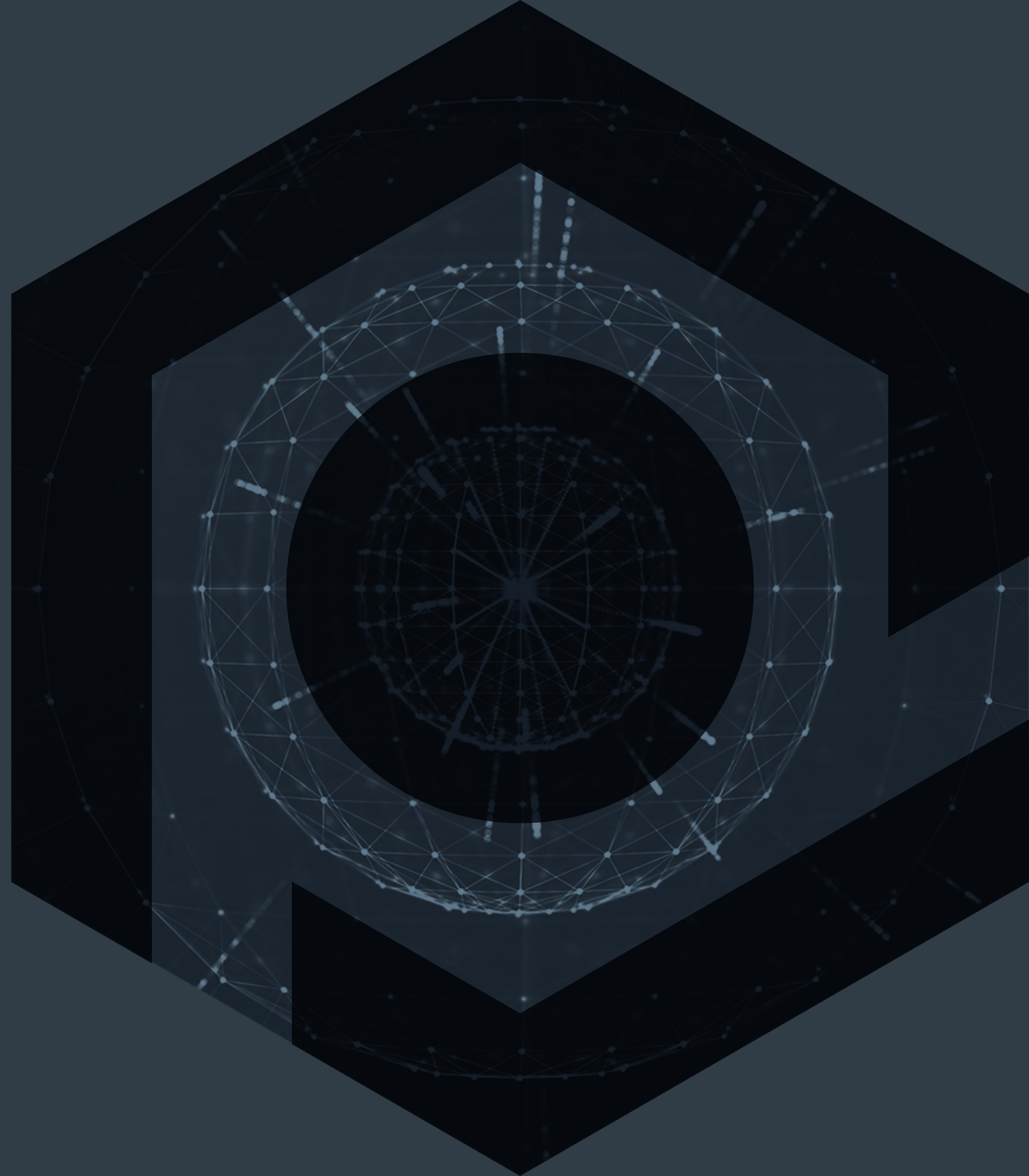


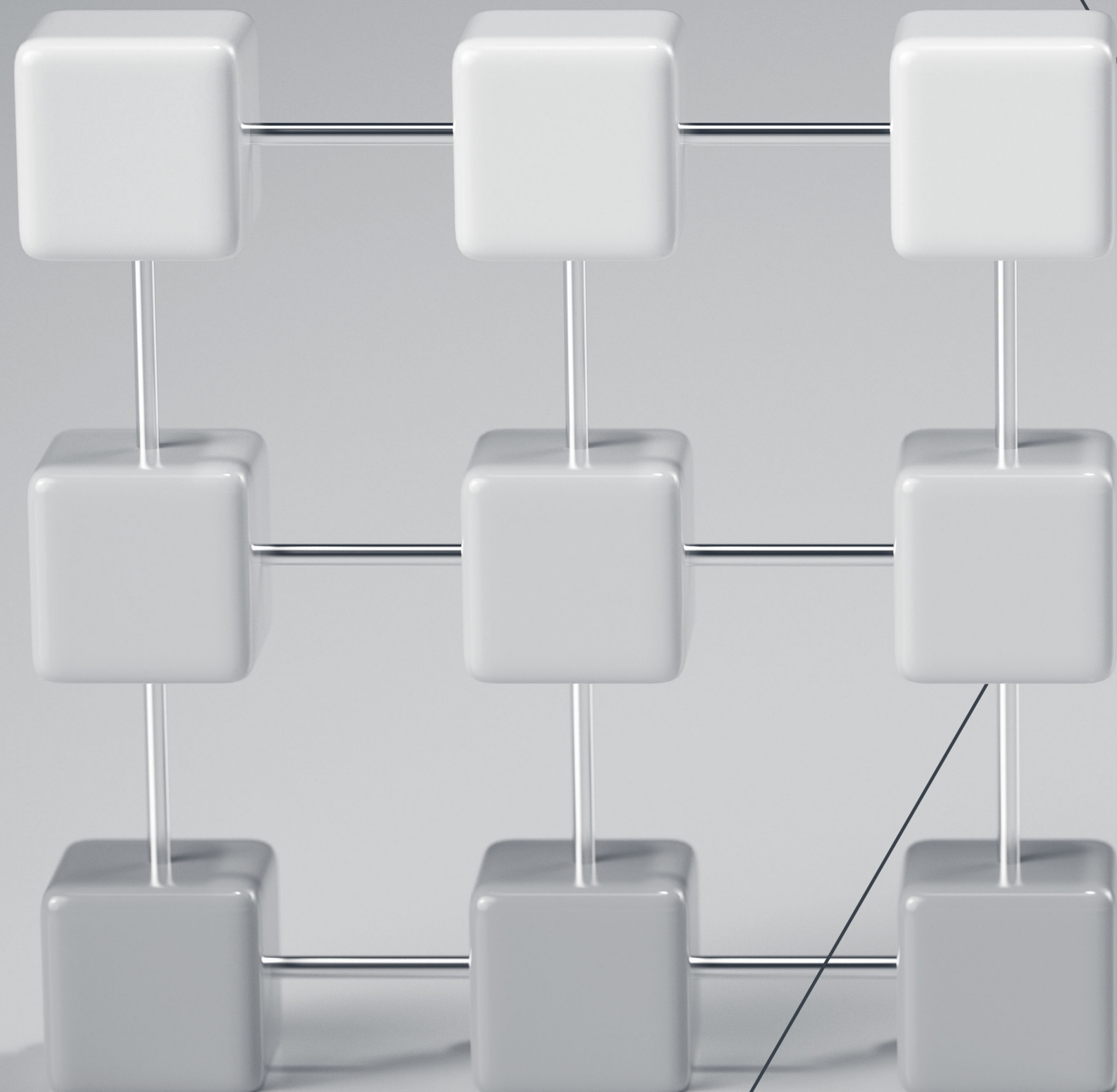


# HOW SHOULD YOU DEAL WITH THE SOFTWARE IN BATTERY TECHNOLOGY?

POTTERCLARKSON.COM







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**Today, software is about much more than desktop computer applications.**

Software is integral to almost every aspect of innovation and is found in a huge number of products because it offers greater functionality, control and connectivity; the battery and energy storage sector is no different.

Software is now integral to the development, manufacture, charging and discharging of cells. In the devices the cells ultimately power, software is used to ensure these devices achieve maximum performance and safety.

However, although software is becoming a more vital component of most batteries and battery powered devices, there is still a lot of confusion as to what is actually possible in relation to protecting the software elements of a battery-related innovation.

**This takes us back to what has become a frequently asked question in today's software-driven world: Can you patent software?**

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# CAN YOU PATENT SOFTWARE?

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**This is a question that has, for some time, been as complex as it is confusing. And providing a conclusive answer isn't made any easier by the fact that every jurisdiction seems to have a different approach.**

## **Our view is fairly straightforward.**

Patent protection is most definitely available for certain types of software as long as it can be proven to be new and inventive. Again, this answer is as applicable to the battery world as to any other sector.

Admittedly, the picture becomes less clear when potential 'non-inventions' like computer programs, mathematical methods, scientific theories, and business methods are involved.

However, we stress that even in these cases, while there can be challenges to overcome, they are not always insurmountable if you can talk through the options with a patent attorney who specialises in protecting software.

## **While we have that expertise, we also go one step further.**

We recognise that, today, any innovation is likely to involve the convergence of a number of different technologies - with software and battery technology being a perfect example. So our ethos is to create cohesive multidisciplinary and multi-jurisdictional teams that bring together the highest qualified experts in the disciplines concerned.

This provides the breadth of perspective and level of detail and practicality our clients need to achieve the level of protection that will maximise the commercial and strategic value of their inventions.

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## SO WHAT IS THE RIGHT KIND OF SOFTWARE?

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Within most jurisdictions, successfully patenting computer programs or algorithms requires us to show that the software makes a technical contribution over the prior art. But what is a technical contribution?

Here are some examples of potentially patentable technical contributions:



**AUTOMATED CONTROL OF A PROCESS**



**ERROR DETECTION**



**IMPROVED MEASURE OF PERFORMANCE OR OF A CHARACTERISTIC**



**IMPROVED ACCURACY/RESULTS**



**FASTER/MORE EFFICIENT PROCESSING**

If the software in your battery technology makes any of these technical contributions, it may be patentable. However, there is scope for protection for software that performs other functions.



## THREE MAJOR EXAMPLES OF **BATTERY TECH-RELATED PATENTS**

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To give you a better idea of how some instantly  
recognisable names have obtained patent protection  
for their products, here are some examples:

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# 1

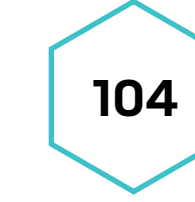
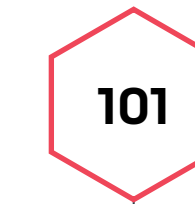
## UNIVERSITY OF MICHIGAN

The University of Michigan has filed an application, which has been granted in the UK, for a method of charging a lithium-ion battery. The application discloses:

**“Lithium-ion cells are widely used in various platforms, such as electric vehicles (EVs) and mobile devices. Complete and fast charging of cells has always been the goal for sustainable system operation. However, fast charging is not always the best solution, especially in view of a new finding that cells need to rest/relax after being charged with high current to avoid accelerated capacity fading. A user-aware charging algorithm is proposed which**

**maximizes the charged capacity within a user-specified available charging time (i.e., user-awareness) while ensuring enough relaxation (i.e., cell-awareness) and keeping cell temperature below a safe level.”**

The UK Intellectual Property Office granted the patent in September 2021 with claims that consider the software process performed by a battery charger, including the step in which **“determination of the current charging time period accounts for the user available time and a predefined time period for relaxing the battery cell”**.



Receive user's available time

Determine constant current charge period

Determine threshold voltage during CC phase

Determine additional voltage during CV phase

## 2

# TESLA MOTORS INC.

Tesla have also recently been granted a patent in Europe for their charging software that accounts for an “anticipated next operation requirement” which may comprise the required range for the electric vehicle’s next trip. It can be seen from the wording below that the key steps are software-based calculations:

“...computer program instructions ... configured to: obtain an operational parameter representing an anticipated next operation requirement for the next operational cycle following the next charging cycle for the battery cell pack; determine a next cycle plan for the battery cell pack (105) determining a starting point and an ending point for a battery cell state of charge, SOC, that provides the anticipated next operation requirement while

concurrently reducing the impact of the SOC for the battery cell pack (105) on the cycle lifetime of the battery cell pack (105) and wherein the cycle lifetime is measured over a plurality of applied cycles, wherein said SOC for the battery cell pack (105) provides for an additional margin for one or more additional functions, wherein said one or more additional functions include compensating for a declining battery cell capacity due to the age of battery cells of the battery cell pack (105); and establish a discharging/charging plan including one or more stages to produce the starting point for the battery cell SOC for said next cycle plan, wherein the discharging/charging plan includes one or more discharging stages if the starting point for the battery cell SOC is lower than a current battery cell SOC.”

300

305

Obtain operational parameter representing anticipated next operation requirements for vehicle.

310

Determine battery cell performance to provide the anticipated next operation requirements while concurrently enhancing a meta attribute.

315

Establish a discharging/charging plan.

320

Apply discharging/charging plan to the battery cell pack prior to next operation.





### 3

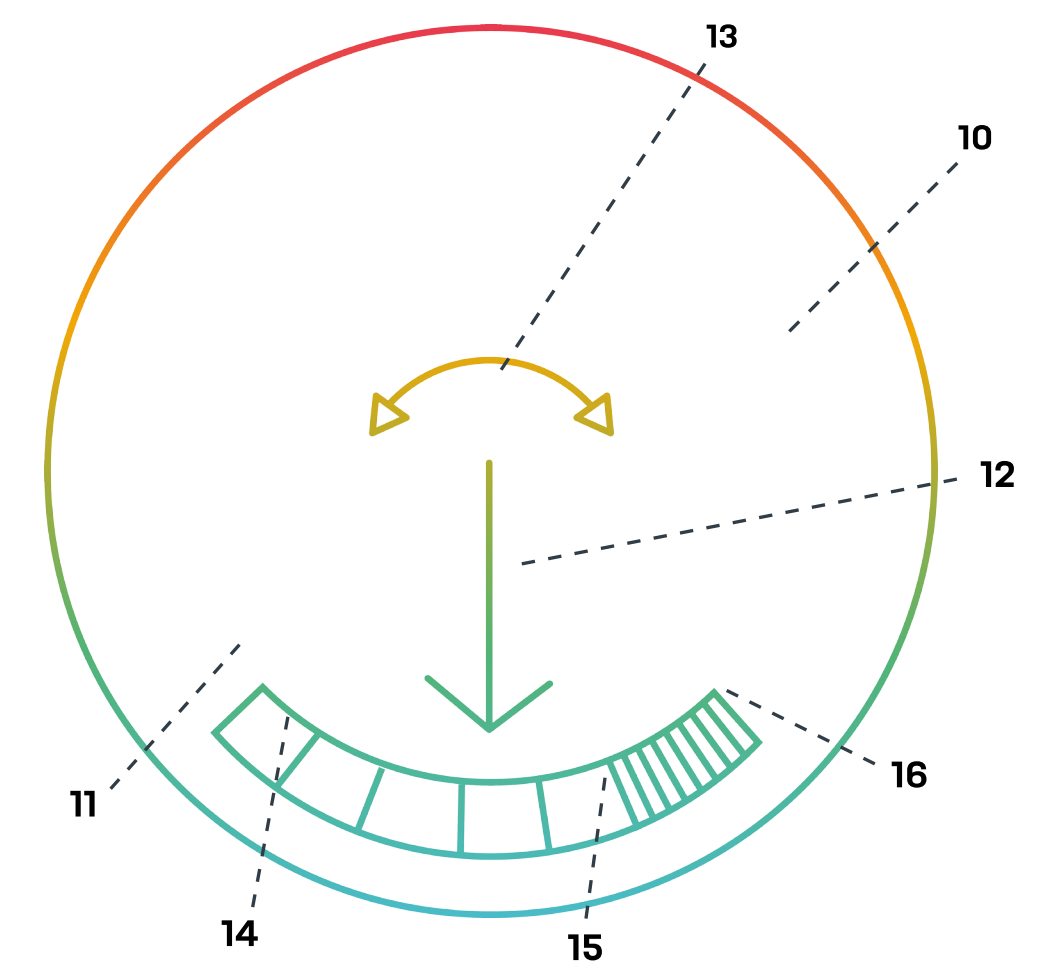
## JAGUAR LAND ROVER LIMITED

JLR have been granted a patent for their system for providing a scale for a state of charge indicator. This patent is more user-focused because it relates to how the state of charge information is presented to a user. Nevertheless, it was deemed to address a technical problem and therefore was seen as more than a computer program and more than the presentation of information.

**"A system for providing a scale of electrical charge of a vehicle battery, the system comprising: a scale of state of charge (11, 21) of the vehicle battery; and a controller arranged to display a current value of charge indicator (12, 24) on the scale (11, 21), ...indicating the state of charge detected by a detector, wherein the controller is arranged to control the current value of charge indicator (12, 24) to appear on the scale (11, 21) between a displayed first indicator (14, 22) indicating a first minimum state of charge and a displayed second indicator (15, 23) indicating a first maximum state of charge when the vehicle is in a first driving mode, wherein the displayed first indicator (14, 22) and the displayed second indicator (15, 23) define a range there between; the system is characterised in that: the controller is arranged to control the current value of charge indicator (12, 24) indicating the state of charge detected to appear on the scale (11, 21) between**

**the displayed first indicator (14, 22) and a displayed third indicator (16) when the vehicle is in a second driving mode; the third indicator (16) indicates a second maximum state of charge; the second maximum state of charge is higher than the first maximum state of charge; and in that, when the vehicle is in the second driving mode, the displayed first indicator (14, 22) and the displayed second indicator (15, 23) and the range there between are displayed, and an extension to the range is provided between the displayed second indicator (15, 23) and the displayed third indicator (16)."**

This is said to be advantageous because **"...the maximum and/or minimum parameters of the scale may be selected without affecting the indicator linked to the state of charge of the battery. For example, the indicator may be movable with respect to the scale for indicating an instant value of state of charge on the scale, wherein the range of the scale is adapted to be changed without movement of said indicator."**





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## WHAT ELSE DO YOU NEED TO KNOW ABOUT PROTECTING SOFTWARE IN BATTERY TECHNOLOGY?

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### What is an example technical effect or technical problem for battery software?

Imagine software for a battery-powered device that provides a pop-up message telling a user to use less power-hungry applications when the rate of discharge reaches a threshold.

The supposed innovation would be technical because it relates to the battery rate of discharge. However, the effect of the innovation could be the influence of human behaviour, which is non-technical and therefore non-patentable.

If we now imagine that the pop-up message is replaced with automatic activation of a set of user-defined power-saving changes, such display screen dimming or limited acceleration, then we see that the effect is the making of mitigating changes to conserve battery charge, while perhaps also indicating to the user that the changes have been implemented. In this case, it is easier to argue the software has a technical effect and, if that technical effect is new and non-obvious, then it could be patentable.

### Can I patent software algorithms for battery-related technology around the world?

Yes, protection is available, although the law varies around the world with respect to what can be protected.

For example, in Europe, you need to have the right sort of software. If the software is controlling a technical process, such as the charging or discharging of cells, it is likely to be patentable.

However, if the software relates to an animated state of charge gauge, then protection may be more difficult unless the animation can be said to serve a technical purpose beyond simply being aesthetically pleasing.



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## WHAT ELSE DO YOU NEED TO KNOW ABOUT PROTECTING SOFTWARE IN BATTERY TECHNOLOGY?

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### Should I copyright my battery tech-related software instead of patenting it?

Copyright and a patent are different forms of intellectual property and protect creations in different ways.

Copyright subsists automatically and protects, amongst other things, literary works, which includes the source code of a computer program, provided it is original. Copyright will give the author the right to stop others from reproducing the source code without their permission.

However, source code is often not publicly released and therefore the ability for someone to copy it is reduced. Also, copyright subsists in the original parts of the source code and for copyright infringement to be established, someone must copy a substantial part of the work.

While copyright protects how the software is expressed in its source code, a patent will protect the technical function of the software. As the technical function of the software is protected by a patent, how that function is achieved and expressed in the source code is no longer key. The patent is concerned with how the technical problem has been overcome, rather than how the computer program was written.

### What standard needs to be met to protect software for battery technology?

In Europe, we need to define the invention so that it provides a non-obvious technical solution to an objective technical problem. In the field of battery technology, the invention is going to be linked to something technical - that is likely to be the operation or manufacture of a battery.

However, we also need to assess what advantages the invention provides. If the advantages indicate that a technical problem has been solved and the solution is non-obvious when compared to the state of the art, then we have something patentable.

### Is it worthwhile patenting software, given that it is constantly updated?

A well-prepared patent protects the technical effect of the software, not the way in which the software is coded. Therefore, even if the source code is periodically revised, if the software still achieves the same effect, the patent should still cover it.



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## SPEAK TO OUR EXPERT

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**BEN LINCOLN**

PARTNER  
**UK AND EUROPEAN  
PATENT ATTORNEY**

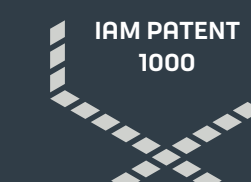


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### OUR ACCOLADES

You can be truly confident in our abilities – we are recognised as a top-tier firm in Europe, having received accreditations from the IP profession's leading benchmarking organisations and programmes.



They always deliver high-quality work regarding the patent filing, prosecution and litigation. They are also approachable and responsive. We feel that they are our in-house attorneys rather than external agents.

In everything they have done, both from technical support and through to commercial sensibility, they are a 10 out of 10."

**Chambers and Partners, 2022**

**MIP IP STARS, 2021**





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