



# The R1 criterion

challenges, climate factor and  
legal projections



# Achieving energy recovery status for **efficient** Waste-to-Energy Plants

Waste Framework Directive, Art. 3(15):

‘recovery’ means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfill a particular function, or waste being prepared to fulfill that function, in the plant or in the wider economy.

Annex II sets out a non-exhaustive list of recovery operations

Annex II R 1 ‘Use principally as a fuel or other means to generate energy’  
This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above:

**0.60 for plants permitted before 1.1.2009**

**0.65 for plants permitted after 31.12.2008**


# Impacts of 'R1 energy recovery status'

## Waste hierarchy:

- ▶ Efficient WtE plants are higher up the hierarchy than landfilling.
- ▶ Level playing field with co-incinerating industry (e.g. cement kilns) which was already considered as 'energy recovery' (European Court of Justice).
- ✓ Public acceptance – building awareness of energy recovery from waste through the improvement of energy efficiency

# R1 Formula

Multiplication factors for heat - 1.1 - and electricity - 2.6 - production compare produced heat and electricity to primary fuels

$$\text{Energy Efficiency} = \frac{E_p - (E_f + E_i)}{0,97 \cdot (E_w + E_f)}$$


More favourable to heat than electricity

# Climate Impacts

WFD - Article 38 “Interpretation and adaptation to technical progress” states:

1. *“[...] If necessary, the application of the formula for incineration facilities referred to in Annex II, R1, shall be specified. Local climatic conditions may be taken into account, such as the severity of the cold and the need for heating insofar as they influence the amounts of energy that can technically be used or produced in the form of electricity, heating, cooling or processing steam. [...]”*

# Climate Impacts

A warm climate influences the R1 performance of a WtE plant in two ways:

1

it decreases  
electricity  
production  
efficiency

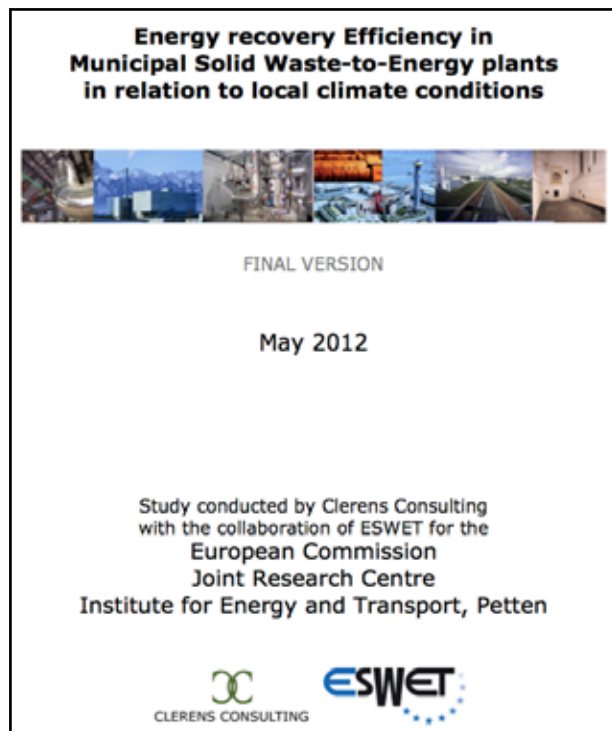
2

it limits  
the heat  
demand

Statistical evidence of R1 value dependency on local conditions was provided by the 3rd CEWEP Energy Efficiency Report

# Climate Impacts -2012 Climate Factor Study

To address this issue in more details the JRC commissioned a study to Clerens Consulting



Investigate the impact of climate on the production and use of energy and assess the opportunity to introduce a climate correction factor

# Climate Impacts -2012 Climate Factor Study

## General results

1

it decreases  
electricity  
production  
efficiency

2

it limits  
the heat  
demand



# Climate Impacts -2012 Climate Factor Study

## 1 Electricity

The warmer the air, the lower the electrical efficiency

Temperature-Efficiency correlation possible with hour-by-hour air temperature values

HDD-Efficiency correlation also accurate and uses widely available data

## 2 Heating

R1 performance depends mainly on a plant ability to export heat

This ability is strictly connected to the existence of District Heating or Industrial heat demand

EU zones where District Heating is widely spread, sparse or virtually inexistent can be identified with HDD values

The base for the correction can be found in a ratio between efficiencies associated to BAT options from BREF WI

