Investments in refinery capaticies in Serbia

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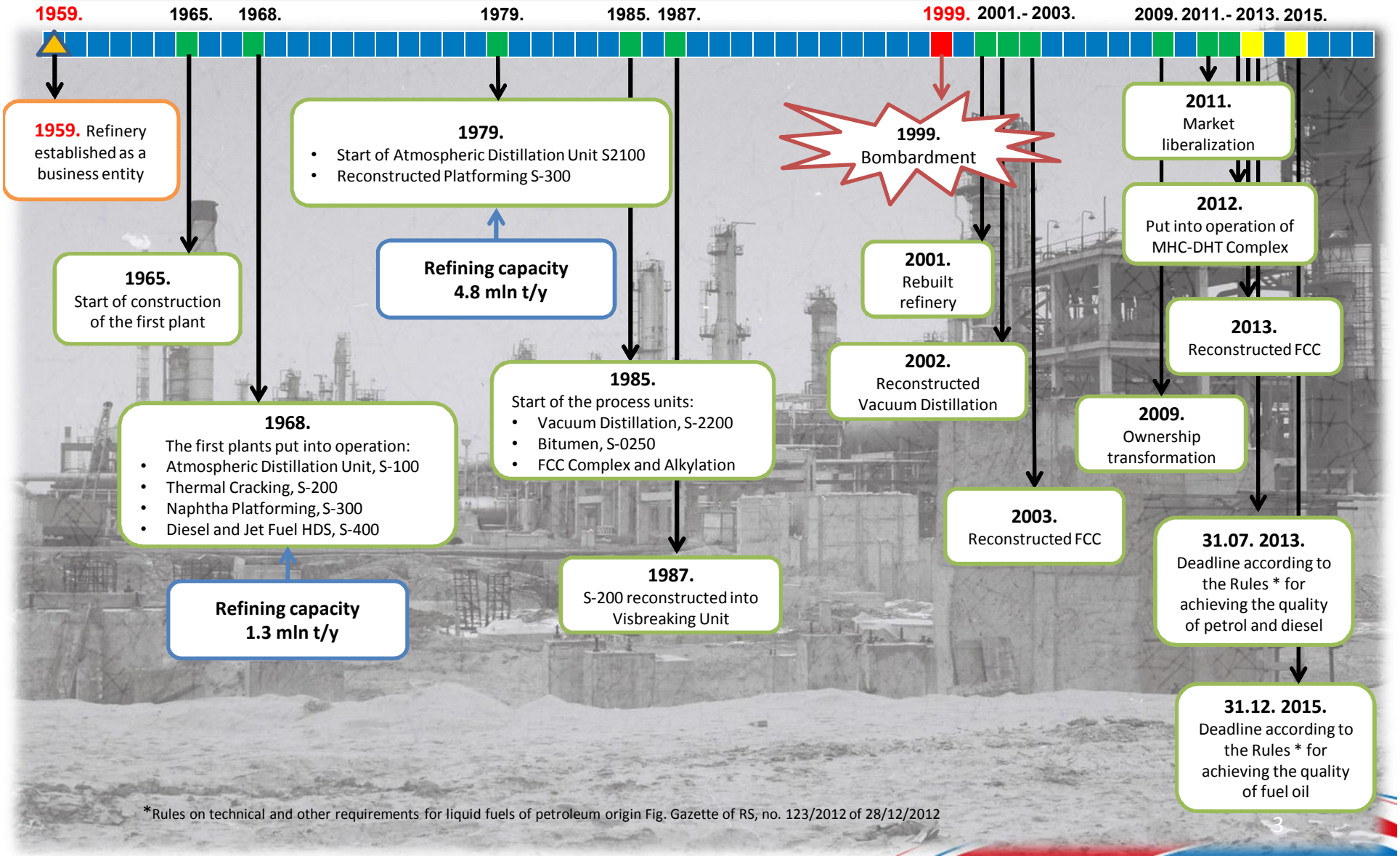
Belgrade, Energy community
Vladimir Gagic, NIS, Refinery

