

PTT Gas Separation Plant 1: Consequence- Based Dispersion Study

Dispersion simulations
Preliminary Results

Revision 00

Feb 13th 2020

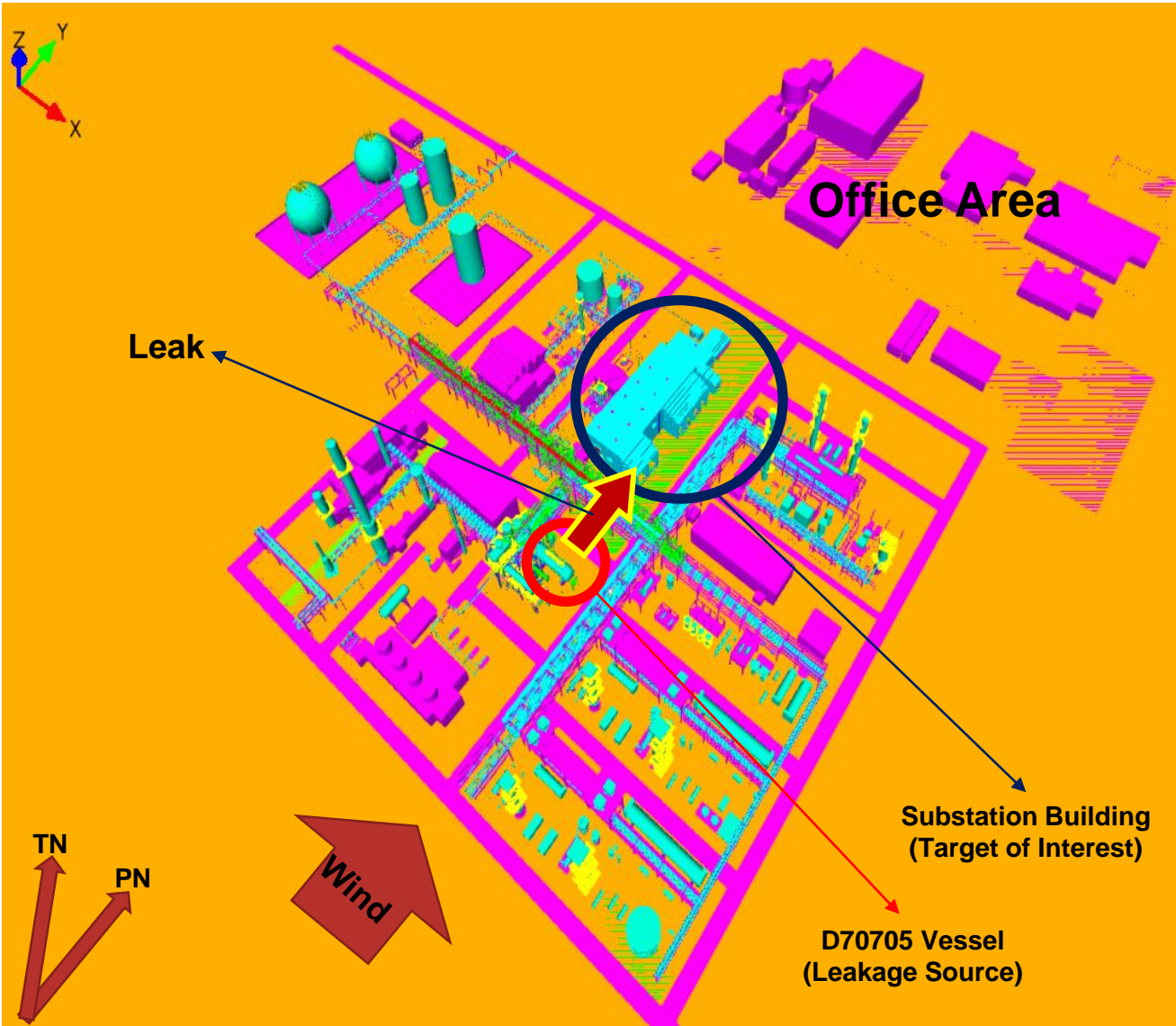


GEXCON

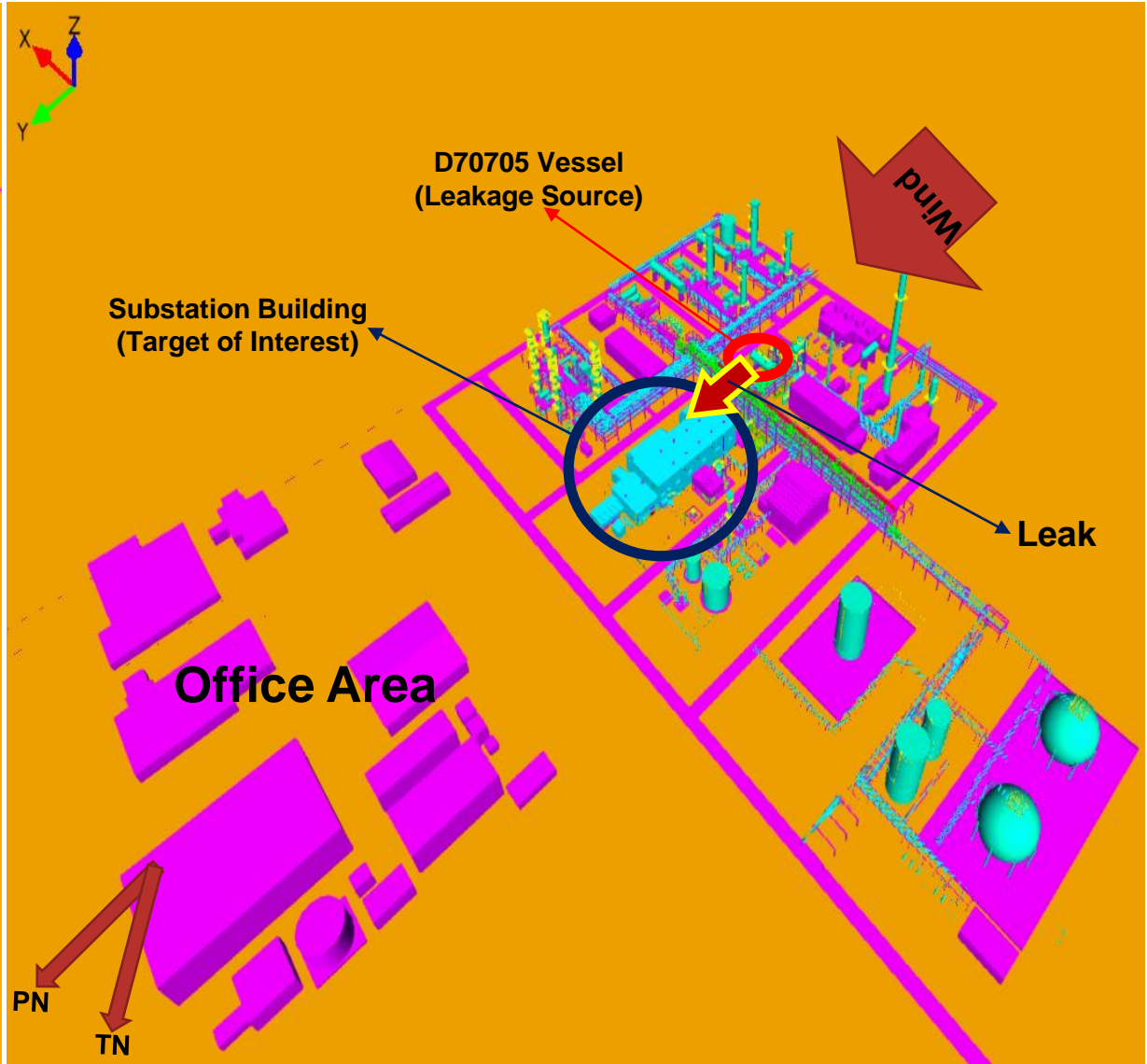
Flammable Gas
Extent

(Liquid Release
from Vessel D70705)