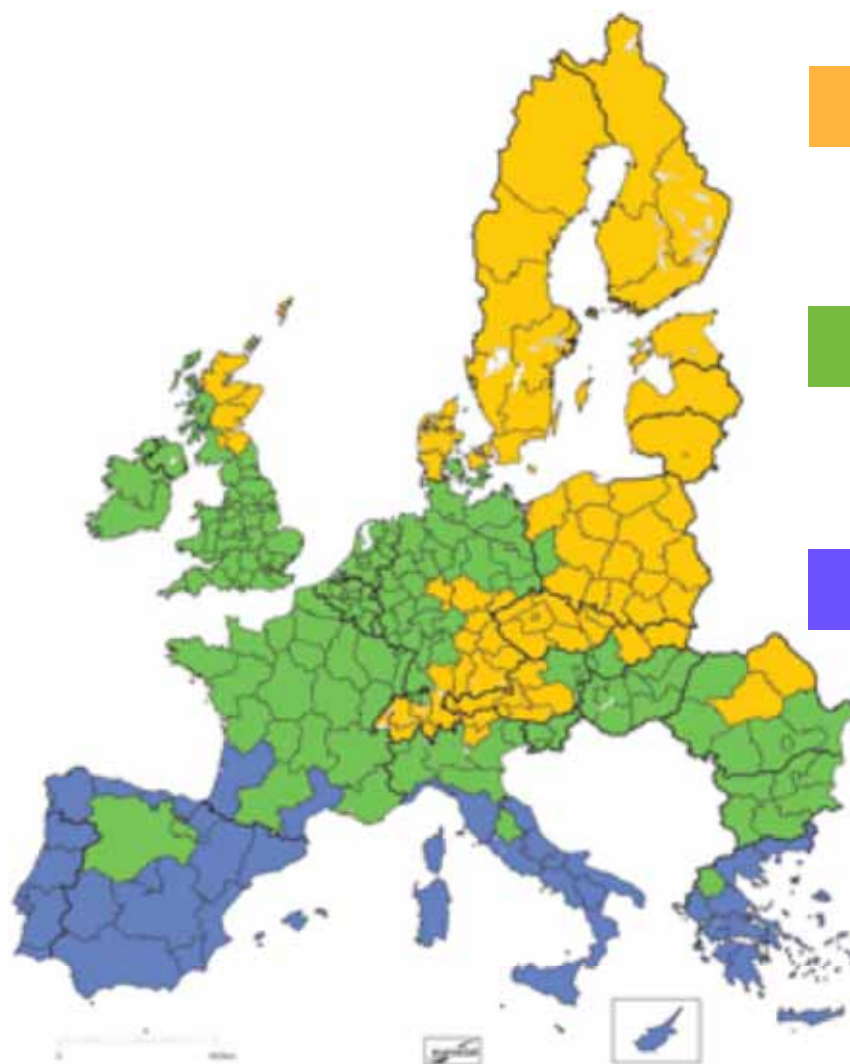
## 3 Cooling

Cooling demand is short - around 3 months per year

District Cooling network attractive when there is parallel demand for heat

Not taken into account for the correction

# Climate Impacts -2012 Climate Factor Study



HDDs > 3350 - cold climate, well developed District Heating network



2150 < HDDs < 3350 - moderate climate, heating demand limited both in quantity and time



HDDs < 2150 - warm climate, low heating demand

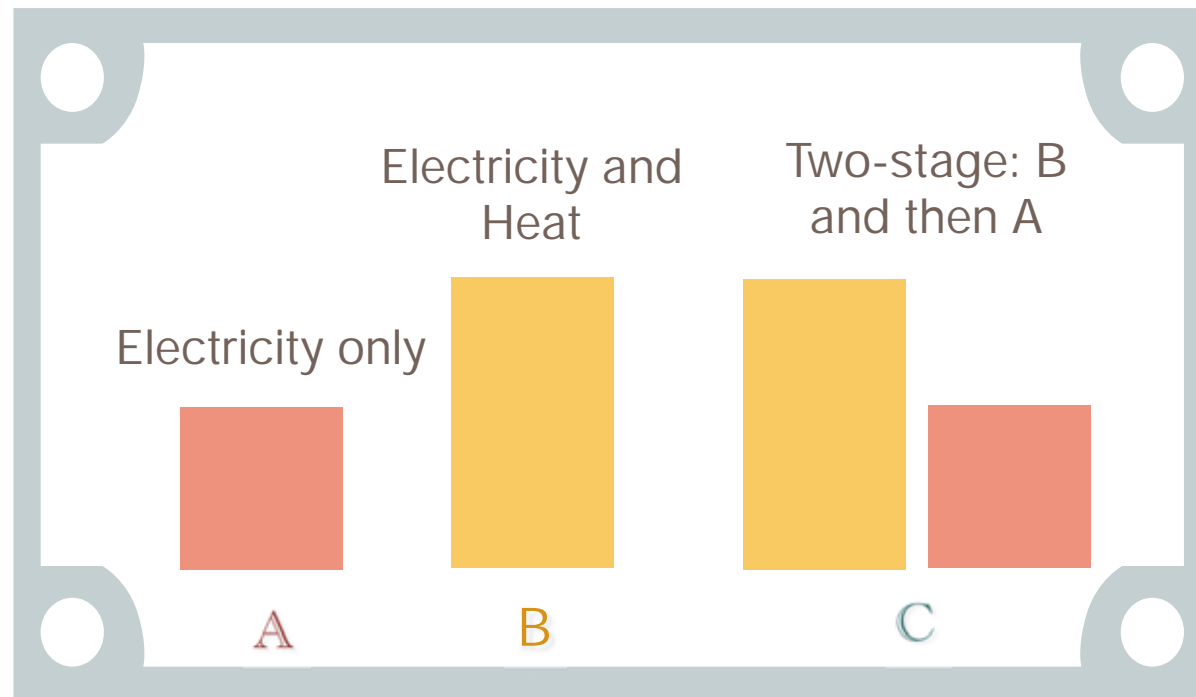
# Proposals for a Climate Correction Factor

