

# AZ OLAJIPARI KUTATÁS-FEJLESZTÉS A SZEGEDI TUDOMÁNYEGYETEMMEL (MA ÉS HOLNAP... )

## HOW TO CREATE VALUE FROM R&D IN THE CURRENT OIL PRICE ENVIRONMENT

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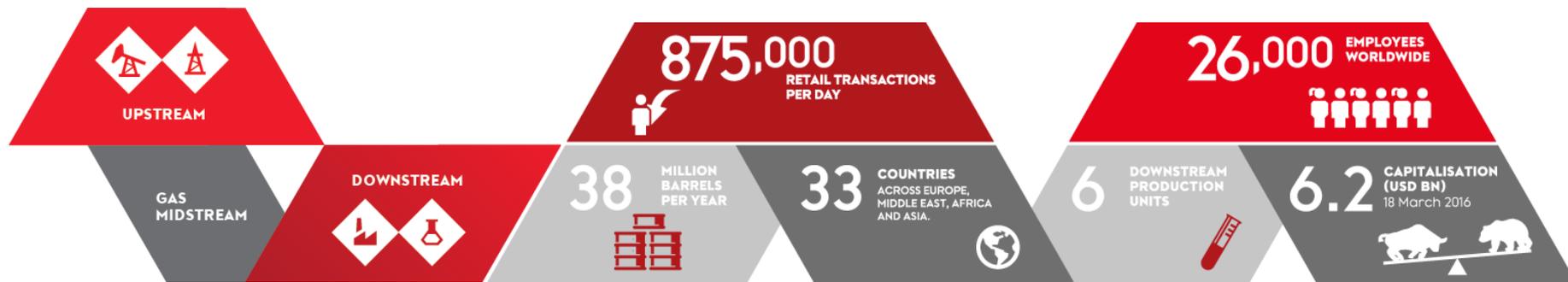
- Hungary and worldwide

# MOL GROUP AT GLANCE

## MOL GROUP IS...

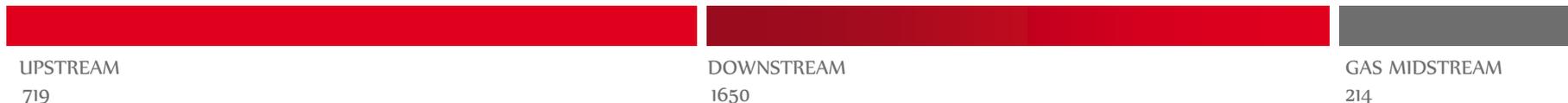
- ▶ AN INTEGRATED, INTERNATIONAL OIL AND GAS COMPANY
- ▶ HEADQUARTERED IN BUDAPEST, HUNGARY
- ▶ TRACK RECORD OF OVER 100 YEARS IN THE INDUSTRY
- ▶ LEAD POSITIONS IN OUR HOME MARKETS WITHIN CENTRAL EASTERN EUROPE

## CORE ACTIVITIES



## CCS EBITDA CONTRIBUTION OF THE MAIN SEGMENTS IN 2015 (USD MN)

ALL FINANCIAL DATA FROM 2015



# UPSTREAM



- ▶ 75 years of experience in exploration and production
- ▶ Oil and gas exploration and production assets in 13 countries
- ▶ Production activity in 8 countries
- ▶ Do business responsibly and sustainably
- ▶ Supporting communities (best possible health and safety and security standards)



EXPLORATION

13



PRODUCTION

8



## DOWNSTREAM



- ▶ 4 refineries and 2 petrochemical plants
- ▶ Crude oil into a range of refined products for domestic, industrial and transport use
- ▶ The products include, among others, gasoline, diesel, heating oil, aviation fuel, lubricants, bitumen, sulphur and liquefied petroleum gas
- ▶ Produce and sell petrochemicals worldwide and hold a leading position in the petrochemical sector in the Central Eastern Europe region

### PRODUCTION UNITS

6



# MOL GROUP

## INTEGRATED BUSINESS MODEL



UPSTREAM



DOWNSTREAM



GAS MIDSTREAM

2015FY CCS EBITDA (USD BN)



