



Brussels, 25.9.2014
SWD(2014) 281 final

COMMISSION STAFF WORKING DOCUMENT
EXECUTIVE SUMMARY OF THE IMPACT ASSESSMENT

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on requirements relating to emission limits and type-approval for internal combustion engines for non-road mobile machinery

{ COM(2014) 581 final }
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Disclaimer: This executive summary commits only the Commission's services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission.

1. PROBLEM DEFINITION

Air pollution

Combustion engines installed in NRMM are a significant source of air pollution and this is the main problem that the Directive itself and the current review seek to address. At present, **many EU Member States struggle to reach their air quality objectives** and a further reduction of emissions from combustion engines is an important issue in this context. Despite the limits set by the NRMM Directive and its subsequent amendments, the **NRMM sector has become an increasingly important source of air pollution** in relative terms, especially of nitrogen oxides (NO_x) and particulate matter (PM). The NRMM sector is responsible for around 15% of the total NO_x emissions and 5% of the total PM emission in the EU. While the PM share is expected to decrease, the NO_x share is expected to increase up to nearly 20% in 2020.

The most stringent emission stage IV requirements foreseen in the current legislation will enter into force in 2014. It now appears necessary to **ensure that the NRMM sector is put on a long-term emission reduction trajectory** that is aligned to the EU's overall air quality policy and regulatory requirements in adjacent sectors.

Due to the strong export orientation of the engine and machinery manufactures based in the EU, it is also of major importance that emission requirements, where relevant, are developed with a view to the corresponding **requirements in the main third-country markets** such as the United States.

Providing more long-term guidance on emission requirements than is currently the case would also give **more planning certainty to industry** and enable the sector to schedule the necessary investments in research and development.

Regulatory shortcomings

Despite past efforts, the legislation in its current form has specific shortcomings. **Not all categories of NRMM engines are covered.** The fact that these engines are currently unregulated means that important environmental benefits are foregone.

There is also a **risk of market distortion** for some machinery where the producer has some choice whether to install an engine covered by the Directive or a presently unregulated one. In particular a switch from CI to SI engines could be encouraged by the present regulatory situation depending on the circumstances and fuel availability. These findings have been confirmed by the feedback received from stakeholders during the open public consultation.

New emission stages were last introduced when the Directive was amended in 2004. This means that emission requirements for certain engine categories are becoming **outdated when compared to the state of the art of technology** and recent developments in the road sector.

Furthermore, conclusive evidence became available in the meantime about the **adverse health effects of diesel exhaust emissions** and especially about particulate matter (i.e. diesel soot). One of the main findings is that the size of the particles is a crucial factor behind the observed health effects and this can only be addressed by limit values that are based on a particle number count (i.e. PN limit). Experts concluded that even the most ambitious levels defined by Stage IV do not guarantee

adequate protection from such pollutants. In line with the developments in the road sector, the introduction of a new emission stage (Stage V) targeting particle number limits in addition to particle mass limits, therefore, needs to be considered for the most relevant engine categories.

Furthermore, there is a **mismatch between certain engines categories** as to the stringency of the currently applicable emission limits. In particular, the emission limits for engines installed in inland waterway vessels appear to be insufficiently ambitious and require reassessment. It also holds for exhaust emissions from constant speed engines, which represent a large part of non-road engines: the emission limits for these engines are less stringent than for variable speed engines, which may encourage manufacturers to move from variable speed engines to constant speed engines with lower environmental standards. This situation needs to be reviewed as there is no technical justification for assigning less stringent limit values to constant speed engines.

Currently, the emission limits for NRMM are being tested under laboratory conditions when the engine is type approved. Whilst the Directive does require the emissions control system to correctly function under real-world conditions, it does not contain any provision to check that a properly maintained emissions control system is indeed functioning correctly when in service. It may be useful to provide measures and **check whether engine emissions in-service are fulfilling the requirements** set by the Directive over the prescribed useful engine life, as this is already the case for heavy duty road vehicles.

2. ANALYSIS OF SUBSIDIARITY

The legal basis of the NRMM Directive 97/68/EC is Article 114 of the Treaty on the Functioning of the European Union.

