Euromot

Worldbank – International Finance Corporation

General concerns and recommendations to the final version of the General Environmental, Health and Safety Guidelines (April 30, 2007)

Background Paper – June 2007

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Engine-in-Society

Euromot is the **European Association of Internal Combustion Engine Manufacturers**.

We represent the leading manufacturers of internal combustion engines used in a broad range of nonroad and marine applications (construction, mining and material handling equipment, trucks and buses, agricultural and forestry equipment, commercial marine and seagoing vessels, workboats and pleasure boats, rail traction, lawn/garden and recreational equipment, power generation).

Euromot has been working for many years with international regulatory bodies, eg European Union, the UN Economic Commission for Europe (UNECE), the UN International Maritime Organizations (IMO) and the Central Commission for the Navigation on the Rhine (CCNR). In addition, we are seeking an open and fair dialogue with national governments to provide reliable know-how on advanced internal combustion engine technologies in general and, in particular, on the feasibility of environmental as well as cost-effective product regulations. To achieve a pro-active engagement of all stakeholders in international harmonisation of regulations affecting engines and equipment, we coordinate our activities worldwide with trade associations of the non-road and marine industry sector.

For further information about our Association please refer to our Annual Report 2003 or pay us a virtual visit at **http://www.euromot.org** – your bookmark for engine power worldwide.

1 Introduction

As additional information to our position paper that represents the common opinion of the engine manufactruers organised in Euromot we summarised important background information in the following text.

In general we find the General EHS Guidelines reasonable reflecting the existing infrastructure (fuel, etc.) around the world and technical development quite well and thus built on sound IPPC (Integrated Pollution Prevention Control), GIIP (Good International Industrial Practice) and BAT (Best Available Technology) principles.

However there are some aspects which needs to be addressed/corrected in order to avoid misperceptions or these might otherwise lead to too strict implementation requirements beyond above mentioned principles. Major items of concern are:

- Effective implementation date of the Guidelines:

  We collected especially information about the negative impacts that we expect on the market due to missing information about the implementation timing of the General Environmental Health and Safety (EHS) Guidelines.

- Ambient Air Quality

  Furthermore we compared different regulations relating to the immissions for the Ambient Air Quality. This background paper explains under which boundary conditions the WHO limit values for the Ambient Air Quality have been developed. It shows how the dependency between low values for the Ambient Air Quality and an applicable operation for a power plant is.

- Noise limit in the control room

  Moreover we compared different noise regulations in order to compare the stipulated noise limit values in control rooms.

- Other concerns

  At the end of this background paper we added other concerns of the engine industry in order to call attention to some issues that can be improved in the General EHS Guidelines according to our opinion (interruption in gas supply, emission measurement verification load span, emission bonuses, etc.).

2 Effective implementation date of the Guidelines

On internet is stated “as of April 30, 2007, new versions of the World Bank Group Environmental, Health, and Safety Guidelines (known as the 'EHS Guidelines') are now in use. They replace those documents previously published”. In the actual General EHS Guidelines is only printed a date “April 30, 2007”. In our submitted paper /4/ we pointed out the importance to give the industry sufficient time for the implementation of the new emission limits on page 5 and other limits in /1/ but unfortunately this seems not to have been considered in the final version of the EHS Guidelines. In below text we want therefore once more to stress the importance of a stepwise implementation of the Guidelines.

Projects sold before above date, but not yet commissioned or projects which were in a late sales stage when Guidelines were published will thus be put into a difficult situation (sales negotiations (plant performance) had been in the spirit of the 1998 World Bank EHS and old IFC Guidelines, which still are applicable to bigger projects > 50 MW_{th} but for the (smaller) power plant range 3 .. 50 MW_{th} old Guidelines are now replaced by new requirements).

