Bill Courtney responds to BEIS assessment of Latent Power Turbines
BEIS REF: TOSL2021/19152
(Your report dated August 2021)

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Introduction

The assessment of Latent Power Turbines by engineers working for the Department of for Business, Energy & Industrial Strategy (BEIS) contains several errors and as a result has come to the wrong conclusion.

However, to be fair to the BEIS experts, the Latent Power Turbine concept is counter-intuitive.
So it is quite common for such errors to been made.
Past presentations made by West and Courtney shows that even highly skilled engineers experience great difficulty coming to terms with the concept of thermal energy from ambient air acting as fuel for cool running heat engines.
Consequently they spend their time trying to discover some clues that they can use to convince themselves that the invention will not work. Eventually, they misread the information and find clues where they do not exist.
In the present case, these false clues are identified in **Sections 1, 2** and **4** below.

The BEIS analysis begins,

"Dear Bill Courtney,

Thank you for your email of 28 July to Alok Sharma about your invention called the latent power turbine. Your email and your attached paper on 'the doublethink science of heat engines' was transferred to ***the Department for Business, Energy & Industrial Strategy (BEIS)*** for a response because energy innovation falls within its remit. I have been asked to reply.

Your email and paper were forwarded to our technical energy specialist team who provide engineering advice to the department."

1 The first misleading BEIS statement

BEIS continue,

"They advise that whereas from the Second Law of Thermodynamics you can extract heat from any system that involves an increase in entropy, this does not mean that such a system will be practical for power generation. In your invention, the change in entropy is caused by restricting the flow of a gas and is very small and consequently the change in temperature achieved is small. The heat extracted comes ultimately from the conduction of heat from the ambient air outside the pipe which needs to penetrate through the pipe walls at a rate which is proportional to the temperature gradient. When considering your concept as a cooling or heating device, this makes it very inefficient."

Courtney responds
There are in fact two distinctly different causes for the change in temperature, but the BEIS analysis only makes reference to the less significant of the two. That is the one "caused by restricting the flow of a gas."
The far more critical one, which is caused by the air doing external work as it transits the turbine, is not referred to.
By omitting critical information the reader is misled.

Figure 17 in the paper sent to Mr Sharma includes the critical information BEIS have omitted.

