

METEC Testing Protocol Developments and International Collaborations

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METEC
 COLORADO STATE UNIVERSITY

Background and Objective

The Global Character of Oil and Gas:

- While oil has always been an internationally traded commodity, LNG has made international sales of natural gas much more prevalent.
- Buyers of natural gas are interested in the emissions intensity of purchased product.
- To support buyer demand, emission reporting has 'gone global' in recent years. Many companies support voluntary reporting programs like OGMP 2.0, MiQ, Veritas™, and others.

Advanced Emission Detection is Now Integral to Reporting

- Unlike traditional regulatory programs, most voluntary programs require some form of *measurement informed inventory* to validate emissions.
- Measurements (estimates of emission rates) require use of new, advanced, emission detection and quantification solutions.
- Testing is necessary to understanding method performance.

Why International Cooperation?

- Global transactions require international trust in underlying methods.
- Multiple test centers, using the same protocol, is the best way to encourage recognition of testing ... and identification of quality advanced methods.

Testing Uses the New, Updated, ADED 2.0 Protocol



New protocol:

- Testing includes
 - **Simulated "baseline" emissions** for normal operational processes at a facility – venting, combustion slip, etc. (top figure)
 - **Simulated failure conditions**, leaks, process failures and similar fugitive emissions (middle plot)
- Test center and solution data are assessed against a **solution-specified detection threshold** for solutions that report the required data
- Data classified into True Positives, True Negatives, False Positives, and False Negatives using a fast, uniform, time step (bottom plot)
- Metrics are time-weighted with no defined start and stop of experiments

Who and Why?

TotalEnergies' TADI test site and METEC – the groups with the most hands-on test experience – cooperated to revise the ADED protocols, released in February 2025.

Protocol link:



Multiple Test Centers Encourages Testing & Equipment Diversity

Test results depend upon:

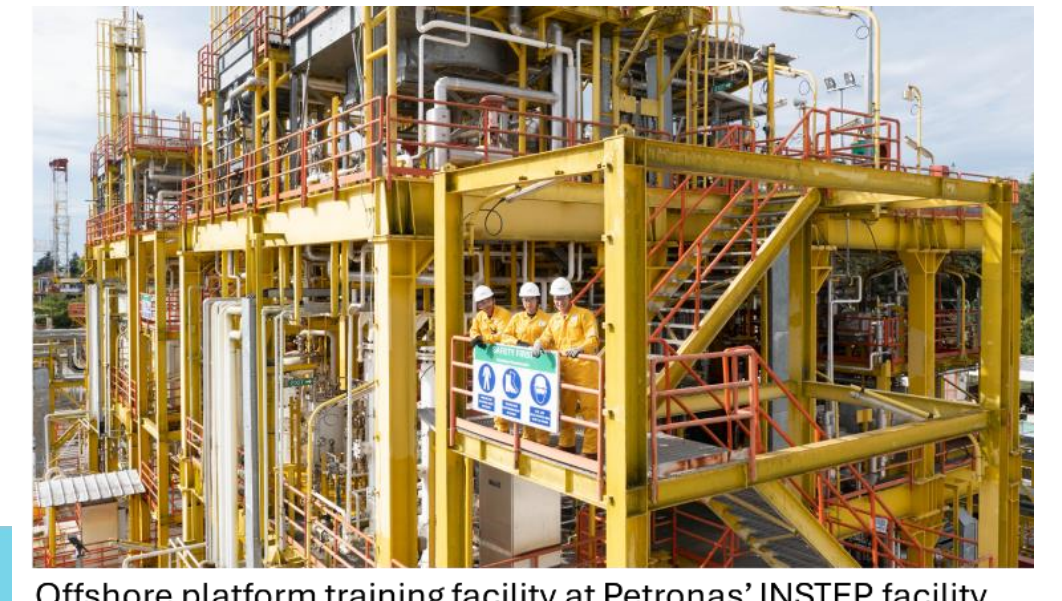
- Environmental conditions
- Equipment types and configurations
- Realism of the test facilities gas releases
- Performance of the solution, given the above variables.

International cooperation provides more diversity on all these variables, while also exposing test results to a wider audience.