## THE RATIONALE

<p>Climate is a factor influencing the potential R1 value of a WtE Plant</p> <p>Uneven playing field at EU level shown by technical and statistical data.</p>	<p>The correlation between the correction and the HDD is a correct approach to determine which regions should benefit from the correction</p>	<p>Considering that landfill diversion is of utmost importance, waste should be used as a resource, moving higher up the hierarchy (i.e. from landfills to R1 WtE plants)</p>	<p>The factor should compensate for lower electricity produced but also for lack of heat demand.</p> <p>Nevertheless, it should be appropriate and fair, avoid the impression of a “free ride” and provide incentive to improve efficiency</p>
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# Proposals for a Climate Correction Factor

Climate Correction Factor to be discussed through comitology process.  
TAC meeting July 2012 - 3 options:



# Proposals for a Climate Correction Factor

- A - addresses the climatic impact on electricity production only through a linear function without a fixed threshold. The highest correction is reached in a theoretical place with  $HDD = 0$

$$CCF = \begin{cases} 1, & \text{if } HDD_{longtermlocal} > 3350 \\ 1.1105 - 32.97 \cdot HDD_{longtermlocal}, & \text{if } HDD_{longtermlocal} < 3350 \end{cases}$$

$CCF_{max}$  for Europe = 1.05

# Proposals for a Climate Correction Factor

**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand on these basis:

should not offset completely the handicap of plants generating electricity

should have a ceiling at 2150 HDD, corresponding to where there are no District Heating networks

should be progressive to incentivise District Heating development

should start where the heat demand does not justify giving priority to heat supply, i.e.  $HDD < 3350$



combine the numerous impacts identified in order to build a global climate factor addressing all of them together

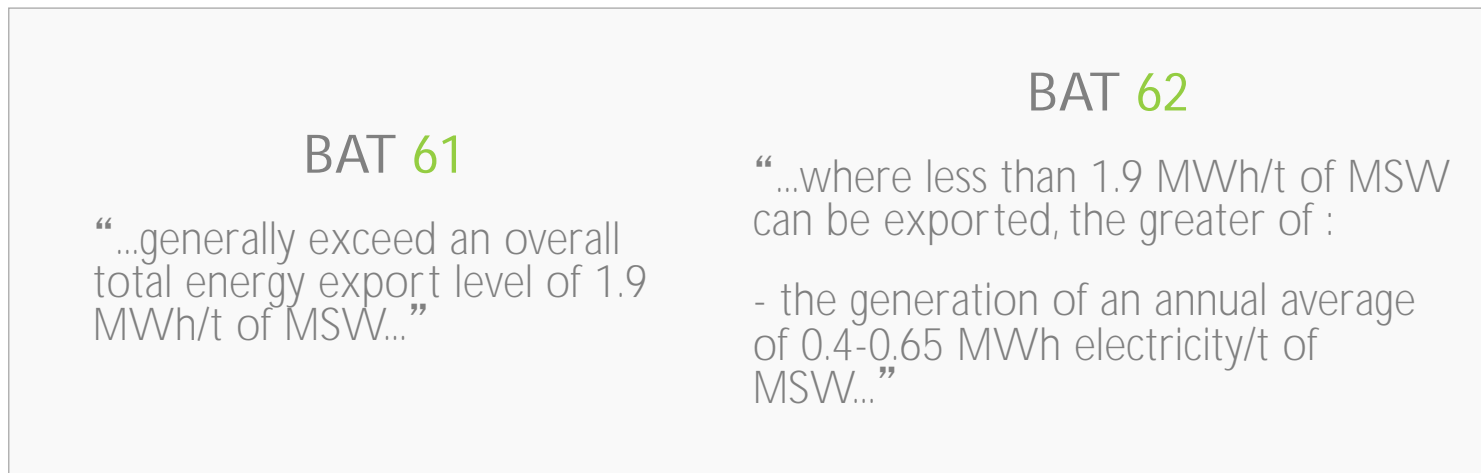


refer to the findings of the Waste-Incineration BREF as summarised in its BATs 61 and 62