GSP1 – Area for Simulations



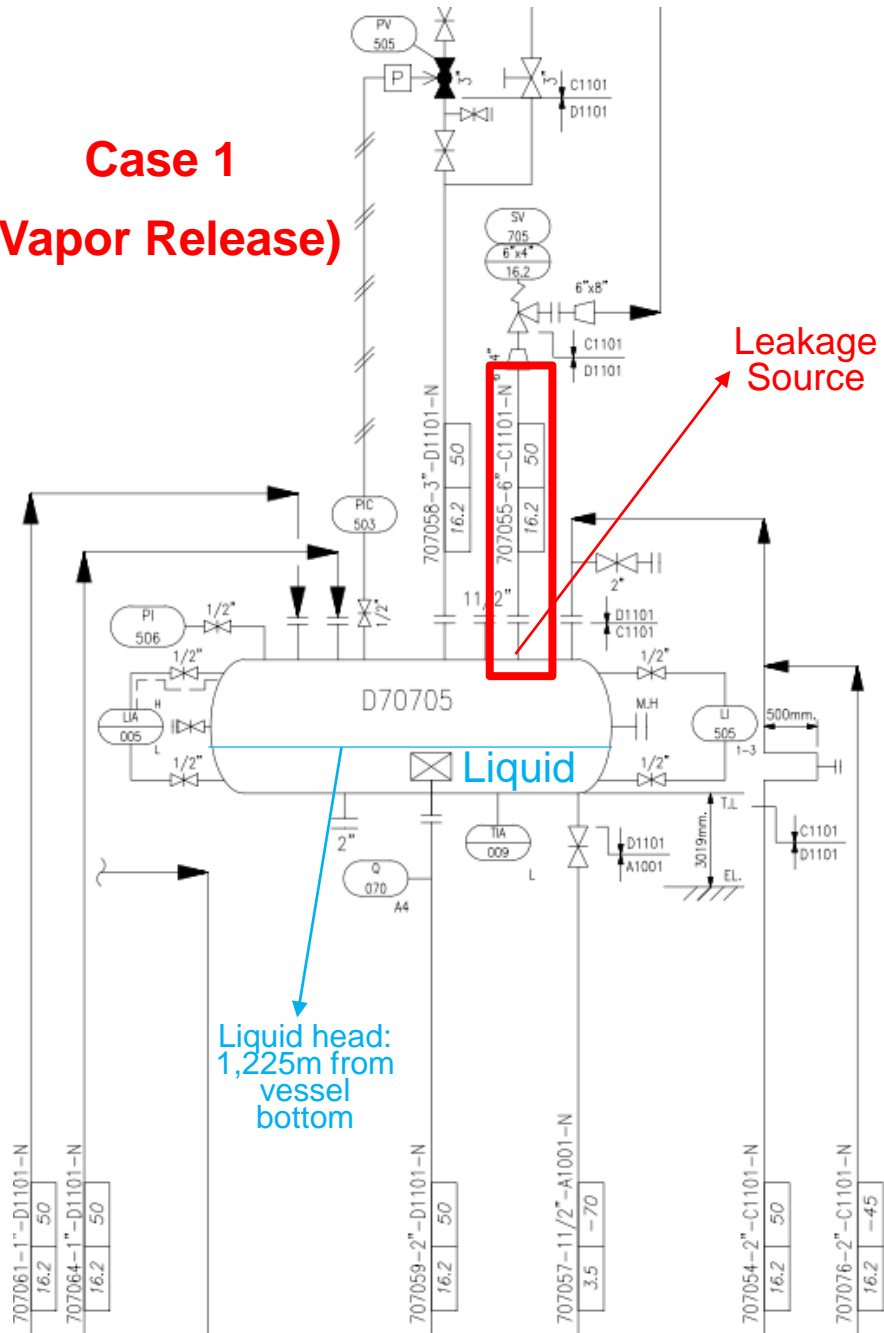
South East View



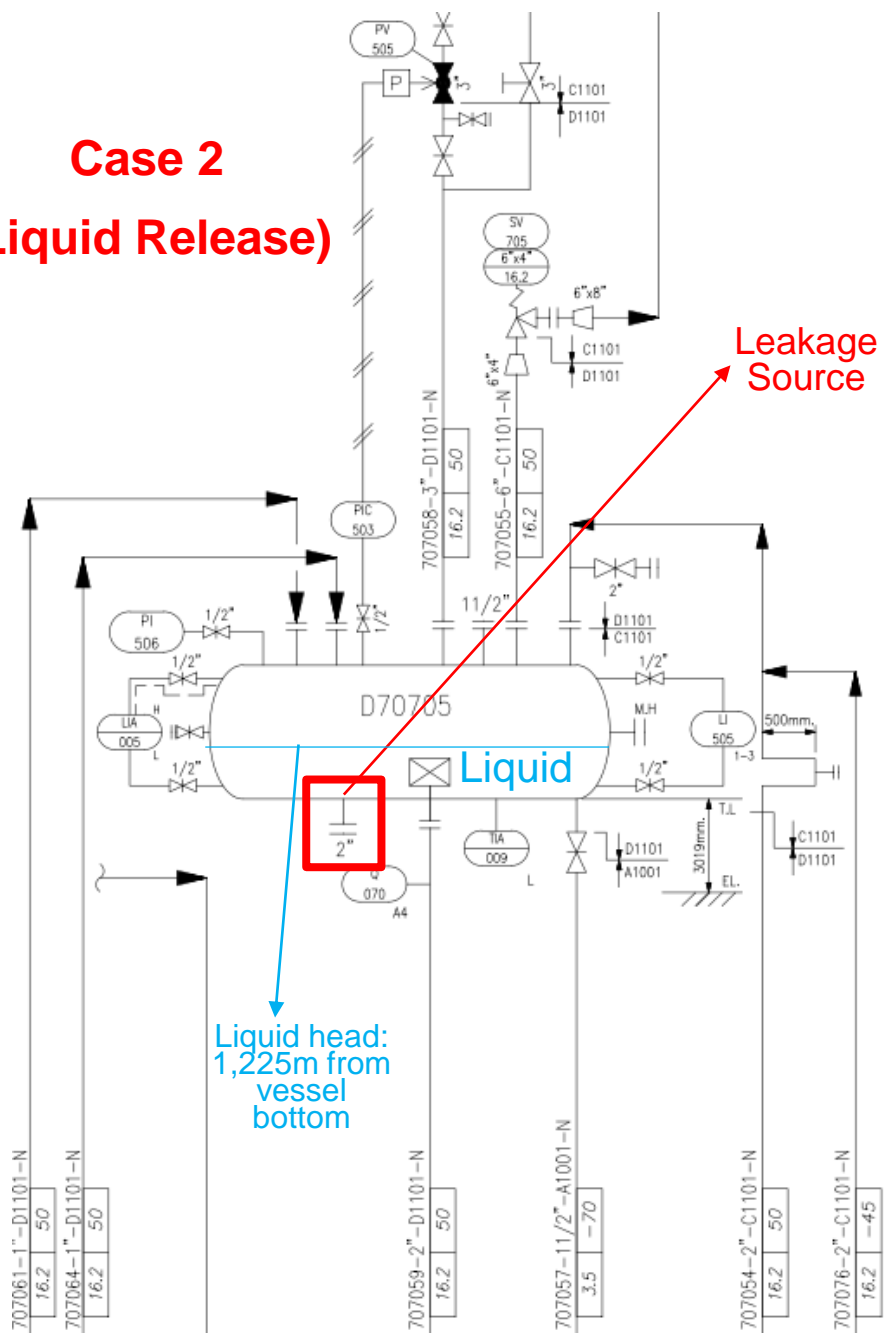
North West View

GSP1 – Leakage Scenarios

Case 1
(Vapor Release)

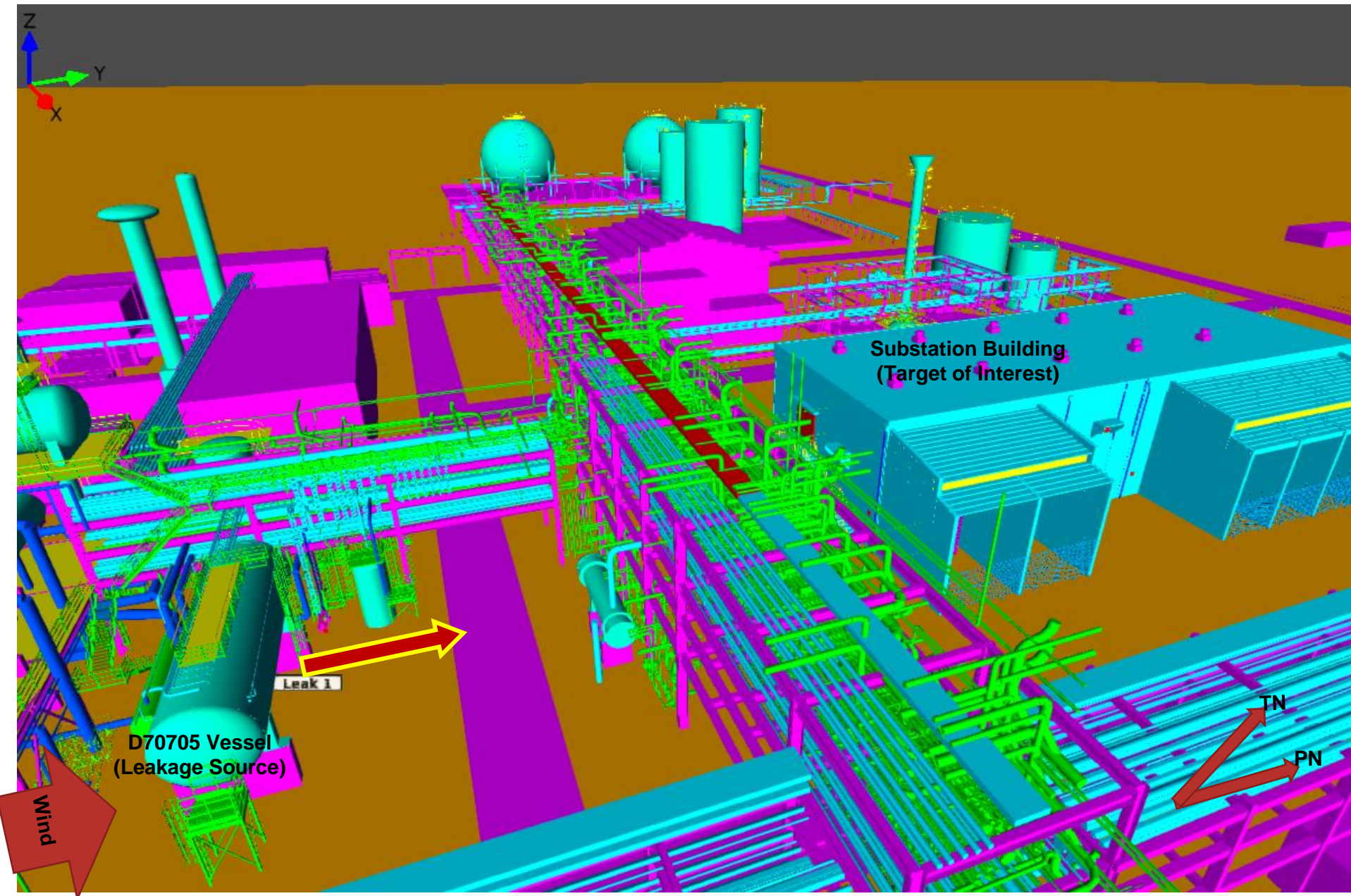


Case 2
(Liquid Release)



Reference:

GSP1 – Leakage Scenario (Case 2)



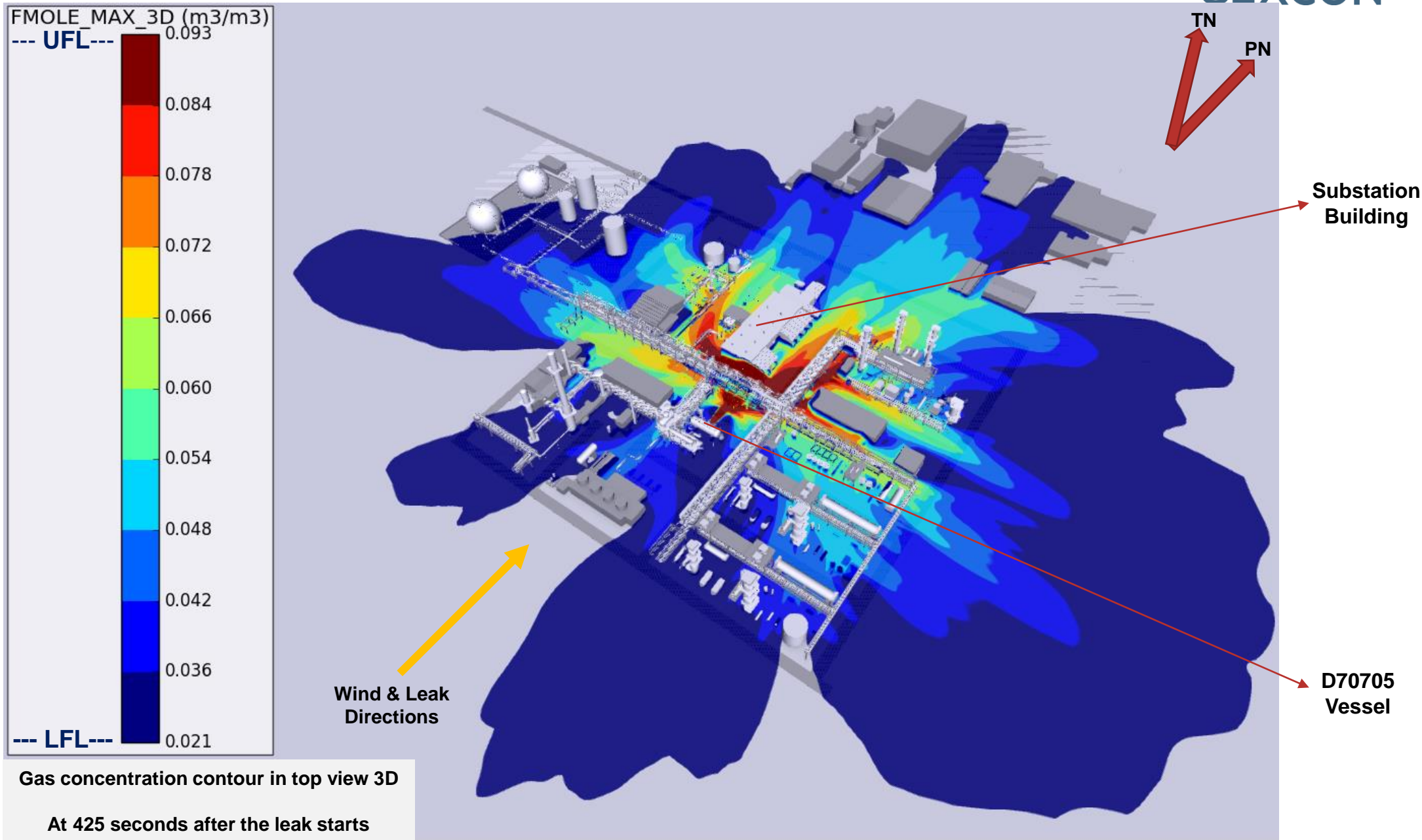
- Leakage hole diameter: 2 inch = 50,8 mm
- Leakage position: 3,5 m from ground
- Leakage direction: to Substation Building (Jet +Y / plant north)
- Leakage position and direction are depicted as a red-yellow arrow
- Leakage starts at 5th second and stops at 427th second of simulation (leakage duration: 422 seconds)
- Total duration of simulations: 450 seconds
- Gas composition: 98,98% Propane, 1,02% Ethane
- Mass flow rate: 43,72 kg/s

Sample of
Dispersion
Simulation Results
in PTT GSP1

Case 2

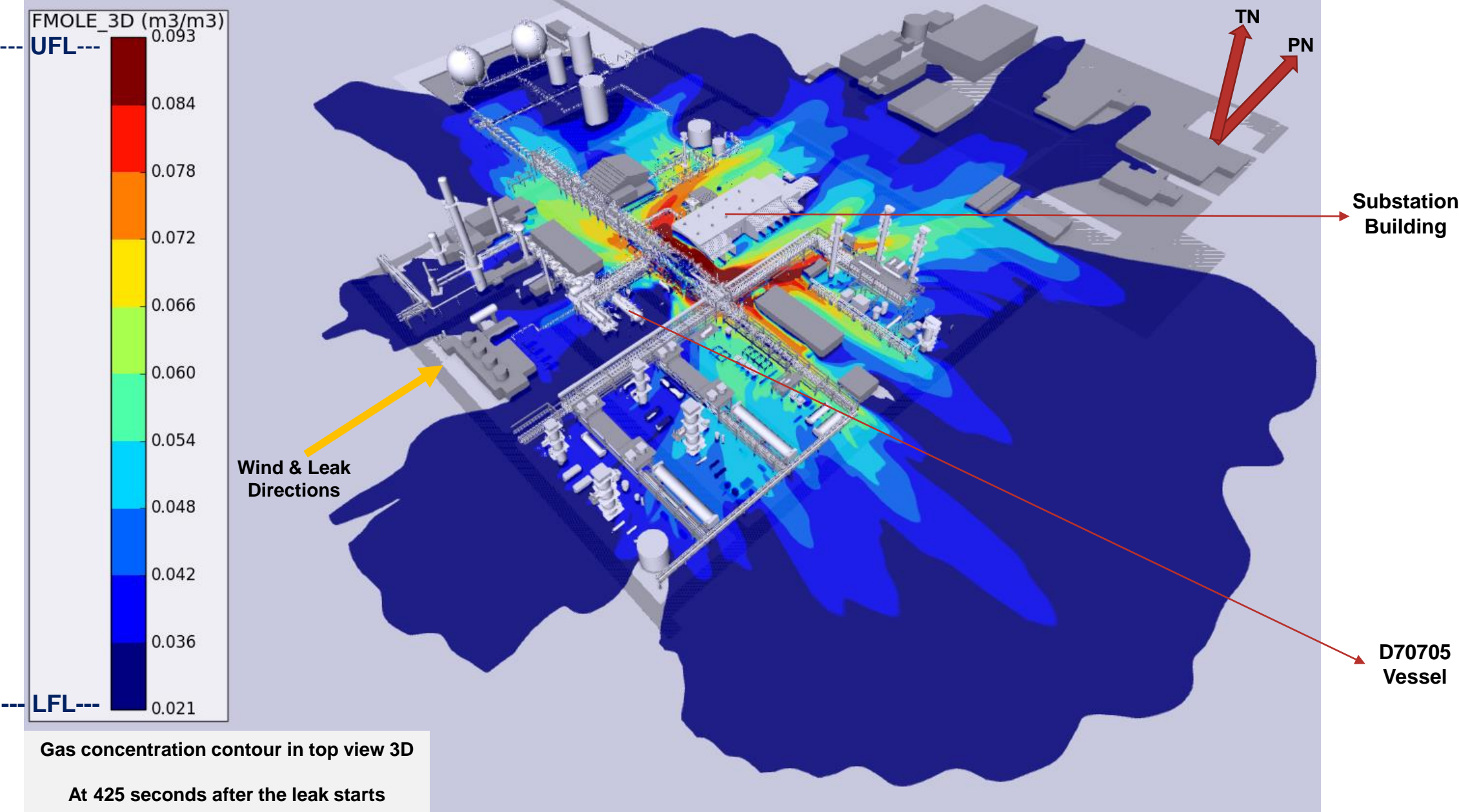
Dispersion Simulation Result Sample: GSP 1– Wind Speed 0.1 m/s