- ▶ Strong integrated business model from Exploration to Retail and Gas Midstream
- ▶ Diversified operation, resilient business profile
- ▶ Leading position in home markets and high potential growth internationally
- ▶ Strong Balance sheet and proved conservative financial policy
- ▶ Dynamic international workforce
- ▶ A member of the Forbes 500 list

## COMPANY OVERVIEW

	Market capitalization (18 March 2016; bn USD)	<b>6,2</b>
	Countries of operation	<b>33</b>
	Number of employees	<b>26,000</b>
	Production – mboepd	<b>104</b>
	Reserves SPE 2P - MMboe	<b>514</b>
	Refineries and Petrochemical facilities	<b>4+2</b>
	Refinery capacity – mbbldpd	<b>417</b>
	Nr. Of Service Stations (31 Dec 2015)	<b>~1900</b>
	Customers buying our fuels every day	<b>875,000</b>

MEMBERS OF  
MOL GROUP



**INA**



Slovaft

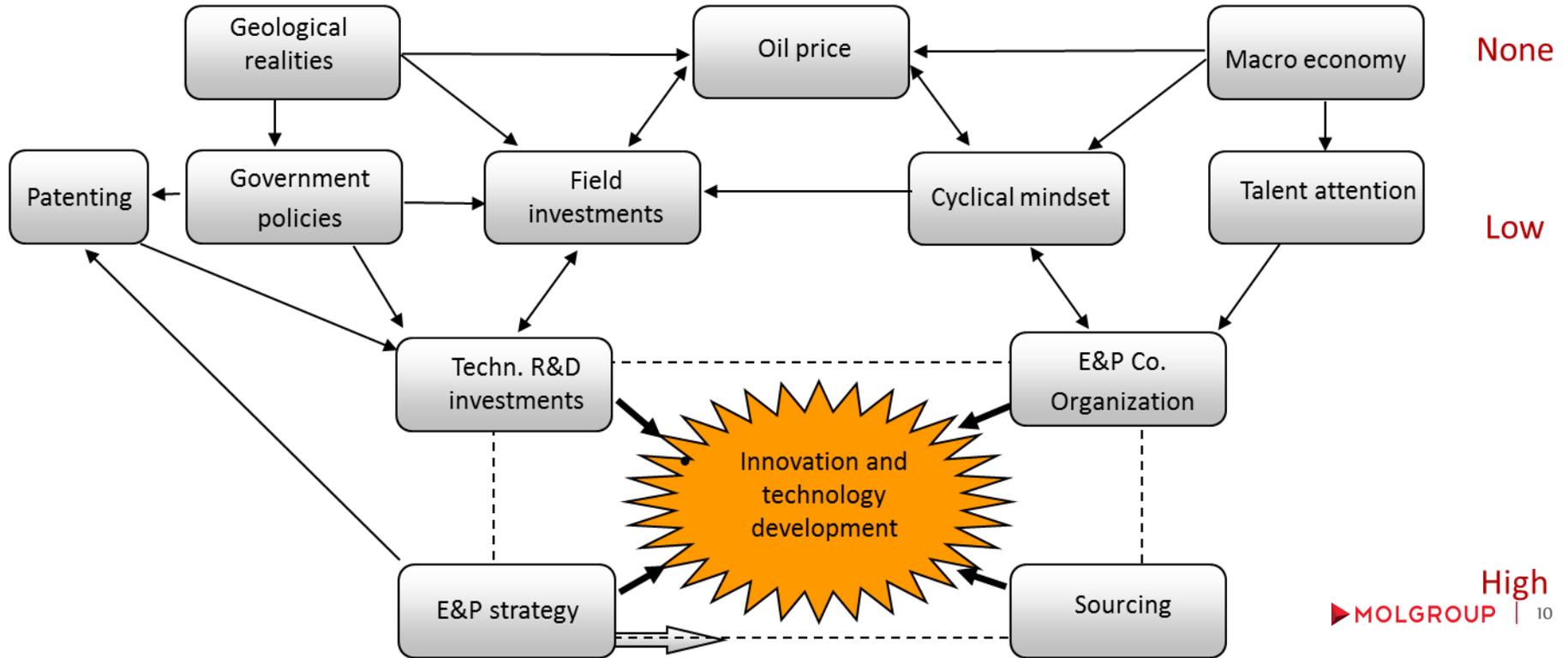