Presentation content

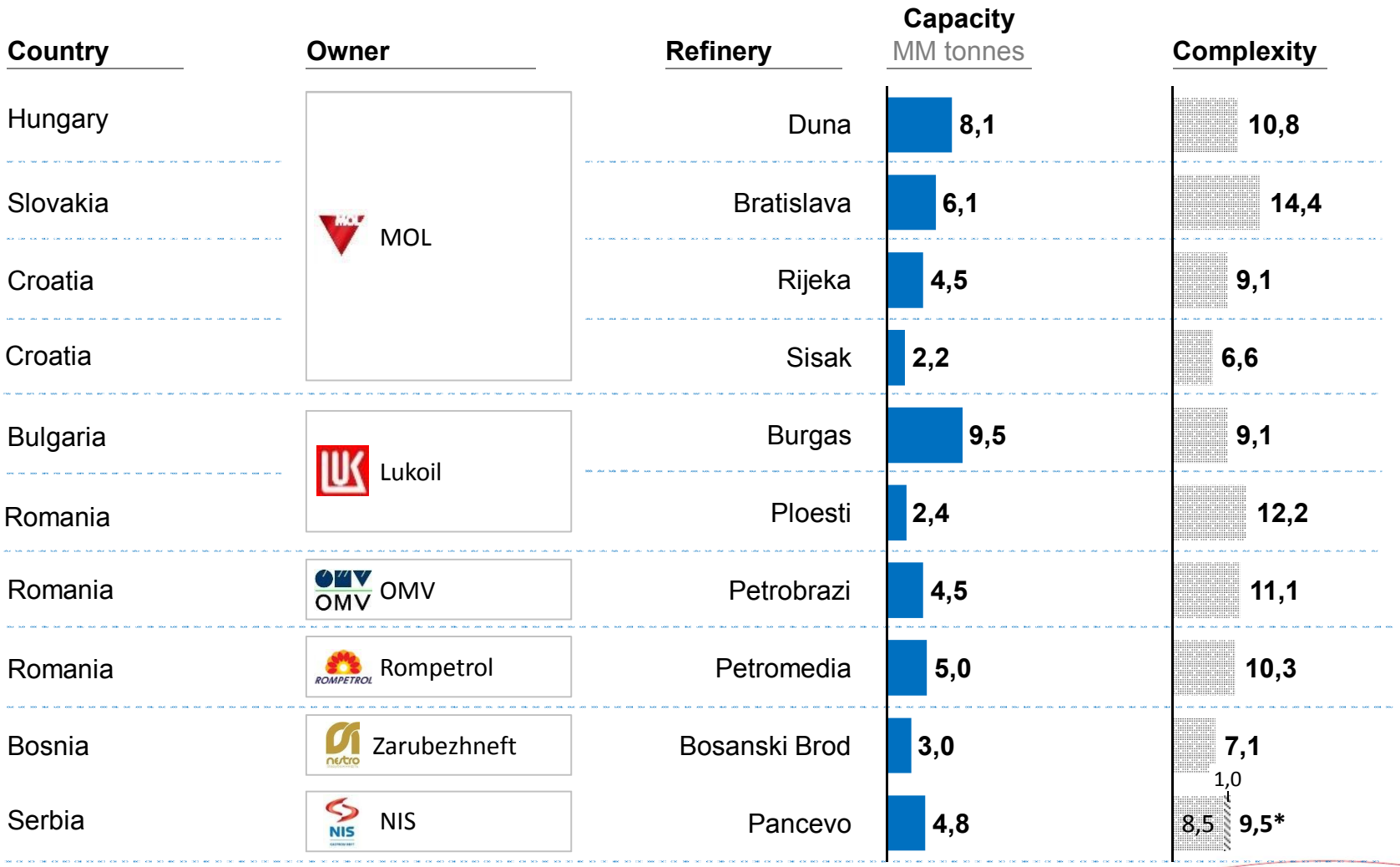
1. Refinery history
2. Refinery today
3. Strategy and development
4. Key investments
5. Conclusion

History of refinery



*Rules on technical and other requirements for liquid fuels of petroleum origin Fig. Gazette of RS, no. 123/2012 of 28/12/2012

