



OPTIMIZATION OF UGS OPERATION PROCESSES

Lubomír Greif

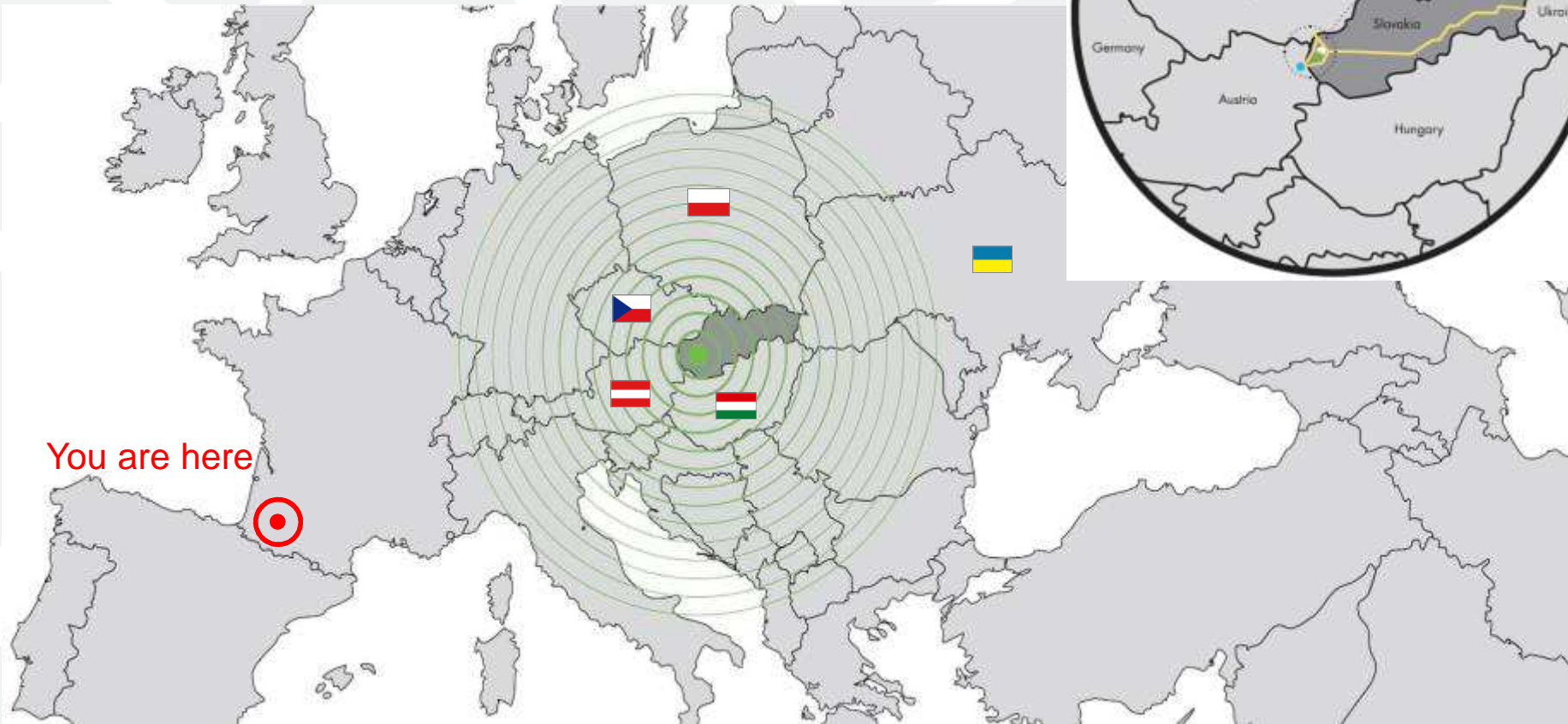
Pau, France

19.3.2014



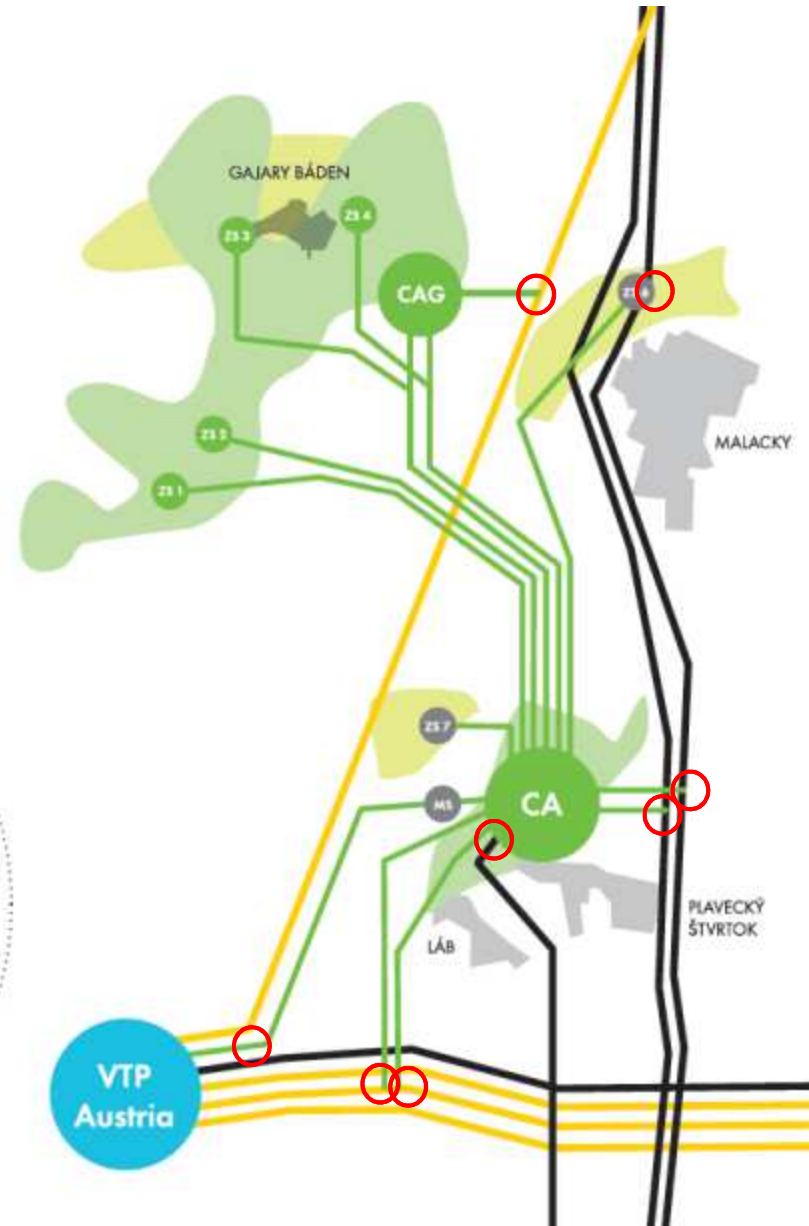
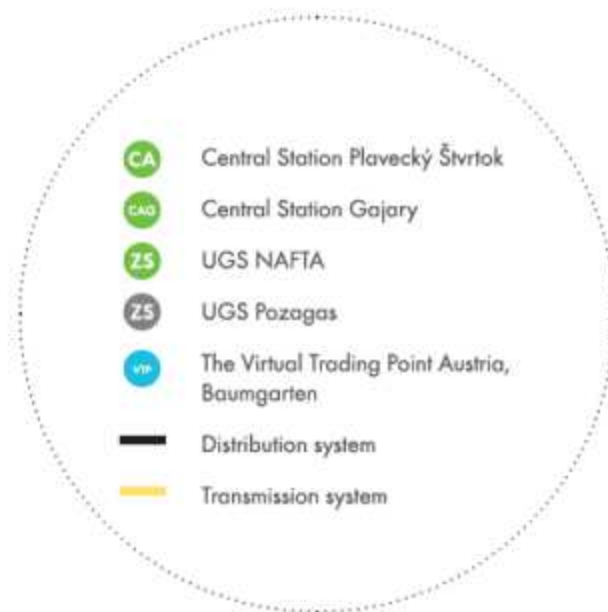
AGENDA