GEXCON



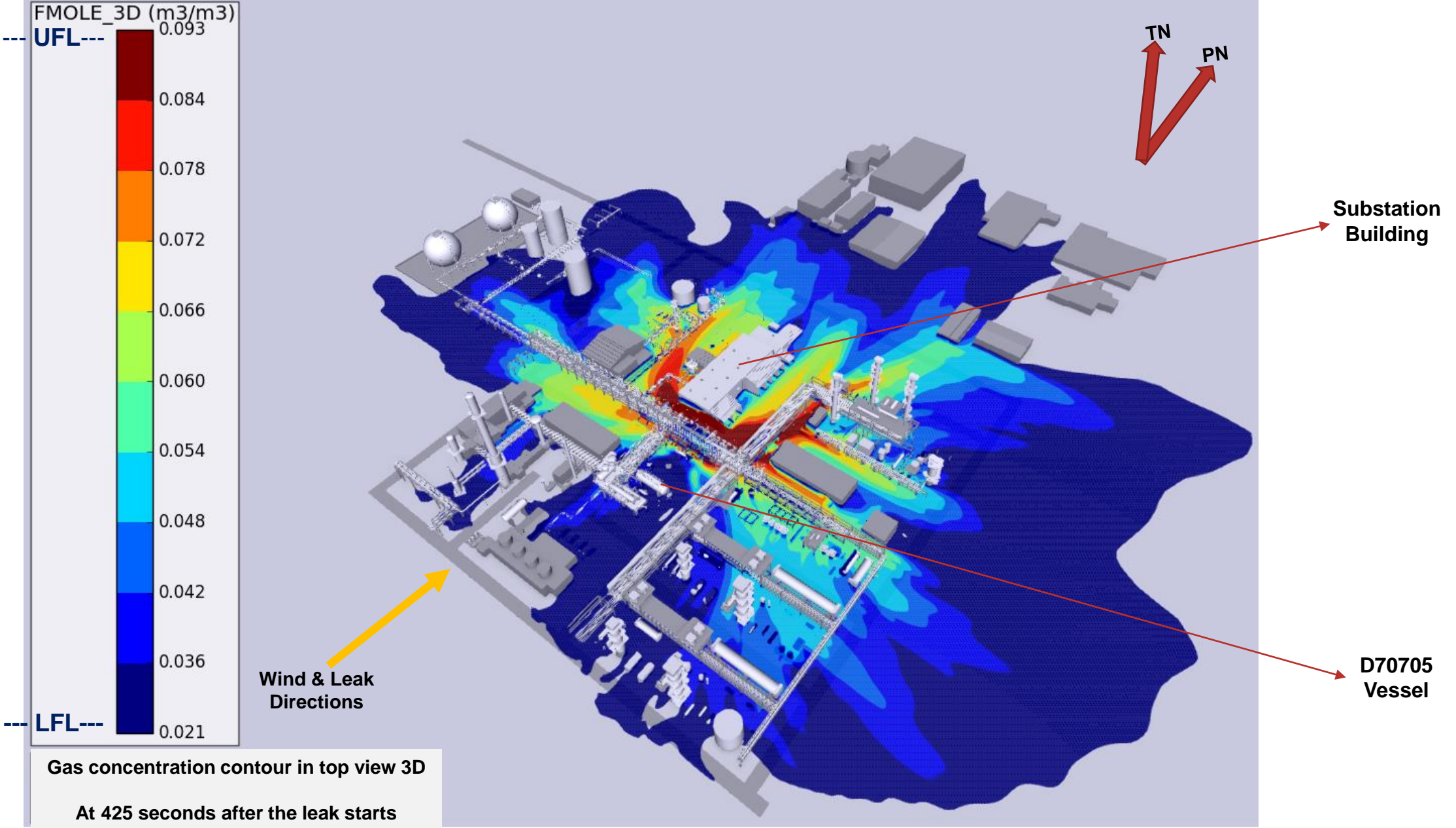
Dispersion Simulation Result Sample:
GSP 1– Wind Speed 0.6 m/s

GEXCON



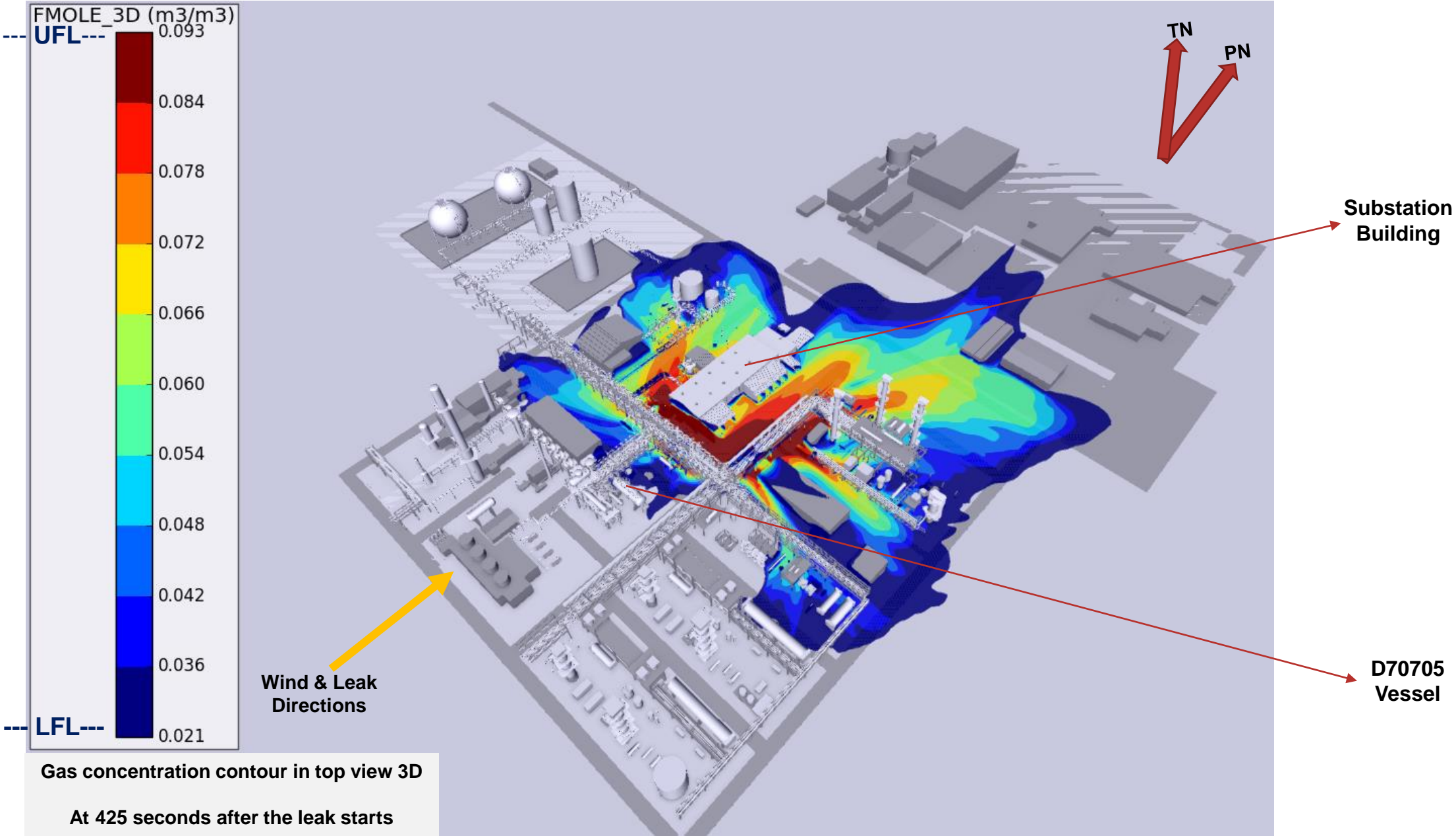
Dispersion Simulation Result Sample: GSP 1– Wind Speed 1.0 m/s

GEXCON



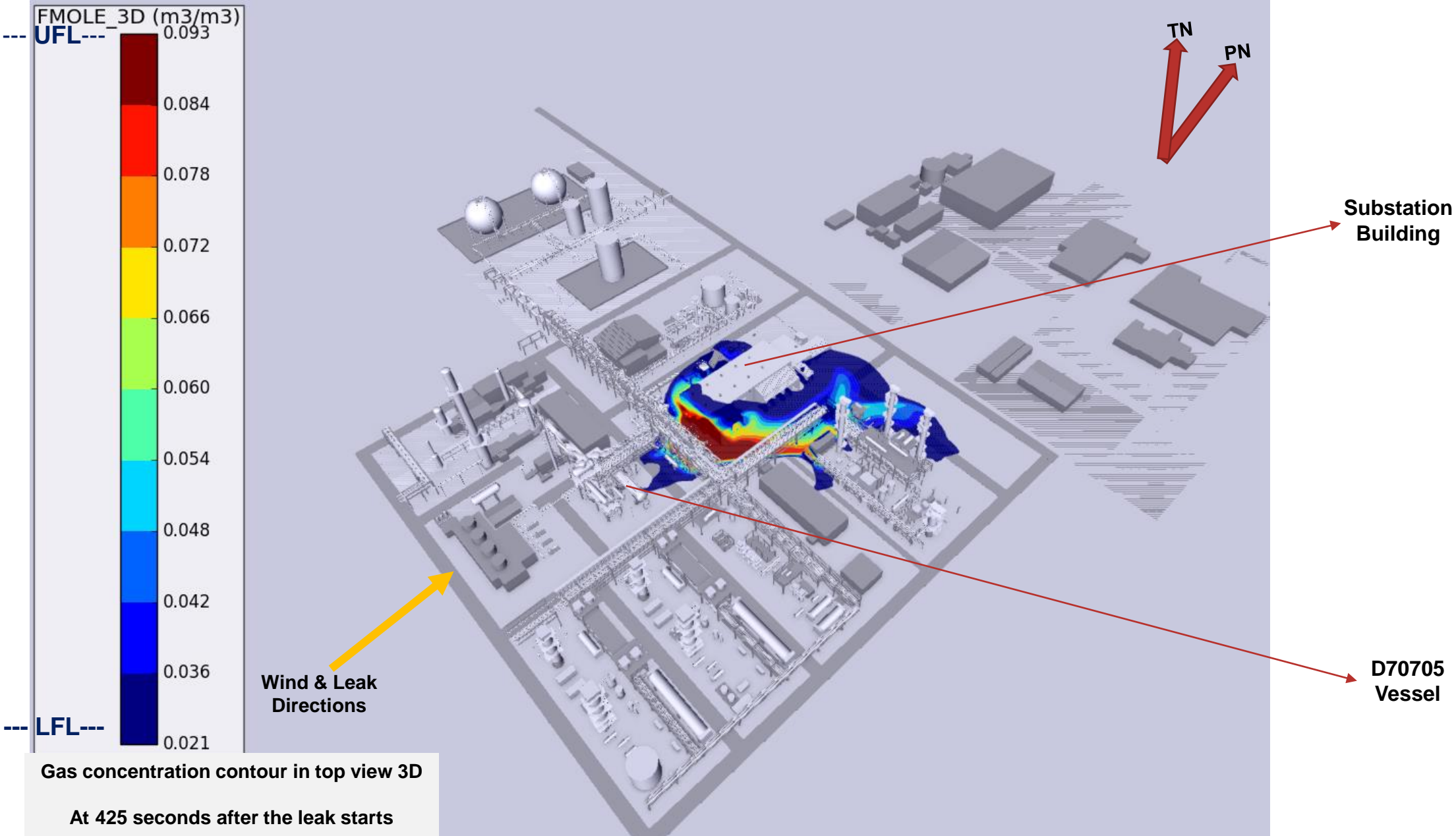
Dispersion Simulation Result Sample:
GSP 1– Wind Speed 2.2 m/s