Refinery today. Key competitors



Source: NIS, workgroup analysis * Nelson index after refinery upgrade

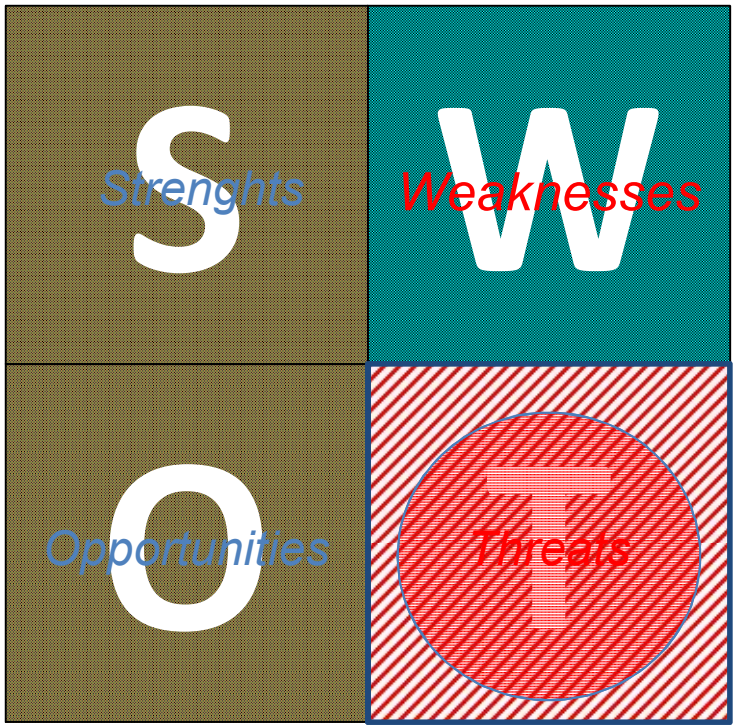
Refinery today. Key business drivers

Margins under pressure
- competition
- regulated prices → market related prices

Mogas / diesel imbalance
- need for max upgrading/conversion capacity
- need for export options

Product quality pressure
- Eurograde quality
- GHG balance – biofuels

SWOT analysis



Variability and uncertainty in demand growth escalate globalization of the downstream sector

Strategy objectives

NIS Refining business:

- Health & Safety
- Modern & efficient processes and operations
- Long term profitability based on sustainable development model
- One of the most efficient refineries in South East Europe
- Zero per cent of heavy residues

Development directions

Efficiency

- Increase Operation Availability
- Improve Technology Efficiency
- Increase Energy Efficiency
- Develop Personal Efficiency

New technologies

- Use of conversion-type hydrogenation processes
- Technologies that will allow termination of fuel oil production

Key directions:

Maximize efficiency of existing refinery assets & Introduce new technologies

HSE Indicators

Block Refining

Health and Safety

Injuries (LTIF):

2006 – 69 injuries in Refinery

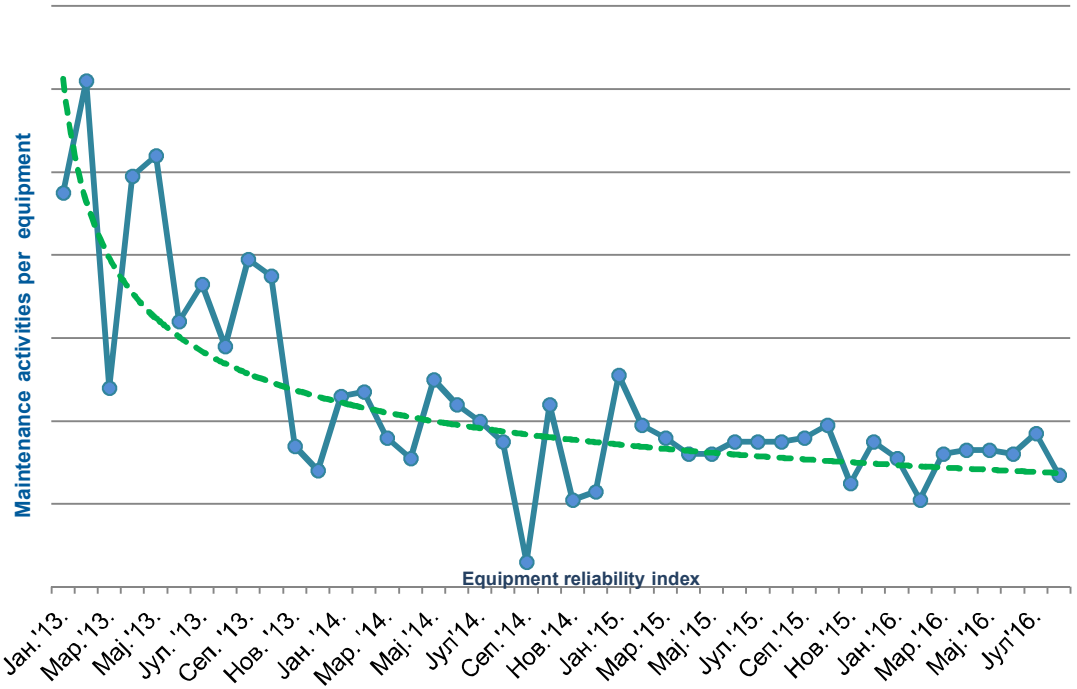
2016 – 0 injuries in Refinery

874 days

without Refinery workers injuries!