Delivery times of projects are today long due to the fact that the engines are sold out for the coming years. Thus a part of the already sold stationary engine power plant projects will be delivered and commissioned in 2010. To be noted also is that engines used in stationary applications are very similar to those engines installed on sea-going vessels. IMO is expected to enforce the next step asking for more stringent emission requirements on January 1 2011 (keel laying of the vessel), which correlates with an engine delivery date close to about in July 2011. The IFC/World Bank updated Guidelines are thus ahead of the IMO requirements and some kind of a "harmonization" is thus needed. In the past lead time for implementation has also been granted e.g. in the current "Thermal Power – Guidelines for New Plants" 1998 for engine-driven plants were due the technical development status granted following for particulate and NO_x:

- For NO_x the "cut point" for introduction of a stricter Guideline value was set to July 1. 2000, i.e. 2 years after the introduction of the Guidelines.
- For particulate the introduction date for the stricter Guideline value was set to January 1. 2001, i.e. about 2 ½ years after introduction of the Guidelines

Recommendation:

Based on above (business situation, New Thermal Power Guidelines, IMO ruling, technique, etc. development statuses) situation we propose following clarification wording for the General EHS Guidelines in order to get a smooth transition towards the new Guidelines:

For sales contracts done at the latest on December 31 2007 provided that the power plant is commissioned latest December 31 2010 the World Bank "Thermal Power – Guidelines for New Plants" 1998 /2/ shall apply.

3 Ambient Air Quality limits

3.1. Introduction

On page 4 in the Guidelines /1/ is stated: "Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines (AQGs) or other internationally recognized sources. … As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed."

In below text we will show that when applying the WHO Air Quality Guidelines (AQGs) in combination with the "general 25 % rule" this leads to a too strict ruling. This will lead to very strict stack limits (much stricter than those in table1.1.2 in /1/); the ambient air quality standard will set strict stack emission limits even for a small power plant in an unpolluted rural area; which has hardly been the intent (primary emission abatement methods in combination with a reasonable stack height will not be enough). Also the "25 % increment rule" itself is too strict to be applied universally on all Guidelines, to be noted is that the immission figures vary greatly between different Guidelines and therefore a "universal" "increment rule" will lead in most cases to big unnecessary problems without enhancing the environment.

3.2. WHO Air Quality Guidelines

World Health Organization (WHO) Air Quality Guidelines (AQGs) Global Update 2005 does not contain percentiles (to take care of unusual meteorological events) for other pollutants than PM10 / PM2.5 such as SO_2, NO_2, ozone as is normally the case for short-term national AQGs such as US EPA /3, 9/ and EU /4, 7/. In below table 1 percentiles in EU are given.

Table 1. Short term percentiles used in EU /7/.

Immission component (microgram/m^3)	Permitted exceedences each year
SO_2 (24-hours) mean 125	3
Nitrogen dioxide (NO_2) (1-hour) mean: 200	18
PM10 (24-hours) mean: 50	35
Ozone (8-hour) mean: 120	25 days averaged over 3 years

WHO AQGs have therefore a "never to exceed approach" and are thus stricter than existing national Guidelines. To be noted also is that some WHO AQGs values are stricter than corresponding ones in the AQGs of EU /7/. In /5/ on page 7 is stated. "The WHO Air Quality Guidelines (AQGs) are intended for worldwide use but have been developed to support actions to achieve air quality that protects public health in different contexts. Air quality standards, on the other hand, are set by each country to protect the public health of their citizens and as such are an important component of national risk management and environmental policies. National standards will vary according to the approach adopted for balancing health risks, technological feasibility, economic considerations and various other political and social factors, which in turn depend on, among other things, the level of development and national capability in air quality management. The guideline values recommended by WHO acknowledge this heterogeneity and, in particular, recognize that when formulating policy targets, governments should consider their own local circumstances carefully before adopting the guidelines directly as legally based standards."

In our opinion WHO AQGs are too strict to be used as such as one of the potential Guidelines in absence of national Guidelines. Below some explanations for this are listed:

- E.g. in source /3/ is the Californian AQGs given. California is known for strict environmental rules. These state immission standards were designed to protect the most sensitive members of the population. BUT the Californian SO_2 24-hour value is anyway about 5 times higher than the WHO corresponding value, also the NO_2 standard value is higher in California.

- The basis for some of the pollutant limits in the WHO AQGs seem to be vague (one of the basis for reducing the SO_2 24-hour Guideline value substantially in the new AQGs was on results based on a Hong Kong study) : on page 18 in /5/ is stated "There is still considerable uncertainty as to whether SO_2 is the pollutant responsible for the observed adverse effects or whether it is a surrogate for ultra-fine particles or some other correlated substance." Also in a poster /6/ presented in a recent HEI (Health Effects Institute) meeting the uncertainty with the SO_2 contribution to the health effect was pointed out: "However uncertainty remains about the independent effects of individual pollutants: on whether the effects seen in Hong Kong were related to the concomitant change in particulate composition and whether there had been a long term benefit that is significant for public policy".

