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Applicability of the Environmental Permitting (England and Wales) Regulations 2010 to the AP1000®

UKP-GW-GL-036, Revision 3

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REVISION HISTORY

Revision	Description of Changes
0	Initial Submittal
1	Complete rewrite and reformatting to incorporate responses to Technical Queries and Regulatory Observations.
2	Incorporates resizing of ancillary diesel generators described in Design Change Proposal APP-GW-GEE-1078, Rev. 0. Addresses new Westinghouse trademark guidelines.
3	Revised standby diesel generator information in section 3 to reflect latest 50 Hz vendor technical data. Updated text in section to reflect new calculated numbers. Changed reference to Technical Data Sheet for 50 Hz Engine

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LIST OF ACRONYMS

BAT	Best Available Techniques
BSFC	Brake Specific Fuel Consumption
CI	Compression Ignition
EA	Environment Agency
GDA	Generic Design Assessment
HSE	Health & Safety Executive
LHV	Lower Heat Value
NPP	Nuclear Power Plant
PPC	Pollution Prevention and Control Regulations
UK	United Kingdom
WML	Waste Management Licensing

1.0 INTRODUCTION

The UK Nuclear Regulators have developed a Generic Design Assessment process for evaluating alternative designs for the next generation of nuclear power plants to be built in the UK. Initially the Regulators will review the safety, security and environmental impact of the nuclear power plant designs against a generic site which, as far as possible, will envelop or bound the characteristics of any potential UK site.

An important issue for the regulators is whether non-nuclear activities on the Westinghouse AP1000® Nuclear Power Plant (NPP) site are required to be considered under Schedule 1 of the Environmental Permitting (England and Wales) Regulations 2010 [Reference 1].

The only non-nuclear activity identified at the AP1000 nuclear power plant as potentially falling within the definition of Schedule 1 Environmental Permitting (England and Wales) Regulations 2007 is the fossil fuel fired combustion devices – the standby diesel generators.

This report identifies the rated thermal input of the standby diesel generators on the AP1000 NPP. This is then compared against the thresholds which govern the applicability of the Environmental Permitting (England and Wales) Regulations 2007 to combustion activities.

2.0 ENVIRONMENTAL PERMITTING REGULATIONS

The Environmental Permitting (England and Wales) Regulations 2010 came into force on 10 March 2010. These regulations combine the previous Pollution Prevention and Control Regulations (PPC) and Waste Management Licensing (WML) regulations.

Schedule 1, Part 2, Chapter 1, Section 1.1 – Combustion Activities categorise the following types of installation as requiring environmental permits [Reference 1]:

Part A(1)

(a) Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

(b) Unless carried on as part of a Part A(2) or Part B activity, burning any—

(i) waste oil;

(ii) recovered oil; or

(iii) fuel manufactured from, or comprising, any other waste,

in an appliance with a rated thermal input of 3 or more megawatts, but less than 50 megawatts.

Part A(2) nil

Part B

Unless falling within Part A(1)(a) of this Section—

(a) Burning any fuel (other than a fuel mentioned in Part A(1)(b)) in—

(i) a boiler;

(ii) a furnace;

(iii) a gas turbine; or

(iv) a compression ignition engine,

with a net rated thermal input of 20 or more megawatts, but a rated thermal input of less than 50 megawatts.

(b) Burning any—

(i) waste oil;

(ii) recovered oil;

(iii) solid fuel which has been manufactured from waste by an activity involving the application of heat,

in an appliance with a rated thermal input of less than 3 megawatts.

(c) Burning fuel manufactured from or including waste (other than a fuel mentioned in paragraph (b)) in any appliance with a net rated thermal input of 0.4 or more megawatts, but a rated thermal input of less than 3 megawatts—

(i) which is used together with other appliances which each have a rated thermal input of less than 3 megawatts; and

(ii) where the aggregate net rated thermal input of all the appliances is at least 0.4 megawatts.