Our workers increased number of observations and **improvement** actions to more that **9000/year**!!!

Industrial safety

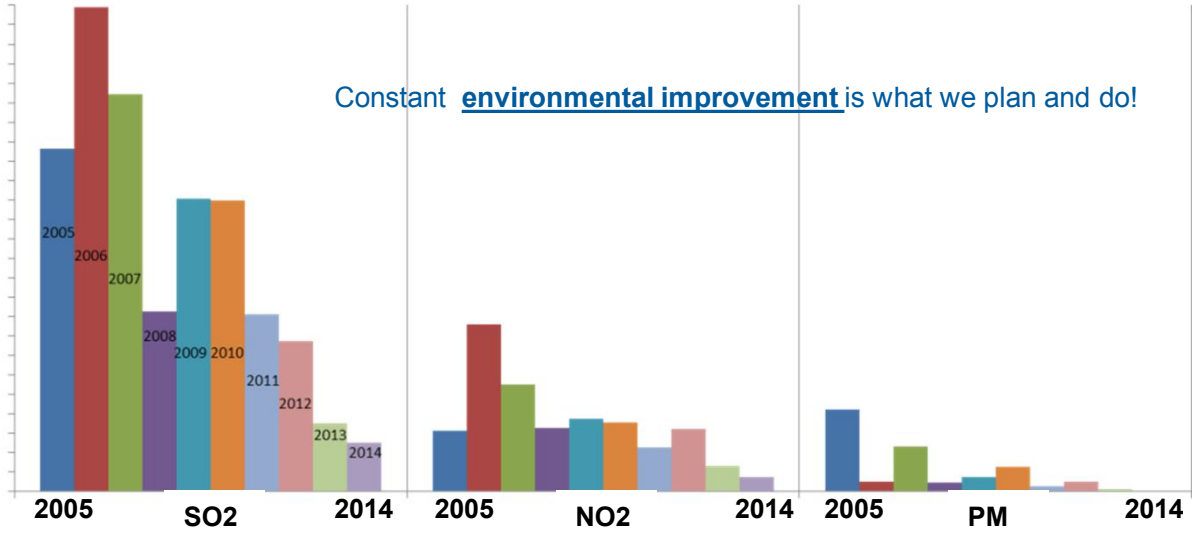


- Number of maintenance activities on process equipment decreased **68%** after **reliability program implementation**!

