Heavy-Duty Vehicles On the Move Towards Natural Gas: Will the Climate Benefit?

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EDF
ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

Overview/Caveats

Goal: open, constructive dialogue

Transparent analytical framework

- Elucidate time-dependent effects of methane emissions
- NOTE: Preliminary results were shared showing key qualitative, high-level insights (quantitative results will change):
  - Difference between fleet and pulse analysis
  - Engine technology and vehicle vocation/duty cycle matter
  - LNG and CNG produce different results owing to different fuel cycles
- Emissions data quality is evolving
  - Much uncertainty remains
  - Pump-to-Wheels data especially scant

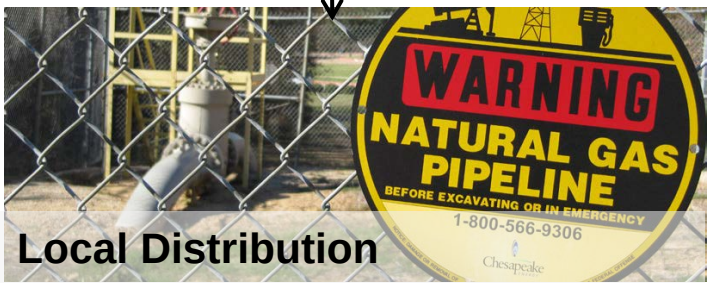
Overview of EDF's series of methane studies