- WHO AQGs do not include short-term percentiles for most components as can be found in national AQGs and has thus a “never to exceed approach”. Percentiles are necessary for considering unusual meteorological conditions, etc.
- In Annex 1A is shown a screen modelling (SCREEN 3 program approved by US EPA) for a small 18 MWe stationary diesel power plant operating on a light fuel oil containing 0.3 % S. Assumptions are: a clean surrounding (no other polluters), one common segmented stack and a flat terrain. The 24-hour value can typically be estimated from the calculated 1-hour value as 0.4*1 hour-value /9/. The screening gives thus a 24-hour SO_2 value of about 5.5 microgram/m^3 which exceeds the “25 % allowed increment” of the WHO AQGs 24-hour value for SO_2. In Annex 1B is a another screen modelling for an about 9 MWe stationary diesel plant operating on a 1 wt-% heavy fuel oil (HFO), other conditions the same as in case 1A. In this “HFO-case” the resulting 24-hour incremental value will be about 10 microgram/m^3 >> “trigger” 5 mg/m^3 (!). To note is that 1.00 % S is allowed in “other” (such as stationary diesel power plants) combustion plants according to EU Directive 1999/32/EC (!).

Above has been shown that applying the WGO AQGs will lead to too unnecessary tight limitations (and indirectly stricten dramatically the stack emission limits) not enhancing the quality of the surrounding environment. WHO has also as pointed out above in their own publication /5/ themselves not recommending the AQG to be used as legally binding standards.

Recommendation:

Therefore we recommend to take out the WHO AQGs from the final version of the General EHS Guidelines and in absence of national AQGs to refer only to other internationally recognized AQGs such as those of federal US EPA.

3.3 Other Internationally recognized AQGs and allowed increments

In /1/ is stated “As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed”.

Increment rules from one AQGs should not be implemented into other different AQGs. Below in table 2 are some immission values listed from the EU and US EPA AQGs and as shown below this will in the case of a universal increment rule lead to big inconsistencies.

Table 2. Some immission components in EU AQGs /7/ and Primary US EPA NAAQS/3/

EU AQGs component, microgram/m^3	US EPA NAAQS component microgram/m^3
SO_2 (24-hour) mean: 125	SO_2 (24-hour) mean: 365
NO_2 (annual) mean: 40	NO_2 (annual) mean: 100

- E.g. when comparing PSD (Prevention of Significant Deterioration) increments from the federal US EPA NAAQS (National Ambient Air Quality Standards) with the WHO AQGs: E.g. in a class II area the federal US EPA NAAQS allows for the SO_2 24-hour PSD increment 91 micrograms/m^3 (this is 25 % of the total NAAQS SO_2 24-hour value). BUT as shown above when applying the “general rule" on WHO AQGs the allowed increment is only about 5 microgram/m^3. The difference between these standards will be above 1800 % (18 times lower (!)).

- A comparison between EU AQGs and US EPA NAAQS (SO_2 24 – hour value) using the "general rule" will give 31 versus 91 microgram/m^3 or a 291 % difference. To note is that in the EU AQGs are not given any allowed increment value, it is of ultimate importance that the overall AQGs will not be exceeded and the implementation is left to the individual authority.

To note also is that in the federal US EPA NAAQS the PSD increments shares vary greatly between the different pollutants, e.g. for PM2.5 no increment has yet been established /9/ and for the PM10 annual value it represents a share of 20 % !

Therefore no "general increment rule" concerning all the different AQGs and pollutants can be given !

Recommendation:

In above text has been shown that WHO AQGs are stricter than national ambient air Guidelines and thus are not suitable to be one of the international guidelines referred to in case of no existing national ruling. It is not a correct way to introduce a "general increment rule" of 25 % as proposed in /1/, this will lead to big problems as pointed out above.

We therefore propose to take out the WHO AQGs and replace table 1.1.1. in /1/ by some widely used/known national standard such as the federal US EPA NAAQS /3/, etc. In Annex 2 federal US EPA primary NAAQS and WHO Global Update 2005 AQGs are compared to each other. We also propose a change of the text in context with the "general rule" as follows.