HSE Indicators

Block Refining

Environmental improvement indicators



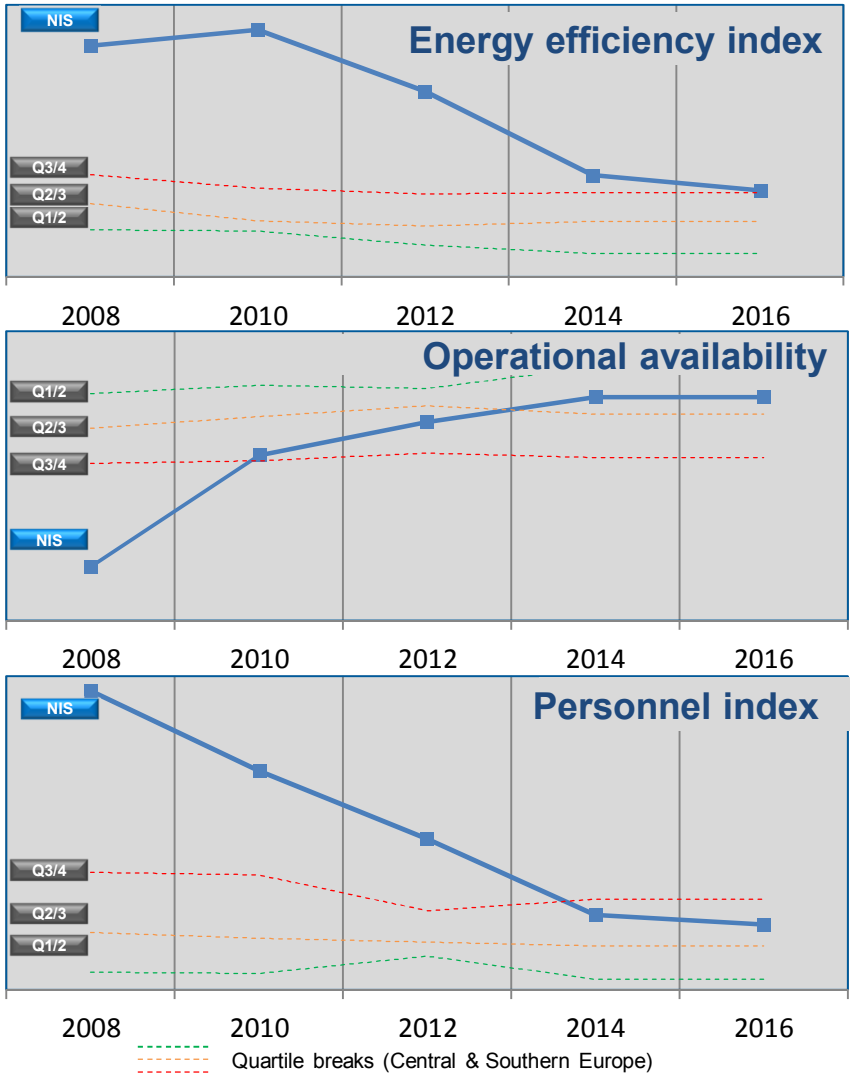
HSE Training in Refinery

- All Refinery and contractor workers **must be** HSE trained in our Refinery
- There are theoretical and **practical** training for all High risk works
- Our goal is to **improve HSE culture**

HSE Training center in Refinery

Efficiency: key performance indicators

KPIs



Achieved Results

Energy efficiency improved by 35%

Operational unavailability reduced by 47%

Personnel efficiency improved by 67%

Key refinery performance indicators significantly improved

Key investments

Refinery modernization 1st phase (till 2012)

Mild Hydrocracking Complex (MHC) [completed]

Refinery modernization 2nd phase(till 2019)

Delayed Coker Unit (DCU) [in progress]

Introduction of the new technologies (phase realization)
Fully in line with NIS refining developement strategy by 2030

MHC Complex [completed]

Scope

- Mild Hydrocracking complex
- Hydrogen Generating Unit
- Sulphur recovery unit
- Amine regeneration unit
- Sour water striper unit

Effects

-Increased yield of the diesel and petrol

-Improved quality of the products

-Reduced the content of the sulphur (according to the Euro 5 specification)