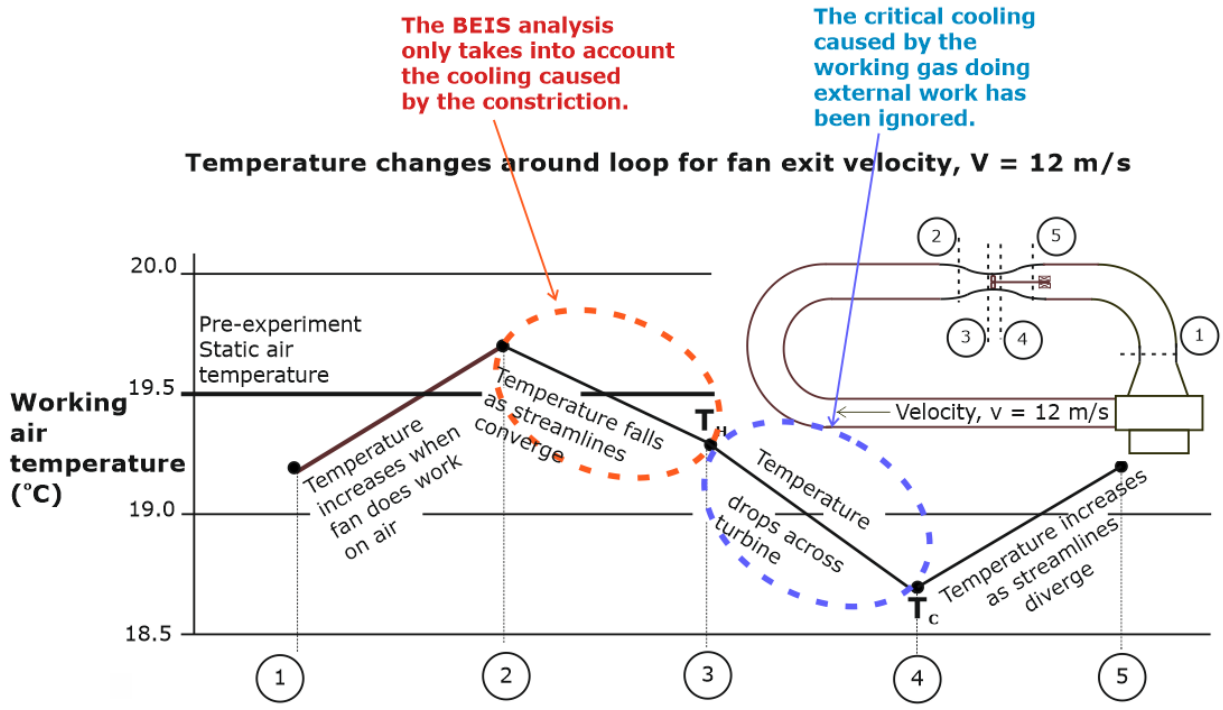

Figure 1. This is an annotated version of Figure 17 in 'The doublethink science of heat engines'.

2 The second misleading BEIS statement

BEIS wrote,
"Looking at your design, we do not believe it will be feasible to extract heat at a fast enough rate to overcome the losses in the system and the power to drive the circulating fan."

Courtney responds
BEIS has made two mistakes here.

(i) They have failed to take into account the critical role played by the temperature drop across the turbine.

(ii) But even if this mistake is tolerated, their statement "we do not believe it will be feasible to extract heat at a fast enough rate to ..." is still wrong because this is a closed loop system and therefore includes feedback.
Thus: if heat does not flow fast enough through the conduit walls, then the circulating gas will be forced to cool, increasing the temperature gradient. This in turn increases the rate of heat flow.

Here is the correct explanation in more detail.
During the first transit of air through the turbine, the BEIS statement is almost certainly correct. But stabilising feedback soon corrects this.
If the rate of heat flow through the conduit walls is insufficient to restore the air to its original temperature before making a transit, then its temperature must fall. It will then continue to fall on successive transits. But this gradual fall in temperature also produces a corresponding increase in temperature gradient across the conduit walls.
After a few transits, a state of dynamic equilibrium is established where

Rate of cooling caused by the air doing work = Rate of heat flow through the conduit walls

Thus, when the BEIS try to discredit Latent Power Turbines by stating "we do not believe it will be feasible to extract heat at a fast enough rate", they are defying the laws of thermodynamics.

Latent Power Turbines provide an extremely stable form of feedback, with the temperature of the working gas rising and falling in harmony with the external temperature.
Consequently they will operate anywhere on the globe from Siberia to the Equator (provided de-icing systems are added).

To be fair to the BEIS experts, their misunderstanding is not surprising because it has its roots in two very old teaching errors.
As explained in Section 3 of the paper sent to Mr Sharma, the term '*heat engine*' is misleading and has led generations of scientists and engineers to confuse the roles of '*heat*' and '*internal energy*.'
Then, in Section 4 of the same paper, an error in the teaching on gas flow through constrictions is discussed.
All of the manufactured heat engines that are contributing to global warming are open loop systems, so engineers do not receive any training in thinking about closed loop systems. Consequently, the above type of mistake is common when Latent Power Turbines are encountered for the first time.

3 The third misleading BEIS statement

BEIS wrote,
".. this concept is a perpetual energy machine"

Courtney responds
When the BEIS experts labelled the Latent Power Turbine as "a perpetual energy machine" they created a useful dismissive sound bite for a busy COP26 President.

But, if the sound bite backfires, they risk making Mr Sharma the laughingstock of the conference.

In the case of Latent Power Turbines, this label builds on the false evidence discussed in Sections 1 and 2 above.

To date, over 200 copies of the Sharma letter have been sent to potential attendees at the COP26 conference. The letter has also been published online.
The readers of 'my' letter are not stupid. Some of them will spot the falsehood of the "perpetual energy machine" gibe. This could be awkward for any BEIS engineers at the conference who try to defend it.

4 The fourth misleading BEIS statement

BEIS wrote,
^We note that you are looking for funding to develop a more efficient turbine, but we do not believe that this will make this concept work."