# UPSTREAM R&D ENVIRONMENT

# KEY POINTS ON UPSTREAM RESOURCES AND RESERVES

- ▶ TECHNOLOGY IS THE KEY. 'PEAK OIL IS' A MISLEADING IDEA. THE POTENTIAL FOR FUTURE OIL PRODUCTION DEPENDS ON RESOURCES BEING CONVERTED INTO RESERVES BY THE APPLICATION OF TECHNOLOGY, ECONOMICS AND INVESTMENT. OIL RESERVES HAVE MORE THAN DOUBLED SINCE 1980 – MORE THAN THE INCREASE IN PRODUCTION: OIL IS NOT RUNNING OUT.
- ▶ A VARIETY OF NEW TECHNOLOGIES IS CREATING NEW RESERVES OUTSIDE THE TRADITIONAL OIL-EXPORTING COUNTRIES: IN PRE-SALT RESERVOIRS, ULTRA-DEEP WATER, IMPERMEABLE DEPOSITS (SUCH AS SHALE), ACCESSED BY A COMBINATION OF HORIZONTAL DRILLING AND 'FRACKING'.
- ▶ RESERVES ARE ALSO INCREASING IN MANY TRADITIONAL EXPORTING COUNTRIES, WITH NEW TECHNOLOGY FOCUSED ON THEIR PARTICULAR CONDITIONS, E.G. ENHANCING ULTIMATE RECOVERY FROM MATURE RESERVOIRS.
- ▶ STATE-CONTROLLED COMPANIES CONTROL NEARLY 90% OF CURRENT OIL RESERVES, BUT IN THE STATE-CONTROLLED SECTOR 50% IS OPEN TO THE PRIVATE SECTOR IN VARIOUS FORMS OF COOPERATION WITH STATE COMPANIES ON THE TERMS SET BY THE COUNTRY CONCERNED, AND WITH SPECIFIC TECHNOLOGY NEEDED BY THE STATE COMPANY.