We propose following change to the text in order to clarify the situation and highlight the importance of the incremental aspect "The incremental rule(s) (if defined) in the applicable air quality standards shall be honoured to allow additional future sustainable development in the same airshed".

Others: In source /4/ on page 7 following aspects were also mentioned:

- Macroscale testing (as is the recommendation in Europe); *".. Sampling value should be representative of air quality of the surrounding – several square kilometers* ..";
- Effect of natural sources on background levels (exceedances of AQGs allowed, if justified).

In the final Guidelines /1/ this kind of important information is missing. In order to have meaningful limits these kinds of aspects should be added to the Guidelines.

4 Control Room Noise

In table 2.3.1 on page 66 in /1/ the noise limits for various working environments are given. In the following text the control room noise limit span is discussed and it is shown that the Guideline limit is too strict.

4.1. Introduction

The new IFC EHS guideline value for the (including also small (<50 MW_{th}) ones) thermal power plant control room ambient noise is 45…50 dB (A-weighted sound pressure level, if not otherwise stated). We understand the scope of a such value to be guaranteeing a sufficient speech communication environment between control room operators.

The main references in the literature with background noise level values conforming to current IFC guideline value 45…50 dB, are the WHO Guidelines for Community Noise /10/ and the International Electrotechnical Commission standard IEC 60964 - Design for Control Rooms of Nuclear Power Plants /11/.

Our point of view is that the guideline values stated in WHO guideline (community noise, not control room noise) and IEC 60964 - Design for Control Rooms of Nuclear Power Plants as the only specific control room design standard should not be directly applied to a (small) thermal power plant control room noise nor as a reference to the IFC EHS guideline regarding power plant control room noise, because the scope of application is very different.

Especially we feel that the accepted, required and technically feasible level in a nuclear power plant control room is very different from that in a stationary diesel power plant control room.

- The need for a totally effortless speech communication in a diesel plant control room is not urgent, the control room being usually occupied by one or two operators.
- Regarding consequences of a communication failure, the risk involved in a nuclear power plant operator error is of seriousness far beyond that in a diesel plant. We define risk = probability x consequences: in a nuclear plant it is necessary to keep the probability down to an absolute minimum due to severe consequences
- Finally, the technical complexity of a nuclear power plant is of a complete different magnitude than of a diesel power plant, requiring and facilitating heavy concrete structures, large footprint thus providing large distance from sources to receivers and thermal and sound insulation, etc.

In the following the technical implications of the 45…50 dB limit value on power plant civil engineering structures are presented, along with estimated cost effect.

The IFC guideline value is compared to current legislative, standard and other guideline values. Also a comparison of new IFC guideline values with “practical state-of-the-art” values is presented. Based on the literature survey a counter proposal for an updated guideline control room ambient noise level is presented.

4.2. Technical considerations and cost effect

The design of diesel power plant civil engineering structures is usually based on the concept of modularity, overall functionality and simplicity of construction with sufficient sound and thermal insulation. In some regions effects of earthquakes have also to be accounted for.

The currently often applied flexible steel framework structures with wall elements suit the purposes above well. These are simple to transport, erect, provide sufficient insulation and withstand seismic disturbances well without incurring excessive cost.

The limit of 45…50 dB dictates the use of very thick, heavy structures regarding the current engine and plant component sound emissions. The construction of 150…250 mm thick, even double wall concrete structures, or thick steel double wall structures or separate control room buildings is not feasible in comparison to the overall infrastructure demands.

The construction of separate or otherwise extremely insulated control rooms does affect the overall construction costs of a small thermal power plant by 5…15 %, depending on the application and the local conditions at the site of installation. The incurred additional cost is prohibitive regarding smaller installations in the scope of the current guideline.

Even by the successful application of these heavy structures the ambient noise level inside the control room is likely to exceed 50 dB because of ventilation, electrical control and computing equipment. /12, 13, 14, 15/.

Regarding warning signal audibility we note that a typical alarm horn creates a sound pressure level of over 90 dB at 1 m distance. If the same horn is installed inside a typical control electronics cabinet, the level at 1 m distance is still typically over 80 dB due to thin steel structures, ventilation openings and slits in the cabinet. A tonal warning signal of such magnitude is clearly audible, even when the background level would be of the order 70 dB /16/.