Cost/Time

Total cost: App. 500 MM EUR

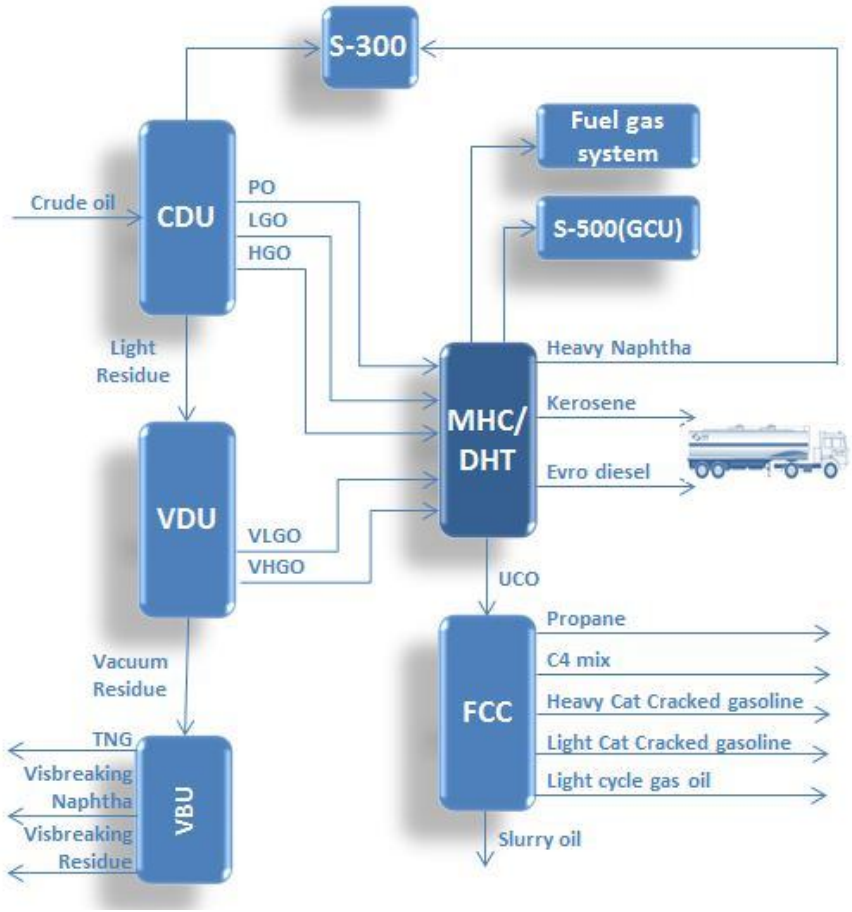
Realization (EPC phase): 2009-2012

MHC Technology: Chevron

EPCM contractor: CB&I Lummus

Gasoline	Before	After
Sulphur, max, mg/kg	650	10
Benzene, max, % (v/v)	5	1
Total aromatics, % (v/v)	65	35
Pb, mg/l	13	0
Diesel	**Before**	**After**
Sulphur, mg/kg	5.000 (avg)	max. 10
Polycyclic aromatics max, % (m/m)	not limited	11

MHC Complex [completed]



MHC/DHT FEED

- Petroleum, Light & Heavy Gas Oil from Crude Distillation Unit
- Vacuum Heavy & Light Gas Oil from Vacuum Distillation Unit

KEY FLOWS

- Unconvertible Oil: Feed to FCC unit
- Low sulphur kerosene: Diesel blending (high quality jet fuel)
- Low sulphur Euro Diesel: High quality product (Euro 5 standard)

MCH: Realized fully in line with NIS refining developement strategy

MHC Complex [completed]

Implementation Schedule

№		2006				2007				2008				2009				2010				2011				2012			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	**MHC**																												
2	Design & survey work																												
3	Equipment and Materials																												
4	Construction and assembly works																												
5	Other																												

Project realized within planned budget and projected time frame.

Proved projected process performance

Delayed Coking Unit (DCU) [in progres]

Scope

New Units
- Delayed Cocking Unit
- Amine regeneration unit
- Acid waste water treatement unit

Revamping of existing Units
- MHC/DHT hidro cracking
- Sulphur & Merox Unit

Effects

- Increasing of refinery profitability
- Maximazing high-margin finished products production
- Maximazing process utilization
- Increasing of flexibility (vs. market requirements and constraints)