- Infrastructure & Interconnections
- UGS complex management
- Best practices
- Efficiency & environment
- Plans for the future



UGS INFRASTRUCTURE & INTERCONNECTIONS

- **Entry/exit points** 3
- **Exit points** 5
(5 Pressure levels)
- **Gathering stations** 11
- **Reservoirs** 13



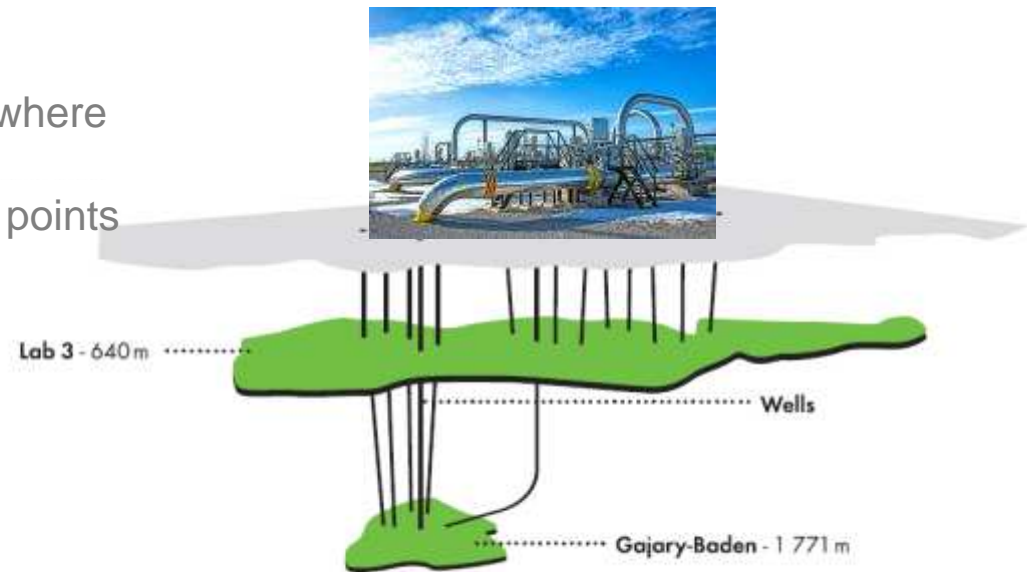
UGS INFRASTRUCTURE - CAPACITY

Working gas volume (WGV)	2.365 bcm	25.08 TWh
Maximum withdrawal rate (WR)	32.4 mcm/d	344 GWh/d
Maximum injection rate (IR)	24.9 mcm/d	265 GWh/d

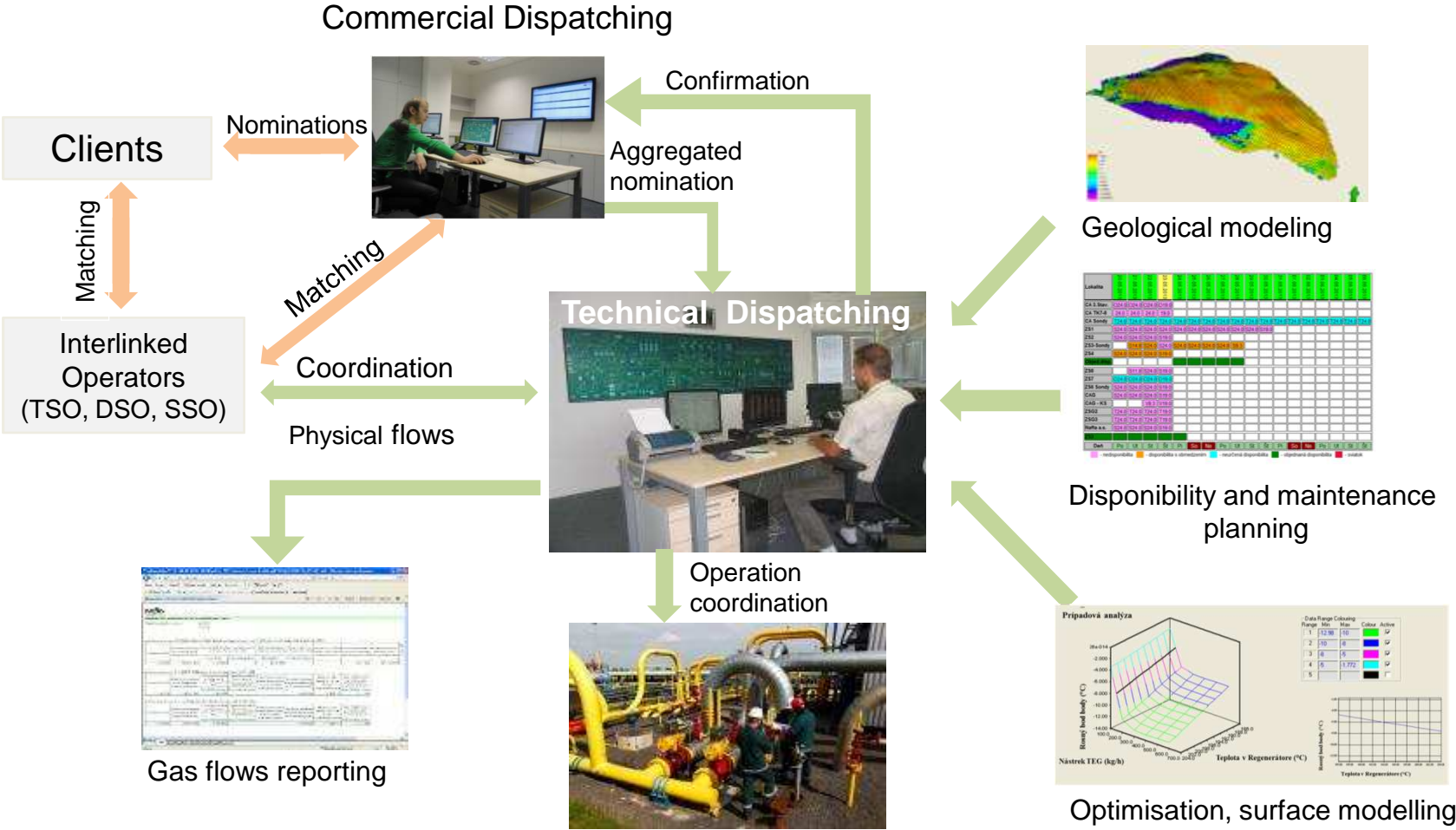
Values represents maximal firm rates, valid for 2013/2014

Scope for:

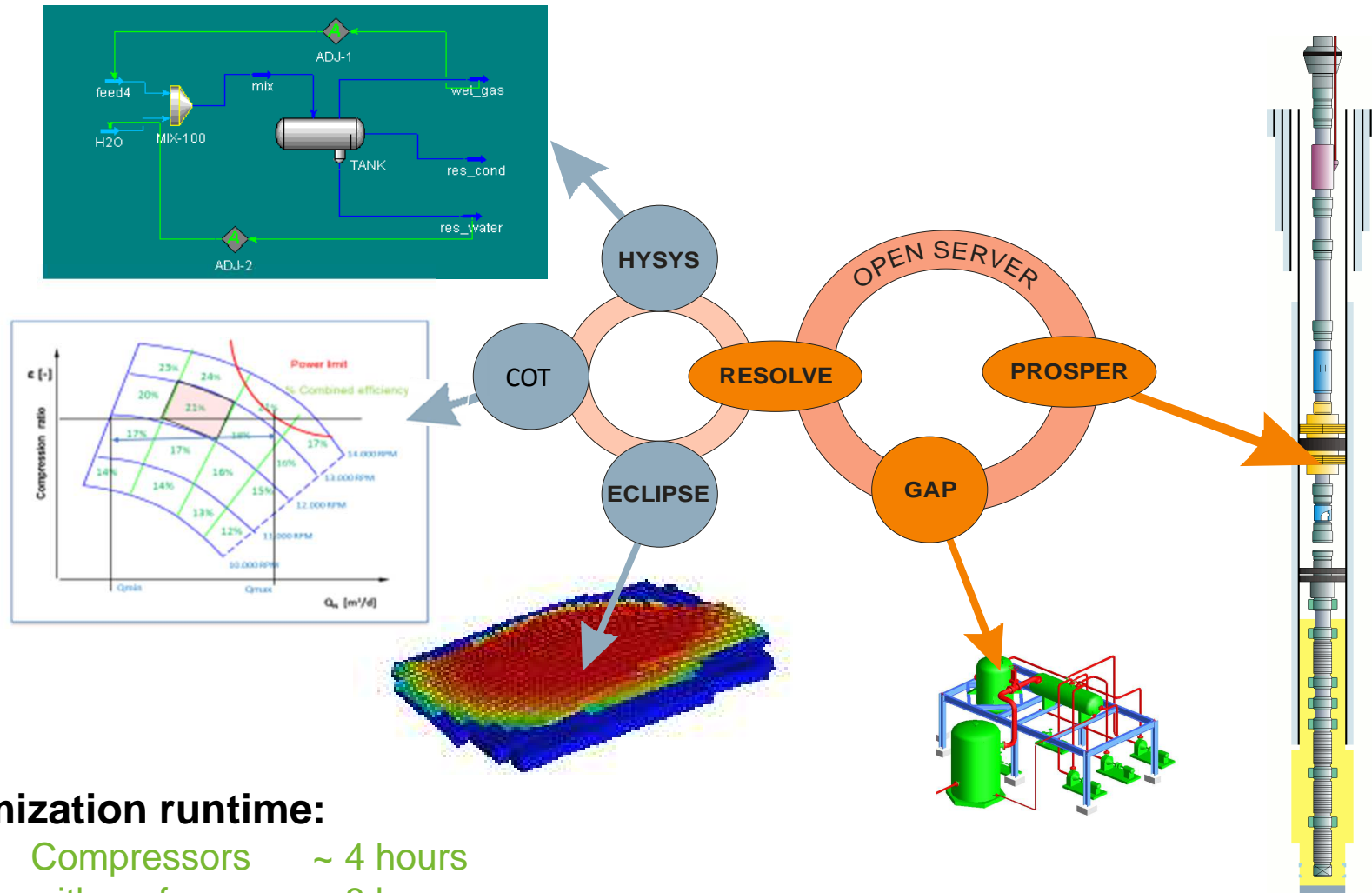
- **Flexibility**
 - Change of flow anytime - anywhere
 - Within day re-nominations
 - Flexible changes of entry-exit points
- **Optimization**
- **Supply diversification**
- **Complexity**



DISPATCHING PROCESS



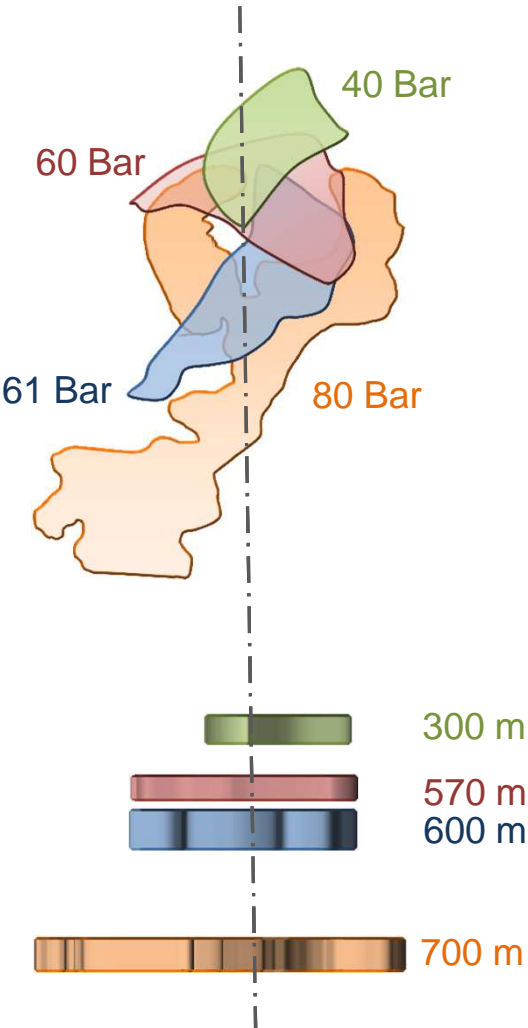
DISPATCHING PROCESS



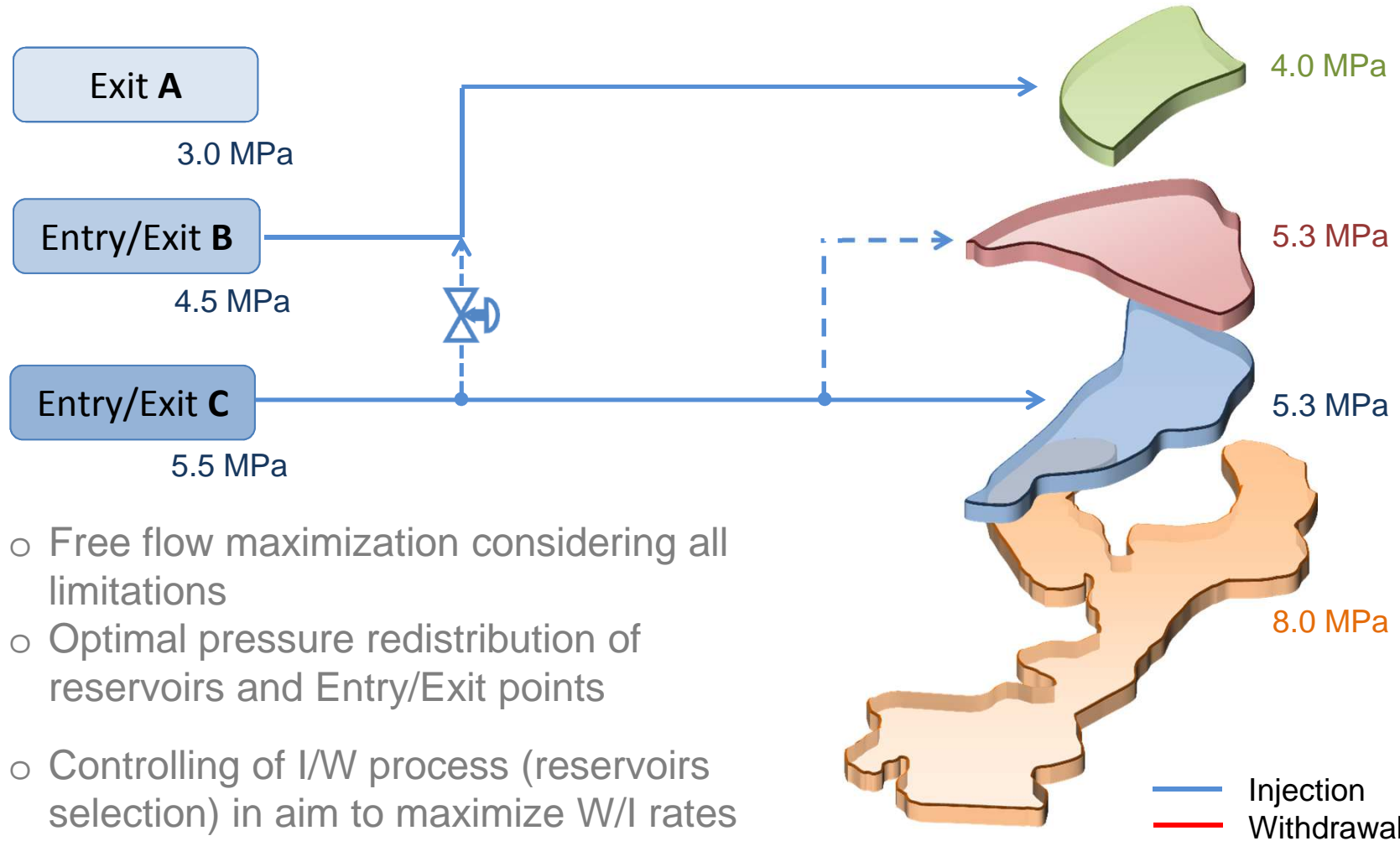
Optimization runtime:

- Compressors ~ 4 hours
- with surface ~ 8 hours
- with subsurface ~ 12 hours

RESERVOIRS – PRESSURE, RATES

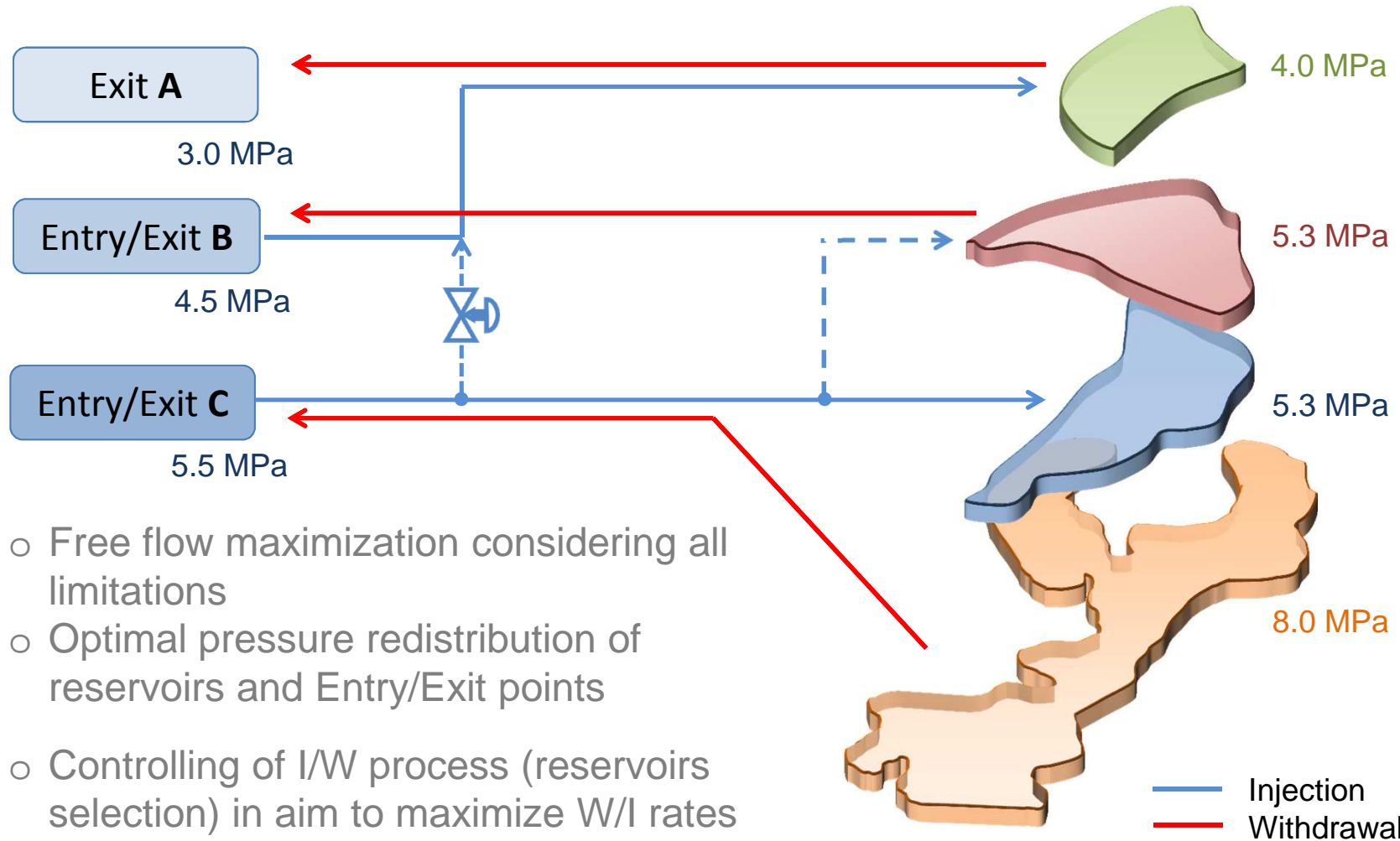


BEST PRACTICES – FREE FLOW MAXIMIZATION



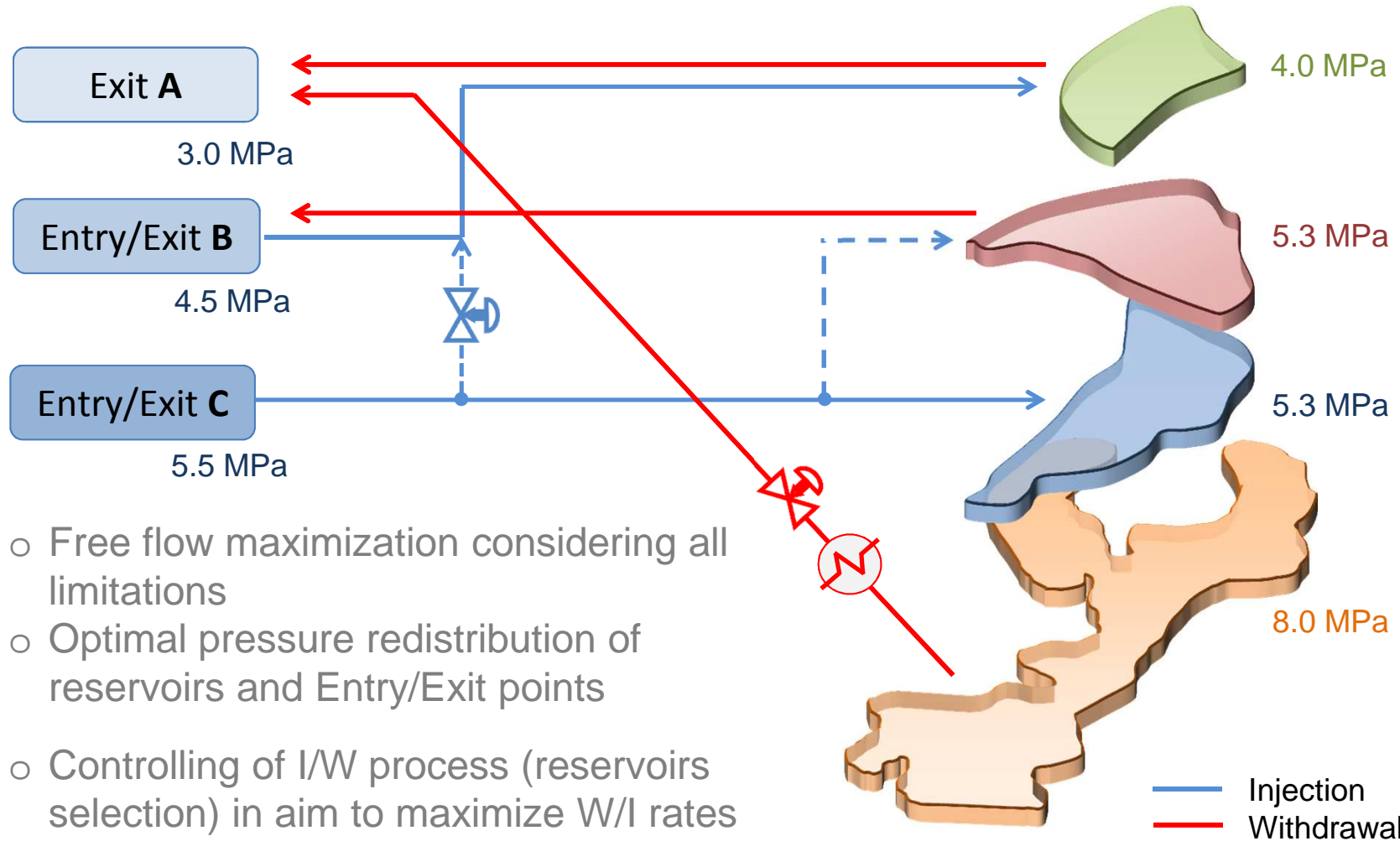
- Free flow maximization considering all limitations
- Optimal pressure redistribution of reservoirs and Entry/Exit points
