

# Cost of emission control systems for Non-Road Mobile Machinery

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# Agenda

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- 01 Background and scope
- 02 Methodology
- 03 Technology mapping
- 04 Technology cost evaluation
- 05 Regulatory costs

# PROCONVE MAR I

- CONAMA Resolution No. 433/2011
  - MAR-I was established in 2011,
  - Phased implementation between 2015 and 2019

## Maximum emission limits for agricultural and non-road machinery (MAR I)

| Power in kW           | CO (g/kWh) | HC + NOx (g/kWh) | MP (g/kWh) |
|-----------------------|------------|------------------|------------|
| $130 \leq P \leq 560$ | 3,5        | 4,0              | 0,2        |
| $75 \leq P < 130$     | 5,0        | 4,0              | 0,3        |
| $37 \leq P < 75$      | 5,0        | 4,7              | 0,4        |
| $19 \leq P < 37$      | 5,5        | 7,5              | 0,6        |

\*Maximum power in accordance with ISO 14396:2002; IBAMA may, at its discretion, adopt an equivalent ABNT standard.

**Brazil's MAR-I is equivalente to U.S. EPA Tier 3 for Non-Road Mobile Machinery**

# MAR II – maximum emission limits for agricultural and non-road machinery

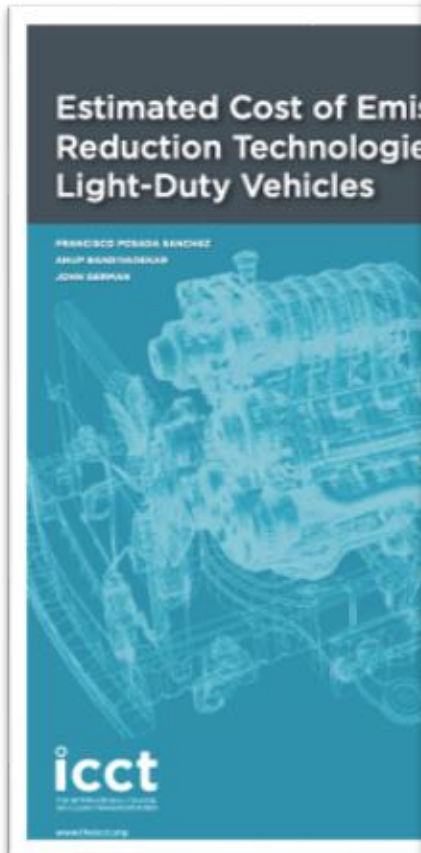
| Power in kW   | CO (g/kWh) | HC (g/kWh) | HC+NOx (g/kWh) | NOx (g/kWh) | MP (g/kWh) | NH <sub>3</sub> <sup>1</sup> (ppm) |
|---------------|------------|------------|----------------|-------------|------------|------------------------------------|
| 130 ≤ P ≤ 560 | 3.5        | 0.19       | -              | 0.4         | 0.02       | 10                                 |
| 75 ≤ P < 130  | 5.0        | 0.19       | -              | 0.4         | 0.02       | 10                                 |
| 56 ≤ P < 75   | 5.0        | 0.19       | -              | 0.4         | 0.02       | 10                                 |
| 37 ≤ P < 56   | 5.0        | -          | 4.7            | -           | 0.03       | 10                                 |
| 19 ≤ P < 37   | 5.5        | -          | 4.7            | -           | 0.03       | 10                                 |

1 - For engines equipped with an SCR system \*Maximum power in accordance with ISO 14396; at IBAMA's discretion, an equivalent ABNT standard may be adopted. New models introduced starting in the year the power regulation takes effect.

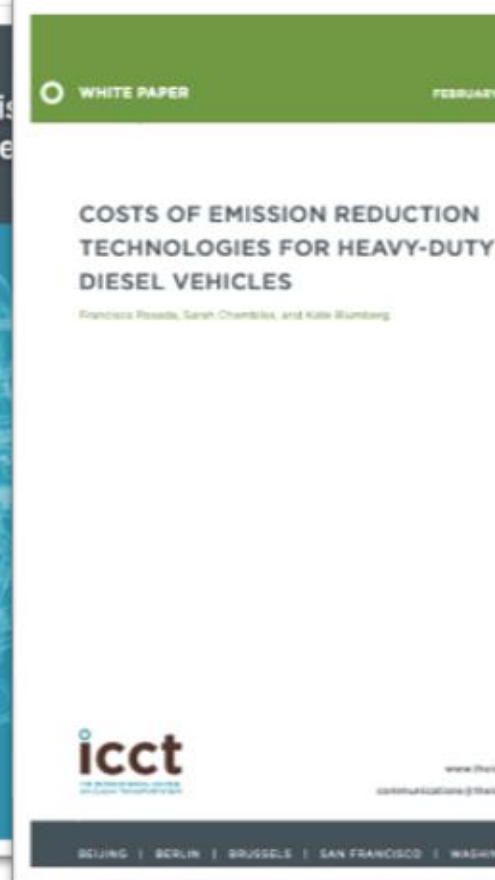
- Implementation phase (Tier 4F):
  - 130 ≤ P ≤ 560 - 4 years
  - 75 ≤ P < 130 - 6 years
  - 19 ≤ P < 37 - 8 years

**Brazil's MAR-II is equivalente to U.S. EPA Tier 4f for Non-Road Mobile Machinery**

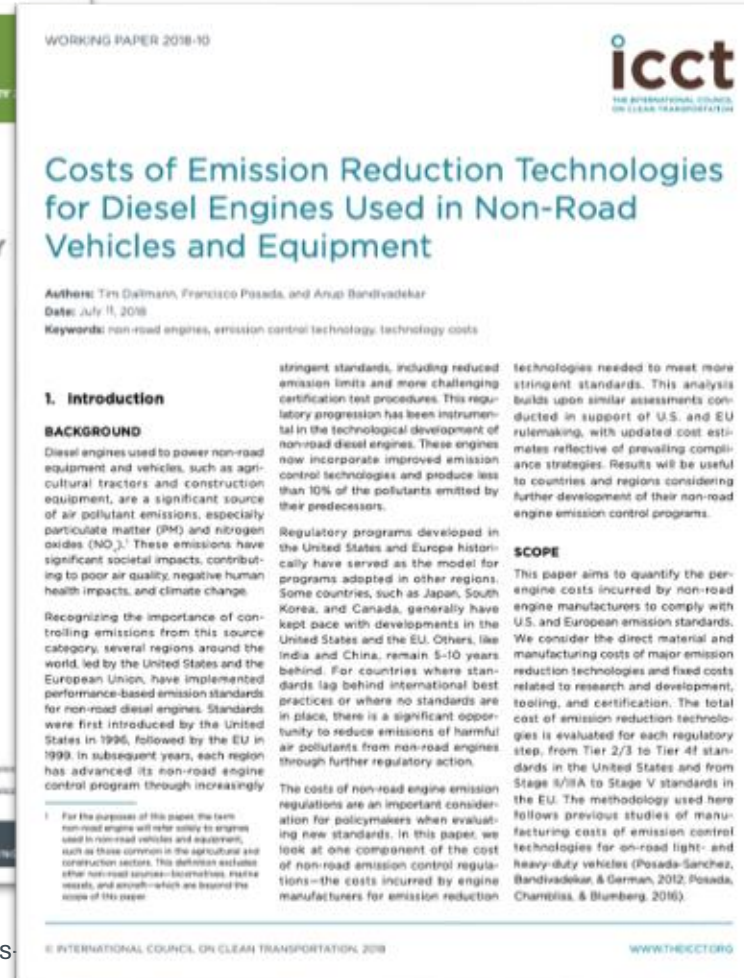
# ICCT publications on costs of technology - examples



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<https://theicct.org/wp-content/uploads/2021/06/HDV-emissions-compliance-cost-may2020.pdf>

# Scope: evaluation of compliance costs for U.S and E.U. NRMM standards

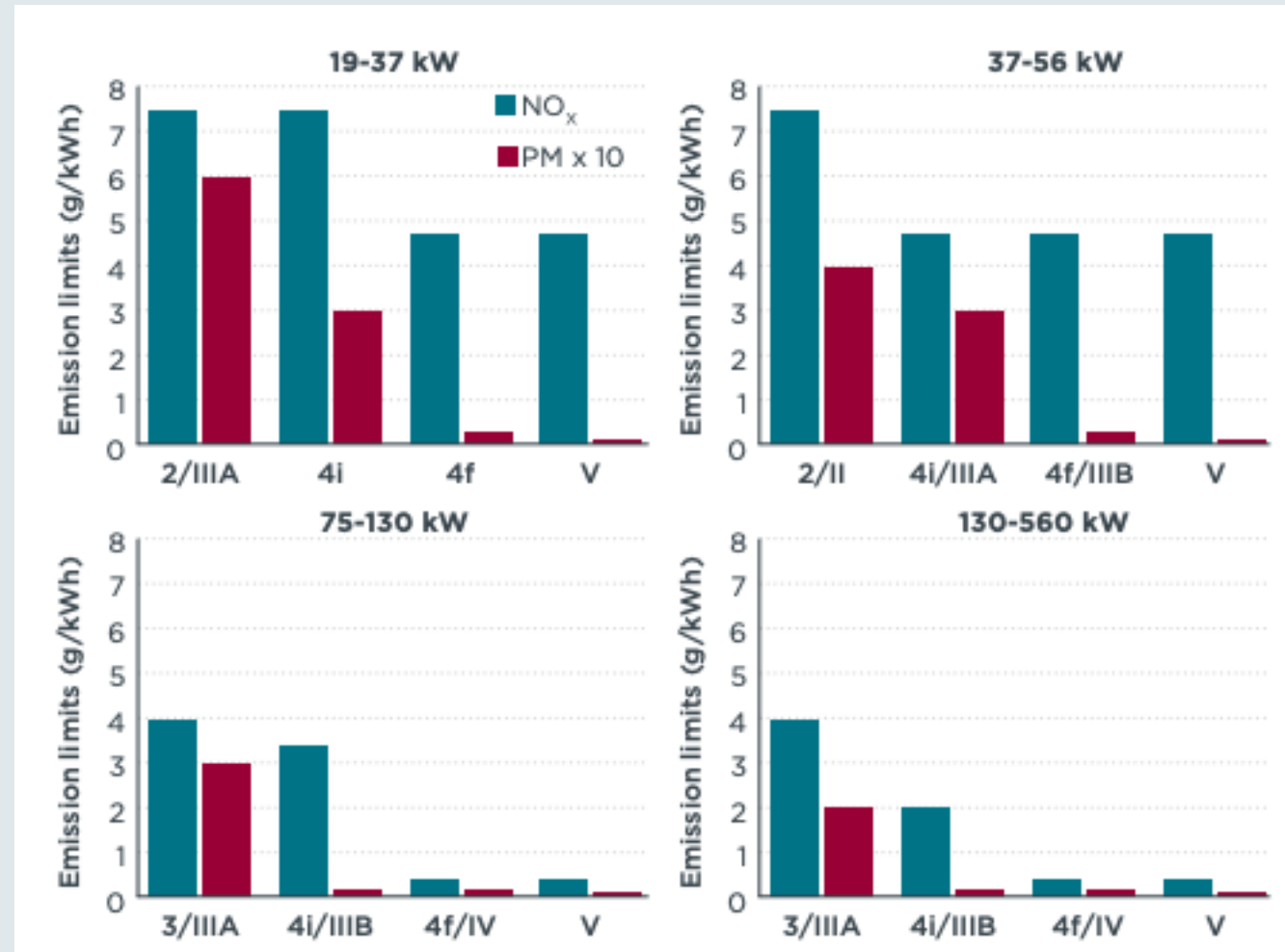
| UNITED STATES    |                  |                         |                 |      |      |                         |                   |      |                   |                   |                   |                                |                   |                   |                                      |                                     |                                      |                                      |                          |      |      |      |      |      |      |      |
|------------------|------------------|-------------------------|-----------------|------|------|-------------------------|-------------------|------|-------------------|-------------------|-------------------|--------------------------------|-------------------|-------------------|--------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------|------|------|------|------|------|------|------|
| Engine Rating kW | Engine rating hP | 1996                    | 1997            | 1998 | 1999 | 2000                    | 2001              | 2002 | 2003              | 2004              | 2005              | 2006                           | 2007              | 2008              | 2009                                 | 2010                                | 2011                                 | 2012                                 | 2013                     | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| P < 8            | P < 11           |                         |                 |      |      | 8.0 / (10.5) / 1.0      |                   |      | 8.0 / (7.5) / 0.8 |                   |                   | 8.0 / (7.5) / 0.4 <sup>a</sup> |                   |                   |                                      |                                     |                                      |                                      |                          |      |      |      |      |      |      |      |
| 8 ≤ P < 19       | 11 ≤ P < 25      |                         |                 |      |      | 6.6 / (9.5) / 0.8       |                   |      | 6.6 / (7.5) / 0.8 |                   |                   | 6.6 / (7.5) / 0.4              |                   |                   |                                      |                                     |                                      |                                      |                          |      |      |      |      |      |      |      |
| 19 ≤ P < 37      | 25 ≤ P < 50      |                         |                 |      |      | 5.5 / (9.5) / 0.8       |                   |      |                   | 5.5 / (7.5) / 0.6 |                   |                                | 5.5 / (7.5) / 0.3 |                   |                                      |                                     | 5.5 / (4.7) / 0.03                   |                                      |                          |      |      |      |      |      |      |      |
| 37 ≤ P < 56      | 50 ≤ P < 75      |                         |                 |      |      | - / - / 9.2 / -         |                   |      |                   |                   |                   | 5.0 / (7.5) / 0.4              |                   |                   | 5.0 / (4.7) / 0.3 <sup>b</sup>       |                                     |                                      |                                      | 5.0 / (4.7) / 0.03       |      |      |      |      |      |      |      |
| 56 ≤ P < 75      | 75 ≤ P < 100     |                         |                 |      |      |                         |                   |      |                   |                   |                   |                                |                   | 5.0 / (4.7) / 0.4 |                                      |                                     | 5.0 / 0.19 / 2.3 <sup>c</sup> / 0.02 | 5.0 / 0.19 / 0.40 / 0.02             |                          |      |      |      |      |      |      |      |
| 75 ≤ P < 130     | 100 ≤ P < 175    |                         | - / - / 9.2 / - |      |      |                         |                   |      | 5.0 / (6.6) / 0.3 |                   |                   |                                | 5.0 / (4.0) / 0.3 |                   |                                      |                                     |                                      |                                      |                          |      |      |      |      |      |      |      |
| 130 ≤ P < 225    | 175 ≤ P < 300    | 11.4 / 1.3 / 9.2 / 0.54 |                 |      |      |                         |                   |      | 3.5 / (6.6) / 0.2 |                   |                   | 3.5 / (4.0) / 0.2              |                   |                   |                                      |                                     | 3.5 / 0.19 / 2.0 <sup>d</sup> / 0.02 |                                      | 3.5 / 0.19 / 0.40 / 0.02 |      |      |      |      |      |      |      |
| 225 ≤ P < 450    | 300 ≤ P < 600    | 11.4 / 1.3 / 9.2 / 0.54 |                 |      |      |                         | 3.5 / 6.4 / 0.2   |      |                   | 3.5 / (4.0) / 0.2 |                   |                                |                   |                   | 3.5 / 0.19 / 2.0 <sup>d</sup> / 0.02 |                                     | 3.5 / 0.19 / 0.40 / 0.02             |                                      |                          |      |      |      |      |      |      |      |
| 450 ≤ P < 560    | 600 ≤ P < 750    | 11.4 / 1.3 / 9.2 / 0.54 |                 |      |      |                         | 3.5 / (6.4) / 0.2 |      |                   | 3.5 / (4.0) / 0.2 |                   |                                |                   |                   | 3.5 / 0.4 / 3.5 / 0.10 <sup>e</sup>  |                                     | 3.5 / 0.19 / 3.5 / 0.04 <sup>e</sup> |                                      |                          |      |      |      |      |      |      |      |
| P ≥ 560          | P ≥ 750          |                         |                 |      |      | 11.4 / 1.3 / 9.2 / 0.54 |                   |      |                   |                   | 3.5 / (6.4) / 0.2 |                                |                   |                   |                                      | 3.5 / 0.4 / 3.5 / 0.10 <sup>e</sup> |                                      | 3.5 / 0.19 / 3.5 / 0.04 <sup>e</sup> |                          |      |      |      |      |      |      |      |

| EUROPEAN UNION Tier 3 / Stage IIIA |                  |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      |                          |      |      |      |
|------------------------------------|------------------|------|------|------|------------------------|------|------|-----------------------|------|------|-------------------|------|------|------|--------------------------|------|--------------------------|------|------|---------------------------|------|----------------------|--------------------------|------|------|------|
| Engine Rating kW                   | Engine rating hP | 1996 | 1997 | 1998 | 1999                   | 2000 | 2001 | 2002                  | 2003 | 2004 | 2005              | 2006 | 2007 | 2008 | 2009                     | 2010 | 2011                     | 2012 | 2013 | 2014                      | 2015 | 2016                 | 2017                     | 2018 | 2019 | 2020 |
| P < 8                              | P < 11           |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      | 8.0 / (7.5) / 0.4        |      |      |      |
| 8 ≤ P < 19                         | 11 ≤ P < 25      |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      | 6.6 / (7.5) / 0.4        |      |      |      |
| 19 ≤ P < 37                        | 25 ≤ P < 50      |      |      |      |                        |      |      | 5.5 / 1.5 / 8.0 / 0.8 |      |      | 5.5 / (7.5) / 0.6 |      |      |      |                          |      |                          |      |      |                           |      | 5.0 / (4.7) / 0.015' |                          |      |      |      |
| 37 ≤ P < 56                        | 50 ≤ P < 75      |      |      |      | 6.5 / 1.3 / 9.2 / 0.85 |      |      | 5.0 / 1.3 / 7.0 / 0.4 |      |      | 5.0 / (4.7) / 0.4 |      |      |      | 5.0 / (4.7) / 0.025      |      | 5.0 / (4.7) / 0.015'     |      |      |                           |      |                      |                          |      |      |      |
| 56 ≤ P < 75                        | 75 ≤ P < 100     |      |      |      | 5.0 / 1.3 / 9.2 / 0.70 |      |      | 5.0 / 1.0 / 6.0 / 0.3 |      |      | 5.0 / (4.7) / 0.4 |      |      |      | 5.0 / 0.19 / 3.3 / 0.025 |      | 5.0 / 0.19 / 0.4 / 0.025 |      |      | 5.0 / 0.19 / 0.4 / 0.015' |      |                      |                          |      |      |      |
| 75 ≤ P < 130                       | 100 ≤ P < 175    |      |      |      | 5.0 / 1.3 / 9.2 / 0.70 |      |      | 5.0 / 1.0 / 6.0 / 0.3 |      |      | 5.0 / (4.0) / 0.3 |      |      |      | 5.0 / 0.19 / 3.3 / 0.025 |      | 5.0 / 0.19 / 0.4 / 0.025 |      |      | 5.0 / 0.19 / 0.4 / 0.015' |      |                      |                          |      |      |      |
| 130 ≤ P < 225                      | 175 ≤ P < 300    |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      |                          |      |      |      |
| 225 ≤ P < 450                      | 300 ≤ P < 600    |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      |                          |      |      |      |
| 450 ≤ P < 560                      | 600 ≤ P < 750    |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      |                          |      |      |      |
| P ≥ 560                            | P ≥ 750          |      |      |      |                        |      |      |                       |      |      |                   |      |      |      |                          |      |                          |      |      |                           |      |                      | 3.5 / 0.19 / 3.5 / 0.045 |      |      |      |

|                       |             |                  |                   |                     |                      |                    |         |
|-----------------------|-------------|------------------|-------------------|---------------------|----------------------|--------------------|---------|
| Pollutant key (g/kWh) | Unregulated | Tier 1 / Stage I | Tier 2 / Stage II | Tier 3 / Stage IIIA | Tier 4i / Stage IIIB | Tier 4f / Stage IV | Stage V |
|-----------------------|-------------|------------------|-------------------|---------------------|----------------------|--------------------|---------|

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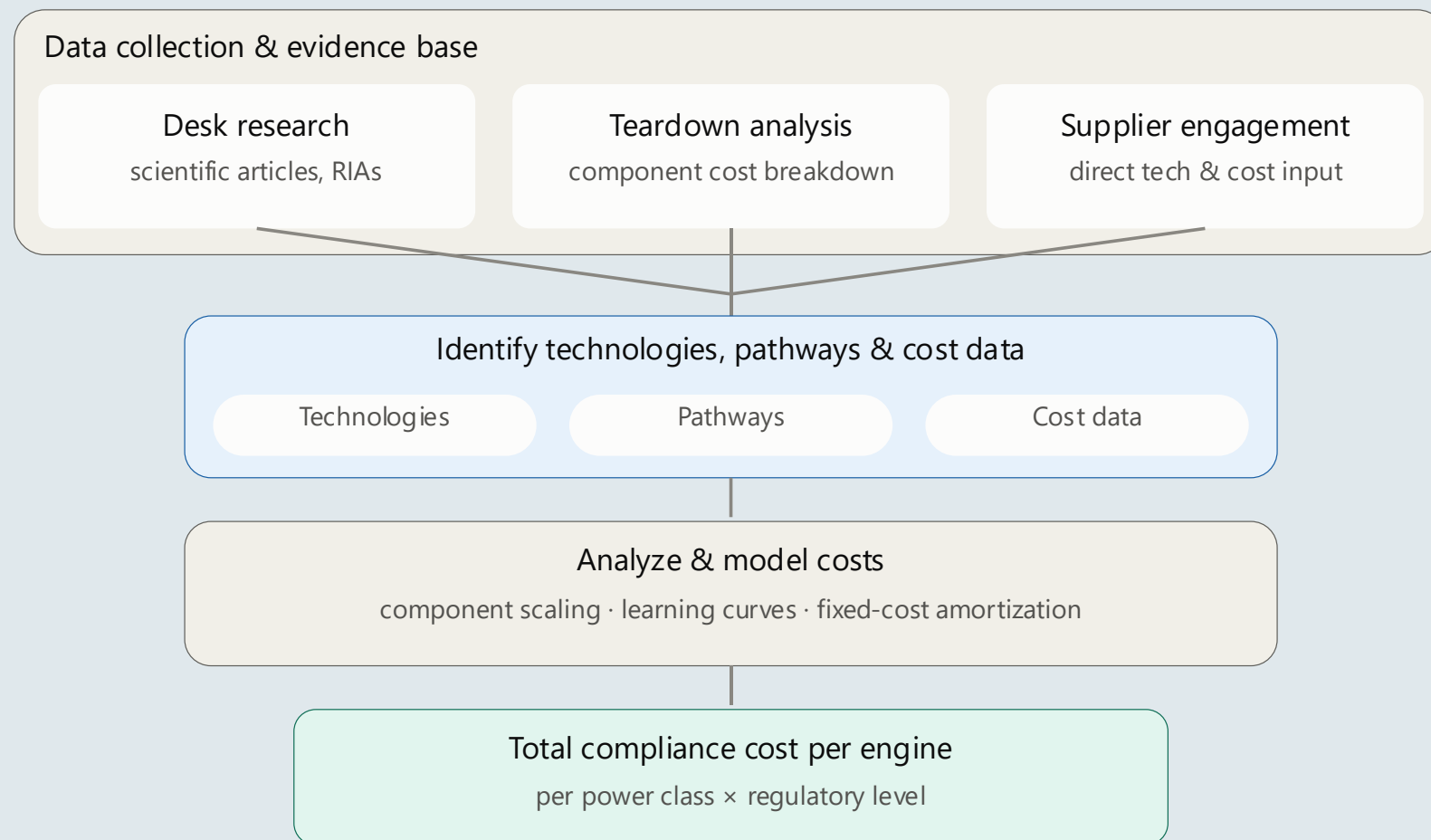
# PM and NOx emission limits for engine power categories studied



# Methodology

ICCT has been developing technology cost estimates since 2010:

- LDV
- HDV
- Fuel Economy
- Emission standards
- Cleaner fuels
- Electric Vehicles



# Emission reduction technologies are fully available in the non-road and on-road market

## In-cylinder controls

Prevent pollutant formation

### Fuel injection

HPCR, multiple, electronic

### Air handling

Turbocharger, VGT

### EGR

Recirculation lowers NO<sub>x</sub>

## Exhaust aftertreatment

Treat after combustion

### DOC

Oxidizes HC, CO, soot SOF

### SCR

Urea/DEF: NO<sub>x</sub> to N<sub>2</sub> + H<sub>2</sub>O

### DPF

Traps and burns soot

## Electronic controls

System coordination

### ECU

Coordinates in real time:

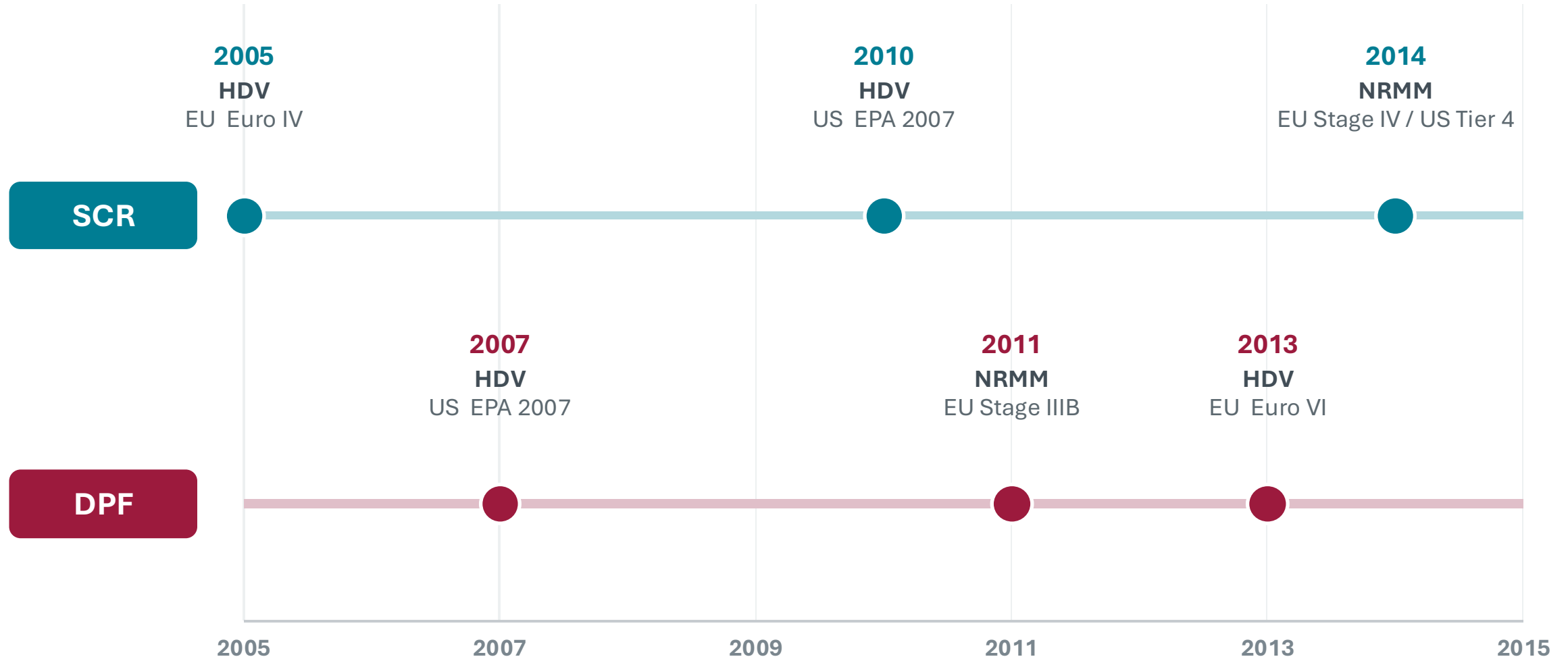
- fuel metering
- air delivery
- EGR valve position
- aftertreatment dosing

# Technology adoption pathways

| Power class           | System component | Tier 1/Stage I                                                                    | Tier 2/Stage II                                                          | Tier 3/Stage IIIA                                                          | Tier 4I/Stage IIIB                     | Tier 4I/Stage IV                | Stage V*                |
|-----------------------|------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------|---------------------------------|-------------------------|
| < 19 kW <sup>b</sup>  | FIE              | IDI or MDI; injection timing delay; upgrades to mechanical fuel injection systems |                                                                          |                                                                            |                                        |                                 |                         |
|                       | AH               | NA                                                                                |                                                                          |                                                                            |                                        |                                 |                         |
|                       | EGR              | None                                                                              |                                                                          |                                                                            |                                        |                                 |                         |
|                       | ATD              | None                                                                              |                                                                          |                                                                            |                                        |                                 |                         |
| 19-37 kW <sup>c</sup> | FIE              | IDI or MDI; injection timing delay; upgrades to mechanical fuel injection systems |                                                                          |                                                                            |                                        | IDI or CR                       | EDI: CR                 |
|                       | AH               | NA                                                                                |                                                                          |                                                                            |                                        | NA or TC                        |                         |
|                       | EGR              | None                                                                              |                                                                          |                                                                            |                                        | IEGR, cEGR                      | cEGR                    |
|                       | ATD              | None                                                                              |                                                                          |                                                                            |                                        | DOC+(DPF)                       | DOC+DPF                 |
| 37-56 kW              | FIE              | IDI or MDI; injection timing delay; upgrades to mechanical fuel injection systems |                                                                          | IDI or MDI; fuel injection system upgrades with limited application of ECU |                                        | EDI, CR                         |                         |
|                       | AH               | NA, limited use of TC (FG)                                                        |                                                                          | TC (FG or WG), limited NA                                                  |                                        | TC (FG or WG)                   |                         |
|                       | EGR              | None                                                                              |                                                                          | Increased EGR application                                                  |                                        | IEGR, cEGR                      | cEGR                    |
|                       | ATD              | None                                                                              |                                                                          |                                                                            |                                        | DOC+(DPF)                       | DOC+DPF                 |
| 56-75 kW              | FIE              | MDI; injection timing delay; upgrades to mechanical fuel injection systems        |                                                                          | MDI; increasing use of EDI                                                 |                                        | EDI: CR                         |                         |
|                       | AH               | Increasing application of TC (FG, WG)                                             |                                                                          | TC (FG, WG)                                                                |                                        |                                 |                         |
|                       | EGR              | None                                                                              |                                                                          | Moderate IEGR, cEGR application                                            |                                        |                                 |                         |
|                       | ATD              | None                                                                              |                                                                          |                                                                            |                                        | DOC+(DPF)                       | (DOC)+SCR / DOC+DPF+SCR |
| 75-130 kW             | FIE              | MDI; injection timing delay, upgrade to mechanical fuel injection systems         | MDI, increasing use of EDI: electronic EUI or CR ( $P_{inj}$ = 1200 bar) | EDI: EUI or CR ( $P_{inj}$ = 1600 bar); limited MDI                        |                                        | EDI: CR ( $P_{inj}$ = 2000 bar) |                         |
|                       | AH               | TC (FG, WG)                                                                       |                                                                          | TC (WG, VGT)                                                               |                                        |                                 |                         |
|                       | EGR              | None                                                                              |                                                                          | cEGR used in ~50% of engine families                                       |                                        |                                 |                         |
|                       | ATD              | None                                                                              |                                                                          |                                                                            |                                        | DOC+(DPF) / SCR                 | (DOC)+SCR / DOC+DPF+SCR |
| 130-560 kW            | FIE              | MDI, limited EDI; injection timing delay,                                         | Increasing use of EDI: EUI or CR ( $P_{inj}$ = 1200 bar)                 | EDI: EUI or CR ( $P_{inj}$ = 1600 bar);                                    | EDI: CR or EUI ( $P_{inj}$ = 2000 bar) | EDI: CR ( $P_{inj}$ = 2000 bar) |                         |
|                       | AH               | TC (FG, WG)                                                                       |                                                                          | TC (FG, WG, VGT)                                                           |                                        | TC (WG, VGT, 2stT)              |                         |
|                       | EGR              | None                                                                              |                                                                          | cEGR in ~50% engine families                                               |                                        |                                 |                         |
|                       | ATD              | None                                                                              |                                                                          |                                                                            |                                        | DOC + DPF / SCR                 | (DOC)+SCR / DOC+DPF+SCR |

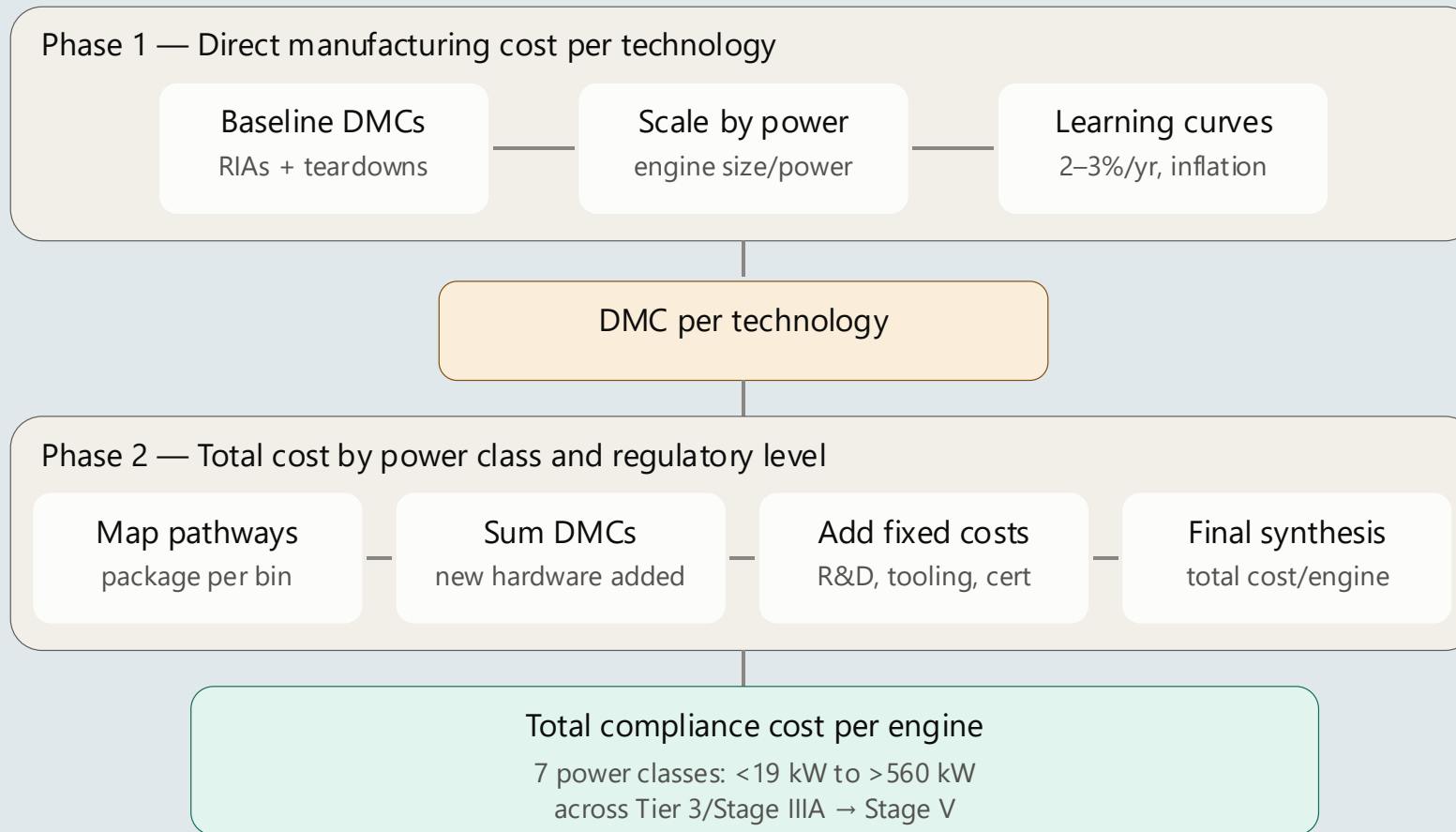
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# SCR and DPF technology has been in the market for decades



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# Cost evaluation method



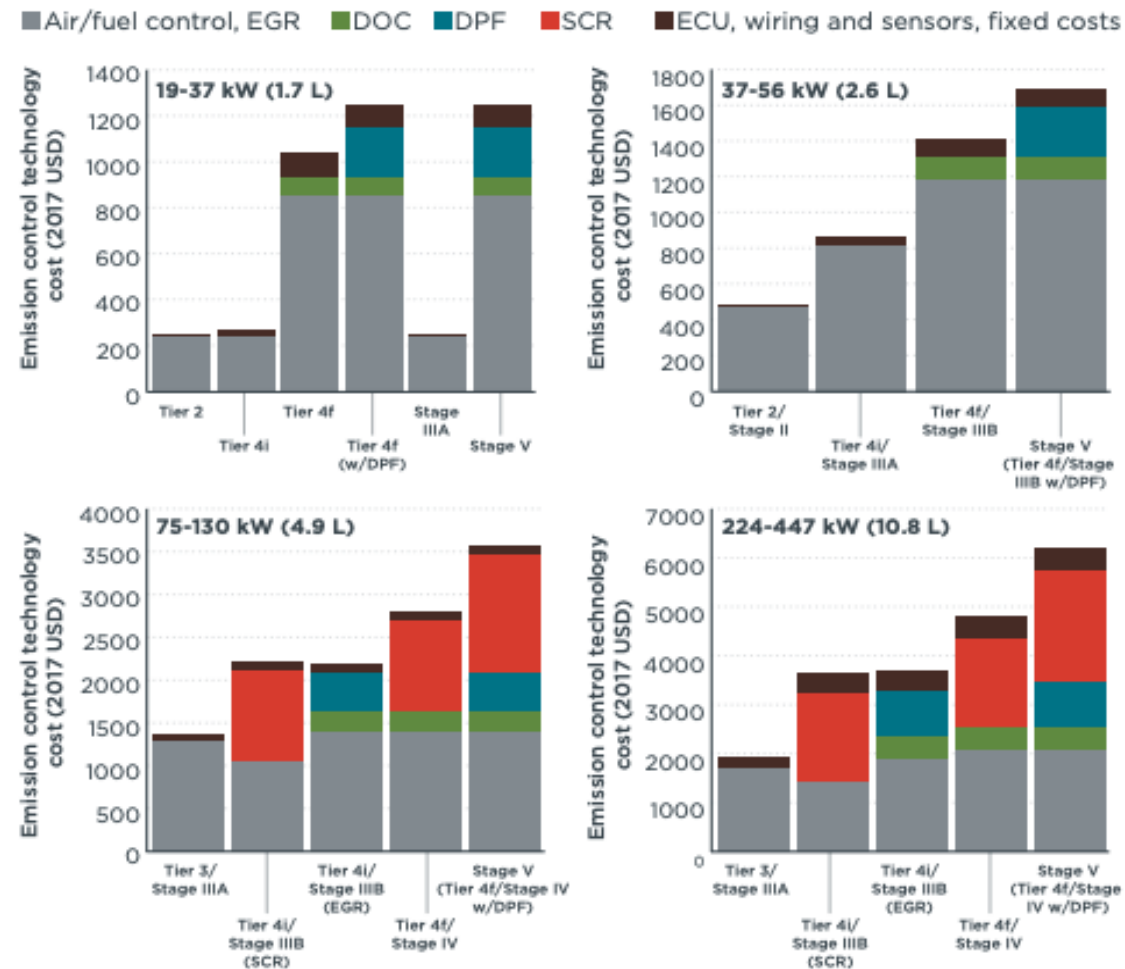
# Direct manufacturing cost assessment for components: SCR

| Average engine displacement                                                          | 1.7 L        | 2.6 L        | 4.9 L          | 10.8 L         |
|--------------------------------------------------------------------------------------|--------------|--------------|----------------|----------------|
| <b>Catalyst volume (SVR = 2.0)</b>                                                   | <b>3.4</b>   | <b>5.2</b>   | <b>9.8</b>     | <b>21.6</b>    |
| Precious metals not required; base metals costs negligible                           | \$0          | \$0          | \$0            | \$0            |
| Ammonia slip catalyst (25 ppm emission standards)                                    | \$2          | \$3          | \$6            | \$12           |
| <b>Total PGMs</b>                                                                    | <b>\$2</b>   | <b>\$3</b>   | <b>\$6</b>     | <b>\$12</b>    |
| Substrate and washcoat (vanadium: \$12*CV)                                           | \$41         | \$62         | \$118          | \$259          |
| Canning (\$25*CV) – includes ASC costs                                               | \$85         | \$130        | \$245          | \$540          |
| <b>Total SCR catalyst: PGMs + substrate + washcoat</b>                               | <b>\$128</b> | <b>\$195</b> | <b>\$368</b>   | <b>\$811</b>   |
| Urea tank volume (6*Vd)                                                              | <b>10</b>    | <b>16</b>    | <b>29</b>      | <b>65</b>      |
| Urea tank cost                                                                       | \$85         | \$112        | \$172          | \$290          |
| Urea level sensor                                                                    | \$48         | \$48         | \$48           | \$48           |
| Urea tank accessories (brackets, bolts, spacers)                                     | \$30         | \$33         | \$36           | \$40           |
| Urea pump                                                                            | \$49         | \$57         | \$70           | \$91           |
| Urea injector                                                                        | \$33         | \$38         | \$46           | \$60           |
| Tubing, stainless steel                                                              | \$14         | \$21         | \$40           | \$89           |
| Urea injection pipe section                                                          | \$14         | \$21         | \$40           | \$89           |
| Urea injection mounting parts (brackets, bolts, gaskets, spacers, tubing connectors) | \$15         | \$19         | \$25           | \$38           |
| Urea heating system, 200 W, 12 V DC                                                  | \$38         | \$44         | \$54           | \$70           |
| Temperature sensor (4 per system)                                                    | \$84         | \$84         | \$84           | \$84           |
| Urea Mixer                                                                           | \$20         | \$25         | \$34           | \$50           |
| Dosing control unit                                                                  | \$200        | \$200        | \$200          | \$200          |
| NO <sub>x</sub> sensor not required—open loop NO <sub>x</sub> control                | \$0          | \$0          | \$0            | \$0            |
| <b>Total urea system</b>                                                             | <b>\$629</b> | <b>\$701</b> | <b>\$850</b>   | <b>\$1,149</b> |
| <b>Total manufacturing - short term</b>                                              | <b>\$757</b> | <b>\$897</b> | <b>\$1,218</b> | <b>\$1,960</b> |
| <b>Total manufacturing - long term (2017USD)</b>                                     | <b>\$681</b> | <b>\$807</b> | <b>\$1,096</b> | <b>\$1,764</b> |

Note. Vd = engine displacement; CV = catalyst volume.

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# Cost of emission control technology



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# Incremental cost emission control technology for NRMM (2017USD)

**Table 21.** Summary of non-road emission control technology costs for U.S. regulatory progression

|                                                                     | Standard | <19 kW | 19–37 kW | 37–56 kW | 56–75 kW | 75–130 kW | 130–224 kW | 224–447 kW | 447–560 kW |
|---------------------------------------------------------------------|----------|--------|----------|----------|----------|-----------|------------|------------|------------|
| <b>Total costs<br/>(2017USD)</b>                                    | Tier 3   | \$223  | \$251    | \$485    | \$850    | \$1,366   | \$1,627    | \$1,941    | \$2,731    |
|                                                                     | Tier 4i  | —      | \$265    | \$862    | \$1,569  | \$2,227   | \$2,859    | \$3,621    | \$5,933    |
|                                                                     | Tier 4f  | \$229  | \$1,035  | \$1,412  | \$2,544  | \$2,808   | \$3,797    | \$4,787    | \$7,759    |
| <b>Incremental costs<br/>with respect to<br/>baseline (2017USD)</b> | Tier 4i  | —      | \$14     | \$377    | \$719    | \$861     | \$1,232    | \$1,680    | \$3,202    |
|                                                                     | Tier 4f  | \$6    | \$785    | \$927    | \$1,694  | \$1,442   | \$2,171    | \$2,845    | \$5,028    |

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# NRMM Emission control technology cost corrections to 2026

Preliminary

- Corrections from 2017 to 2026 include
  - Updated technology costs ~ 33% reduction in total costs<sup>[1]</sup>
  - Cost reductions due to manufacturing improvements and learning defined at 1% per year – follows EPA's methodology.
  - U.S inflation 2017-2026: 1.18<sup>[2]</sup>

| Standard                      | <19 kW | 19–37 kW | 37–56 kW | 56–75 kW | 75–130 kW | 130–224 kW | 224–447 kW | 447–560 kW |
|-------------------------------|--------|----------|----------|----------|-----------|------------|------------|------------|
| Total costs                   |        |          |          |          |           |            |            |            |
| Tier 3                        | \$ 160 | \$ 181   | \$ 349   | \$ 611   | \$ 983    | \$ 1,170   | \$ 1,396   | \$ 1,965   |
| Tier 4f                       | \$ 165 | \$ 745   | \$ 1,016 | \$ 1,830 | \$ 2,020  | \$ 2,731   | \$ 3,443   | \$ 5,581   |
| Incremental cost vs. baseline |        |          |          |          |           |            |            |            |
| Tier 3 to Tier 4f Preliminary | \$ 4   | \$ 564   | \$ 667   | \$ 1,219 | \$ 1,037  | \$ 1,561   | \$ 2,047   | \$ 3,617   |

[1] Posada, F., Isenstadt, A., & Badshah, H. (2020). Estimated cost of diesel emissions-control technology to meet future California low NOx standards in 2024 and 2027 (White Paper). International Council on Clean Transportation. <https://theicct.org/wp-content/uploads/2021/06/HDV-emissions-compliance-cost-may2020.pdf>

[2] Producer Price Index by Industry: Motor Vehicle Parts Manufacturing (PCU33633363)

# MAR II cost in perspective: less than 1% of the price

## Loader

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- 200 kW, Op. weight 20 tons, Engine 7.1L
- Sales price, new
  - USD\$200,000-\$300,000 in the US
  - R\$700,000 to R\$1.1 million in Brazil
- **Tier 4f incremental costs (2026USD)**
  - USD\$1,561, or 0.8%-0.5% of the sales price

## Excavator

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- 128 kW, Op. weight 24 tons, Engine 7.1L
- Sales price, new
  - USD\$250,000 -\$300,000 in the US, Tier 4f
  - R\$800,000 and R\$1.1 million in Brazil
- **Tier 4f incremental costs (2026USD)**
  - \$1,037, or 0.7%-0.6% of the sales price

**Questions:**  
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