# Proposals for a Climate Correction Factor

**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand

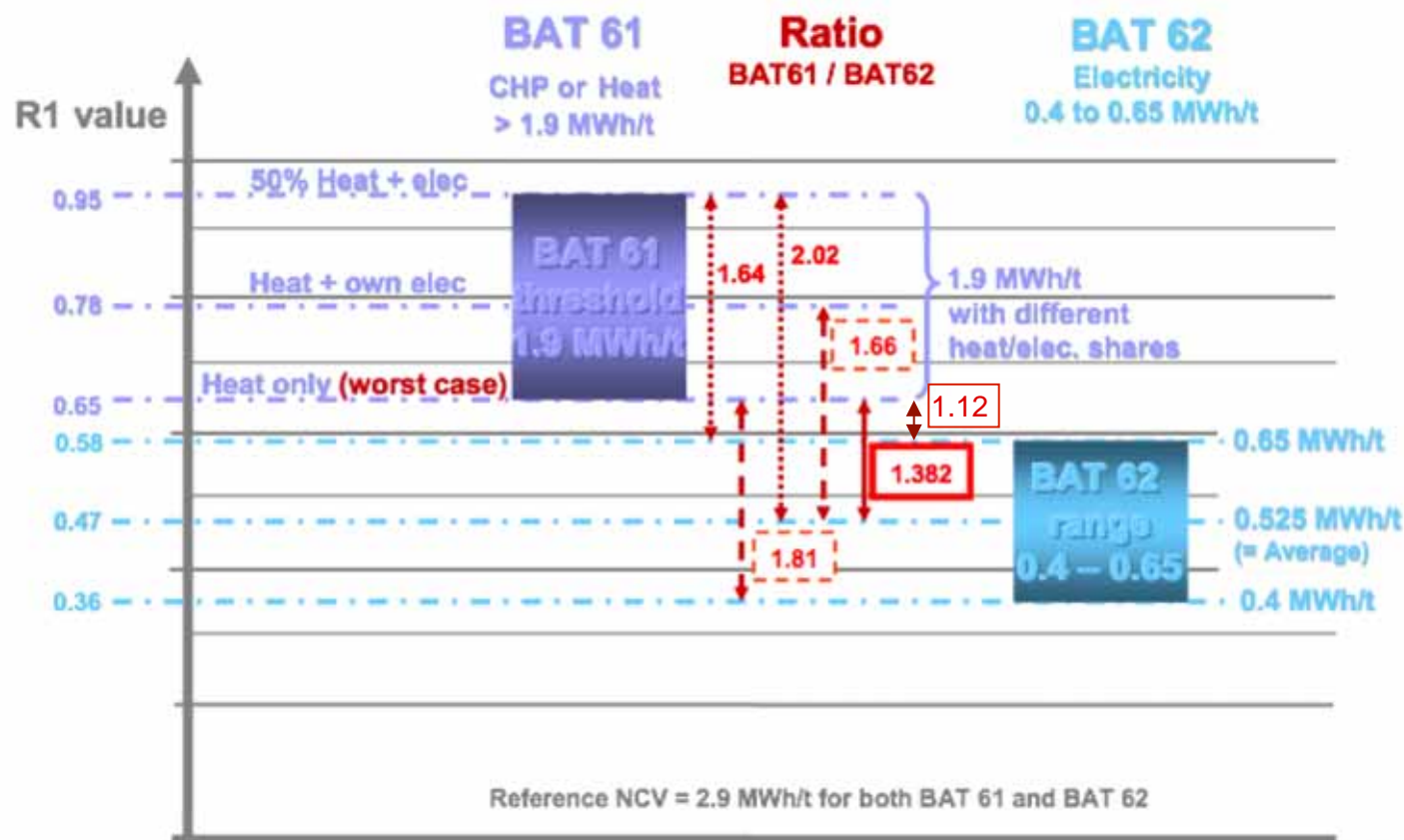
WFD - ANNEX II: R1 IN ACCORDANCE WITH BREF WI