Courtney responds
This statement is false and sows confusion about the future of Latent Power Turbines.

In the **Conclusion** section of 'The doublethink science of heat engines' Courtney wrote,

> "West and Courtney would up their company Latent Power Turbines Ltd in 2020, gave away their Mk 2 Latent Power Turbine test rig and abandoned their intellectual property portfolio."

So, there is no honest reason why Courtney should still be seeking funding from the British government or elsewhere.
The BEIS engineers are not the first to fall into this type of perception trap. On several occasions West and Courtney have encountered people who have subconsciously created false evidence to fit in with their preconceived belief that '*Latent Power Turbines will not work*.'

The truth is entirely different and CIP26 attendees should be made aware of it.

The Latent Power Turbine designs have now been declared as open source technology. This means that any party attending the COP26 conference, or indeed, anyone else, is free to exploit the technology without paying Courtney a royalty.

Using the Sharma letter as a hook, Courtney is spelling out this opportunity in the letters he is sending.

It would be a tragedy if a false message about Courtney still trying to develop Latent Power Turbines discouraged bright young innovators from entering the field.

As a patriotic Brit, Courtney would have preferred Latent Power Turbines to be developed in Britain. But as explained in the paper sent to Sharma, the UK has blown several opportunities to take the lead in their development.

The following diagram summarises the opportunities lost.