- Controlling of I/W process (reservoirs selection) in aim to maximize W/I rates – longtime perspective

BEST PRACTICES – FREE FLOW MAXIMIZATION



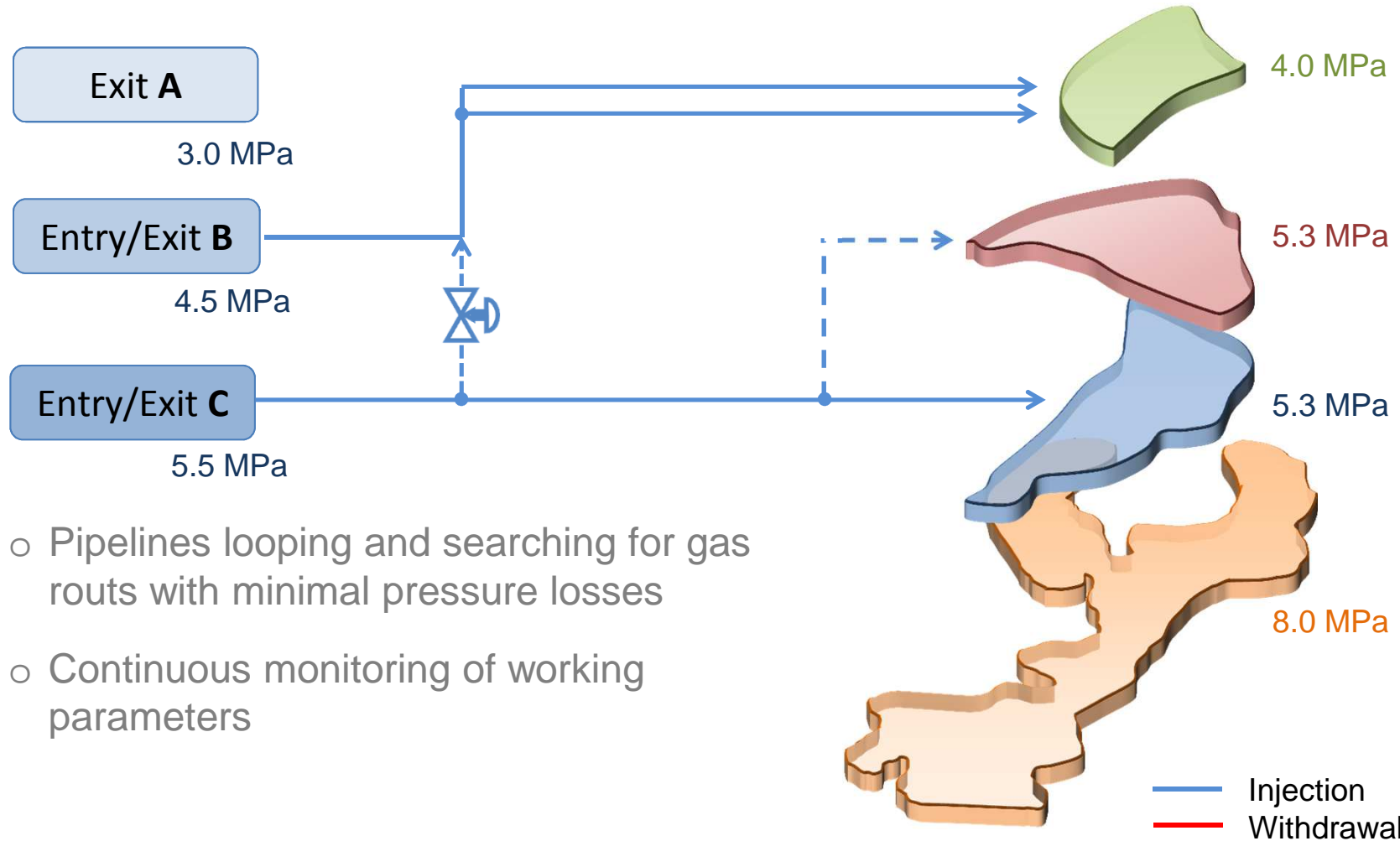
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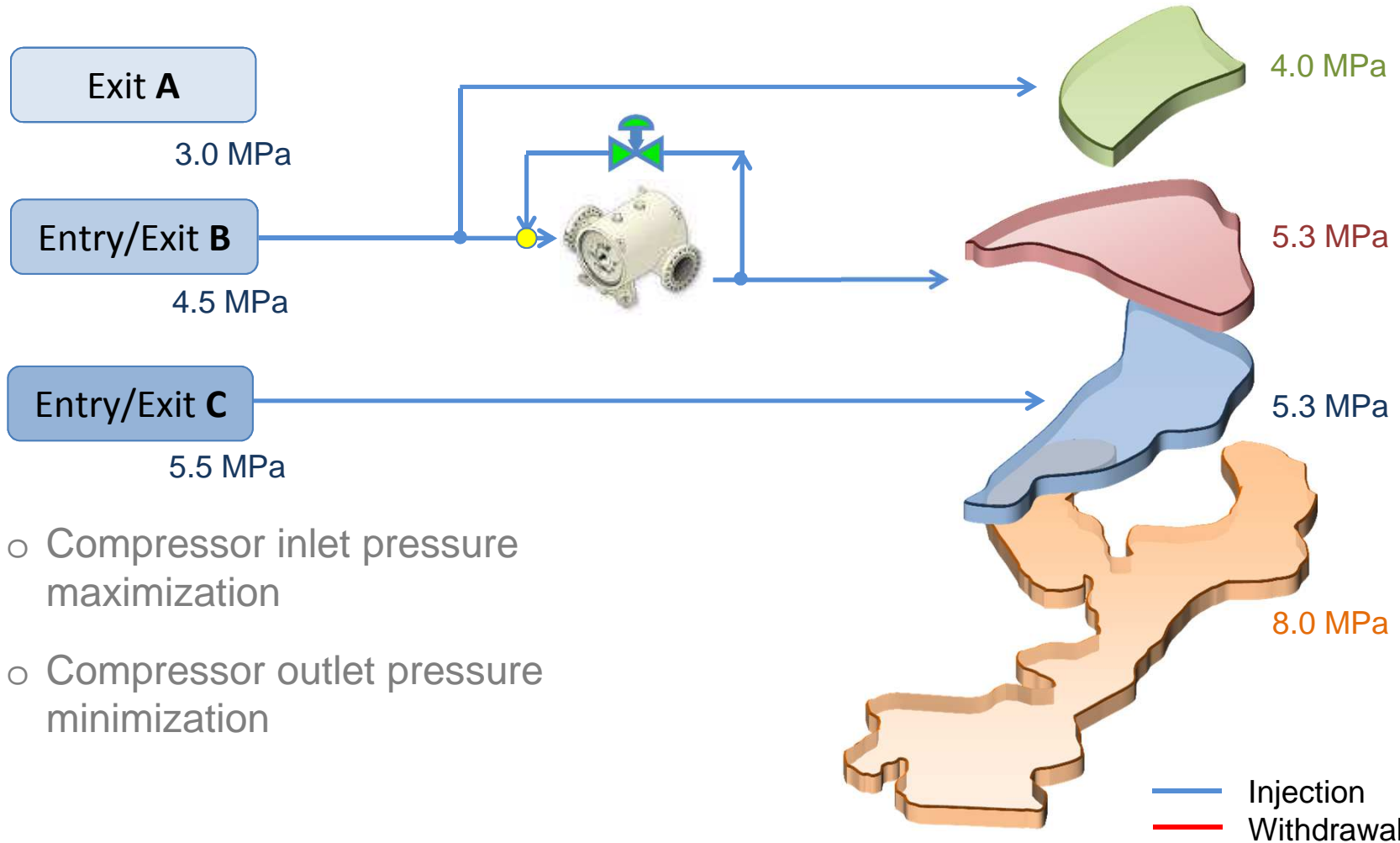
- Free flow maximization considering all limitations
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BEST PRACTICES – PRESSURE LOSSES