As this concerns amendments to existing EU legislation, only the EU can effectively address the issues. The subsidiarity principle is respected, since the policy objectives cannot be sufficiently achieved by actions of the Member States. European Union action is necessary because of the need to avoid the emergence of barriers to the single market notably in the field of NRMM engines, and because of the transnational nature of air pollution. Even though the effects of the main air pollutants are most severe close to the source, the effects on air quality are not limited to the local level and cross-border pollution is a serious environmental problem that can make national solutions ineffective. In order to solve the problem of air pollution, concerted action at the EU scale is required.

Setting up emission limits and type approval procedures at national level would potentially result in a patchwork of 28 different regimes which would represent a serious obstacle to intra-Union trade. Moreover, it could impose a significant administrative and financial burden on manufacturers who are active in more than one market. Therefore, the objectives of the initiative under consideration cannot be achieved without action at the EU level.

Finally, a harmonised approach at EU level is expected to represent the most cost-efficient way for manufacturers and end-users to achieve emission reductions.

3. OBJECTIVES

The primary objective of the NRMM Directive is to reduce the emission of gaseous and particulate emissions (NO_x, HC, PM, CO) from the engines incorporated in non-road mobile machinery. This is also the central objective of the review process.

Greenhouse gas (GHG) emissions are currently not included in the scope of the NRMM Directive. This is mainly due to the fact that the Directive targets at the emission performance of engines rather than of the machinery in which the engines are installed. Given that the GHG emission performance is, however, to a great extent influenced by the machinery (e.g. weight, design,...) as well as its actual operation, the most appropriate legislative way as to how best address GHG emissions is still to be sought. For the considerations of the current review process, GHG emissions, therefore, remain out of scope.

The specific objectives pursued are as follows:

Health and environment:

- Protect human health and the environment through a further reduction of toxic air pollutant emissions (NO_x, HC, PM, CO) from NRMM engines, in line with the EU's air quality policy;
- Ensure that NRMM emission limits and type approval requirements reflect technical progress and address the regulatory shortcomings that have been identified

Competitiveness:

- Ensure a good functioning of the internal market, notably by reducing obstacles to internal and external trade.
- Provide a reliable, long-term regulatory outlook for the relevant economic sectors.
- Prevent regulatory fragmentation by reducing the pressure on Member States and other public authorities to impose restrictions on the use of NRMM.
- Promote technical progress by providing long term guidance on emission limits
- Increase alignment with regulations established outside of the EU market, and the United States in particular.

Compliance:

- Support Member States in their efforts to comply with the requirements of EU air quality policy by providing them with a supportive regulatory environment;
- Support Member States, regions and cities in addressing compliance problems in the so-called urban hotspots, where air quality problems have proven to be most difficult to address.

4. POLICY OPTIONS

The following options were considered and studied in more detail on the basis of cost-benefit analyses:

Option 1: Business as usual – applying the existing legislation (Baseline)

The NRMM Directive would continue to apply in its current form and no new emission stage would follow on Stage IV, which enters into force from 2014

onwards. Engine types outside of the current scope would continue to be unregulated, unless Member States decide to act themselves.

Option 2: Alignment with US standards in scope and limit values

The revision would seek to achieve alignment with US-EPA standards where feasible. As today's US-EPA standards are generally stricter than current EU standards, this approach would have the effect of both extending the scope of regulated engines and introducing stricter emission limit values. For engine categories where a meaningful correspondence between the EU and the US limits cannot be established, or where less stringent standards apply in the US than in the EU, notably for railcars which do not exist as a distinct category in the US, no alignment would be sought. Instead, an appropriate level of ambition would be applied with a view to ensuring consistency across engine categories. It is also important to note that this option would target particle mass limits rather than particle number limits.

Option 3: Step towards road sector ambition levels, for the most relevant emission sources

The Euro VI emission standard for heavy duty vehicles (i.e. trucks and buses) would be used as the main point of orientation. This would notably include the issue of particulate matter number limits which currently do not exist in NRMM legislation. However, the technical and regulatory differences between heavy duty vehicles and NRMM would be taken into account when defining limit values. With regard to the definition of limit values, this option is more ambitious than Option 2 and would seek a coherent and comparable reduction across the most relevant engine categories. It would allow for some limited differentiation among the different power classes in accordance with the results of cost-benefit analyses.

As for engines for the IWV transport sector, two options are studied: Option 3A being inspired by alignment with future US standards on NO_x and HC yet introducing PN emission limits, Option 3B setting in addition also very ambitious emission reduction targets for NO_x and HC. In a similar manner, two options are being studied for rail applications, i.e. the introduction of PN emission limits only (Option 3A) respectively PN emission limits in combination with more stringent NO_x/HC limits (Option 3B).