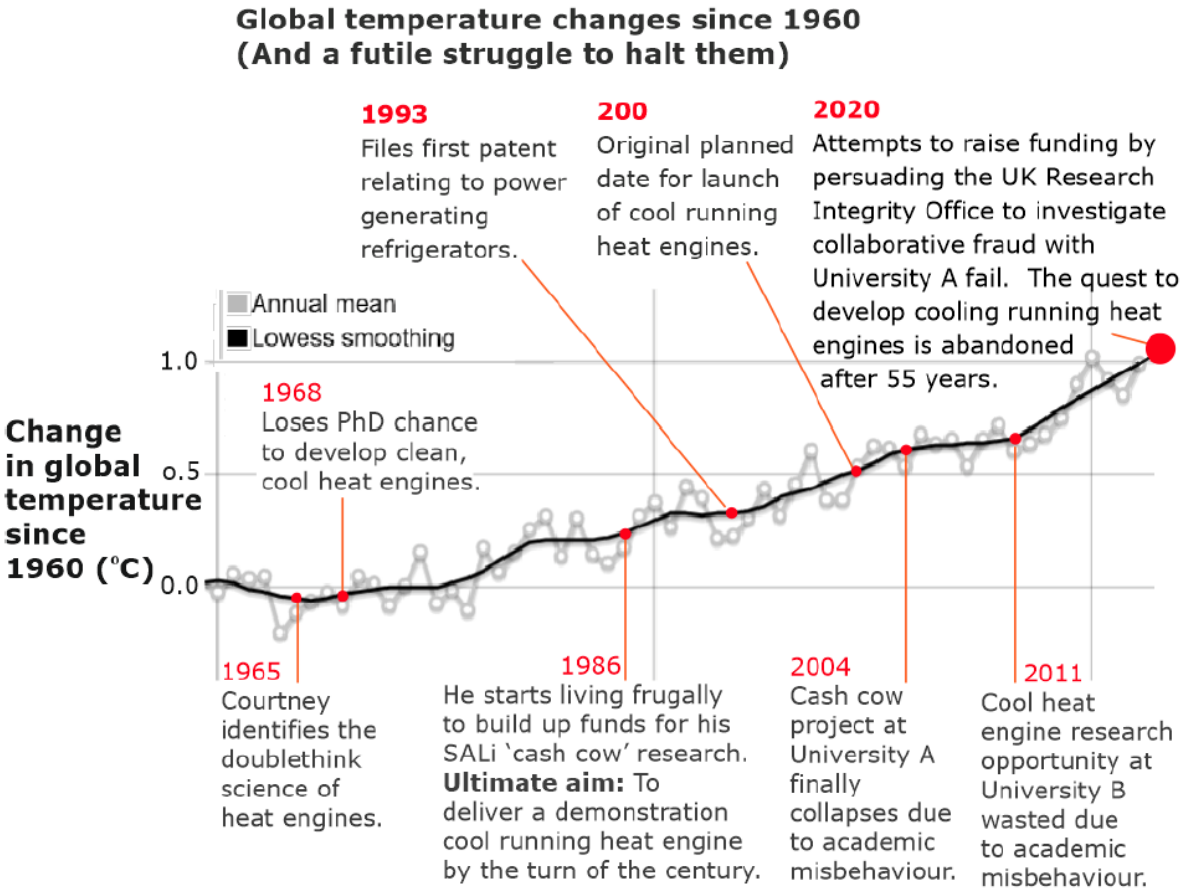

Figure 2. This is Figure 20 from the paper. It illustrates graphically how unprofessional behaviour within British science may have aggravated the climate change crisis.

5 The fifth misleading BEIS statement

BEIS wrote,

"Finally, we should mention that the earth's atmosphere is not a 100% efficient heat engine. The climate system converts the energy the earth receives from the sun into work – the meteorological processes that drive the weather systems. The Carnot efficiency of the process is roughly 30%, but in reality is much lower than this due to irreversible processes in the system."

Courtney responds

This 30% efficiency statement provides a good example of the doublethink science that has handicapped heat engine design since Mid-Victorian times.

Feeding upper and lower atmospheric temperature values into the Carnot equation may well come up with a Carnot efficiency of 30%. But this raises the question, '*Where does the residual 70% of the heat go?*'

A comparison between manufactured and natural heat engines tells us that something is wrong.

In most cases, manufactured heat engines dump their rejected heat into the atmosphere.
But the Earth does not have a spare atmosphere where it can dump heat rejected by natural heat engines.

So it has to go back into the same atmosphere that it came from.
It is impossible to separate out the air molecules that have just left a natural heat from those that are about to enter one. This means the rejected heat must be recycled.

We can consider this conundrum another way.

The Earth's atmosphere cannot be treated as a giant heat engine because it is an assembly of a huge number of interacting microscopic heat engines, each only involving a few molecules.
There are only three possibilities for this assembly to deal with its rejected heat.

(i) The rejected heat flows into the ground.
(ii) The rejected heat is radiated into space.
(iii) The heat stays within the atmosphere and is recycle

The Earth must remain in a state of radiation balance if its temperature is to remain stable.

Thus, in the steady state,

Rate of thermal radiation received from the sun = Rate of thermal radiation emitted by Earth

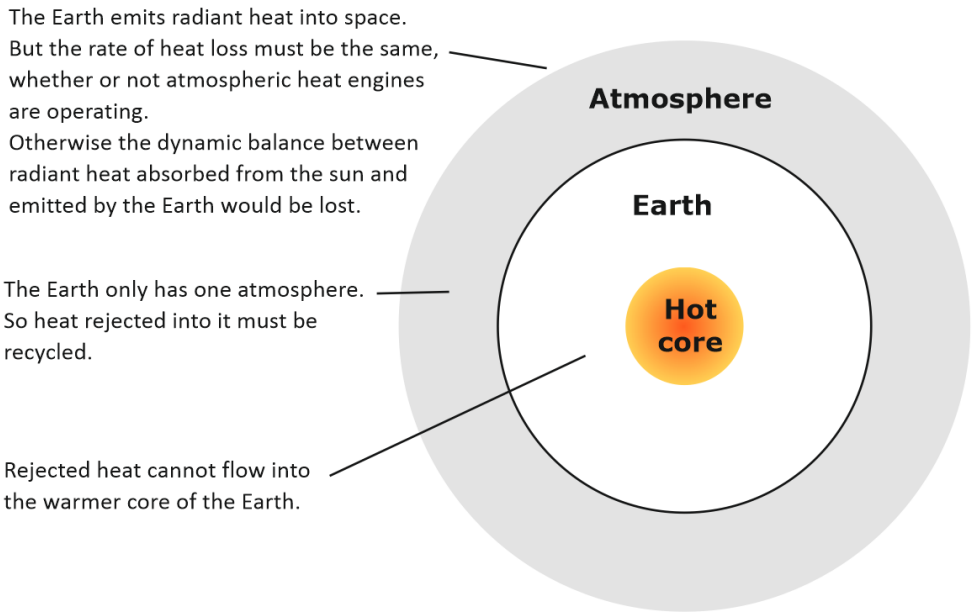

Figure 3. The Earth's atmosphere can be considered as a very large assembly of micro- heat engines. Each individual heat engine must obey the Carnot equation. But there is nowhere for the rejected heat from the heat engines to go, apart from back into the atmosphere it comes from. So, somehow, the assembly of heat engines must be able to tend towards 100% efficiency without violating the laws of thermodynamics.

It may be tempting to think that the atmospheric heat engines dump their waste heat into space as radiation.
But a thought experiment can be used to falsify this option.

Consider an atmosphere in which all atmospheric heat engine activities are temporarily suspended.

1 The atmosphere would not be doing any external work, so its temperature would rise.
2. This would cause an increase in radiant heat losses into space, because the radiation emissions from a body are proportional to its Kelvin temperature raised to the fourth power.
3. This would result in the Earth losing heat at a greater rate than it is receiving heat from the sun.
4. In order to regain its state of thermal balance, the atmospheric temperature would need to fall to that when all the atrophic heat engines were operating.

This means that the radiant heat losses from the atmosphere are the same, whether or not the atmospheric heat engines are running.
In other words, atmospheric heat engine action does not result in any additional heat being radiated into space.

Therefore, with no thermal energy losses from the atmosphere, the assembly of atmospheric heat engines must tend towards 100% efficiency.

A closed loop version of the flow lines in Figure 7, in the paper sent to Mr Sharma explains how a cool running heat engine can both have a low Carnot efficiency and yet tend towards 100% efficiency.

Conclusion
Climate change is currently the greatest threat to humanity, with 99.2% of the victims living outside the UK.

So the British Presidency is under great pressure to come up with viable solutions.

In principle, Latent Power Turbines could provide the key. But the errors in the BEIS assessment, place this opportunity in jeopardy.

A reassessment of their value, taking into account the observation made in this document is required.

Based on past experiences of making live presentations, it requires a fairly intensive session of debate before the concept starts to gain credibility. And in the present case, this opportunity for debate has not been available.

A copy of this document will be added to the existing online copy of the letter to Mr Sharma at
The COP26 Climate Conference and Latent Power Turbines

Bill Courtney

***BELOW:* the complete BEIS assessment of Latent Power Turbines**

Dear Bill Courtney,

Thank you for your email of 28 July to Alok Sharma about your invention called the latent power turbine. Your email and your attached paper on 'the doublethink science of heat engines' was transferred to the Department for Business, Energy & Industrial Strategy (BEIS) for a response because energy innovation falls within its remit. I have been asked to reply.

Your email and paper were forwarded to our technical energy specialist team who provide engineering advice to the department. They advise that whereas from the Second Law of Thermodynamics you can extract heat from any system that involves an increase in entropy, this does not mean that such a system will be practical for power generation. In your invention, the change in entropy is caused by restricting the flow of a gas and is very small and consequently the change in temperature achieved is small. The heat extracted comes ultimately from the conduction of heat from the ambient air outside the pipe which needs to penetrate through the pipe walls at a rate which is proportional to the temperature gradient. When considering your concept as a cooling or heating device, this makes it very inefficient.

Turning to this concept being used for electricity generation, looking at your design, we do not believe it will be feasible to extract heat at a fast enough rate to overcome the losses in the system and the power to drive the circulating fan. We note that you are looking for funding to develop a more efficient turbine, but we do not believe that this will make this concept work either as a power generator as fundamentally, when used for power generation and not cooling, this concept is a perpetual energy machine. It is for these reasons, that practical existing heat pumps extracting heat energy from ambient air all use a phase change to increase the entropy difference achieved and use the power extracted as heat and do not convert the heat back to electricity (when by thermodynamic principles, the electricity they generate would be less than the electricity needed to drive the compressor).

Finally, we should mention that the earth's atmosphere is not a 100% efficient heat engine. The climate system converts the energy the earth receives from the sun into work – the meteorological processes that drive the weather systems. The Carnot efficiency of the process is roughly 30%, but in reality is much lower than this due to irreversible processes in the system.

Yours sincerely,

BEIS CORRESPONDENCE UNIT