Innovation in emissions mitigation - the road ahead for a sustainable future

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International Organisations Director

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The raising of awareness of the CH₄ emissions issue of the gas industry

Guiding principles:
- To continually reduce CH₄ emissions;
- advance strong performance across gas value chains;
- improve accuracy of CH₄ emissions data;
- advocate sound policies and regulations on CH₄ emissions;
- and increase transparency
Enagas Sustainable Management Model establishes the company’s responsibilities for sustainability and defines the evaluation methodologies for the identification of action lines.
Enagás’ Carbon Footprint

- Enagás’ GHG emissions were reduced by around 50% since 2014
- Emissions related to the national activity have decreased every year

Enagás’ scope 1 and 2 emissions (tCO₂e) (*)

Enagás is implementing the Best Available Techniques to reduce the emissions

(*) Taking into account only the facilities in Spain
Energy Efficiency & Emissions Reduction Plan

CH4 Emissions

1. **Venting (32%-22.961t.)**
   - O&M or security venting (92.9%)
   - Pneumatic valves (3.5%)
   - Natural gas analyzers (i.e. chromatographs) (3.6%)

2. **Fugitive emissions (68%-48.000t.)**

CH4 Emission Mitigation Measures

- LDAR campaigns
- Flaring instead of venting
- Replacing wet seals with dry seals
- Hot taps for in-service pipeline connections
- Composite wrap for non-leaking pipeline defects
- Electric motor starters in compressors
- Electrical driven chemical plants
- Converting gas pneumatic controls to instrument air
- Optimising the operation and trying to align it with the maintenance works in order to reduce vents.
Energy Efficiency & Emissions Reduction Plan
CH4 Emissions

1. Venting (32%-22.961t.)
2. Fugitive emissions (68%-48.000t.)
   - Improvements in 2017 campaign

Reduction of vents
- Methane emissions abated during 2017 campaign

<table>
<thead>
<tr>
<th>Year</th>
<th>Venting (t CH4)</th>
<th>Fugitive emissions (t CH4)</th>
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<tbody>
<tr>
<td>2013</td>
<td>1.755</td>
<td>2.707</td>
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<tr>
<td>2014</td>
<td>1.714</td>
<td>1.895</td>
</tr>
<tr>
<td>2015</td>
<td>1.023</td>
<td>1.034</td>
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<tr>
<td>2016</td>
<td>1.034</td>
<td>883</td>
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<tr>
<td>2017</td>
<td>883</td>
<td>412</td>
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</tbody>
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- Own emission factors
- LDAR campaign internalised
- Own technology
Methods for measurement, results and effect on greenhouse gas balance of electricity produced

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Methane Emissions – In Summary
Thank you very much!