it is possible to link R1 values to BAT61 and BAT62 performances

# Proposals for a Climate Correction Factor

**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand

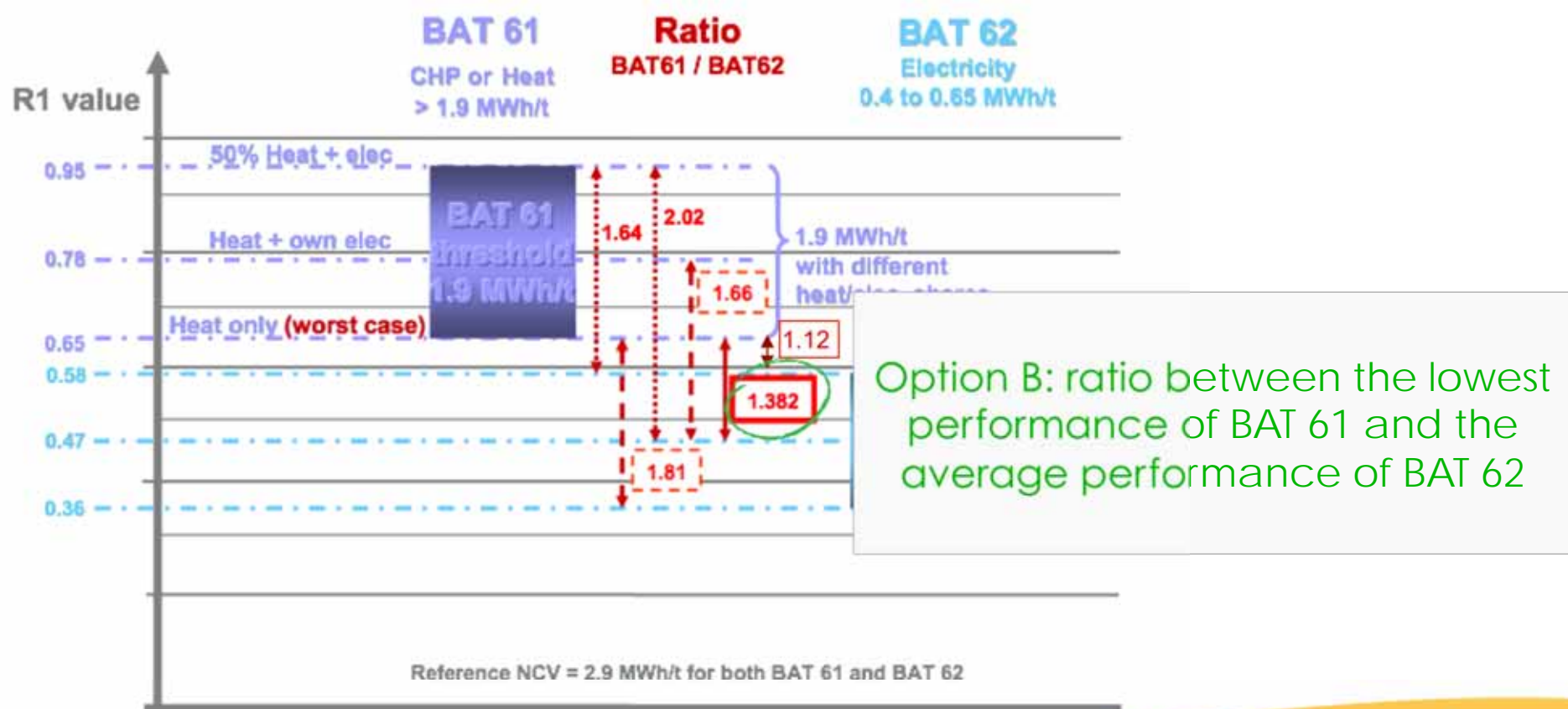


CCF<sub>max</sub> built on the ratio between BAT 61 and BAT 62