# FACTORS INFLUENCING E&P INNOVATION AND TECHNOLOGY BY MCKINSEY

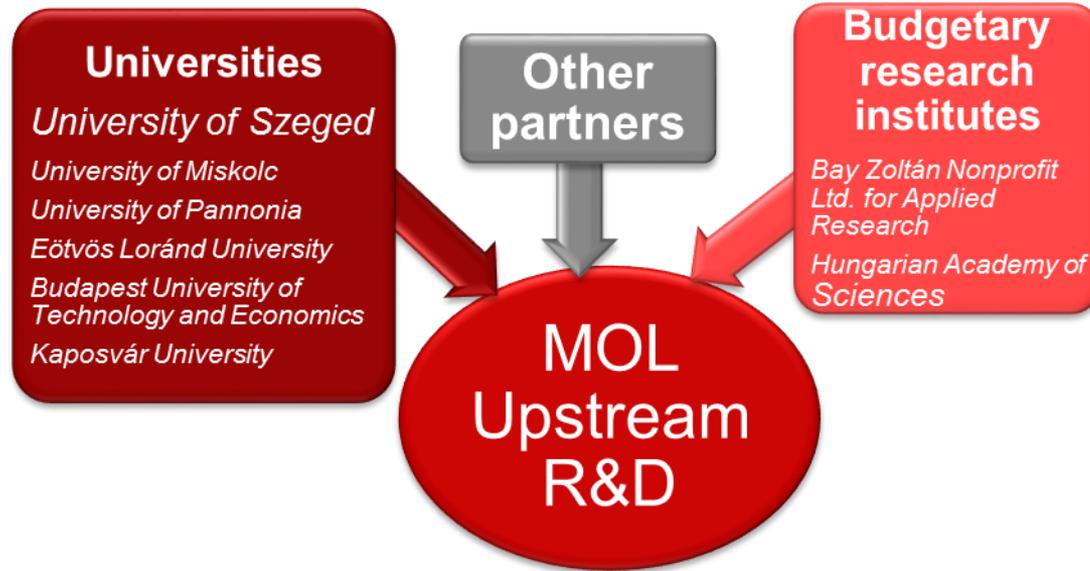
Level of  
influence



# UPSTREAM RESEARCH & DEVELOPMENT STRATEGY 2013-2018

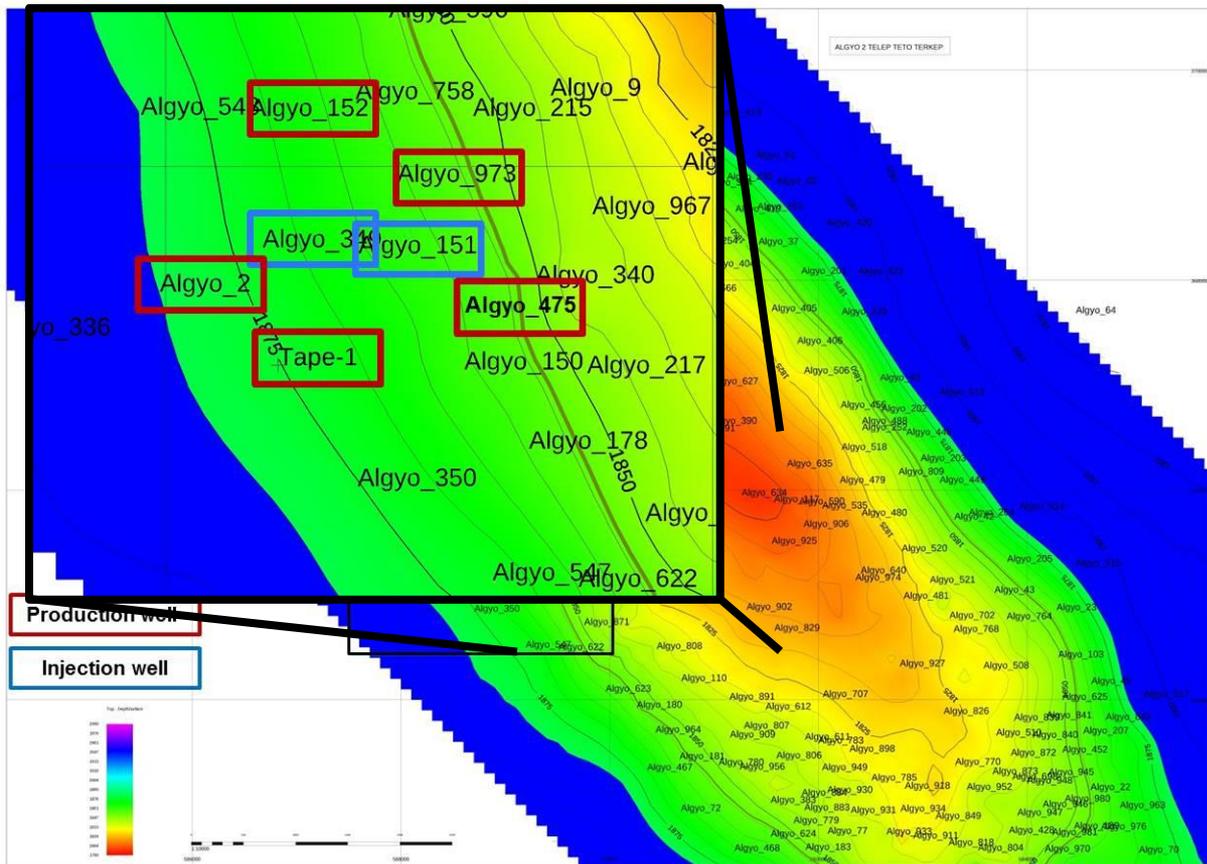
- ▶ Upstream R&D & Innovation is a key activity for value creation via successful project implementation worldwide
  - ▶ Increase recovery factors in mature fields
  - ▶ Decrease production cost (USD/boe)
  - ▶ Additional value available in the upstream business development processes
  - ▶ Optimise commercialisation and deployment of R&D projects
- ▶ Increase the international technology reputation of MOL Group E&P
- ▶ All of the above mentioned based on the upstream country strategies as well