Well-to-Wheels Fuel Cycle

Chesapeake

DCP Midstream

TransCanada

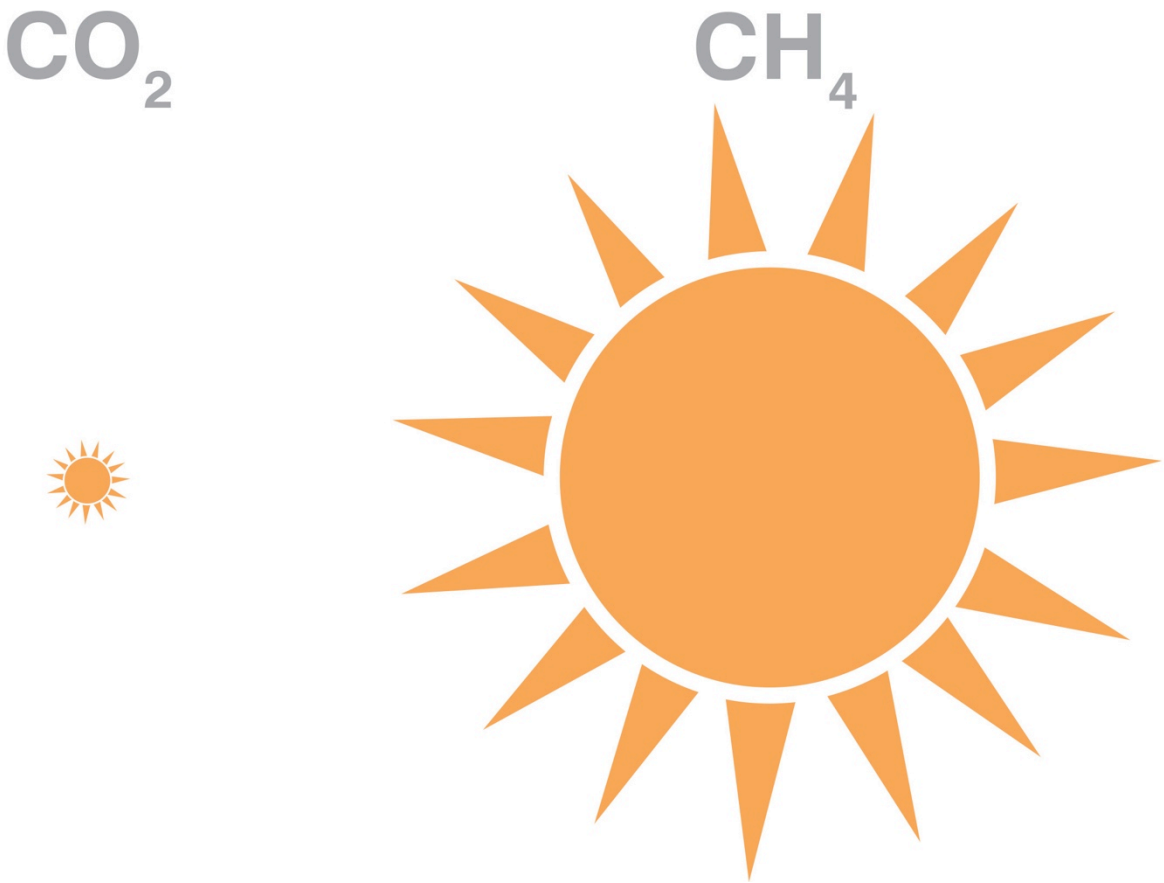


W.L Sunshine

DOE Clean Cities

Climate implications of methane

POUND FOR POUND METHANE TRAPS
84x MORE HEAT OVER 20 YEARS



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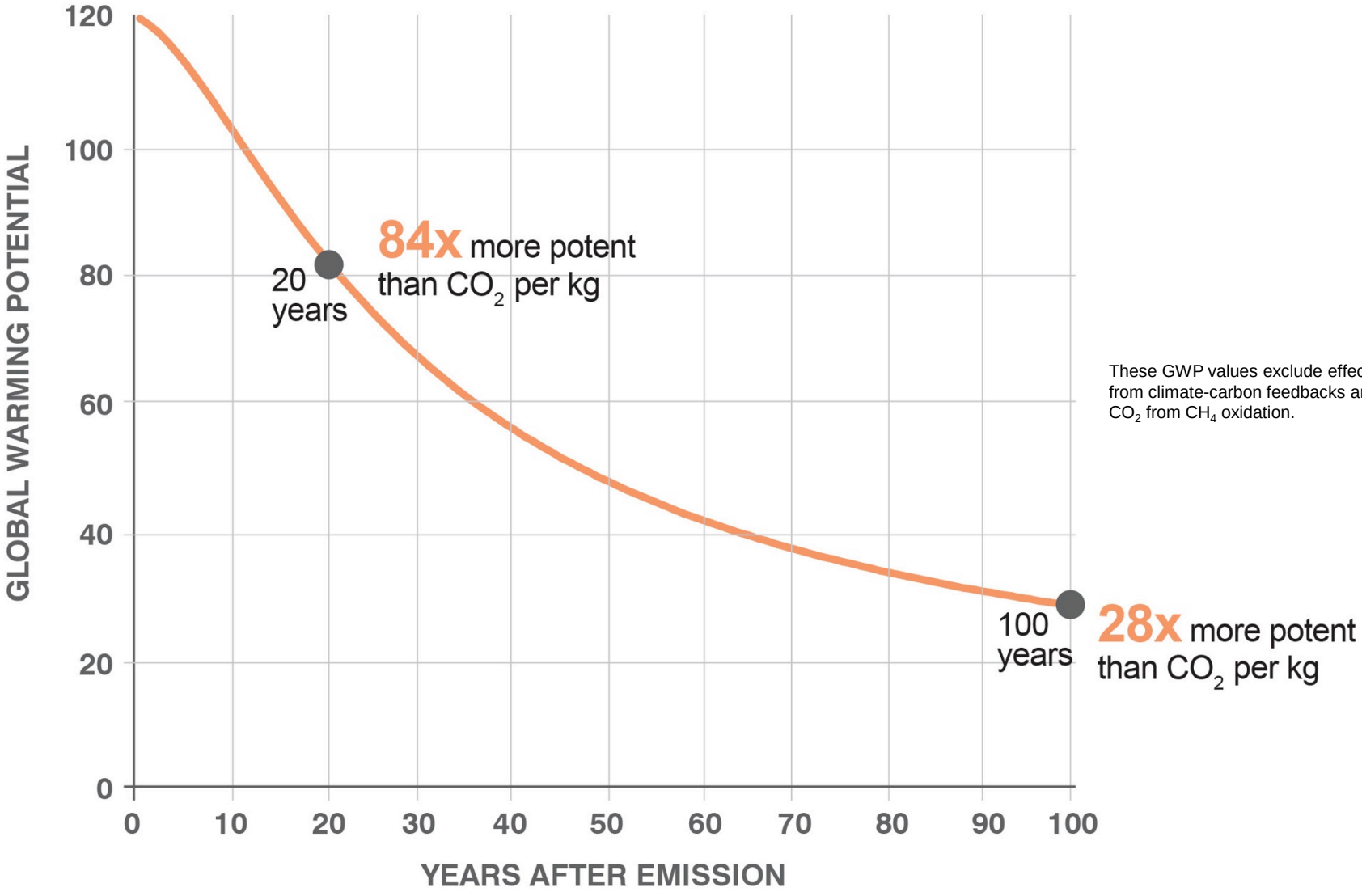

These GWP values exclude effects from climate-carbon feedbacks and CO_2 from CH_4 oxidation.