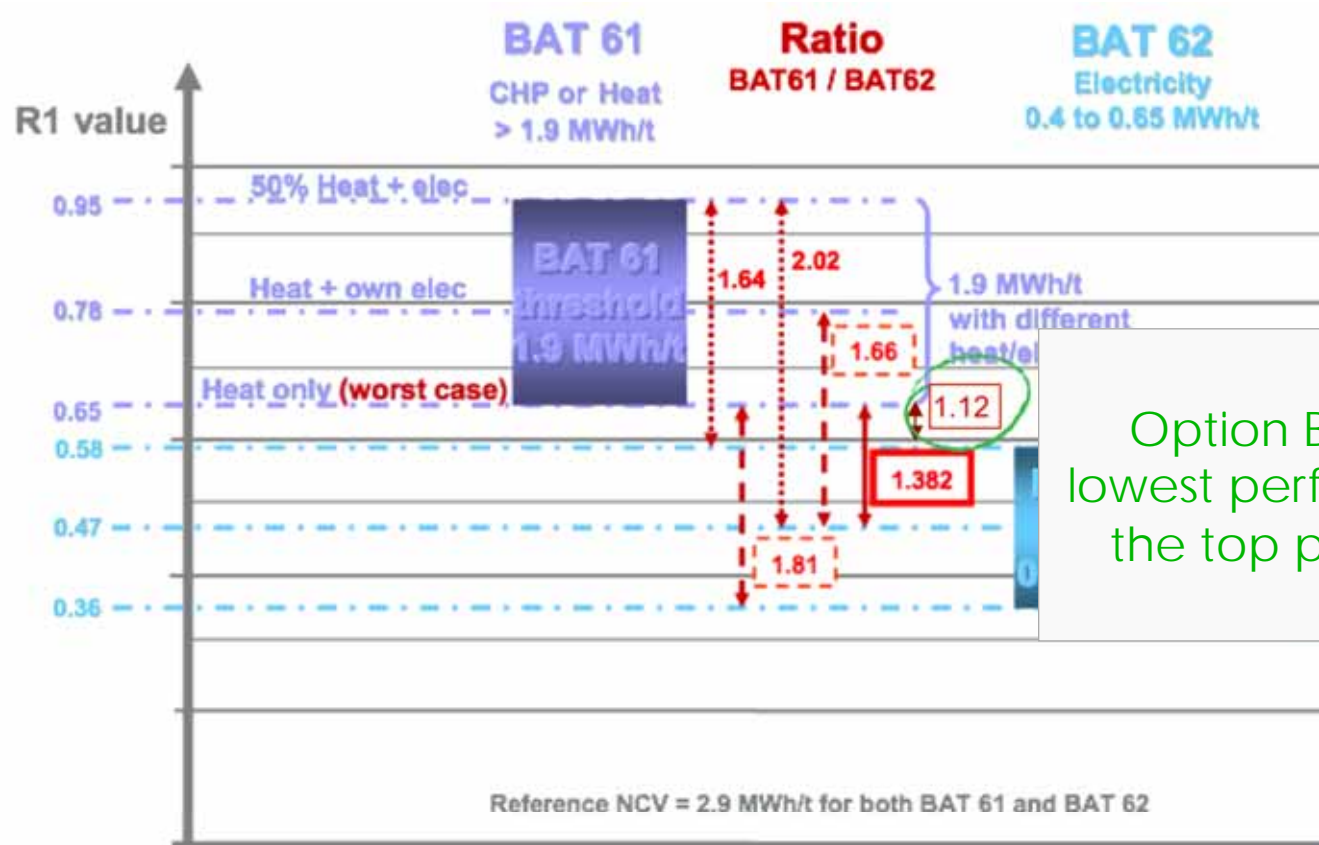
# Proposals for a Climate Correction Factor

**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand



# Proposals for a Climate Correction Factor

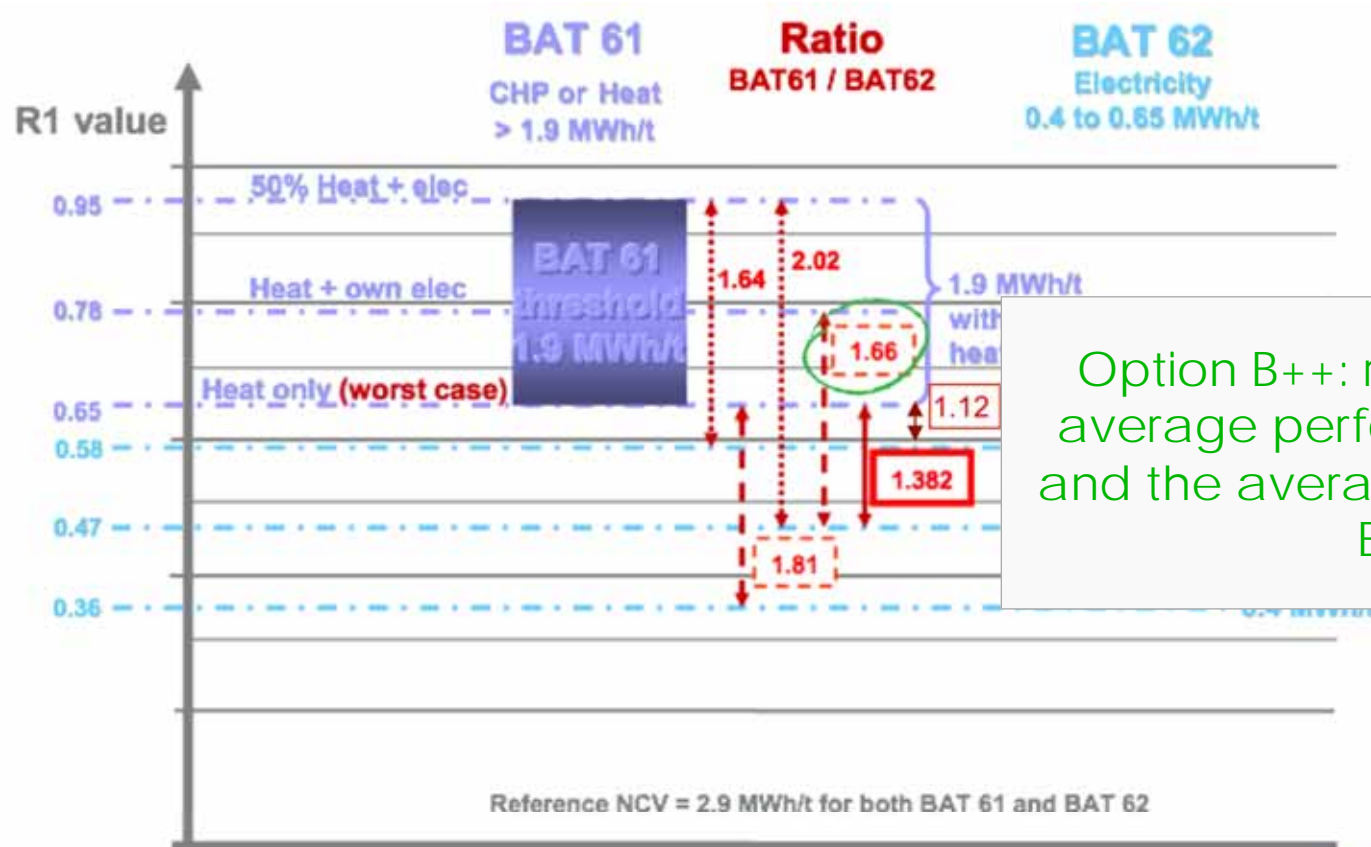
**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand



Option B+: ratio between the lowest performance of BAT 61 and the top performance of BAT 62

# Proposals for a Climate Correction Factor

**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand

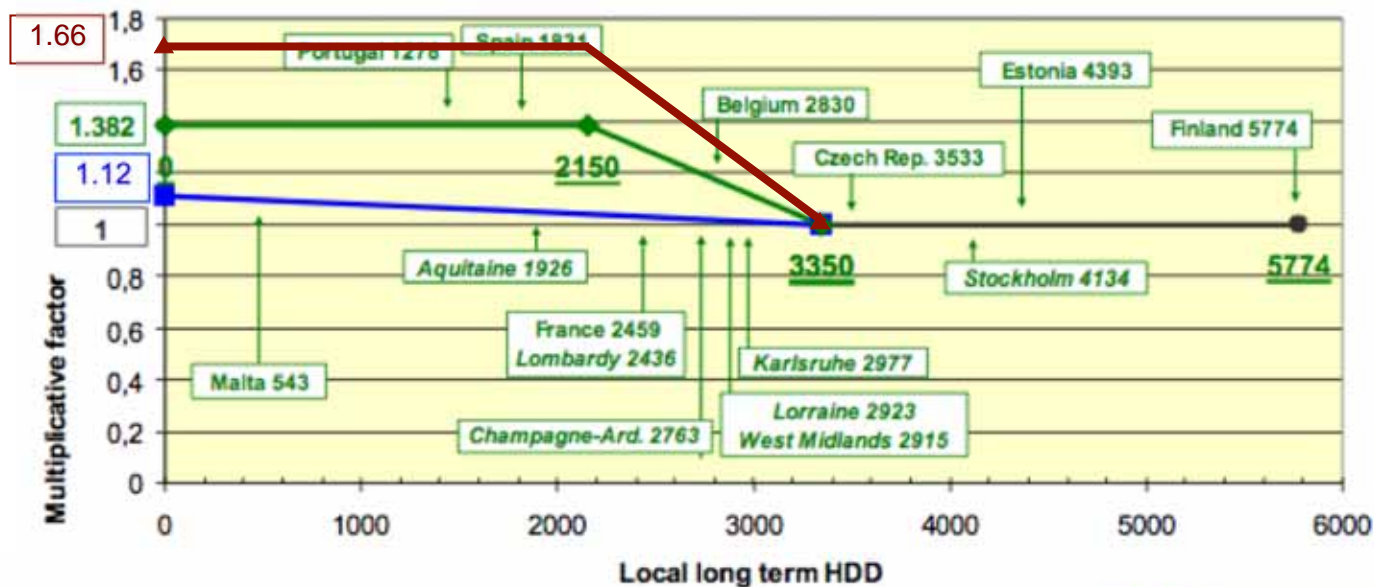


Option B++: ratio between the average performance of BAT 61 and the average performance of BAT 62