# PARTNERSHIP AND INTERDISCIPLINARY APPROACH



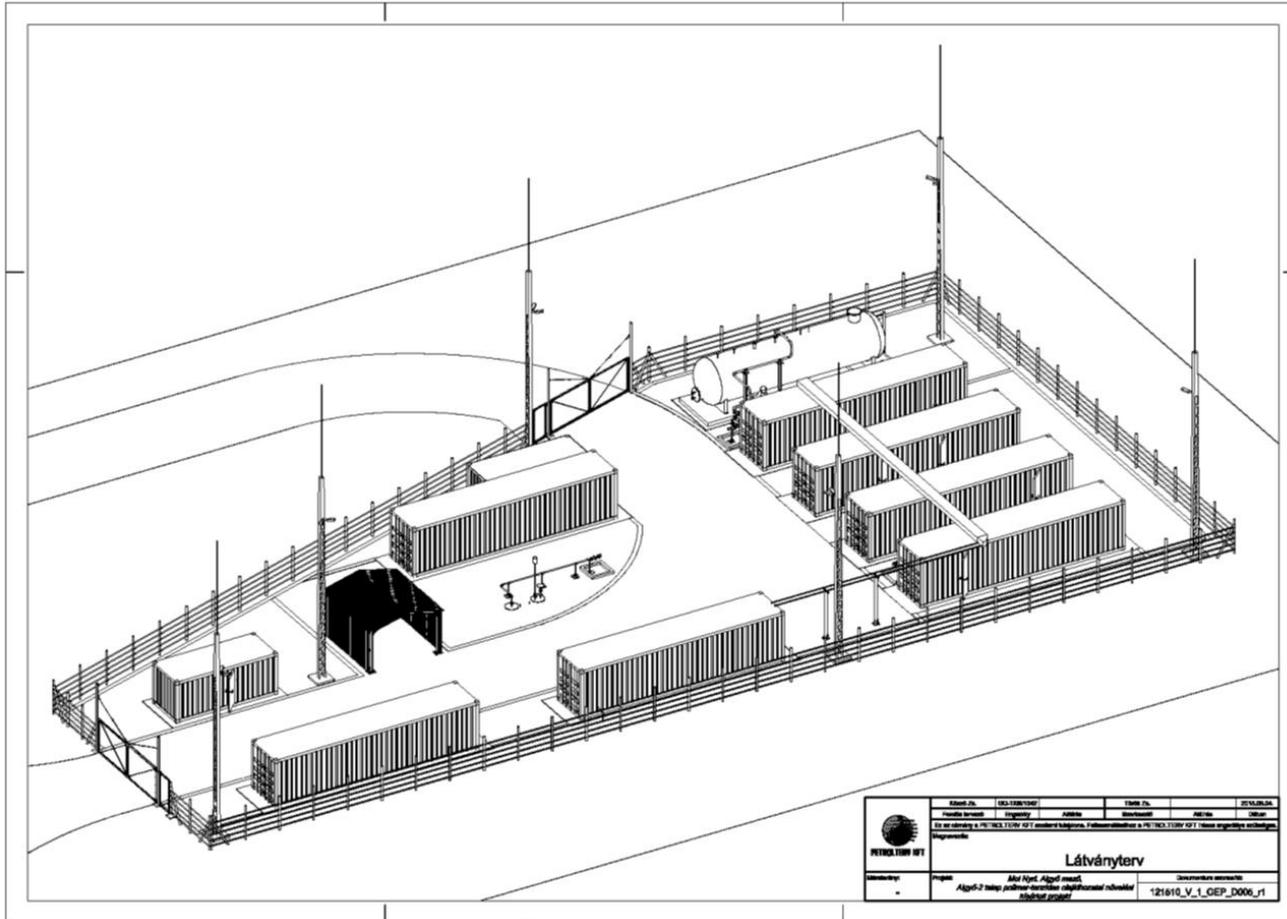
# TODAY WITH SZTE

# PROJECT 1.-TARGET RESERVOIR MAP



- ▶ ONE LAYER-ONE SEGMENT SURFACTANT-POLYMER EOR PILOT APPLYING MOL R&D DEVELOPED HIGH THERMALLY STABLE SURFACTANT MIXTURE IN ORDER TO ACHIEVE AN ADDITIONAL 17.5 % RECOVERY FACTOR BY INJECTION RATE OF 628 BBL/D/WELL . DURING THE WHOLE LIFECYCLE AN ESTIMATED 676 225 BBL CRUDE WILL BE TARGETED
- ▶ LOCATION: HUNGARY, ALGYÓ-FIELD, ALGYÓ-2 RESERVOIR (SANDSTONE)
- ▶ TIMEFRAME: 2015-2030
- ▶ TECHNICAL CONTENT: 2 INJECTION AND 5 PRODUCTION WELL SYSTEM
- ▶ TECHNICALLY BASED ON: LABORATORY CORE MODELLING + RESERVOIR SIMULATION + ONE-WELL INJECTIVITY AND BLACK-FLOW TEST

# PROJECT 1.- OVERVIEW OF THE INJECTION TECHNOLOGY



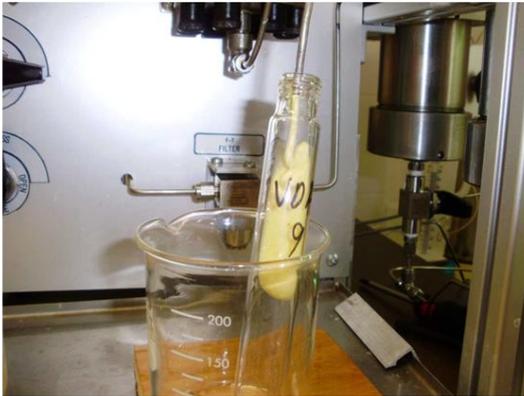
# PROJECT 1.- OVERVIEW OF THE INJECTION TECHNOLOGY



# PROJECT 2.-ACIDIZATION

## ► Acidizing as well stimulating method

- Acid reaction in the high-permeability regions causes the development of large, highly conductive flow channels called wormholes.
- Increase in productivity is possible by creating a highly conductive flow path through the formation.



Acid solution in



Acid solution out



# PROJECT 2.-ACIDIZATION

▶ Nanoemulsion as acidizing agent



Modelling the acid treatment with nanoemulsion

Improved oil productivity in laboratory tests



Several micro-wormholes, higher permeability

TOMORROW WITH SZTE

# EOR/IOR R&D CHALLENGES

**R&D experimental:** can range from simple (phase behaviour), to complex (core flooding) and very complex (ISC testing).

**Back to basics :** better understanding of mechanisms, but how to predict field performance, under laboratory conditions?

**Continuing challenges in EOR:** higher T, higher salinity and difficult HC (sour fields). Still some R&D to be done (e.g. new chemistries)

**Staff competence:** requires multidisciplinary mentality, difficult to find technical specialists in individual areas.

**Links between different disciplines in EOR:** geo-mechanics, water treatment, facilities to establish R&D needs (link with operational needs).

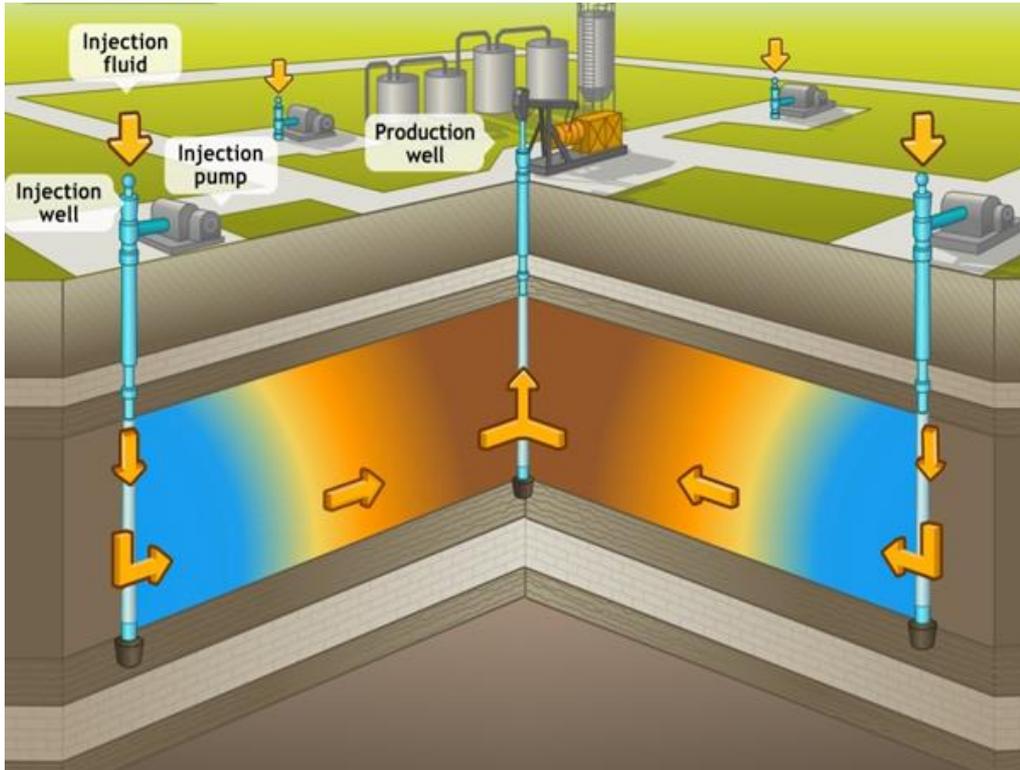
**Not covered in presentations:** surveillance : is there R&D needed for particular EOR applications (meters for produced fluids).

Many challenges in reservoir modeling in EOR applications.

**Materials:** many new developments – but these need to be considered within the brownfield context (e.g. integrity).

# DEVELOPMENT DIRECTIONS

ROAD FROM RF 0,3 TO 0,8



- ▶ Nano-EOR
- ▶ M(microbial)EOR/EEOR
- ▶ Intelligent materials
- ▶ Polimer coated nano materials
- ▶ Solar heat utilisation ( FIEK)
- ▶ New wettability modifiers

# CONCLUSION

# CONCLUSION

- ▶ R&D IS THE KEY. THE POTENTIAL FOR FUTURE OIL PRODUCTION DEPENDS ON RESOURCES BEING CONVERTED INTO RESERVES BY THE APPLICATION OF R&D
- ▶ OIL PRICE WOULD NOT HAVE TO LEAD THE FUTURE OF EOR RELATED R&D PROJECTS
- ▶ SO MANY EOR RELATED TECHNOLOGY ARE FINANCIALLY ATTRACTIVE IN THE PRESENT PRICE ENVIRONMENT
- ▶ TECHNOLOGIES ARE CONTINUOUSLY DEVELOPING RESULTING LESS COST AND BETTER EFFICIENCY COMPARE TO PREVIOUS YEARS
- ▶ RISK MANAGEMENT HAS TO BE TAKE INTO ACCOUNT GREEN FIELD EXPLORATORY DRILLING VERSUS R&D RELATED EOR PILOT/PROJECT
- ▶ OGP'S MUST BE UTILIZE THE LESS SERVICE COSTS BY STARTING AT LEAST NEW PILOTS
- ▶ SO MANY CHEMICAL ADDITIVE'S PRICE WENT DOWN JUST BECAUSE OF OIL PRICE, TIME FOR REEVALUATE THE ,FROZEN' PROJECTS
- ▶ IN CASE OF MATURE FIELD, THE TECHNICAL CONDITION OF WELLS HAVE TO BE ON ACCEPTED LEVEL TO GET CHANCE FOR EOR BEFORE ABANDONMENT.
- ▶ CHEMISTRY AND MICROBIOLOGY UNDERSTANDING MUST BE INCREASED AT THE OGP'S
- ▶ LABORATORY INTENSIVE TESTS ARE IMPORTANT BEFORE GOING TO THE FIELDS

# UPSTREAM COUNTRIES



# THE END...

THANK YOU FOR YOUR COOPERATION  
AND SUPPORT!

**Tibor István Ördög**

Manager of MOL Group E&P R&D

28-04-2016, Szeged, SZTE Innovation Day

 **MOLGROUP**

„Innovativeness requires a climate of trust”  
(Arthur D. Little, Prism, 2013)