Cost/Time

Total cost: App. 330 MM US$

Realization (EPCm phase): 2016-2019

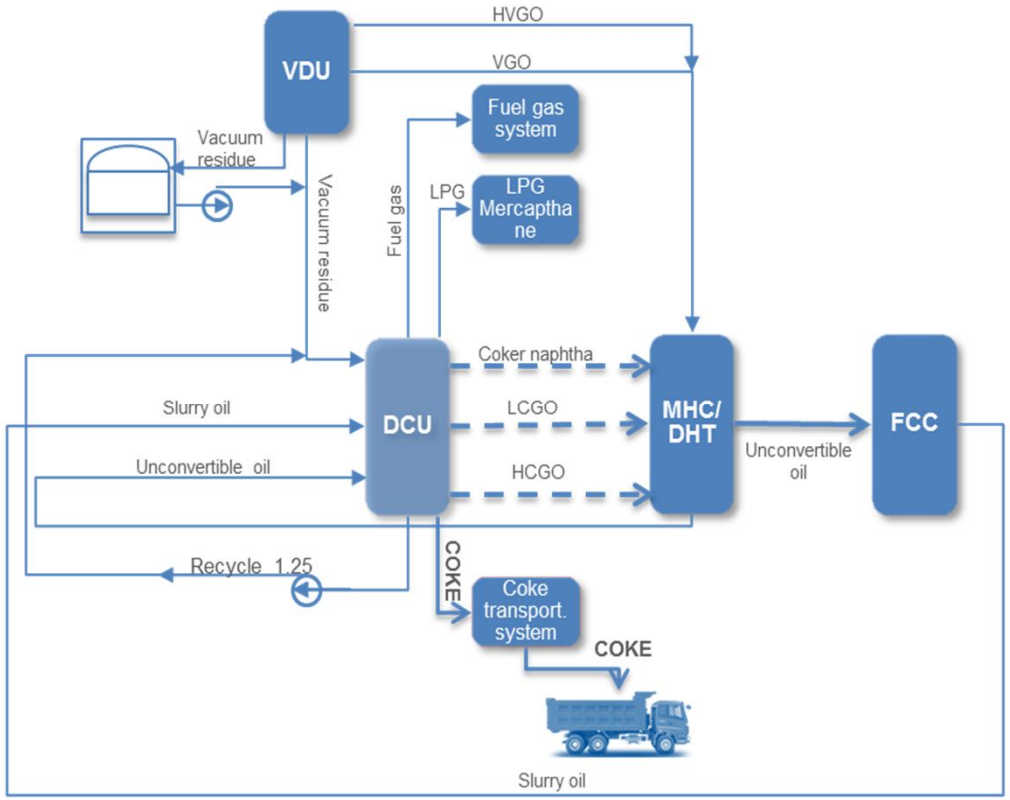
DCU Technology: Lummus Technology

EPCM contractor: TBA

Product yield:

- **Termination of Fuel Oil production**

Delayed Coking Unit (DCU)



DCU Feed

- Vacuum Residue from Vacuum Distillation Unit
- Slurry oil from Fluid Catalytic Cracking Unit.

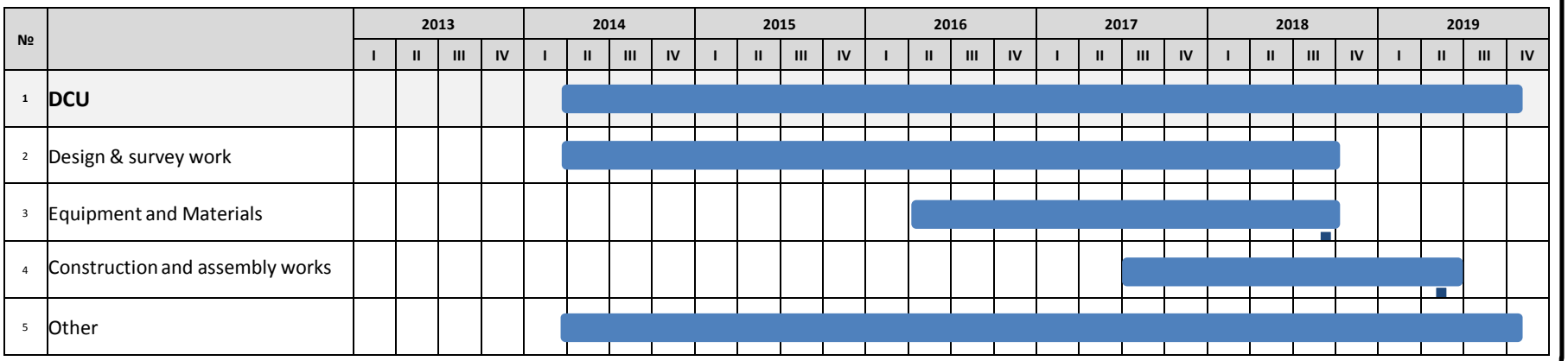
KEY FLOWS:

- LPG: To LPG storage (after amine washing & caustic treatment)
- Coker Naphtha and Light Coker Gasoil: To DHT;
- Heavy Coker Gasoil: To Mild Hydrocracking (MHC);
- The produced coke: Market (as coke fuel grade)

DCU: Technology optimally selected for closing identified gaps

Delayed Coking Unit (DCU) [in progres]

Implementation Schedule



№		2013				2014				2015				2016				2017				2018				2019			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	**DCU**																												
2	Design & survey work																												
3	Equipment and Materials																												
4	Construction and assembly works																												
5	Other																												

Current project status:

- Confirmed Project Economical effectiveness and approved project budget

- Signed Purchase Orders for LLI equipment

Delayed Coking Unit (DCU). Key phases

- Feasibility Study (completed 07/2013)
- FEED CONTRACTOR Selection (completed 02/2015)
- BASIC/FEED Design (completed 02/2016)
- EPCM CONTRACTOR Selection (in progress)
- EPCM (expected duration is 28 months)

Conslusion

- Key business challenges recognized and addressed
- Efficiency improvement program defined and realization started
- First phase of refinery modernization completed
- Competitive position on the market significantly improved
- NIS refinery continues realization of significant investment program despite negative macroeconomic environment