Technology Warming Potential (TWP)

Alvarez, R. A., S. W. Pacala, J. J. Winebrake, W. L. Chameides, and S. P. Hamburg. **"Greater Focus Needed on Methane Leakage from Natural Gas Infrastructure."** *Proceedings of the National Academy of Sciences* 109, no. 17 (2012): 6435–6440.

- The TWP plots, as a function of time, the relative radiative forcing of the technology options being considered:

$$TWP(t) = \frac{\frac{L}{L_{REF}} E_{1,CH_4} TRF_{CH_4}(t) + E_{1,CO_2} TRF_{CO_2}(t)}{E_{2,CH_4} TRF_{CH_4}(t) + E_{2,CO_2} TRF_{CO_2}(t)}$$

- It reveals the time-dependent tradeoffs of choosing between two technologies using different fuels and emitting different shares of CO_2 and CH_4;
- It enables us to look at streams of emissions, therefore better simulating the consequences of real world decisions.

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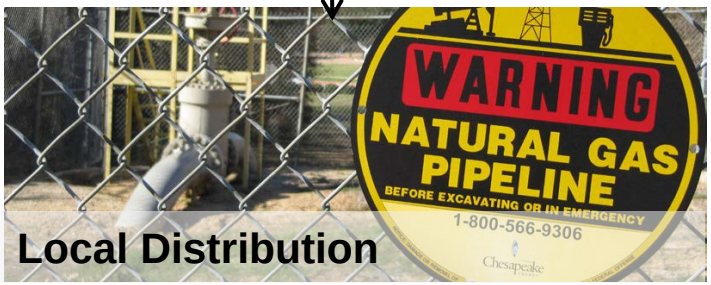


W.L Sunshine

LNG

CNG

DOE Clean Cities

Key Messages:
Are Natural Gas Vehicles Better for Climate?

Critical to look beyond CO_2e (100-year GWP)

- Technology Warming Potential one approach

Results hard to generalize

- Careful application-specific analyses needed
- Better data needed
  - Emissions
  - CNG/LNG fuel pathways
  - Relative engine/vehicle efficiencies

- Please contact us with comments, suggestions, data

EDF Methane Work (2012-2014)