# Proposals for a Climate Correction Factor

**B** - cumulates the climatic impact on the electricity production as well as the impact on production and heat demand

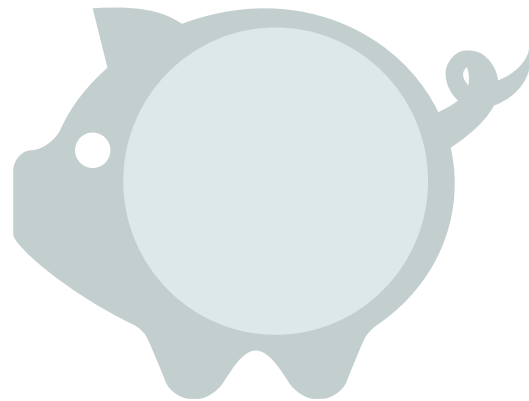
The ratio is used as the maximum factor used when HDD < 2150 and then it is gradually reduced to 1 as HDDs increase from 2150 to 3350



Source: *Climate Factor study*, 2012

# Proposals for a Climate Correction Factor

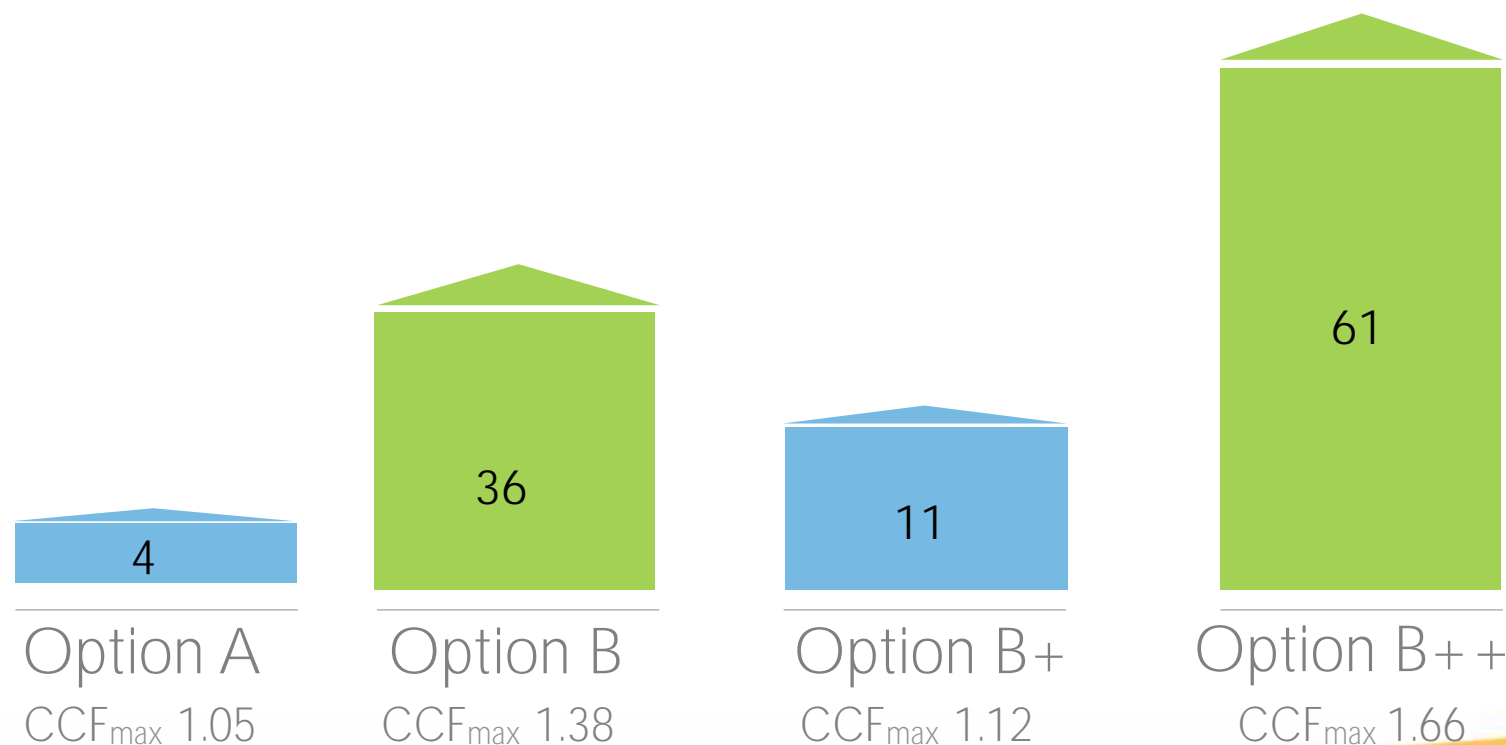
- C - two-stage process: option B for a period of time (to be determined) with a phase-out clause leading to the eventual application of option A



# Climate Correction Factor Options CEWEP Impact Assessment

To assess the impact, the four options have been applied to the Southern and Central EU28 WtE plants that have delivered data for CEWEP Energy Efficiency Report III.

Additional number of plants achieving R1 in EU28



Data refer to year 2010 and operational years 2007-2010 for the R1 calculations.



# Thank You.

Questions?

For more information on Waste-to-Energy

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