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Dispersion Simulation Result Sample: GSP 1– Wind Speed 4.9 m/s

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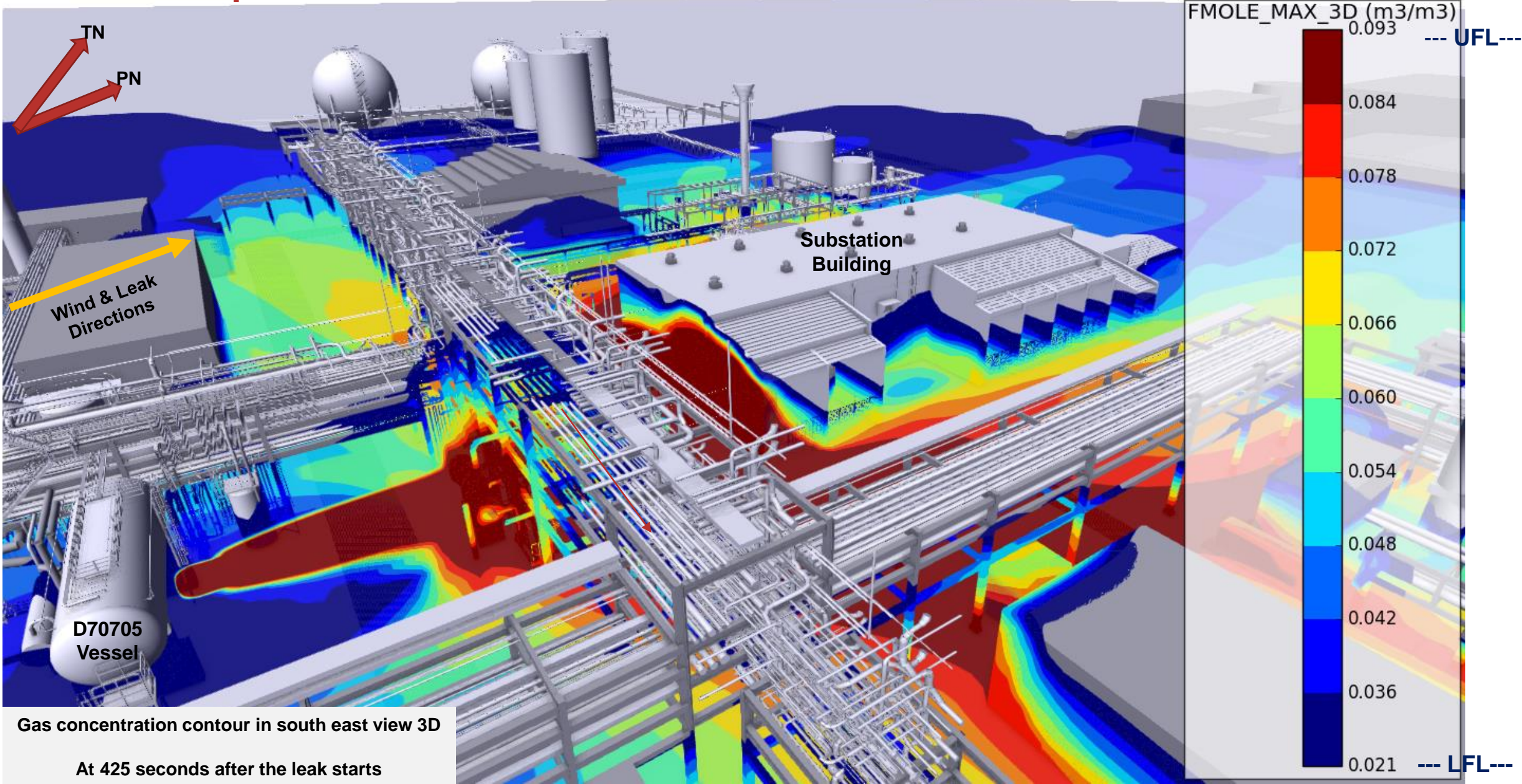


**Sample of
Dispersion
Simulation Results
in PTT GSP1**

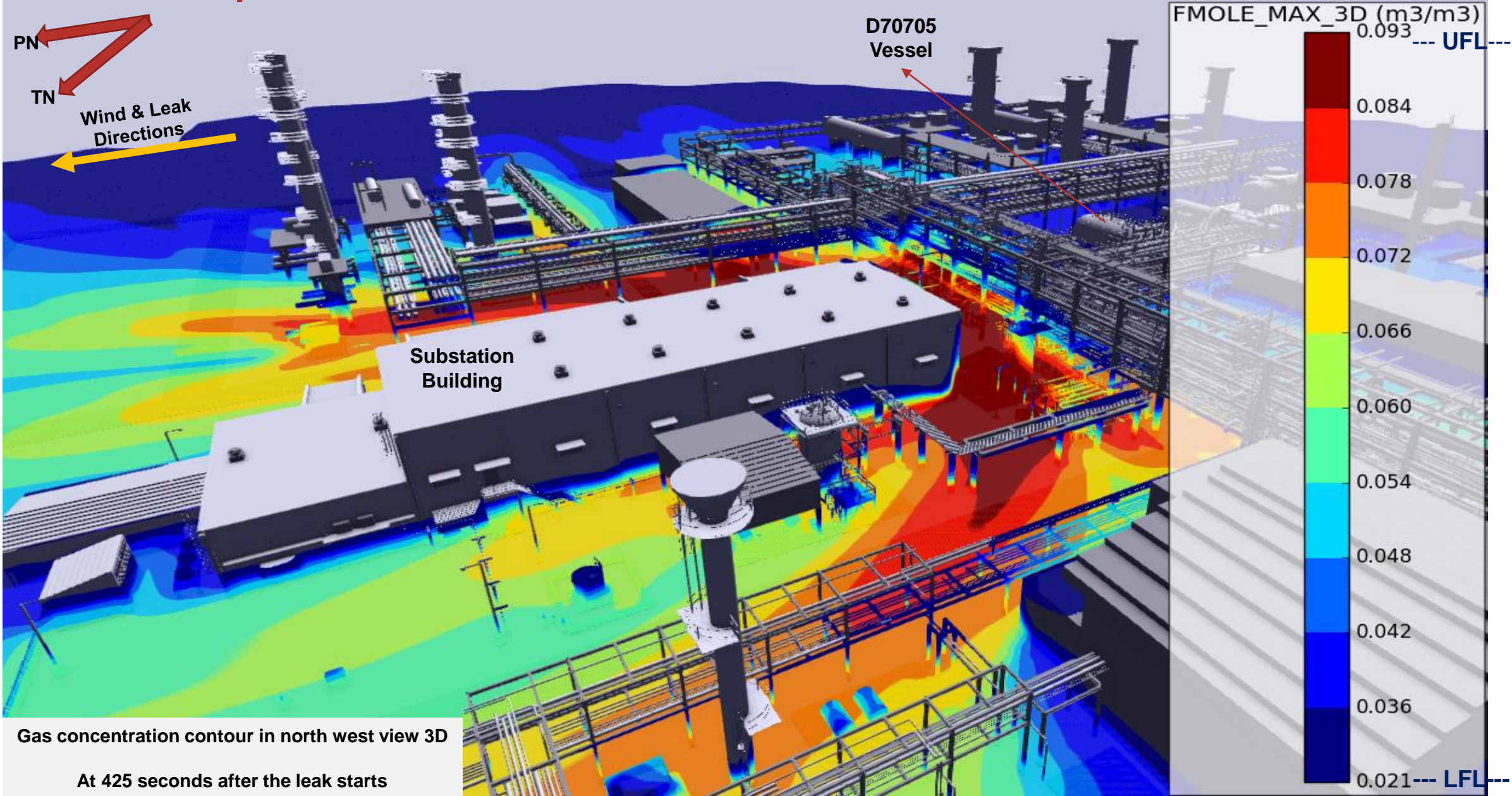
Case 2

**Wind Speed 0.1 m/s
(Farthest Distance
of Flammable Gas
from Leakage
Source)**

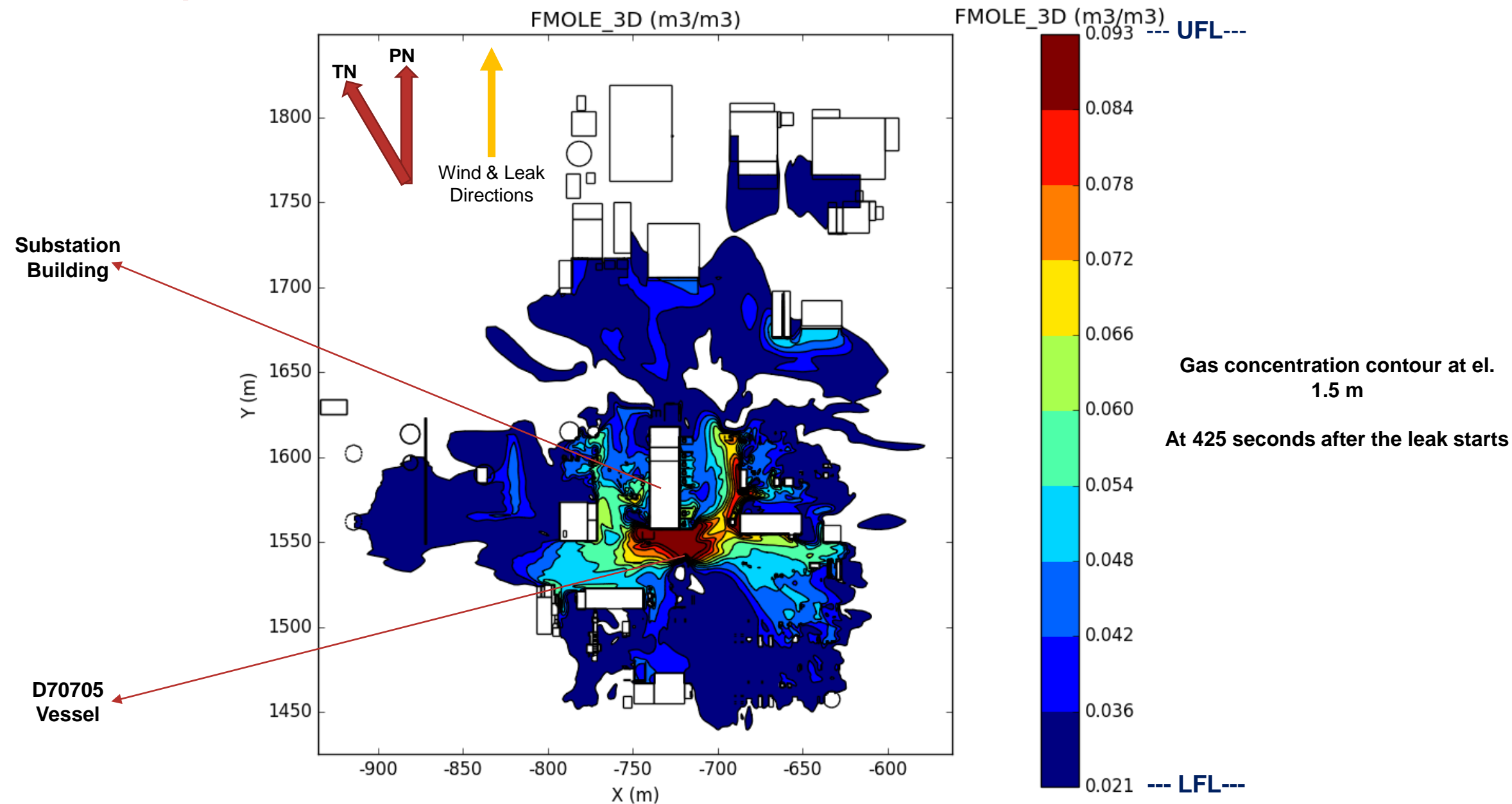
Dispersion Simulation Result Sample: GSP 1– Wind Speed 0.1 m/s



Dispersion Simulation Result Sample: GSP 1– Wind Speed 0.1 m/s



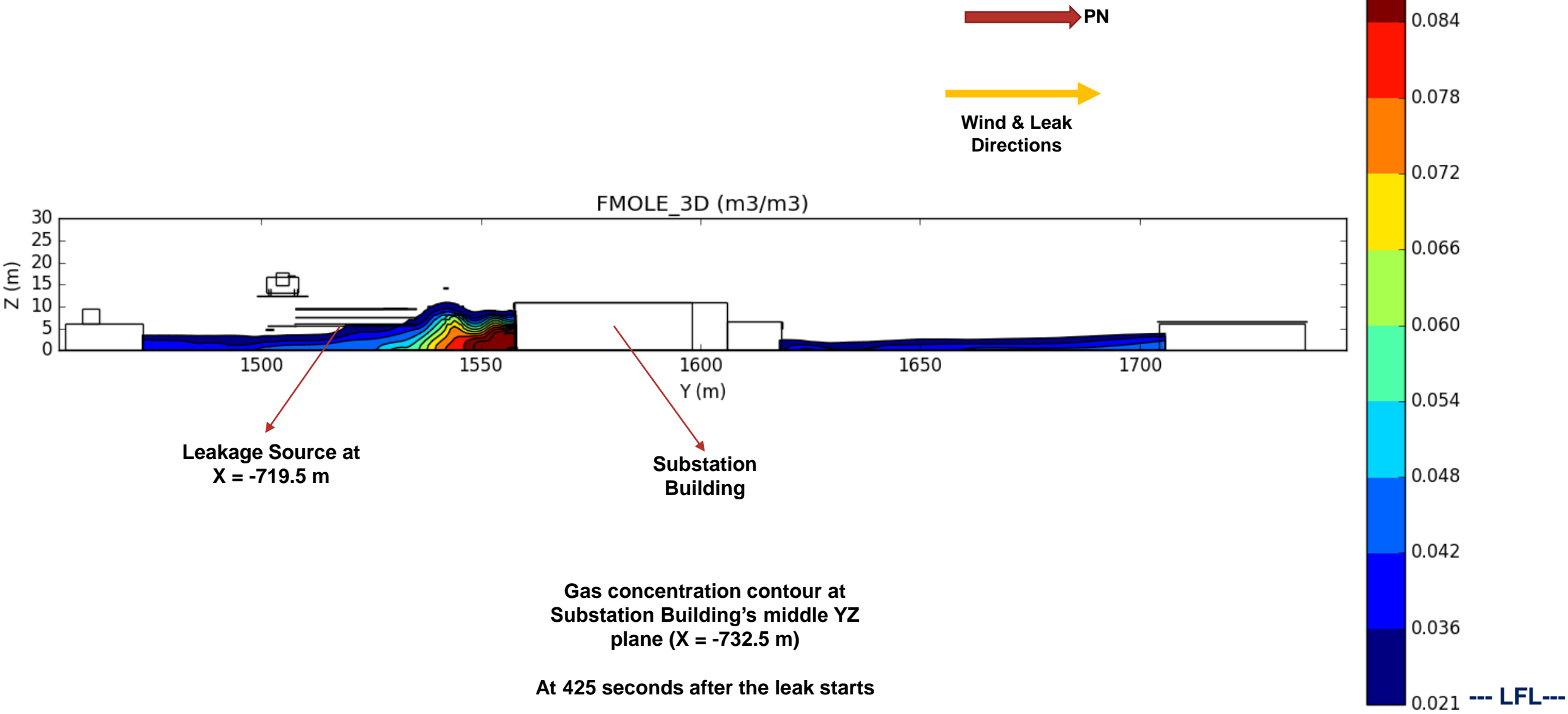
Dispersion Simulation Result Sample: GSP 1– Wind Speed 0.1 m/s



Dispersion Simulation Result Sample: GSP 1– Wind Speed 0.1 m/s

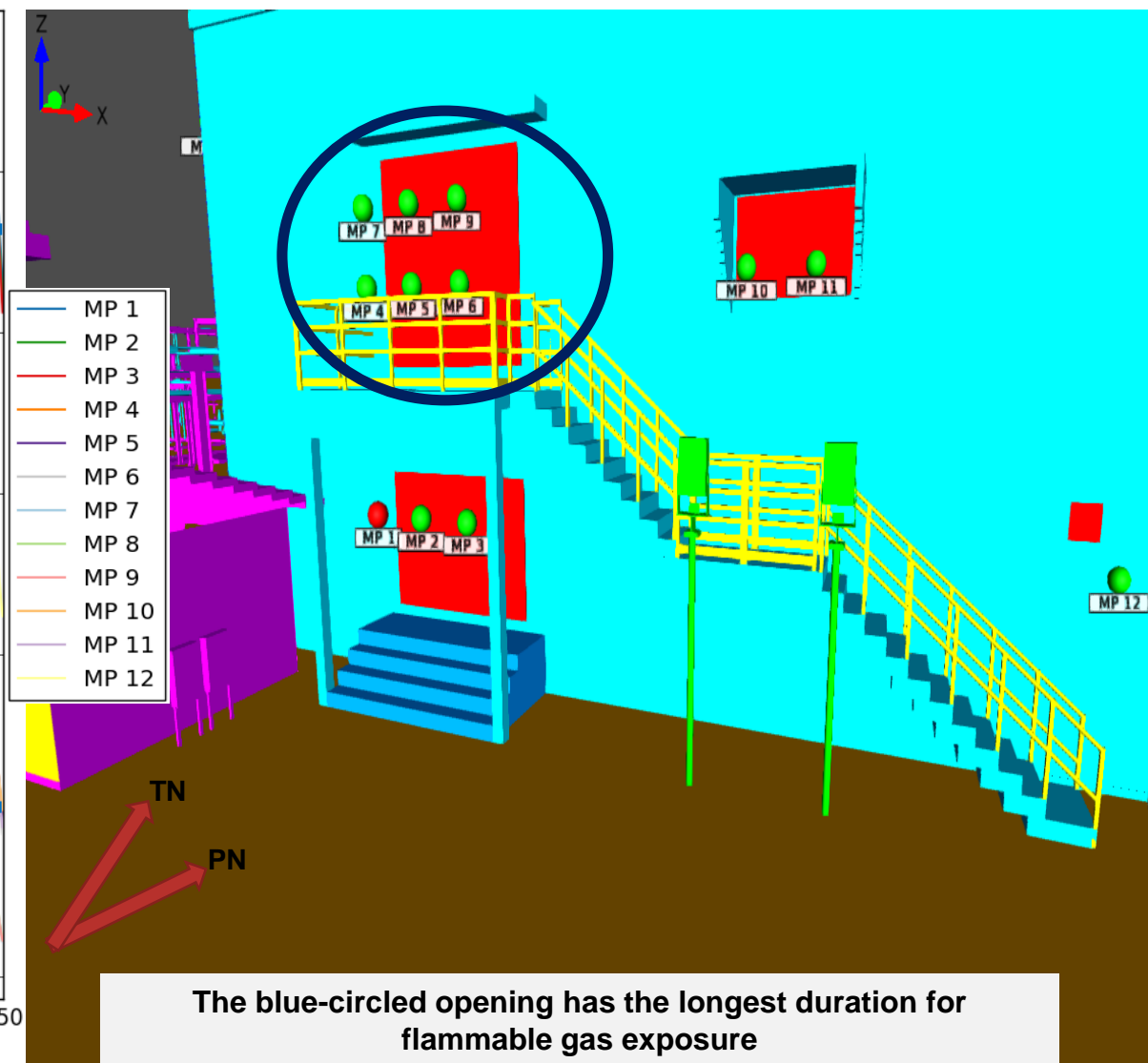
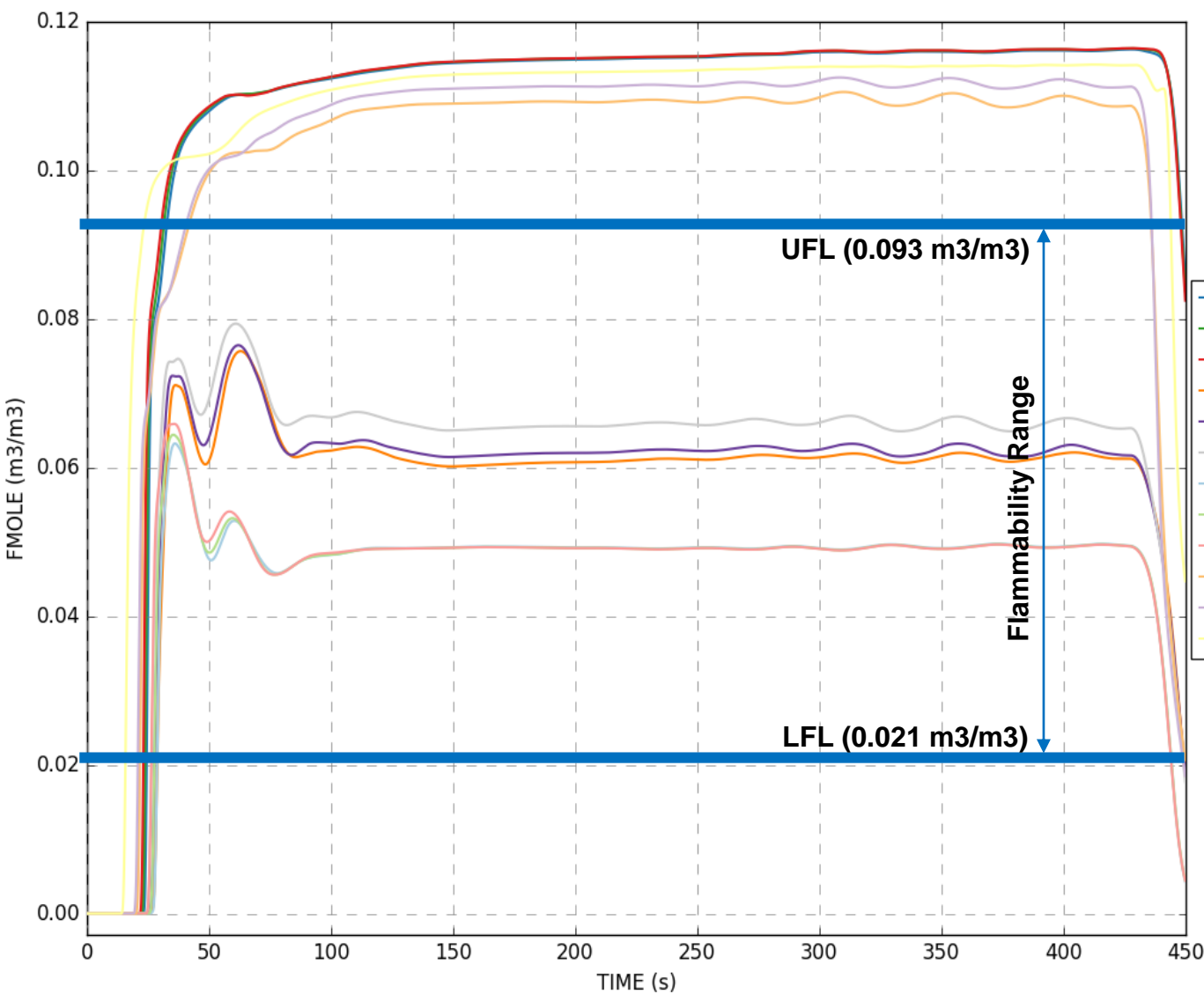
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FMOLE_3D (m3/m3) 0.093 --- UFL---



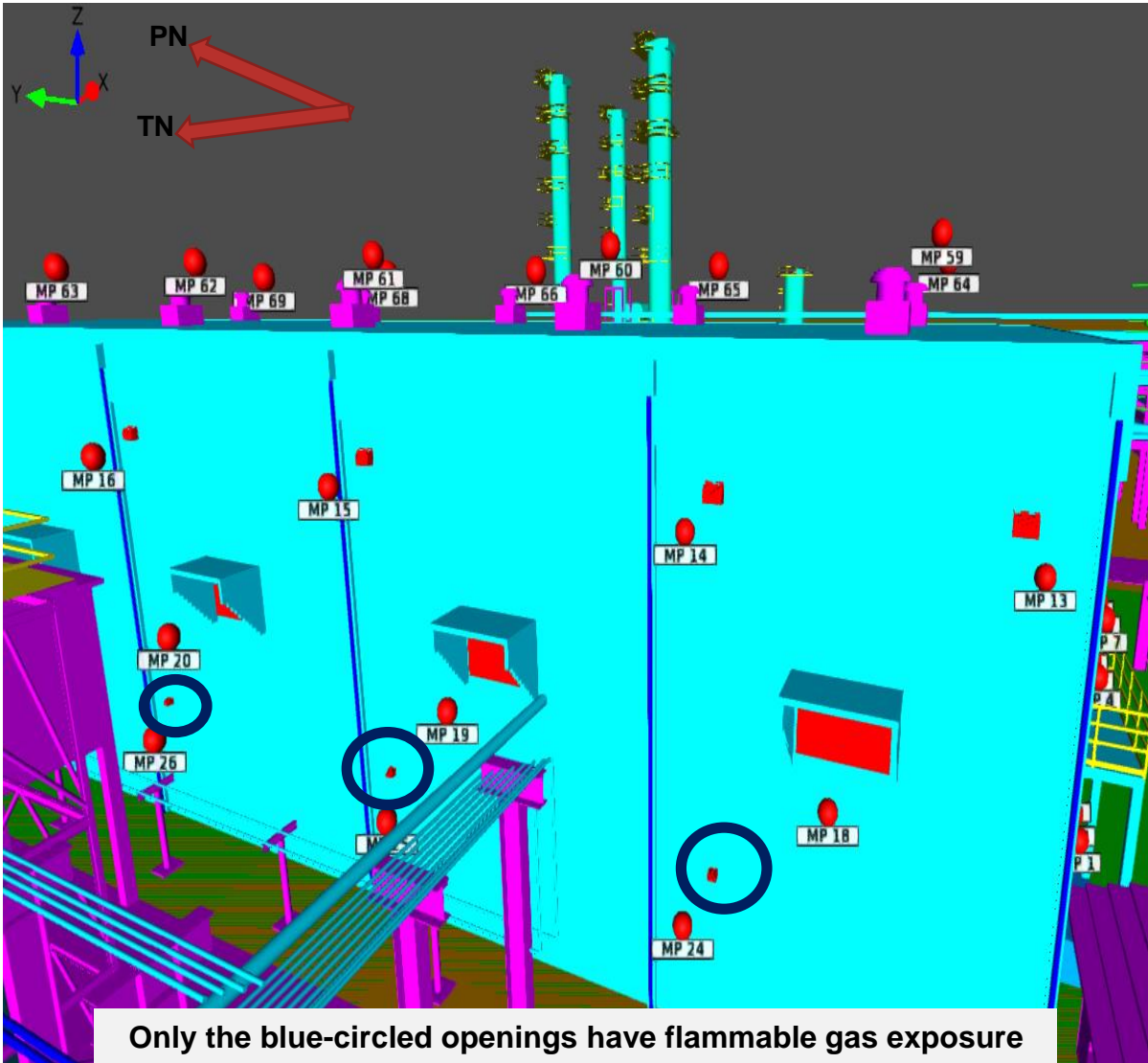
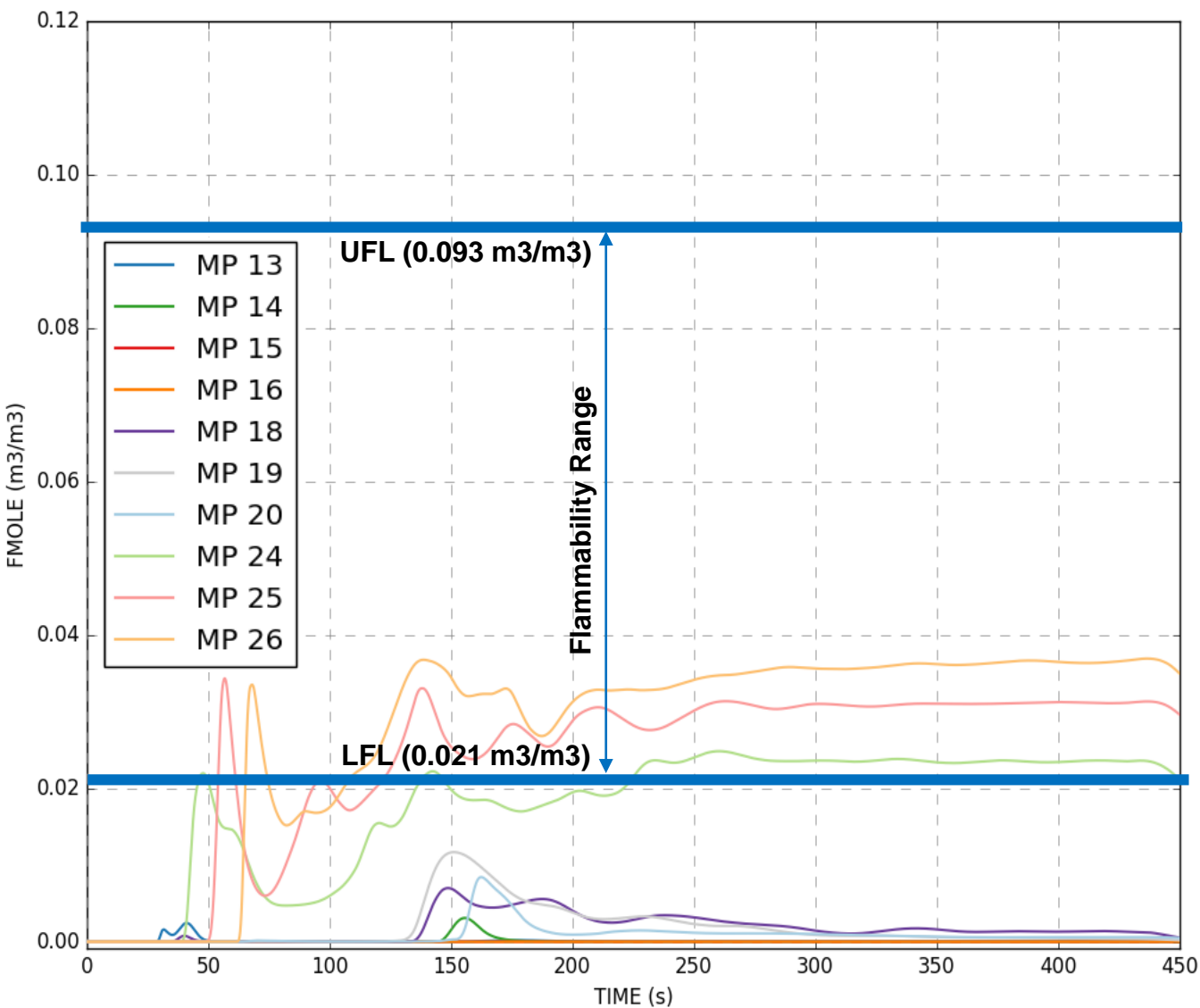
Monitor Points (FMOLE) Reading at Southern Substation Opening

GSP 1– Wind Speed 0.1 m/s



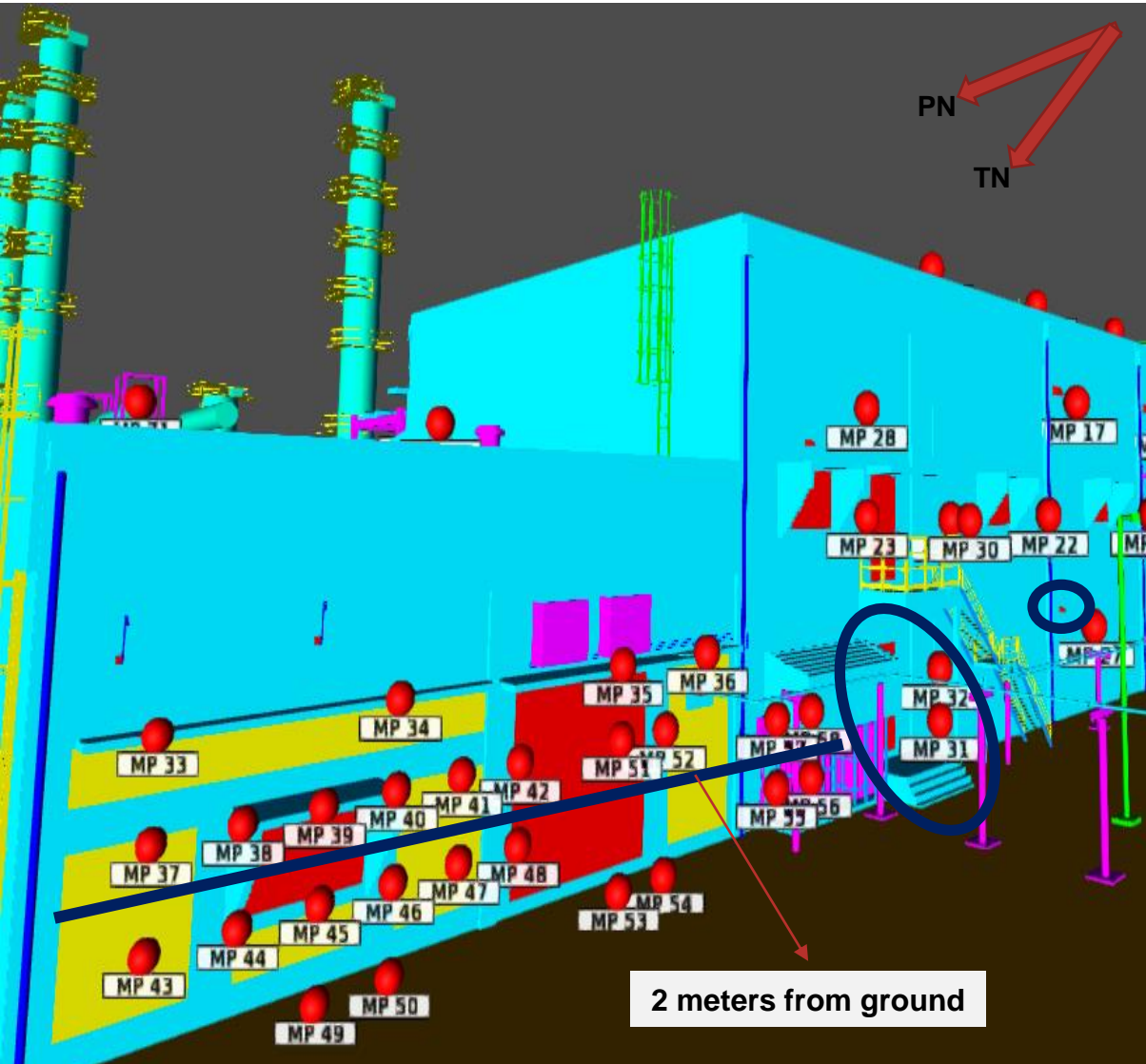
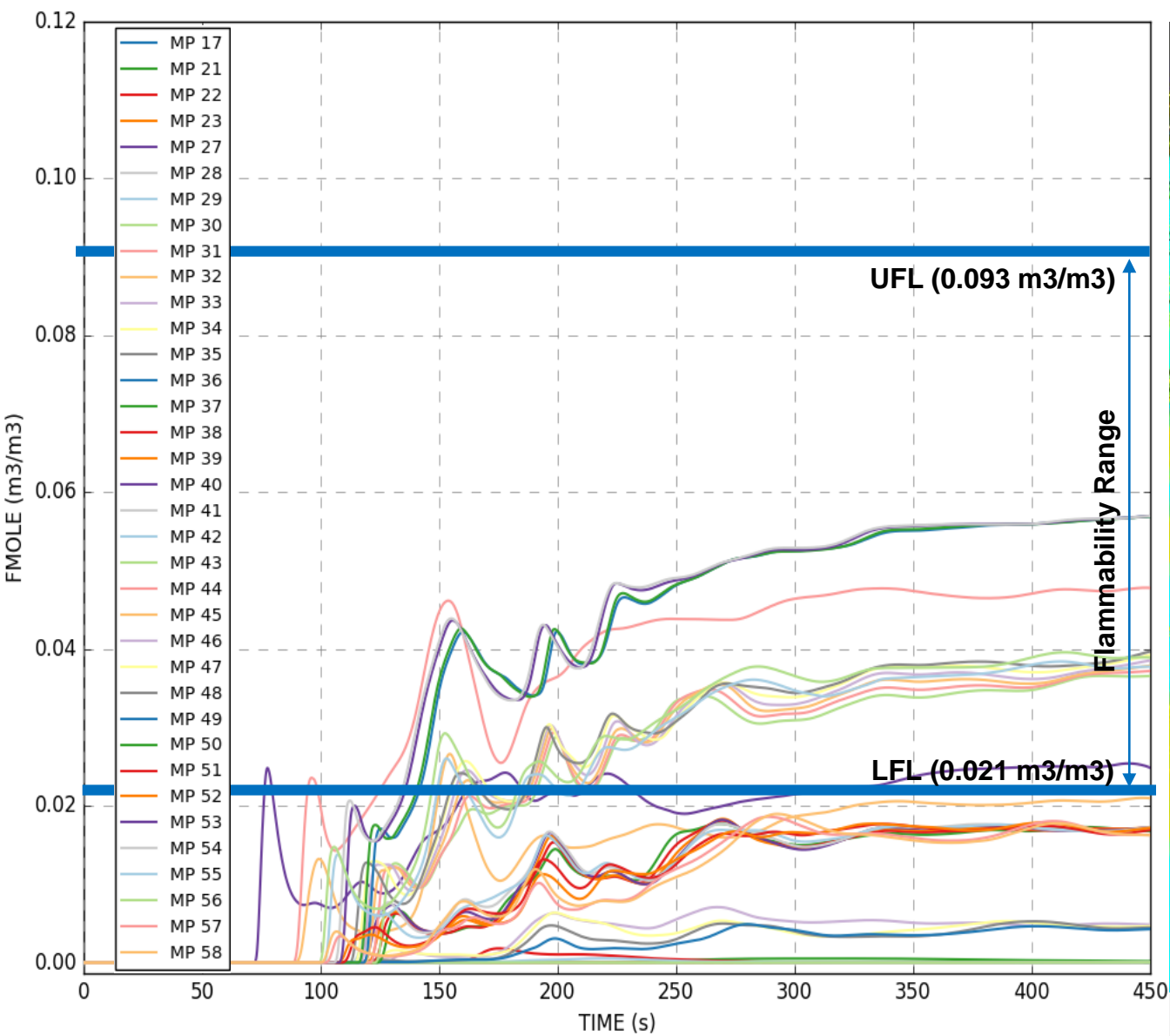
Monitor Points (FMOLE) Reading at Western Substation Opening (1)

GSP 1– Wind Speed 0.1 m/s



Monitor Points (FMOLE) Reading at Western Substation Opening (2)

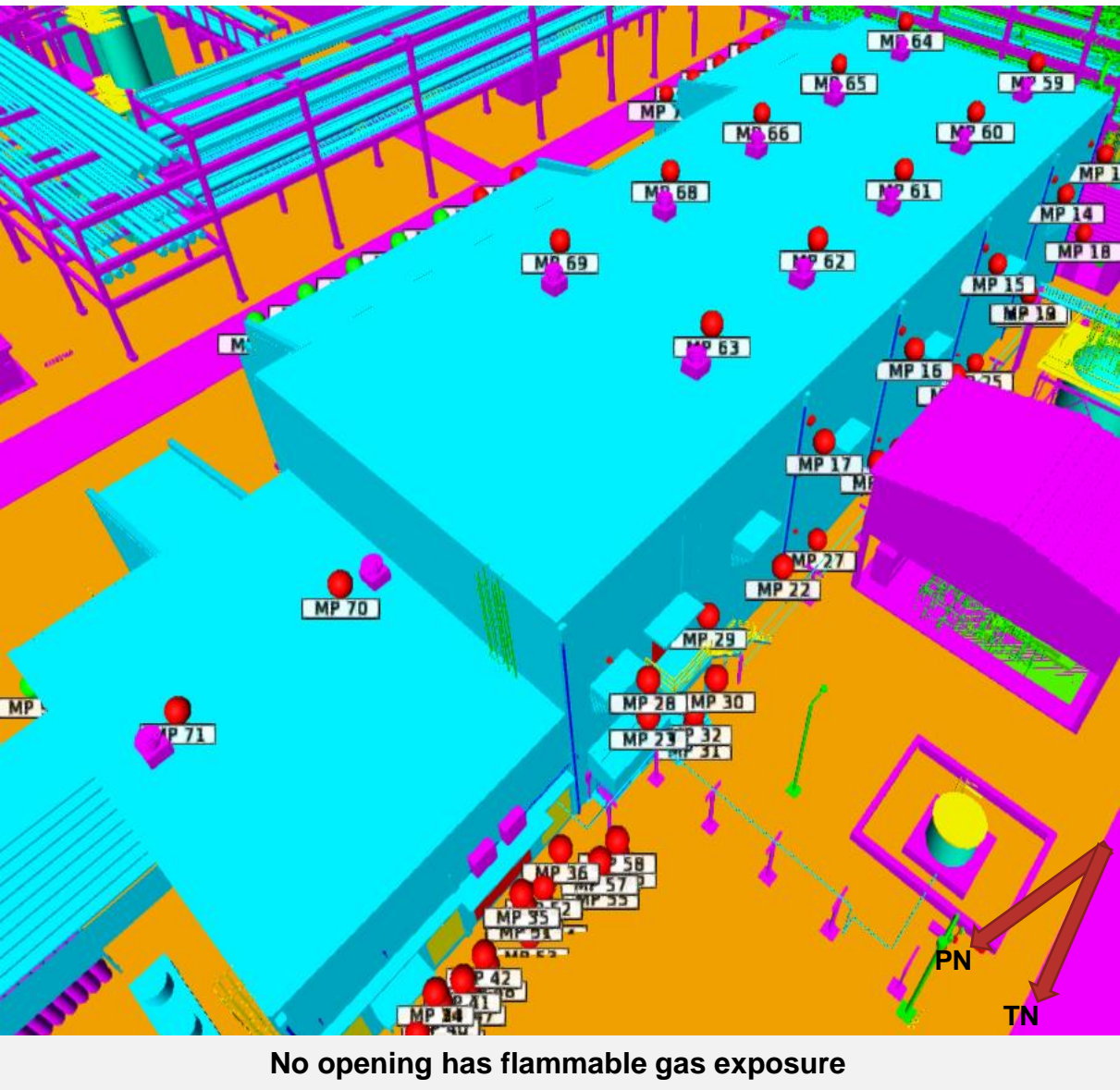
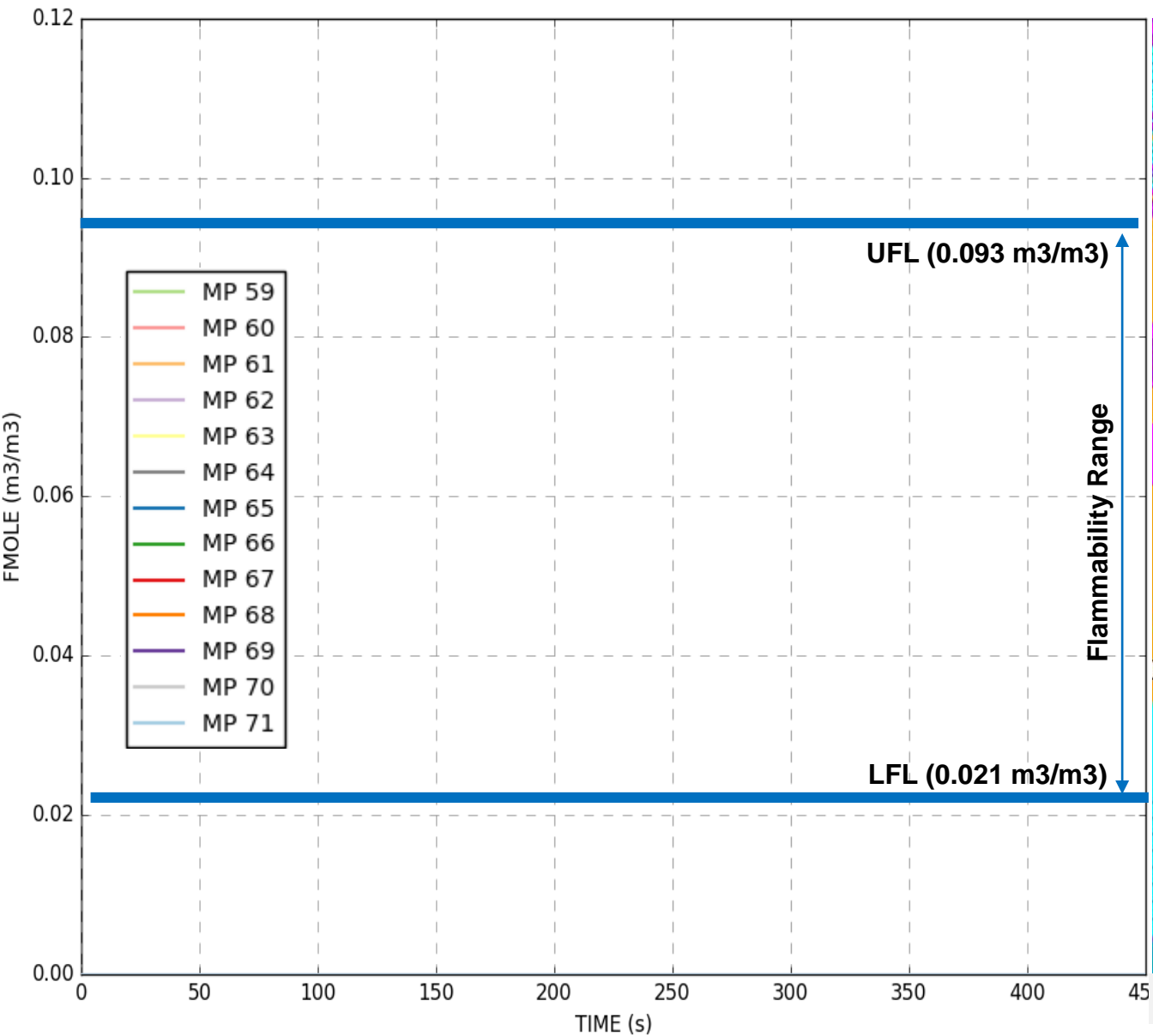
GSP 1– Wind Speed 0.1 m/s



Only the blue-circled openings and opening areas below the blue line have flammable gas exposure

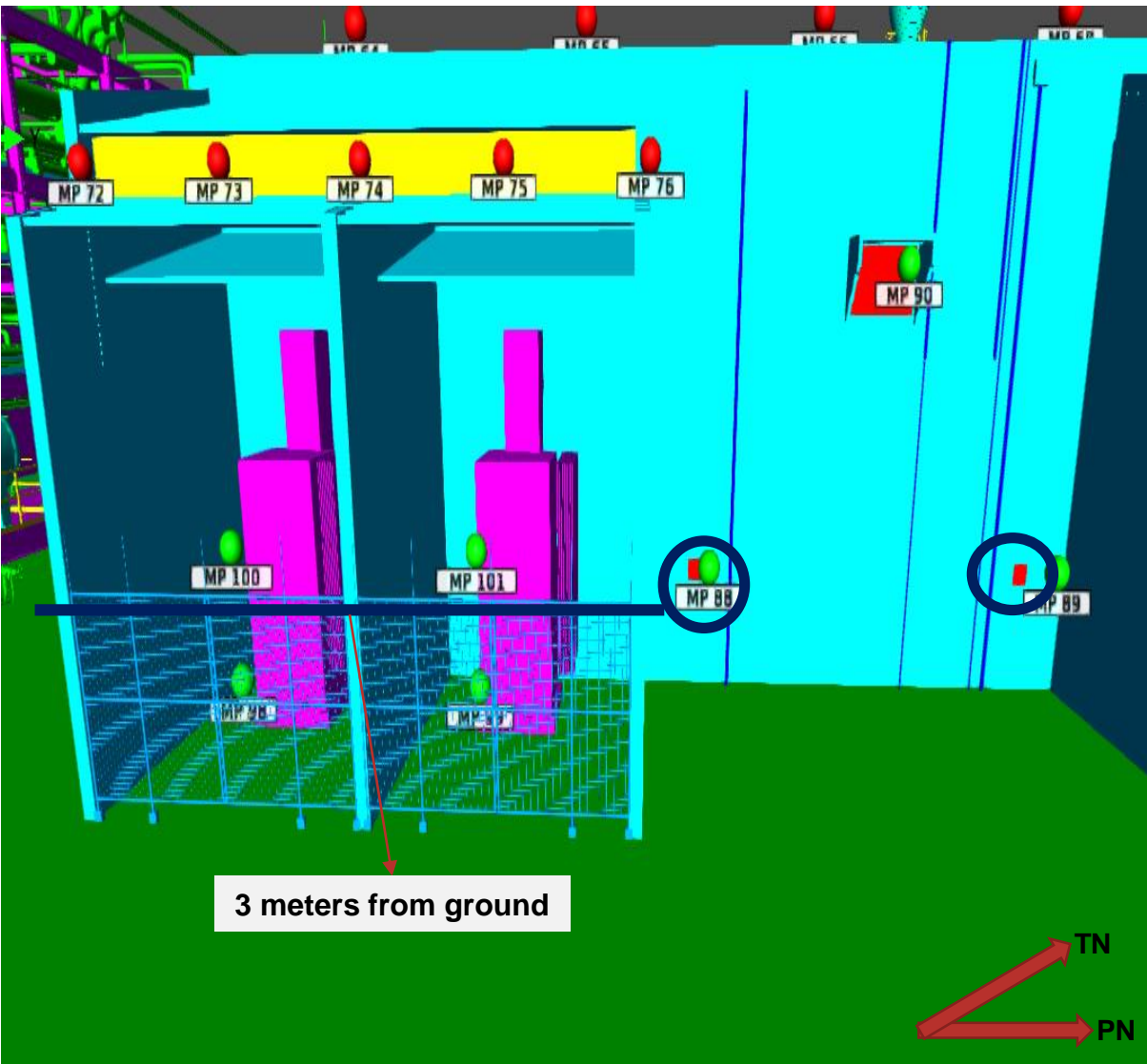
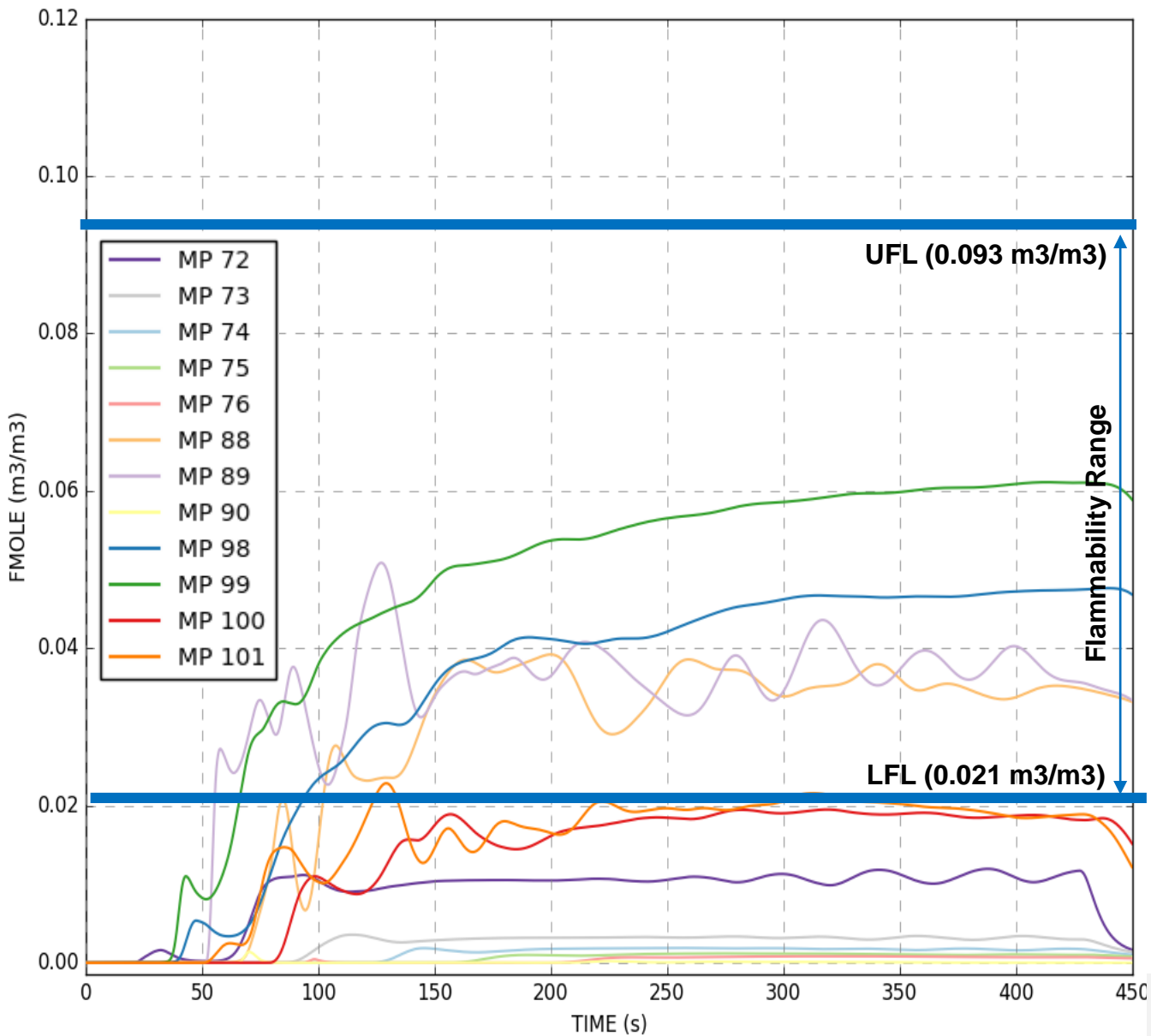
Monitor Points (FMOLE) Reading at Top Substation Opening

GSP 1– Wind Speed 0.1 m/s



Monitor Points (FMOLE) Reading at Eastern Substation Opening (1)

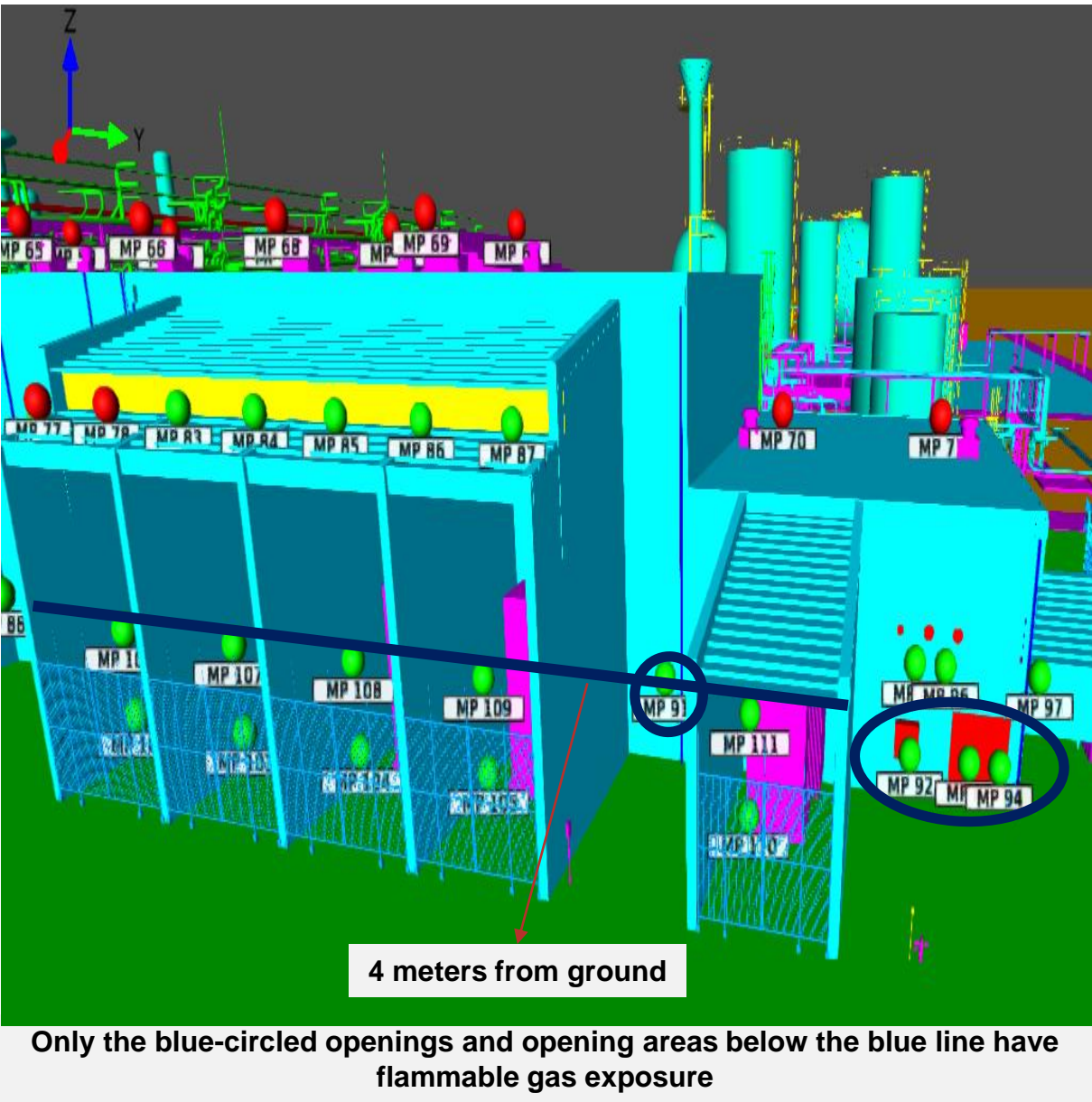
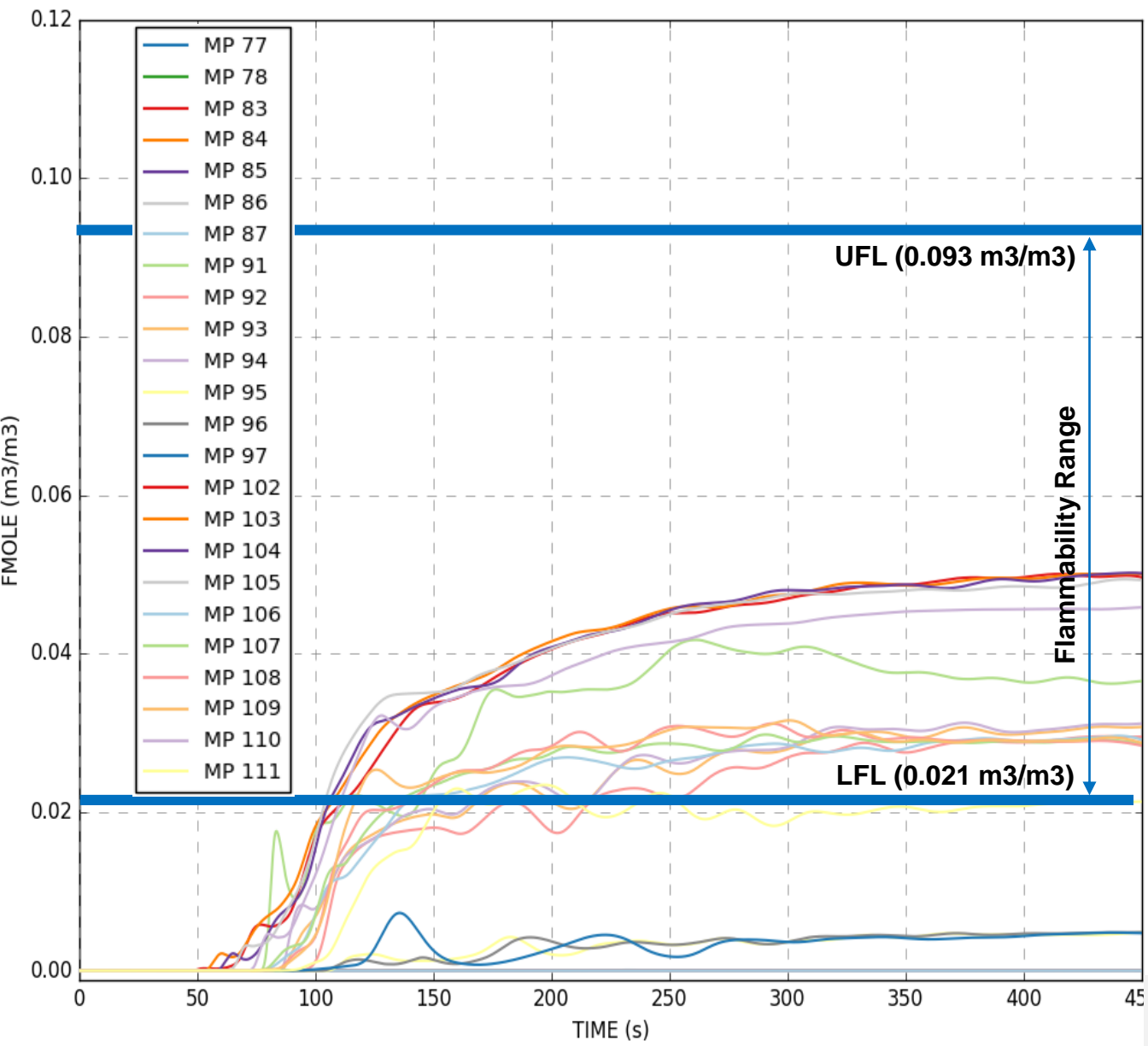
GSP 1– Wind Speed 0.1 m/s



Only the blue-circled openings and opening areas below the blue line have flammable gas exposure

Monitor Points (FMOLE) Reading at Eastern Substation Opening (2)

GSP 1– Wind Speed 0.1 m/s



General Discussion

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PTT GSP 1 Dispersion Study General Discussion: Case 2 – Liquid Release from Vessel D70705



- The liquid-release scenario in this dispersion study has a tendency to spread more widely in lower wind speed.
- It spreads the farthest flammable gas from the leakage source when the wind flows in the speed of 0.1 m/s steadily. The farthest distances of the dispersion for north, east, south, and west directions occur at 0.5 m elevation from ground and tend to fan out farther as the liquid keeps releasing to the atmosphere. The farthest distance measured in the simulation is 325 meters to north.
- The Substation's openings located above 4 meters elevation from ground for this case are considered to be safe from flammable gas exposure. An exception applies to the southern openings which are exposed to considerably rich mixture at lower elevation. For this Substation's side, the openings located at 2nd floor tend to have more flammable gas exposure compared to those which are at 1st floor.
- However, dispersion cases using higher wind speeds are likely to spread flammable gas to higher elevation in the southern Substation's area.
- Note that other cases of dispersion may not be typical with this study. Variables such as geometry, atmospheric condition, and leakage scenario contribute to the spreading behaviour.

Thank You!

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