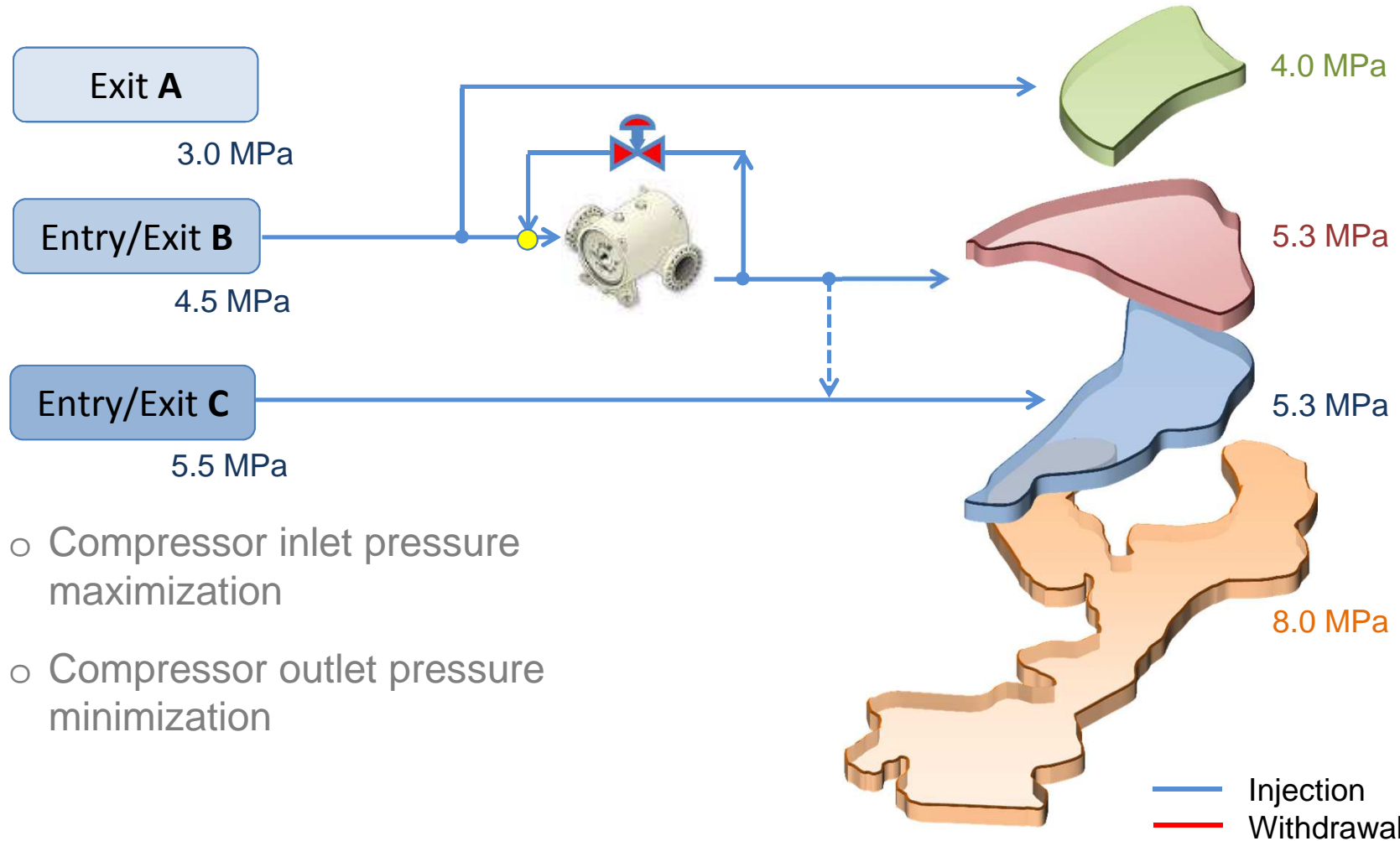
- Pipelines looping and searching for gas routes with minimal pressure losses
- Continuous monitoring of working parameters