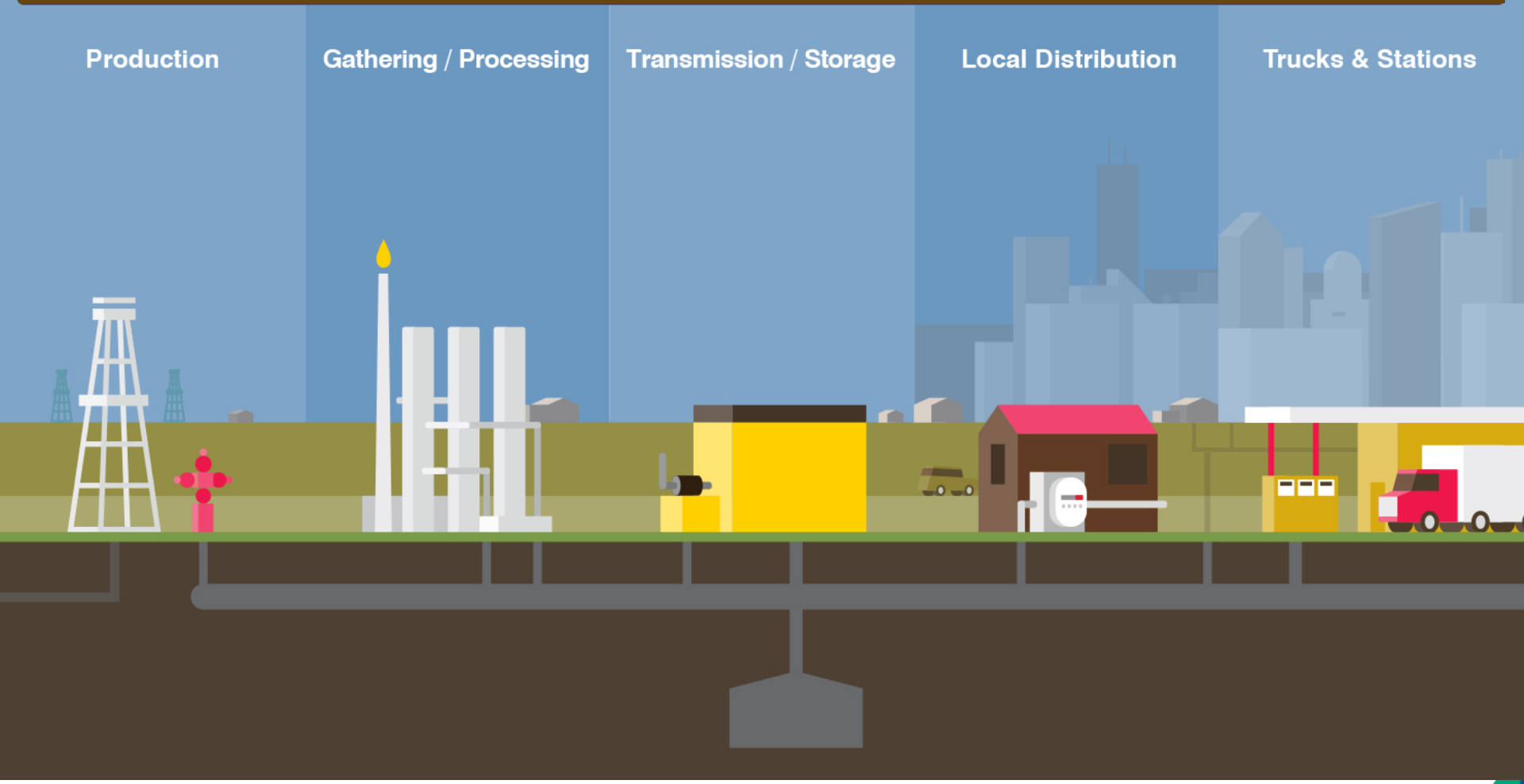
16 studies w/roughly 90 collaborators

Studies embody 5 principles:

1. Led by academic scientists;
2. Employ multiple methodologies, where possible;
3. Input from independent scientific experts;
4. Make all data public to ensure transparency; and
5. Publish results in a peer reviewed journal.

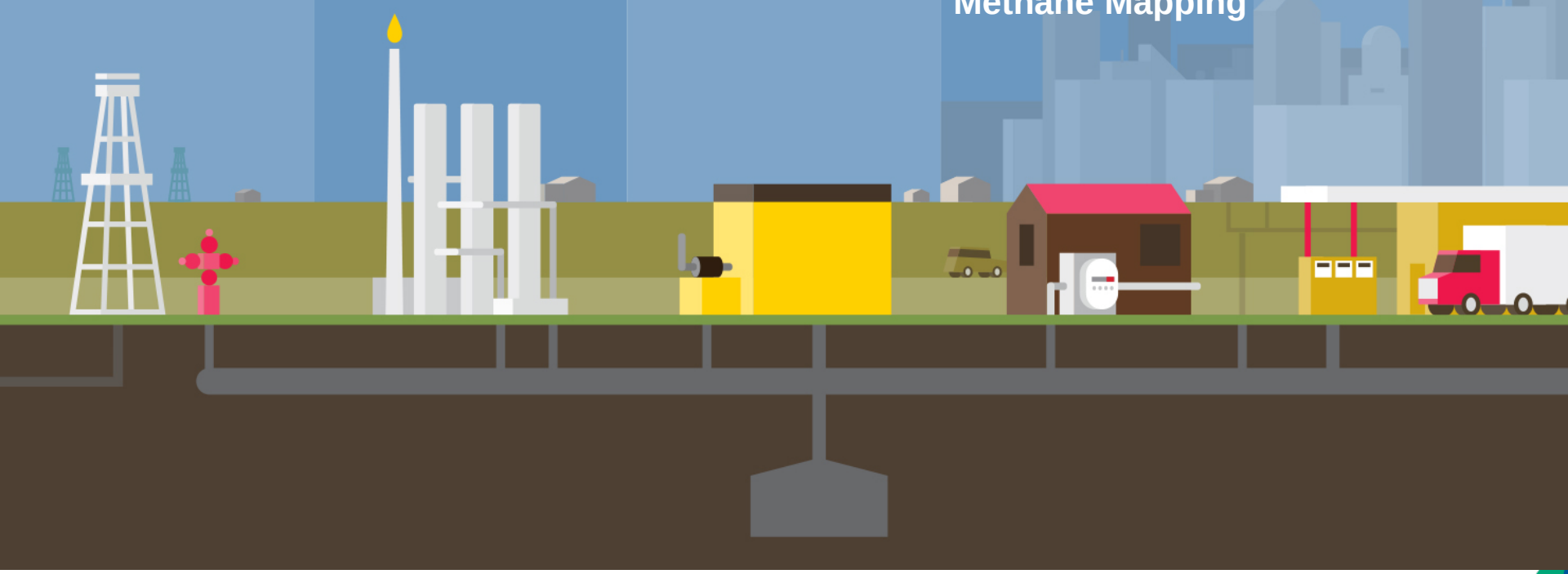
We expect all studies to be submitted or published by mid-2014