3.0 COMBUSTION ACTIVITIES ON AN AP1000 NPP

There are four diesel generators on the AP1000 plant:

- Two ancillary diesel generators, output rated at 80 kW (on a 50 Hz plant)
- Two on-site standby diesel generators, output rated at 5200 kW (on a 50 Hz plant)

The standby diesel generators are assumed to conform to the Caterpillar Marine Auxiliary & Diesel Electric Propulsion Generator Set C280-16 engine specifications [Reference 2]. From this specification the thermal rated input of the generators may be calculated, as described in Section 3.1.

The ancillary generators are rated at approximately 2 percent of the power of the standby generators. The contribution of these generators to the overall thermal rated input will be minimal, and thus they have not been considered further in this assessment.

3.1 Thermal Rated Input of the Standby Diesel Generators

The thermal rated input of the standby diesel generators may be calculated using the specification of the Caterpillar C280-16 Marine Auxiliary & Diesel Electric Propulsion Generator Set, as listed in Table 3-1.

The thermal rated input power may be calculated using the following equation:

$$\text{Input Power} = \frac{1}{3600}\left(\text{Output Power} \times \text{BSFC} \times \frac{\text{LHV}}{1000}\right)$$

From this, the thermal rated input power range for a single generator is calculated to be 10.1-12.8 bMW, as shown below:

$$\textit{Maximum Input Power} = \frac{1}{3600}\left(5420 \times 198 \times \frac{42780}{1000}\right)$$
$$= 12753\ bkW$$

$$\textit{Minimum Input Power} = \frac{1}{3600}\left(4065 \times 210 \times \frac{42780}{1000}\right)$$
$$= 10144\ bkW$$

This equates to an engine thermal efficiency between 40-42%.

3.2 Applicability of Environmental Regulations to an AP1000 NPP

The environmental regulations that apply to the four-stroke compression injection standby diesel generators are:

- Part A(1) (a) Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

- Part B (a) Burning any fuel in a compression ignition engine, with a net rated thermal input of 20 or more megawatts, but a rated thermal input of less than 50 megawatts.

The regulations for Part A(1) require that where more than one appliance is operated on the same site, and can be used at the same time, the thermal rated input is defined by the aggregate of the individual appliances. This includes all appliances, as well as those designated as standby plant. The aggregated maximum thermal rated input of the two standby generators is 25.5 MW, which is below the 50 MW threshold for a Part A(1) combustion process.

The maximum thermal rated input of an individual generator is 12.8 MW, which is below the 20 MW threshold for a Part B combustion process. Therefore at the current specification, the standby generators do not need to be permitted as fossil fuel fired combustion devices under Part B of the of the Environmental Permitting (England and Wales) Regulations 2010.

Table 3-1

STANDBY DIESEL GENERATOR SPECIFICATIONS

Range	Minimum Power	Maximum Power
Speed (rpm)	1000 rpm, Continuous Service	1000 rpm, Maximum Continuous
Output Power (bkW)	4065	5420
Specific Fuel Consumption, BSFC (g/bkW-h)	210	198
Lower Heat Value, LHV(kJ/kg)	42780	42780

4.0 SUMMARY AND CONCLUSIONS

There are four diesel generators on the AP1000 plant:

- Two ancillary diesel generators, output rated at 80 kW (on a 50 Hz plant)
- Two on-site standby diesel generators, output rated at 5200 kW (on a 50 Hz plant)

The ancillary generators are rated at approximately two percent of the power of the standby generators, and so were not considered for further assessment.

The aggregated maximum thermal rated input of the two standby generators is 25.5 MW, which is below the 50 MW threshold for a Part A(1) combustion process. The maximum thermal rated input of an individual generator is 12.8 MW, which is below the 20 MW threshold for a Part B combustion process.

Therefore at the current specification, the standby generators do not need to be permitted as fossil fuel fired combustion devices under Part A(1) or Part B of the of the Environmental Permitting (England and Wales) Regulations 2010.

5.0 REFERENCES

1. The Environmental Permitting (England and Wales) Regulations 2010, 2010 No. 675.

2. CATERPILLAR; C280-16 Marine Auxiliary & Diesel Electric Propulsion; Spec Sheet LEHM7118-00.