Emerging Facilities

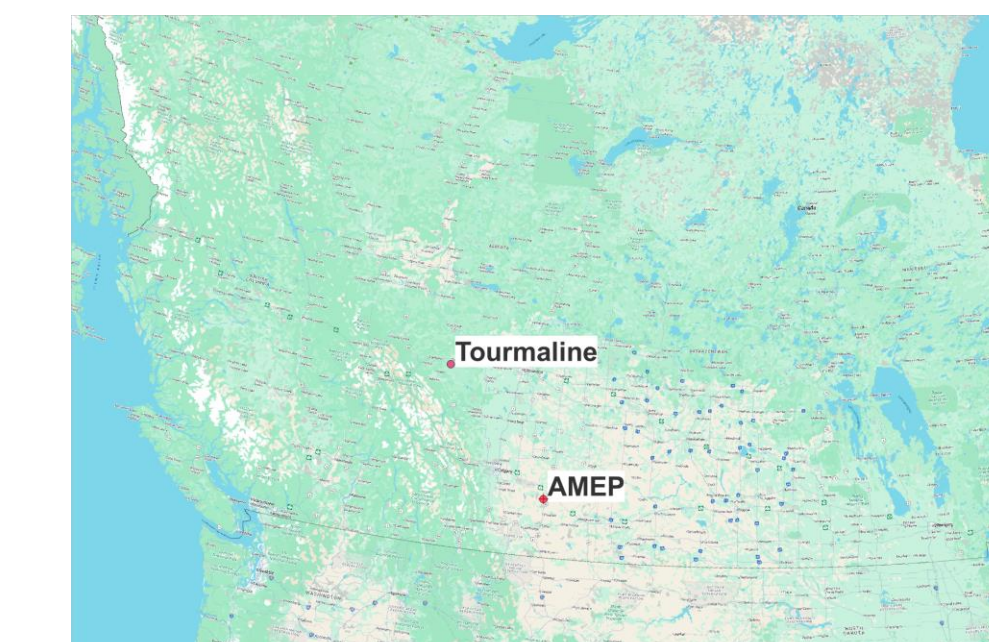
Petronas SEA METEC, in Cooperation with JOGMEC (Under development)

- Located at Institut Teknologi Petroleum PETRONAS (INSTEP) in Kuala Terengganu, Malaysia
- Development partnership with Japanese Organization for Metals and Energy Security
- Equipment characteristic of offshore production platform
- In tropical location
- Continuously operating training center but test operations will be intermittent