EDF SERIES OF METHANE STUDIES



EDF SERIES OF METHANE STUDIES

Production	Gathering / Processing	Transmission / Storage	Local Distribution	Trucks & Stations
UT Phase 1 ★ UT Phase 2 EPA/HARC	CSU	CSU	WSU Multi-City Boston Indianapolis Methane Mapping	WVU



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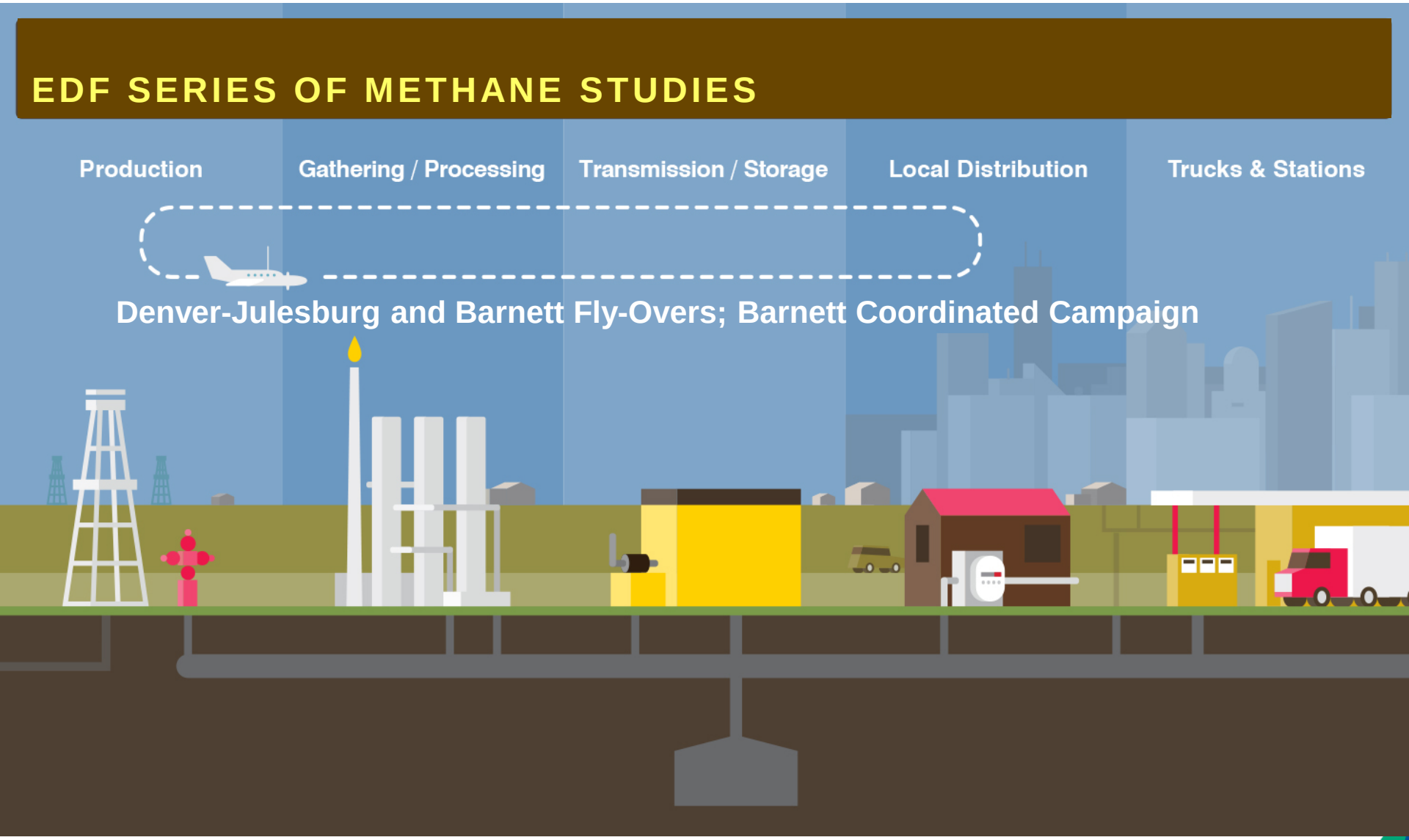