BEST PRACTICES – RECYCLING ELIMINATION



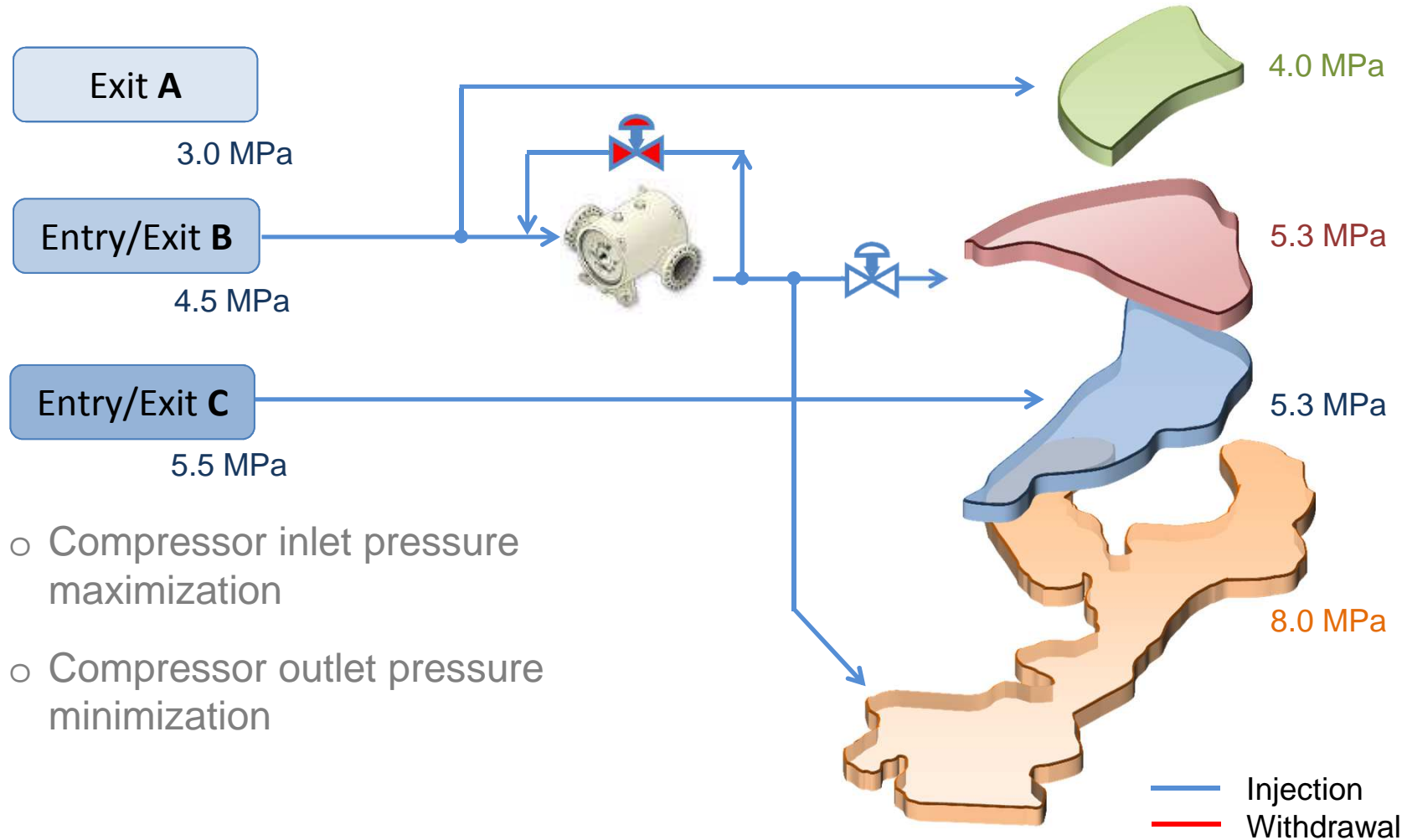
- Compressor inlet pressure maximization
- Compressor outlet pressure minimization

BEST PRACTICES – RECYCLING ELIMINATION

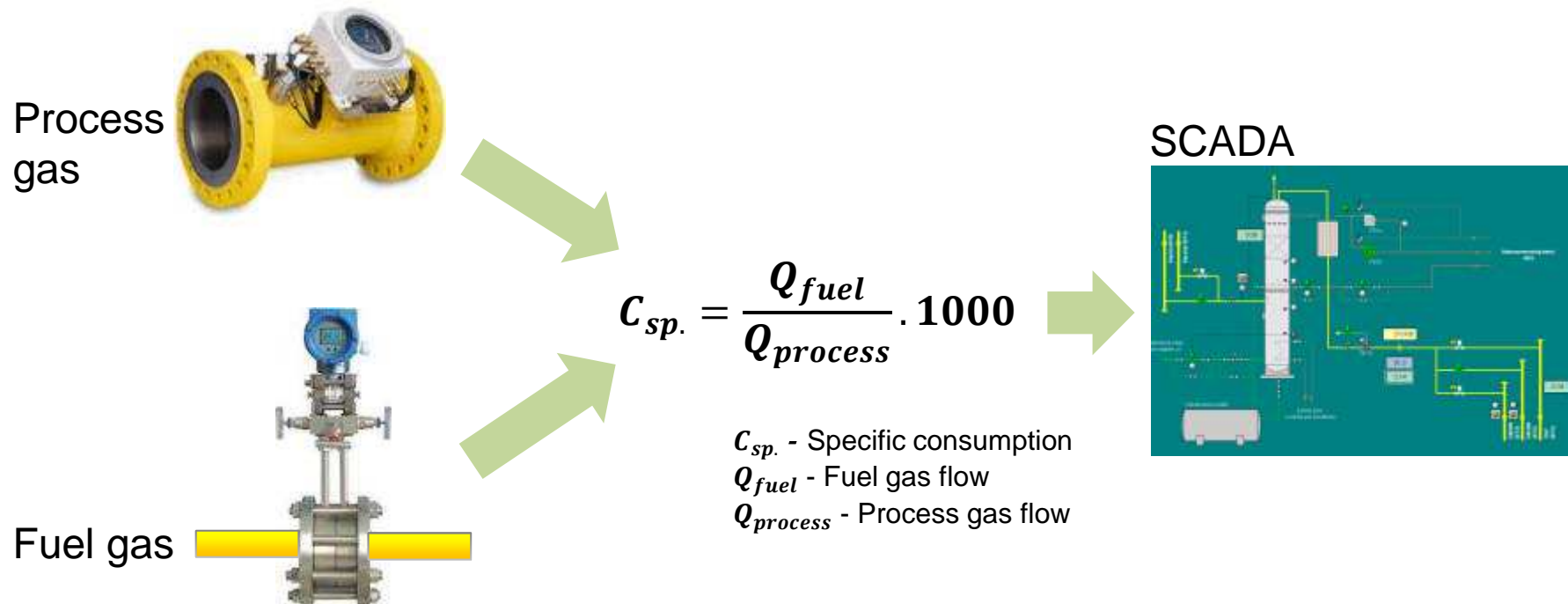


- Compressor inlet pressure maximization
- Compressor outlet pressure minimization

BEST PRACTICES – RECYCLING ELIMINATION



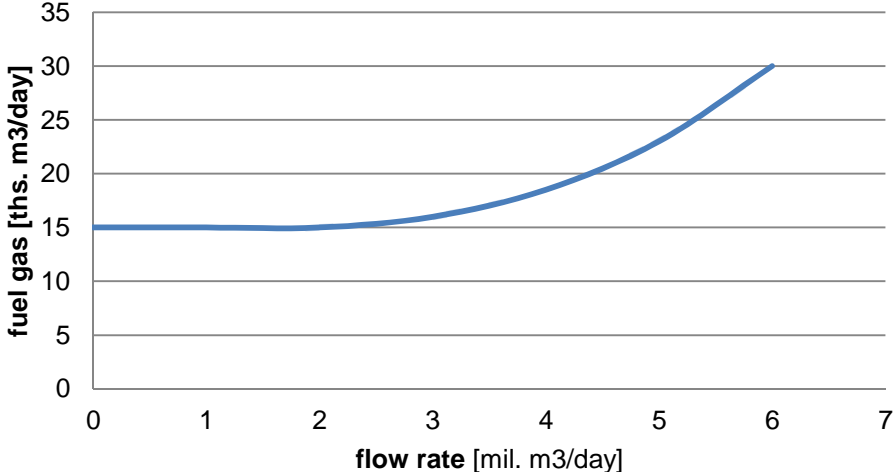
COMPRESSOR OPTIMIZATION – SPECIFIC CONSUMPTION



