

In-Depth Analysis: CH₄ Emissions from Power Industry

1. Full-Series Trend (1970–2024): An Insignificant but Interesting Trend

Methane emissions from the power industry (a result of incomplete fuel combustion) are, in absolute terms, an insignificant contributor to India's emissions, growing from virtually zero to just **~1 Mt CO₂eq** in 54 years.

However, despite its small scale, the trend is interesting. It tells a story of growth, acceleration, and a recent, notable **deceleration**, suggesting that technological improvements in the power fleet are having a positive impact on abating these minor emissions.

2. Breakpoint Detection: The Rise and Fall of Growth

The analysis identifies breakpoints at **2001, 2013, and 2018**. The slopes reveal a clear arc: **[0.005 → 0.029 → 0.038 → 0.023]**.

- **1970–2017:** For nearly five decades, this emission source grew at an accelerating rate, mirroring the overall expansion of the power sector. The growth rate peaked in the 2013–2017 period with a slope of **0.038**.
- **2018–2024:** The most recent regime, starting from the 2018 break, shows a significant **deceleration**, with the slope dropping by nearly 40% to **0.023**.

Inference: This slowdown is a key insight. It suggests that as India has modernized its power fleet, bringing more efficient supercritical and ultra-supercritical power plants online, the efficiency of combustion has increased, leading to a reduction in the rate of methane slip.

3. Forecast & Future Implications: A Non-Issue

The statistical model for the final regime is **ARIMA(0,0,0)**, which is a model for random noise with no underlying trend. Correspondingly, the 10-year forecast is **perfectly flat**.

This provides strong statistical confirmation that the growth phase for this specific emission source is over.

4. Core Data-Backed Conclusions

- **A Peaked Trend:** Methane emissions from the power sector, while always minor, appear to have peaked in terms of their *growth rate* around 2018.
- **A Positive Side Effect of Modernization:** The recent deceleration is likely a direct, positive consequence of improved combustion efficiency in newer power plants.

- **Not a Climate Concern:** This emission source is insignificant in scale and is not a growing problem. Its trend is a small but encouraging sign of technological improvement.