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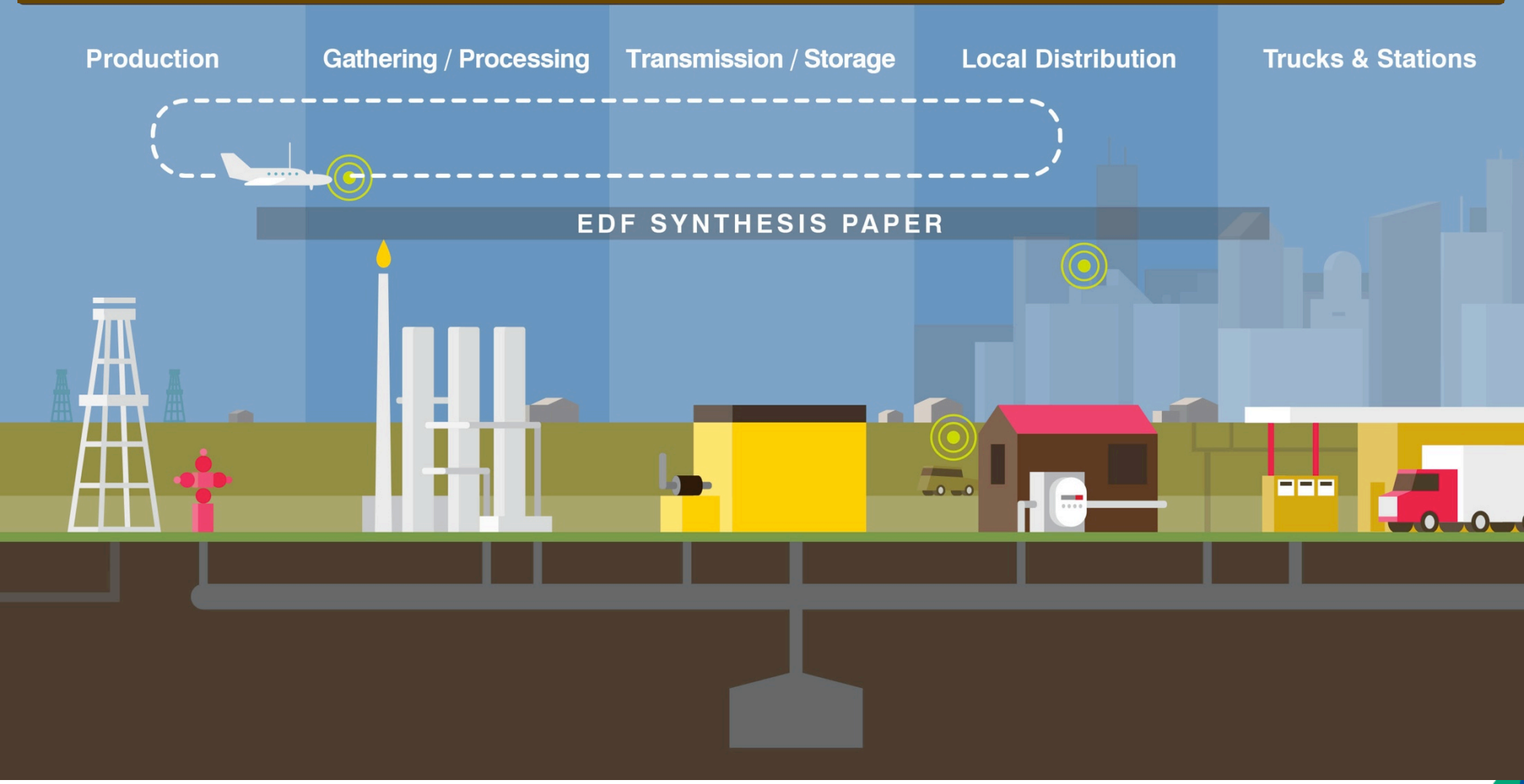

Thank You.

Questions?

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