4.3. Current legislation and standards

4.3.1. Legislation:

The ambient noise level in a control room is controlled by general occupational health legislation. We have been unable to find any indication of legislative limits below 80 dB. The European Directive EC2003/10 “on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)” states 80 dB as “the lower exposure action value”. Should this value be exceeded, the employer is to provide individual hearing protection to workforce. Should the level rise above 85 dB, the provided protection should be taken into use.

The disparity of values in occupational and environmental health legislation and the current IFC guideline is due to different scopes of application: the EC directive /17/ and e.g. Indian /18, 19/ or Brazilian /20/ legislation are set to protect workers from noise induced hearing loss or in the case of environmental noise legislation, ensure sufficiently low community noise exposure. None of these /17, 18, 19, 20/ consider speech communication nor set any limit or target values for control room noise.

More specifically, the Indian legislation /18/ gives limit values for small diesel generating set sound emission and minimum values for noise attenuating structures. However, these are for small, under 1 MW installations.

We have been unable to find any specific legislative limit values for control room noise. Several applicable standards with corresponding values for control room noise are presented below.

4.3.2. Standards:

The International Electrotechnical Commission IEC has defined a standard for control room design in a nuclear power plant. In this extremely safety-critical application an ambient noise level of 45 dB is deemed sufficient /11/.

Several standards /21, 22, 23/ released within the last ten years give guideline values for acoustic classification of buildings and present good practices to achieve these values. The scope of these standards is broadly the “acoustic classification for dwellings, hotels and lodgings, health care facilities, facilities for the elderly, schools, day-care centers, offices and industrial work places” /22/. The control room as a special case of industrial work place can thus be seen as an “upper end” extension of the scope of the standards regarding noise level.

The British standard BS 8233:1999 states 57 dB to be a sufficiently low ambient noise level for speech communication at 1 m distance between operators. If the voice is “raised”, 62 dB is stated as acceptable /21/

The Finnish standard SFS 5907 states 55…60 dB as sufficient for general control room ambient noise /22/ The Swedish standard SS 02 52 68 is similar in scope, but does not consider control room noise /23/.

The American national standard ANSI S12.2 in its current version suggests the application of “Balanced Noise Criterion” Curves NCB 43 to NCB 53 for premises like industrial plant control rooms. These standard curves correspond to approximate A-weighted sound pressure levels 51…61 dB /24/.

4.3.3. Guidelines:

The WHO guidelines for community noise /10/ give relevant criteria regarding power plant control room noise in chapter 4.2.1 “Interference with communication”.

In chapter 4.2.1 it is stated, that:

“

a. Speech in relaxed conversation is 100% intelligible in background noise levels of about 35 dB, and can be understood fairly well in background levels of 45 dB.
b. Speech with more vocal effort can be understood when the background sound pressure level is about 65 dB.

“

In table 4.1 specific values for community noise are stated. For industrial environments the value 70 dB is stated.

The values given in chapter 3.3 “Interference with Speech Communication” are not applicable for industrial premises, as they consider dwellings, classrooms and the like.

The Swedish Maritime Administration Sjöfartsverket states 70 dB and 65 dB as acceptable background noise levels for ship machine control room and navigation respectively. /25, 26/ Similar value of 65 dB is stated e.g. in the American Bureau of Shipping (ABS) guidelines for crew habitability in offshore- and ship premises /27, 28/.

The usual A-weighted overall level has been found to exaggerate the perceived interference and annoyance of low frequency noise by as much as 6 dB. Also, the somewhat low frequency noise characterised by engine firing harmonics typical to a diesel generating power plant control room has been found to be significantly less interfering than broadband noise at similar pressure level. The so-called interference threshold for low frequency tonal noise is stated as 65 dB when the operator is performing difficult tasks. For easier tasks, the introduced interference threshold is 71 dB /29/.

4.4. Practical "state-of-the-art"

The widely used Industrial Ventilation Design Guidebook /15/ for ventilation system design gives guidelines for background noise level due to HVAC systems inside industrial premises. In chapter 9.8.3 "Criteria for Acceptable Air-handling Units and HVAC System Noise Level" it is stated that:

"It is desirable to control noise pressure levels to meet the requirements of speech communication; in this case noise should not exceed 65…70 dB (A-weighted).

The practical target level for control room noise design suggested by the Finnish Institute of Occupational Health is 50 dB…65 dB, depending on the estimated level of acceptable speech interference and safety criticality of the work /30/. This guide can be seen as interpretation of standard SFS5907 /22/.

