and material transports
- More than 4500 off-road vehicles including pipe trucks, regular trucks

### *Resourcing for key positions:*

- eNEBOSH certified H&S Advisors with pipeline projects experience
- H&S Managers
- Training Managers
- Health Advisors

### *Aligning Project contractors with TANAP requirements*

## Minimum Requirements

- TANAP Safety Requirements reflected in the main contract documents for all Contractors.
- **Contractors** developed project specific safety related manuals, plans, procedures **reviewed and approved by TANAP** as per the Contracts.
- TANAP Incident Investigation Procedure
- TANAP Safety Disciplinary Actions Procedure

## TANAP Safety Team

- As per the competency requirements of key positions (Safety Manager, Safety Advisor, Training Manager, Health Advisor)
- 1/50 ratio for Advisor positions
  - ✓ TANAP Safety Team - 52 Professionals
  - ✓ Contractors Safety Teams - More than 200 H&S Professionals at peak time
- Provision of Advisors to risky activities such as excavation, lowering-in, tie-in welding, crossings, night works (subject to special permission)



## Leadership

- Safety Commitment Letter signed by Senior Management and shared with each and every Contractor and within TANAP
- Quarterly Safety Walk-Downs by TANAP Senior Management
- Weekly Site Construction Leads Safety Walk-Down Programmes
- Quarterly TANAP-Contractors Senior Management Safety Forums

## Continuous Improvement Training Sessions

- Supervisor/Foreman Safety Leadership Programmes
- TANAP Line of Fire Campaigns
- TANAP Road Safety Campaigns
- LLD (Lessons Learned)
- WAH (Working at Height)
- Lifting
- PTW (Permit to Work)
- Process Safety
- RCA (Root Cause Analysis)
- NEBOSH IGC

## Incentive Programme and Disciplinary Actions

### *TANAP H&S Incentive Programme*

- Monthly monetary awards for good performances
- Instant gifts for exemplary safe behaviours
- Monthly gifts via draws for safety oriented workers
- Monthly Recognition Programme

### *TANAP H&S Discipline Procedure*

- Zero tolerance to persisting safety violations
- More than 300 project employees subject to infringements

## Road Safety

Driver Permit Card



Safe Pass



Driver Recognition Buttons



IVMS System



Vehicle Cameras



Road Risk Assessments



## Assurance and Verification

### Daily H&S Inspections

- Based on march-charts
- Pre-developed checklists

### H&S Audit Programme

- Lifting
- Road Safety
- Occupational Health and Hygiene
- Road Safety

### Regular Site Visits

- Based on a pre-determined H&S Walk-down Programme - Weekly
- Senior Management H&S Walk-down Programme – Quarterly

### ATR

- Action Tracking Register
- Centralized
- Open to Ankara and Site H&S & Delivery Managers

### H&S Meeting Schedule

- Daily H&S Meetings - Site
- Weekly H&S Meetings - TANAP & Contractors
- Construction Progress Meetings - Monthly
- H&S Committee Meetings - Monthly
- Contractor Senior Management H&S Forums - Quarterly

## The Pillars

- Turkish H&S Law No. 6331
- Standards of International Trade Associations (i.e. IPLOCA, IAOGP etc)
- Standards of international Financial Institutions (i.e. IBRD, EBRD etc.)
- The Requirements of TANAP Integrated Management System Standards
- Lessons Learned from similar projects

## Benchmarked Targets

LTif	RTA	TRIR
Lost Time Incident Frequency	Road Traffic Accident Rate	Total Recordable Incident Rate
0,74	1,19	1,80



## H&S Performance as of August 2018

LTif	RTA	TRIR
Lost Time Incident Frequency	Road Traffic Accident Rate	Total Recordable Incident Rate
0,09	0,36	0,39

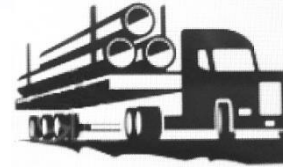




Man-hours worked:  
**96.331.656**



Kilometers driven:  
**198.872.938**



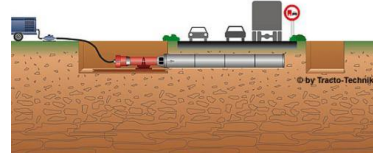
No of truck freights:  
**80.000**



No of pipes welded:  
**135.332 (1,34 MT)**



Volume of soil excavations:  
**50.633.3820 m<sup>3</sup>**



No of crossings:  
**6.834**



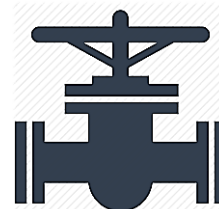
Highest Point on P/L:  
**2.760 m, KP 621 (Red Mountain)**