Option 4: Extended level of ambition through enhanced monitoring provisions

Under this option, the revision would seek to combine the more stringent emission limits resulting from Option 2 and/or Option 3 with enhanced monitoring provisions.

These provisions would mainly be aimed at monitoring the in-service conformity of NRMM engines. In-service conformity means compliance of the engine with the type approval requirements during the product's 'normal life'. For this reason, legislation has been developed in the heavy duty sector which is aimed at monitoring, via limited sampling, the emission performance of engines once installed in vehicles and in service life. Similar procedures would be introduced for the non-road sector. This could also serve as a first step towards controlling real world (so-called off-cycle) emissions.

Furthermore, with a view to obtaining a more accurate picture of the specific greenhouse gas emissions and fuel consumption of NRMM engines, information on these emissions could be used to label engines to better inform buyers and users. If deemed necessary at a later point of time, the results from the monitoring and

reporting of the specific greenhouse gas engine emissions could possibly be used for further measures in the future.

5. ASSESSMENT OF IMPACTS

Due to the considerable diversity of engines and applications in the NRMM sector, the preferred option is a combination of elements cutting across all four policy options studied. The preferred options identified will lead to a significant reduction of pollutant emissions which have adverse effects on human health. A focus is on the reduction of diesel particle emissions. In addition, substantial reductions in NO_x and HC emissions will be achieved.

All together, the benefits of the preferred options are expected to reach amounts in the range of €26,100 to 33,300 million until 2040.

Costs of the preferred option will mainly incur to engine and machinery manufacturers (development, redesign and production costs), but also to end-users of machinery (operational costs for additional fuel consumption, maintenance costs).

All together, the costs of the preferred options are expected to reach amounts in the range of €5,200 to 5,800 million until 2040.

Though the cost-benefit analyses indicate overall net benefits, it must be highlighted that investment needs reach significant levels for some of the engine categories and/or sectors that need to be carefully assessed with the financing capabilities of the main players affected. Most significant investment costs are identified for sectors/categories which benefit as of today, in relative terms, of lower emission standards, i.e. small diesel engines (19-37 kW) and engines used in the IWT sector.

6. COMPARISON OF OPTIONS

Assuming that all the criteria for comparison are given similar weight, Option 2 (US alignment) is the preferred choice for all SI engines and the smallest and largest CI engines. Option 3 (closer alignment with road sector ambition level) would apply to the CI engines in the middle of the power spectrum, where the bulk of CI engines is located. Option 3 would also be appropriate for railcars. Here the analysis points to sub-option 3A. Option 1 (no policy change) only leads to a satisfactory outcome for the engines of diesel locomotives, a segment of the NRMM engine market that will have all but disappeared by 2050.

For inland waterway vessels (IWV), the analysis reveals merits and drawbacks for Option 2 and Options 3A and 3B, which does not allow an easy straightforward selection. Considering, however, that Option 2 does not address an issue of high relevance for the EU (i.e. adverse health impact due to particle sizes), only Option 3A and Option 3B are being retained at this stage as preferred options.

Finally, the analysis indicates that the enhancement measures of Option 4 should be applied across the board.

Due to a considerable diversity of engines and applications in the NRMM sector, it was already expected that the preferred option would, in fact, be a combination of elements cutting across all four policy options. This result is also due to the fact that NRMM engine categories differ widely as to their expected future importance as a source of emissions, the technical feasibility of further emission reductions and the

level or regulatory stringency that is already applied to them. The preferred combination would ensure that these circumstances are duly reflected in NRMM engine emission legislation in the future and, at the same time, would strengthen the effectiveness and coherence of the regulatory framework.

7. MONITORING AND EVALUATION

The European Commission has several tools available to monitor if the objectives of the initiative under consideration are being achieved effectively. The most important one is market surveillance by the relevant authorities of the Member States. Non-compliance will also be spotted as a result of complaints addressed to the Commission. The emission data generated by the engine type approval procedure is also valuable for monitoring and evaluation purposes. In particular, if the database described in section 6.4.3 is set up.

A technical review of the NRMM legislation was carried out in 2008, which triggered the development of the current initiative. Such a review could be repeated a number of years after the entry into force of the revised NRMM legislation once sufficient evidence for the effects of the current initiative can be expected. This could be the case 5 years after the entry into force of new emission requirements.