The noise exposure of workers at different process plants of similar source strength to diesel generating power plants has been investigated e.g. in India /31/ and in the United States /32/. The noise level in plant control rooms varies from 70…75 dB, thus defining the lower level of control room operator noise exposure, as (s)he typically works also on other stations during the shift.

Table 3**: Summary of literature survey**

Legislation	Allowable level [dB, A-weighted L_p]	Comment
EC Directive 2003/10 /17/	80	“Lower exposure action”, scope: occupational health, not speech communication.
Standards		
International standard IEC 60964 /11/	45	Nuclear power plant control room
British standard BS8233 /21/	57…62	“normal”/”raised” voice
Finnish standard SFS 5907 /22/	55…60	
American national standard ANSI S12.2 /24/	51…61	
Guidelines		
WHO guideline /10/	65	“with vocal effort”
Swedish Maritime Administration /25, 26/	65…70	
American Bureau of Shipping /27, 28/	65	
Finnish Institute of Occup. Health /29/	50…65	Relat. to needed speech comm.
Arbetslivsinstitutet /29/	65…70	
Industry practice		
Ventilation noise /15/	65…70	
Process plant noise /31, 32/	70…75	

4.5. Conclusions

In our opinion the IFC EHS guideline values of 45…50 dB for a power plant control room noise are too stringent in reference to

- Available techniques to mitigate noise
- Current applicable guidelines
- Research results concerning the annoyance and interference of low frequency noise with speech communication.
- Practical safety signal audibility and communication requirements.

The limit for control room noise in the current legislation, standards and guidelines is 65…70 dB. This value is based on the results of literature survey summarised above.

Recommendation:

Based on the previous, we suggest the value of 65…70 dB to be set as guideline value (control room noise) for the next revision of IFC EHS guideline.

This would be appropriate also regarding the fact that the current revision version is the first where any guideline values for control room noise are set. A less stringent initial requirement would allow for field experience to be gathered and adaptation of technical measures best suited for each power plant case.

5 Others

In this chapter some items are briefly covered. Majority of these have been already raised in the submitted document /4/ and in the discussions between Euromot and IFC/World Bank in the Washington meeting on January 25 2007.

5.1. Stack emission verification load span

In the Guidelines /1/ it is not defined the loads at which the verification measurements will be conducted.

In source /4/ on page 17 ("Other Aspects") Euromot has explained the measurement procedures in USA and India. E.g. in India stack measurements are performed at 85 … 100 % (in US 90 .. 100 %) Maximum Continuous Rating (MCR) of the individual engine at steady state load conditions. Start-ups and shut-downs are excluded (praxis worldwide).

5.2. Liquid effluent limits

The final version of the General EHS Guidelines do not contain any limit values for liquid effluents besides those for sanitary sewage discharges (on page 30). In the January meeting between IFC/WB and Euromot we raised this issue and proposed the current "Thermal Power - Guidelines for New Plants" 1998 effluent limit. The response by IFC/WB was that in the new Thermal Power Guidelines will be included effluent limit standards for the power plants. Euromot stated then that a power plant with a small liquid effluent stream such as a radiator cooled stationary engine plant should have a leaner standard than e.g. a big steam power plant. Therefore it should be logical to include an own liquid effluent limit for smaller power plants in the General EHS Guidelines.

5.3. Interruption of gas supply

In EU Directive 2001/80/EC (Large Combustion Plant Directive for boilers and gas turbines, stationary engines are excempted article 2 item 7j) in article 7 item 3 a derogation (for plants which would otherwise need to be equipped with a waste gas purification facility), from the obligation to comply with emission limits is granted big gas fired boiler and gas turbine plants in case of these have to resort exceptionally and for a period not exceeding 10 days except where there is an overriding need to maintain energy supplies to use of other fuels because of a sudden interruption in the gas supply.

Some stationary engine types are of multi-fuel type (can operate in gas/liquid modes) and in the Guidelines /1/ it is not explained how to act in a gas supply interruption supply. It should be logical to introduce a similar approach as in the above mentioned Directive for all different prime movers in order to avoid "unnecessary investments". This was also mentioned in document /4/ on page 17 in "Other aspects".