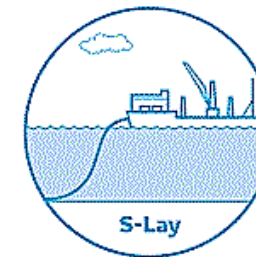
Steepest Slope on P/L:  
**30%, KP 14 (Ilgar Mountain)**



Deepest Point on P/L:  
**- 65 m (Dardanelle)**



Line fill started after the first pipe joint welded for 1.340 km  
56" diameter P/L: **887 days**



2x36" (35,2 km) offshore pipe laying incl. above water tie-ins: **51 days**



Longest time achieved  
without lost time incidents:  
**22.974.080 man-hours-at  
Stations**



Weld repair rate for 2.838  
offshore pipe joints: **0.46%**



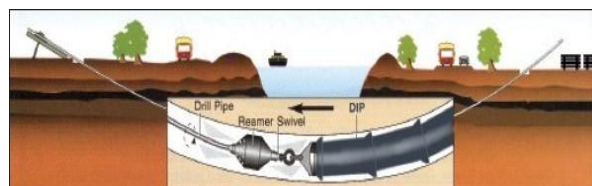
No of FOC installation  
repairs for 70 km offshore  
FOC installed: **None**



Total length of 56" P/L section  
lowered-in in one month:  
**120 km**



No of 36" offshore pipe  
joints welded in one day:  
**136 joints (1.670 m/day)**



Longest river crossing with  
HDD in Europe:  
**1.100 m (Sakarya River)**



Longest 56" P/L section  
lowered-in in one day:  
**10 km**



No of 56" pipe joints welded in  
one day by one welding team:  
**145 joints (2.000 m/day)**  
(CRC World Record)



No of correspondences  
made: ~150.000



No of opinion  
letters from State  
Authorities: 1.200



No of documents  
produced: ~ 180.000



No of permits  
obtained: 434



No of acquired parcels:  
20.818 private / 7.541 public



% of registered  
parcels: 70%



No of landowners:  
112.521



No of land entry  
protocols signed:  
20.818



Total value of contracts  
signed: > USD 5 billion

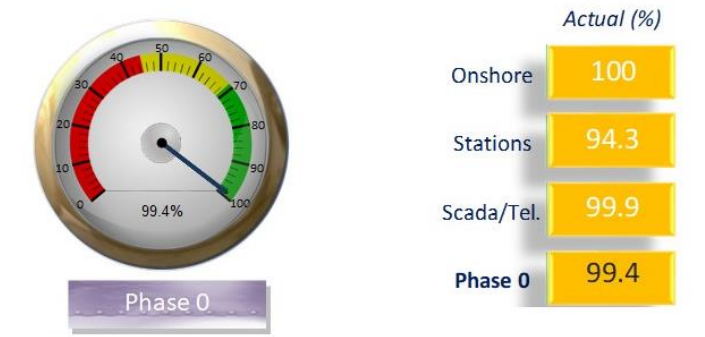
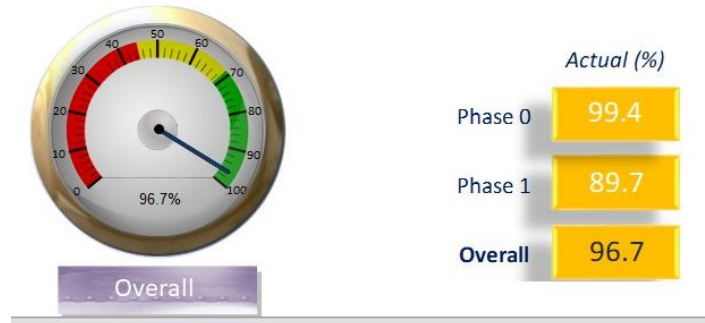


No of archaeological  
sites discovered: 154



No of new species  
discovered: 9 fauna & 1 flora





- Phase 0 – Gas to Eskişehir (1.340 km long 56" diameter P/L + MS-1 + MS-2 + 39 BVSS + 6 PSs) is mechanically completed as of **25.12.2017**.
- Line fill and commissioning of P/L started on **23.01.2018**.
- Gas reached MS-2 at Eskişehir Off-take Point (KP 1.340) and line fill of Phase 0 completed as of **11.03.2018**.
- Inauguration ceremony for Phase 0 held on **12.06.2018**.
- Commercial operation commenced on **30.06.2018**.

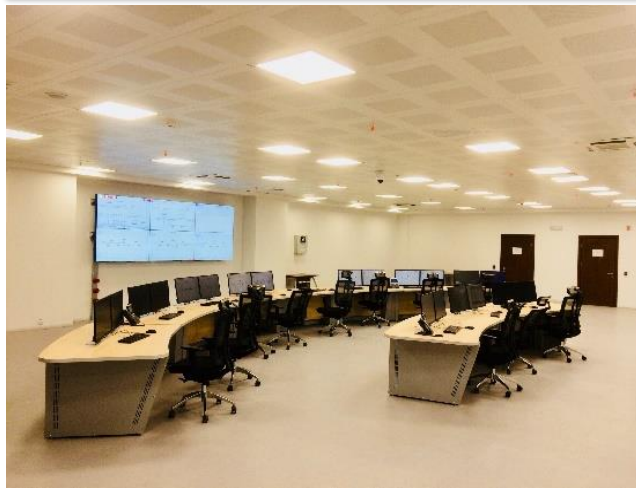




MCC Building, Ankara



MCC Control Room, Ankara



MS-1 Interior View, Posof



MS-2, Eskişehir



CS-5 Offtake, Eskişehir

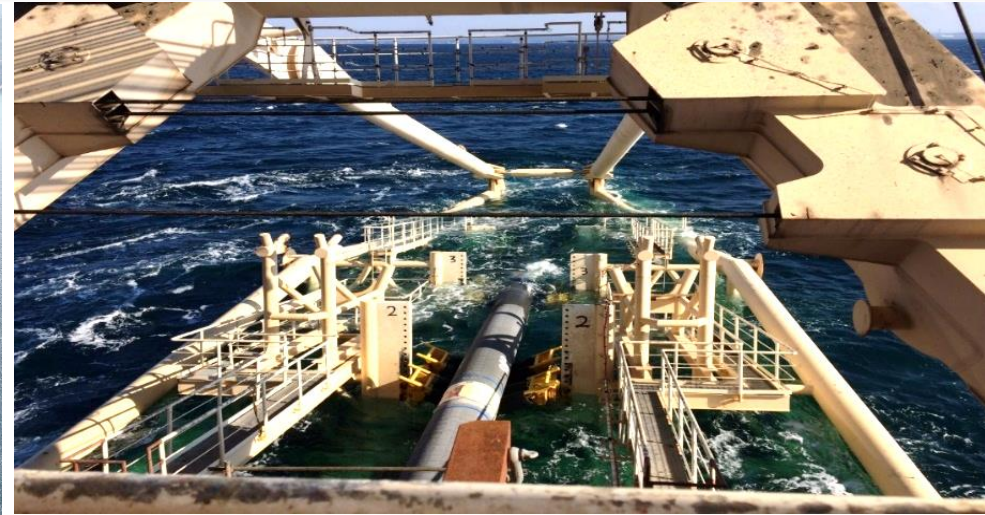


BVS 26, Yozgat





## Dardanelle Strait Crossing General View





- Current CAPEX estimate is now \$6,96 billion after 41% cost saving from initial CAPEX estimate of \$11,77 billion. Further savings are on the way.



- TANAP shareholders have already secured \$3,75 billion under the loan agreements with IFIs including IBRD, MIGA, AIIB, EBRD and EIB.



- Grants received under EU's PCI programme have reached €10,3 million.



- Deploy an experienced and well-organized project execution team. Decide if you really need a PMC/EPCM, if your answer is YES choose the right one, right team and right location
- Rapid & effective decision-making at all levels
- Select the best contractors and vendors with good track records; allocate enough time & resources for pre-bidding, bidding and contract negotiations
- Full EPC contracts vs construction contracts with free issued engineering and materials
- Freeze design and stabilize scope before mobilizing construction contractors, shoot all engineers after (and even before) the contract award
- Avoid diluting focus; clearly define and manage the critical milestones that impact project outcome and success. Prioritize the activities on the critical path according to their impact on cost and schedule



- Execute the basics well: effective planning and execution & robust quality programs across entire project
- Develop and implement effective health and safety programs across entire project (toolbox talks, safety stand-downs etc.); comply with rules (show zero tolerance), encourage better behavior and decisions,
- Recognize that all risks are not defined before starting, always expect the unexpected and be prepared to react/mitigate,
- Closely and continuously monitor and control the performance of your project team, contractors, subcontractors and vendors, make timely interventions to activities which are not on the right track
- Develop and implement effective social and environmental programs, work with local communities to gain sympathy and avoid disruptions