Canadian Test Centers

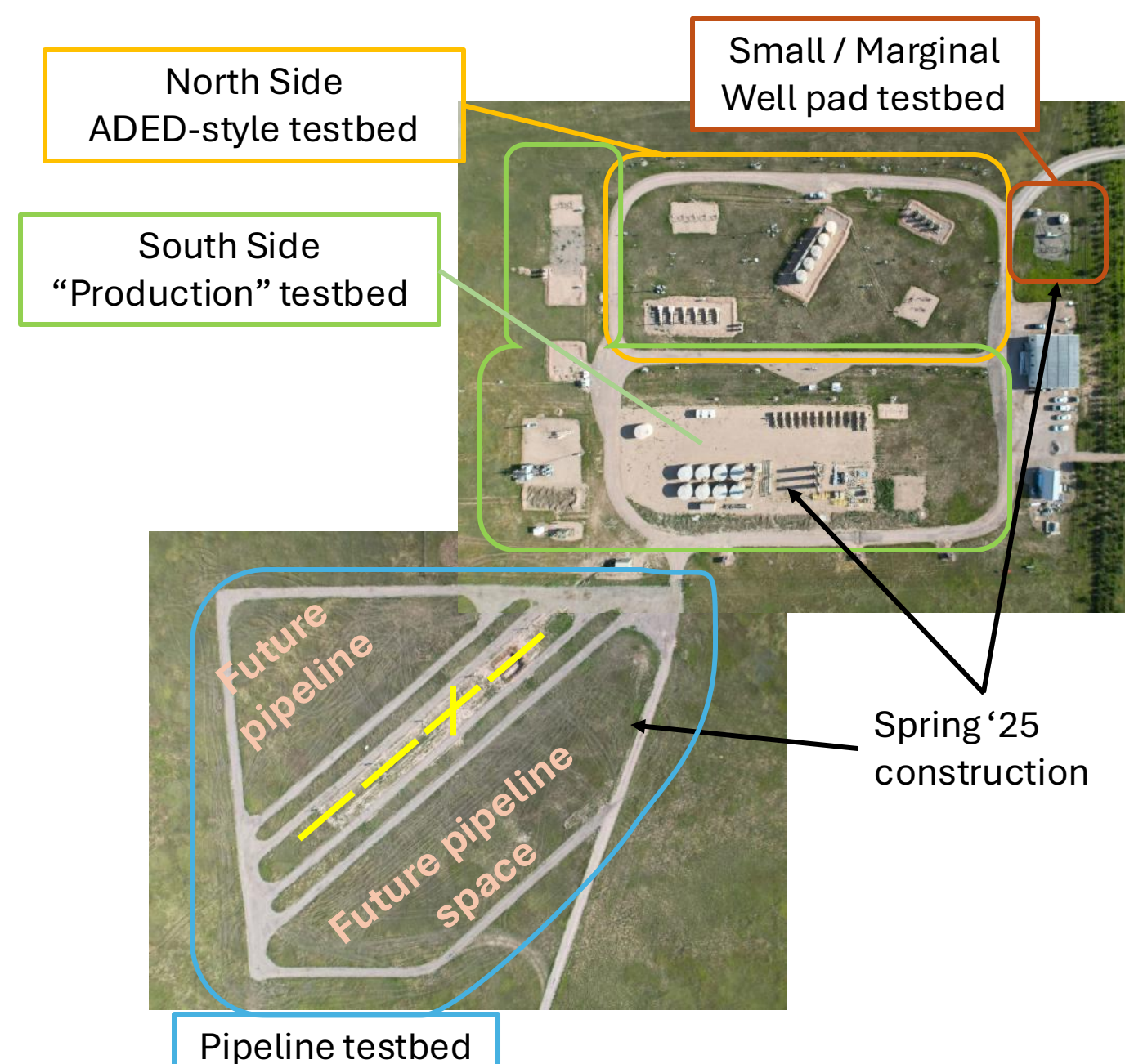
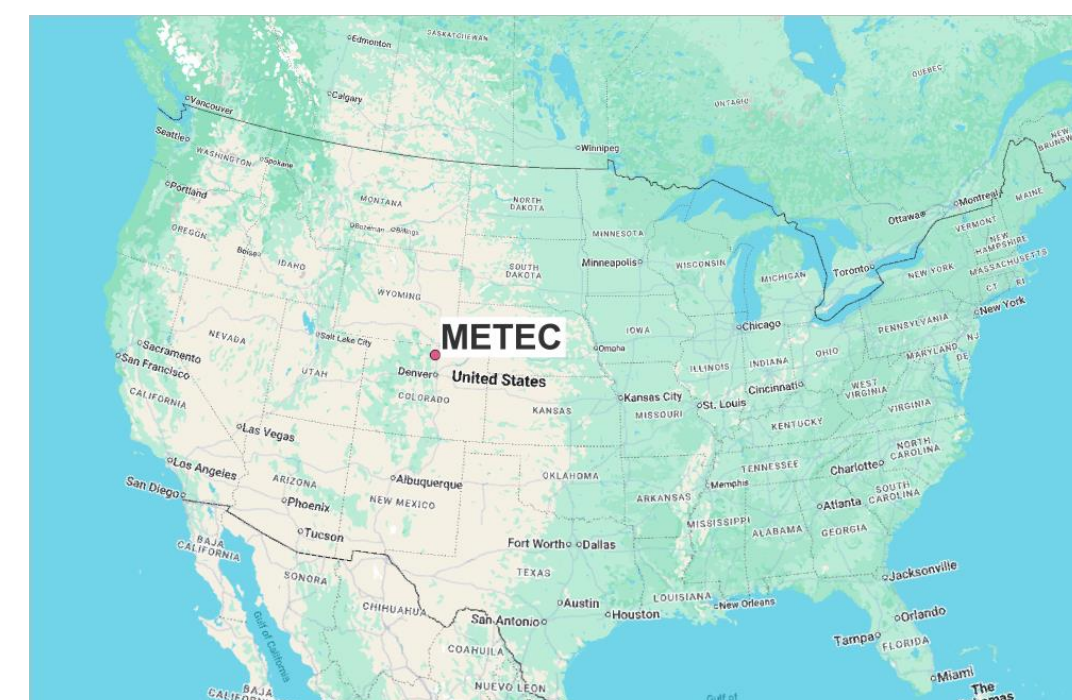
- Two facilities ... different equipment, different funding sources
 - **Tourmaline Test Facility** - The West Wolf Lake Gas Plant, co-owned by Tourmaline and Rubellite Energy
 - **AMEP** – Limited scale METEC-like test facility. Managed by Carbon Management Canada and the Sindre Petroleum Operators Group
- Equipment characteristic northern tier equipment – enclosed equipment
- Protocol use:
 - Tourmaline using protocol for first time fall 2025
 - AMEP has reviewed protocol but not implemented it



The Protocol Development Partners

METEC Facility at Colorado State University

- On-shore equipment from temperate zone north American production basins.
- Dedicated facility, simulates most release types
- Continuous operation



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Total Energies' Anomalies Detection Initiatives (TADI)

- TADI is in Lacq, France
- Includes large equipment characteristic of offshore or large conventional developments.
- Dedicated facility, simulates range of release types including very large rates
- Intermittent operation



Total Energies' TADI facility (foreground) with host industrial site in background.

Test Center Links

- <https://metec.colostate.edu/aded-2-0/>
- <https://cstjf-pau.totalenergies.fr/en/our-expertise/leveraging-digital-innovation/tadi-test-center-international-reach-lacq>
- <https://www.instep.my/>
- <https://www.ngif.ca/ngif-capital-corporation-announces-launch-of-emissions-testing-centre-with-support-from-natural-resources-canada/>
- <https://amep.ca/>

Contact

The protocol development efforts depend on active stakeholder engagement to remain relevant. Please reach out if you have ideas for site improvement, expanded testing capabilities or would like to utilize the protocols for your testing needs.

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