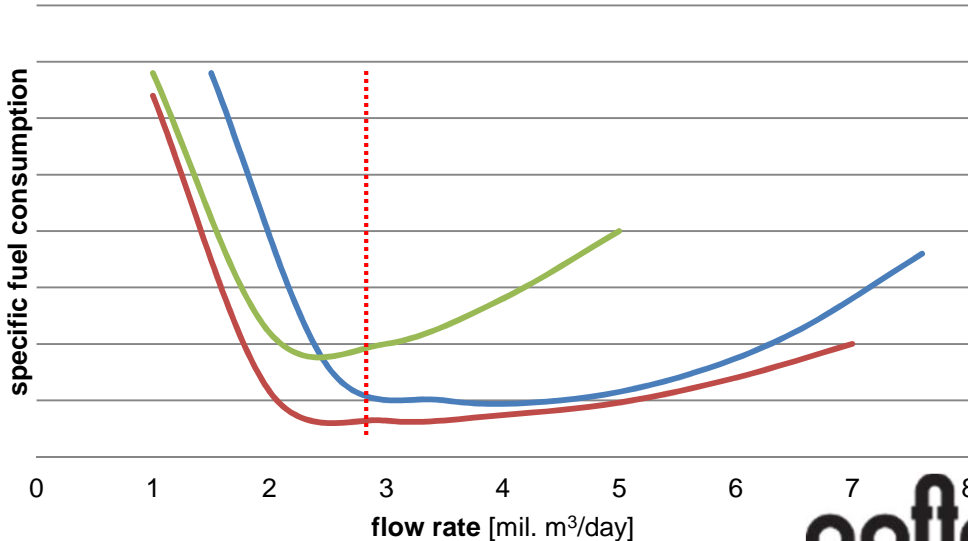
Specific consumption is efficiency factor → represents how effective is gas processed

COMPRESSOR OPTIMIZATION – SPECIFIC CONSUMPTION

Fuel gas consumption

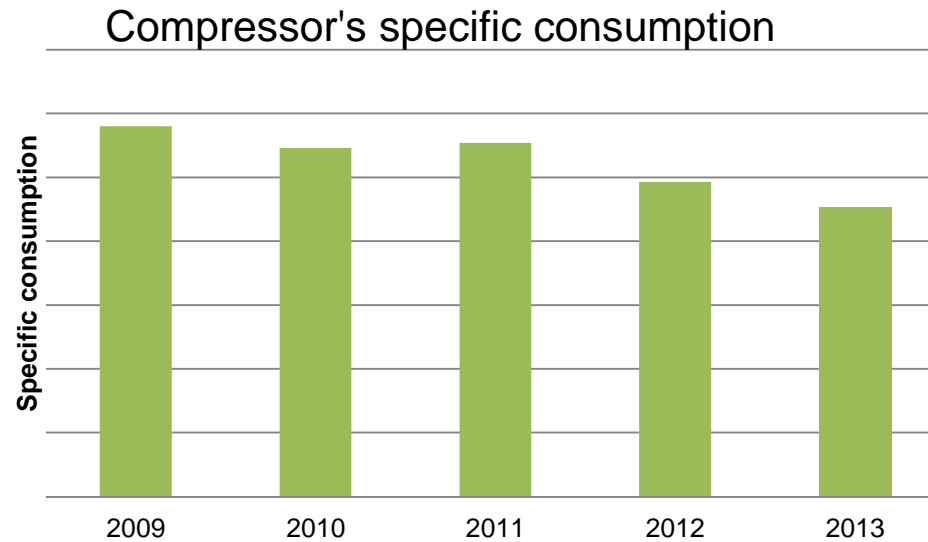


Specific fuel consumption

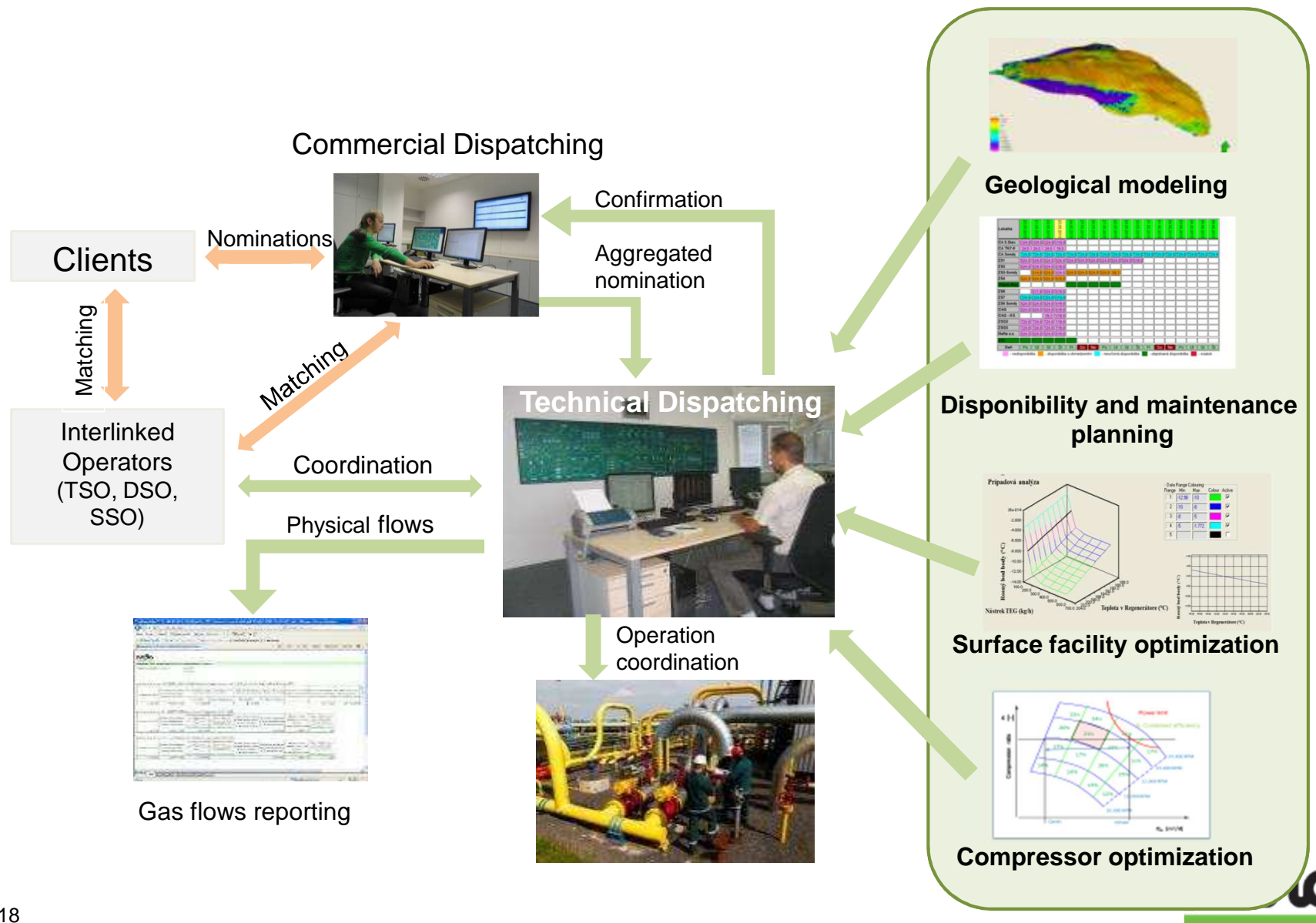


EFFICIENCY & ENVIRONMENT

- **Emission**
 - SoLoNOx - (75% of power = cca. 92% RPM NGP)
 - Fuel gas consumption vs. emission
- **Noise**
 - Consumption vs. Noise emission



PLANS – STORAGE OPTIMIZATION SOFTWARE





THANK YOU FOR YOUR ATTENTION

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