5.4. Emission bonuses

In document /4/ on page 17 in chapter "Efficiency" this was shortly raised and in table 1 on page 5 own limits for bio fuels were proposed. In the final Guideline /1/ the efficiency and other sustainable criterias seems to have been largely ignored. Only in the NO_x-value for liquid fired engines (bore < 400 mm) efficiency has been taken into account by setting a higher alternative value.

In /34/ on page 38499 it is shown in equation 2 that useful heat and additional electricity or mechanical energy from an additional steam turbine are treated equally as the electrical energy generated by the gas turbine. E.g. $P = Pe_t + Pe_c + Ps + Po$, with:

P = Gross energy output of the stationary combustion turbine system

Pe_t = electrical or mechanical output from the combustion turbine system

Pe_c = electrical or mechanical output from the steam turbine system

Ps = Useful energy of the steam

Po = Other useful heat recovery, not used for steam generation or performance enhancement of the combustion turbine

In USA output emission limits are used (pages 38502 – 38504), by adding the recovered heat as above shown to the gross energy output, a big efficiency bonus is granted.

On April 2 2007 U.S. Supreme Court ruled that US EPA must regulate CO_2 emissions (have the right to regulate auto emissions of carbon dioxide) /33/ and in US many individual states have adopted GHG (Green House Gas) emission curb measures. In year 2008 the first Kyoto Period starts and it should therefore be logical to see more sustainable impacts also in the new IFC/WB Guidelines.

Therefore it should be logical to grant efficiency bonuses to all prime movers based on the single/combined cycle, combined heat and power (CHP) efficiencies or usage of a sustainable fuel.

5.5. Engine type definitions

In document /1/ table 1.1.2 "Small Combustion Facilities Emissions Guidelines …" on page 7 engine types are listed such as :

- Spark Ignition
- Dual Fuel
- Compression Ignition

But nowhere in the document is given any description of these different engine types. These needs to briefly be described in an additional appendix. In the current Guideline /2/ in annex A "Engine – Driven Power Plants" technique was shortly described, now this is not the case.

Recommendation:

Add engine type description text from CIMAC document /35/ page 4 "chapter ("2.1 Engine types & fuel options").

5.6. "Variance principle"

In "introduction to EHS Guidelines" (link is available on the IFC internet page http://www.ifc.org/ifcext/policyreview.nsf/Content/EHSGuidelinesUpdate_Comments) it is said: " The EHS Guidelines take into account the technical and financial feasibility, and cost-effectiveness of EHS management actions at a global level. They are intended to be applied using expert professional judgement and with an understanding that site-specific exceptions or variations may be required to meet the Performance Standards´ stated objectives and requirements …".

But nowhere is the "variance principle" documented. This will in practise lead to a strict implementation of the Guideline values without flexibility of external institutions following IFC/WB Guidelines due their own environmental policy. In order to correct the situation an addendum is needed to the Guideline where it is listed/explained the milestones and actions needed for the "variance principle" usage.

5.7. Emission verification in a multi engine plant

A stationary engine plant can consist of multiple engine units. In plants where all the installed engines are of the same type and model, have similar operation profiles and fuel the emissions of the individual engines are expected to be similar. It should therefore be cost-effective, practical and time saving in this kind of a plant only to conduct measurements on some selected units and not on all e.g. 3 units of 6, etc. In this kind of power plant it should be logical to define the emission as an average emission of the power plant and not per individual engine.

In plants consisting of different engine types or models or engines operated on different fuel types emissions for the different engine types and fuel modes should be honoured and no plant average emission approach used.

5.8. Annex 1.1.2 (pages 14 -15) in /1/

Techniques described (reduction efficiencies, etc.) are valid only for boilers. Therefore in the header of the table, wording needs to be added "for boiler power plants" in order to avoid misunderstandings.

In document /4/ on pages 19 – 21 some stationary engine features in context with secondary abatement techniques (particulate/SO_2/NO_x abatement) were given.

Sources

/1/ "Environmental, Health, and Safety General Guidelines", published April 30, 2007. See
http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+-+General+EHS+Guidelines.pdf

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http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_thermnew_WB/$FILE/thermnew_PPAH.pdf

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Vaasa - Frankfurt/M, 2007/06/29

Johan Boij
WG Chairman

Panagiotis Daskalopoulos
Technical Manager

Annex 1A: 0.3 % LFO in a 18 MWe diesel power plant. SO_2 GLC Screening.

SO2.txt

05/11/07
10:19:46

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

18MWe
SO2
0.3%S

2x20V32 SO2

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = POINT
EMISSION RATE (G/S) = 6.40000
STACK HEIGHT (M) = 30.0000
STK INSIDE DIAM (M) = 1.7000
STK EXIT VELOCITY (M/S)= 27.4033
STK GAS EXIT TEMP (K) = 619.0000
AMBIENT AIR TEMP (K) = 293.0000
RECEPTOR HEIGHT (M) = 1.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = .0000
MIN HORIZ BLDG DIM (M) = .0000
MAX HORIZ BLDG DIM (M) = .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 62.200000 (M**3/S)

BUOY. FLUX = 102.251 M**4/S**3; MOM. FLUX = 256.815 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.1	606.7	605.74	4.82	4.81	NO
100.	.1219E-01	5	1.0	1.5	10000.0	152.27	31.95	31.55	NO
200.	.1074	5	1.0	1.5	10000.0	152.27	36.82	35.49	NO
300.	.1303	5	1.0	1.5	10000.0	152.27	38.80	36.00	NO
400.	1.642	1	3.0	3.2	960.0	221.91	99.39	79.67	NO
500.	6.651	1	3.0	3.2	960.0	221.91	120.44	112.60	NO
600.	10.72	1	3.0	3.2	960.0	221.91	140.92	160.94	NO
700.	10.68	1	3.0	3.2	960.0	221.91	160.95	219.58	NO
800.	12.07	1	1.5	1.6	480.0	413.83	203.48	303.51	NO
900.	13.71	1	1.5	1.6	480.0	413.83	219.54	379.33	NO
1000.	13.69	1	1.5	1.6	480.0	413.83	235.76	466.91	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

944.	13.85	1	1.5	1.6	480.0	413.83	226.82	417.30	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)

Page 1

ANNEX 1B: 1.0 % HFO in a 9 MWe diesel power plant. SO_2 GLC Screening.

20v32so2.txt

06/18/07
12:35:44

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

20v32, 1% S

1%S

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	10.2000
STACK HEIGHT (M)	=	30.0000
STK INSIDE DIAM (M)	=	1.2000
STK EXIT VELOCITY (M/S)	=	27.4100
STK GAS EXIT TEMP (K)	=	619.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	1.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 31.000000 (M**3/S)

BUOY. FLUX = 50.961 M**4/S**3; MOM. FLUX = 128.026 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.1	409.4	408.40	3.83	3.81	NO
100.	.9874E-02	5	1.0	1.5	10000.0	126.94	25.60	25.11	NO
200.	.1196	5	1.0	1.5	10000.0	126.94	30.04	28.39	NO
300.	3.233	1	3.0	3.2	960.0	156.13	75.50	52.92	NO
400.	16.92	1	3.0	3.2	960.0	156.13	96.96	76.62	NO
500.	28.18	1	3.0	3.2	960.0	156.13	117.74	109.72	NO
600.	28.29	1	2.5	2.7	800.0	181.36	139.74	159.90	NO
700.	31.10	1	1.0	1.1	409.4	408.40	186.78	239.16	NO
800.	39.33	1	1.0	1.1	409.4	408.40	202.65	302.95	NO
900.	40.84	1	1.0	1.1	409.4	408.40	218.77	378.88	NO
1000.	39.03	1	1.0	1.1	409.4	408.40	235.05	466.55	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

879.	40.93	1	1.0	1.1	409.4	408.40	215.53	362.75	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)

Page 1

ANNEX 2:

Comparison of Federal US EPA NAAQS and WHO global update 2005 AQs

Pollutant	Federal US EPA* (primary) microgram/m^3	WHO 2005 microgram/m^3
PM_{10}: 24-hour	150	50
Annual	-	20
$PM_{2.5}$: 24-hour	35	25
Annual	15	10
Ozone (O_3): ** 8-hour, daily maximum	157	100
NO_2: 1 year	100	40
1 hour	-	200
SO_2: 24 -hour	365	20
10-minute	-	500
Annual	80	-
CO: 8-hour	10000	-
1-hour	40000	-
Lead: Calender Quar-terly average	1.5	-

*Reference temperature 25 degree C and pressure 760 torr.
For short-term percentiles, see source /9/

** In US 1 –hour O_3-limit is stipulated only in some limited areas.
In US 8-hour ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard.