

# HYPERMOTIVE

Integration: the invisible challenge to our hydrogen utopia

CCSHFC  
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## THE HYDROGEN FUTURE IN PERIL?

WHY

Lack of clarity  
Too many options/  
not enough expertise

WHAT

Lack of capacity  
Industry pinch points

HOW

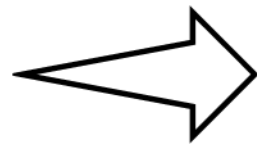
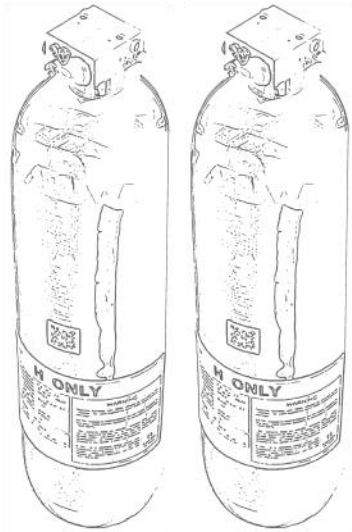
Lack of direction  
Education & skills training



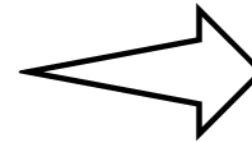
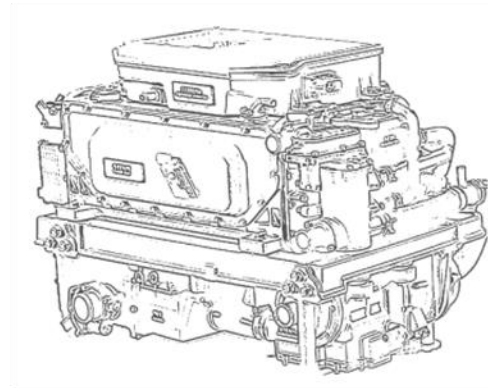
# **H**YPERMOTIVE

THE CHALLENGE:  
INTEGRATION CAPACITY

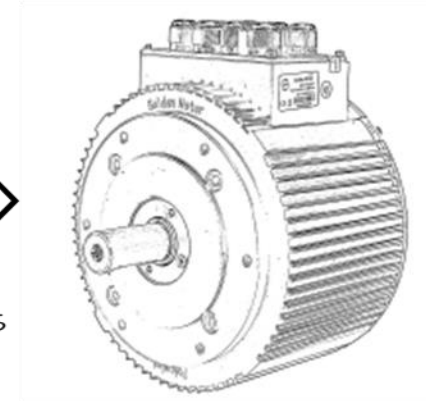
## SETTING THE SCENE: A HYDROGEN FUEL CELL POWER SYSTEM



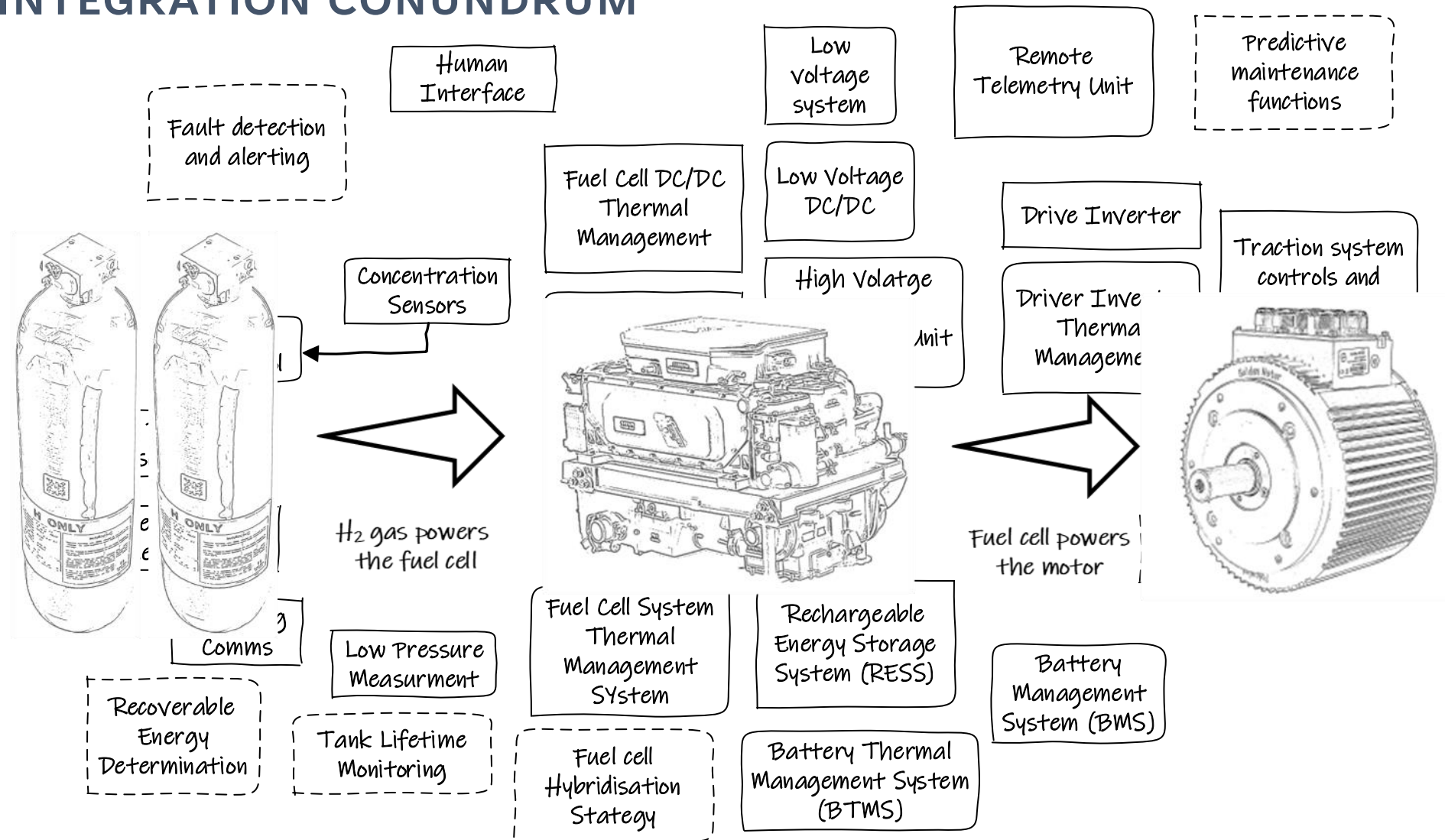
*H<sub>2</sub> gas powers  
the fuel cell*



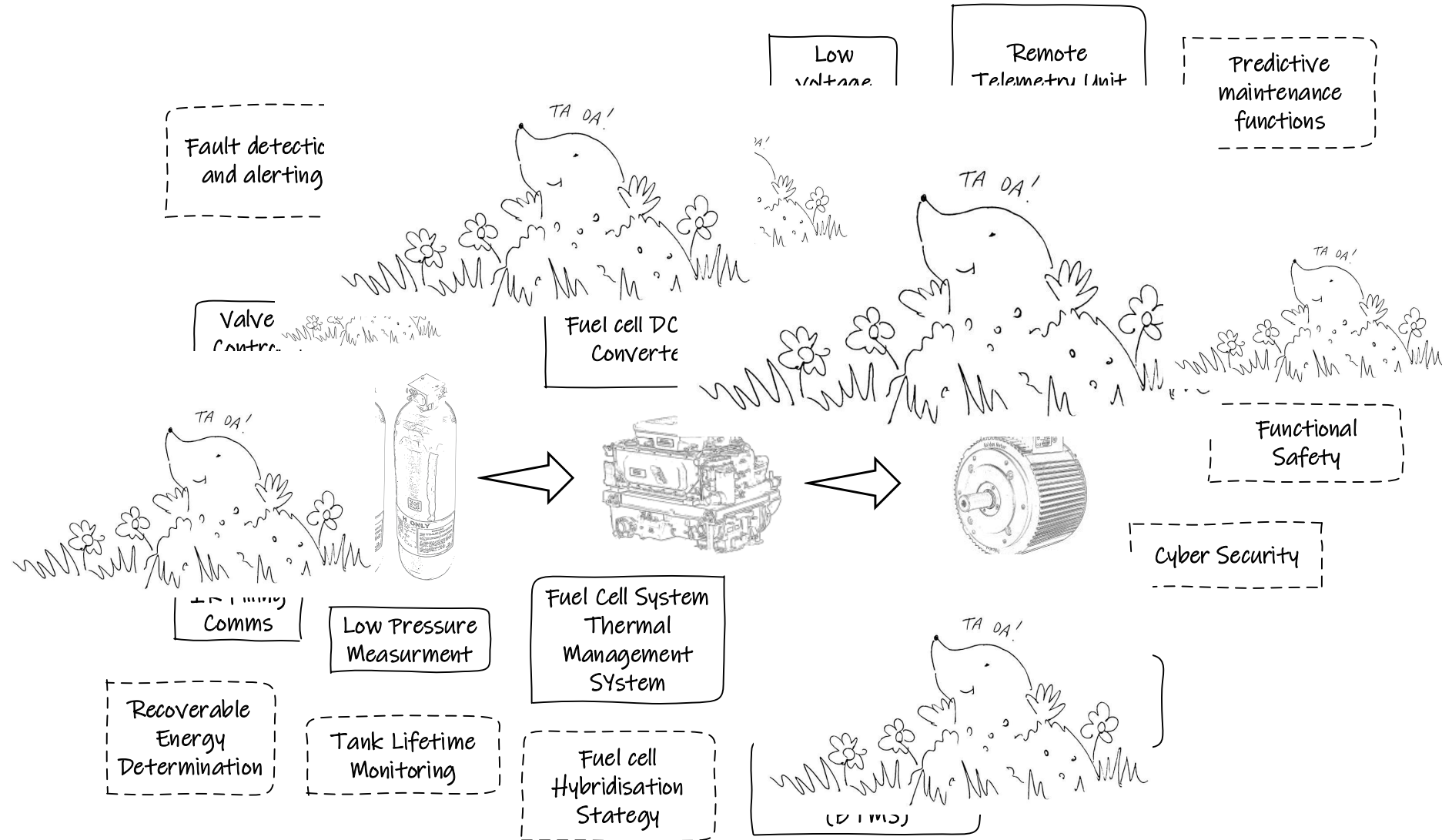
*Fuel cell powers  
the motor*



# LAYERS OF COMPLEXITY: THE INTEGRATION CONUNDRUM



# MANAGING THE CHALLENGES: SYSTEM LEVEL, BUT THE DEVIL IS IN THE DETAIL



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EXPLORING THE CHALLENGES

## WHY CAN'T WE JUST "PLUG & PLAY"? (THE BALANCING CHALLENGE)

WHY

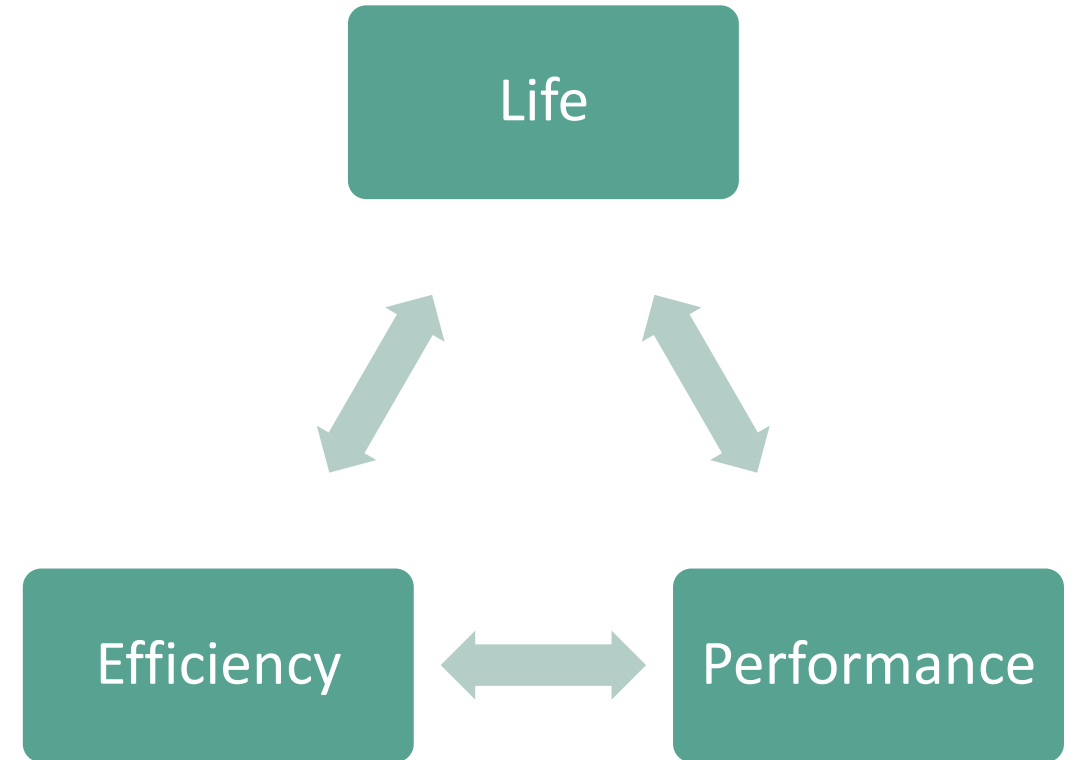
Different metrics for batteries and fuel cells that affect performance, life & efficiency

WHY

Understanding what impacts and trade-offs occur between systems

WHY

Data driven exercise with lots of supplier engagement





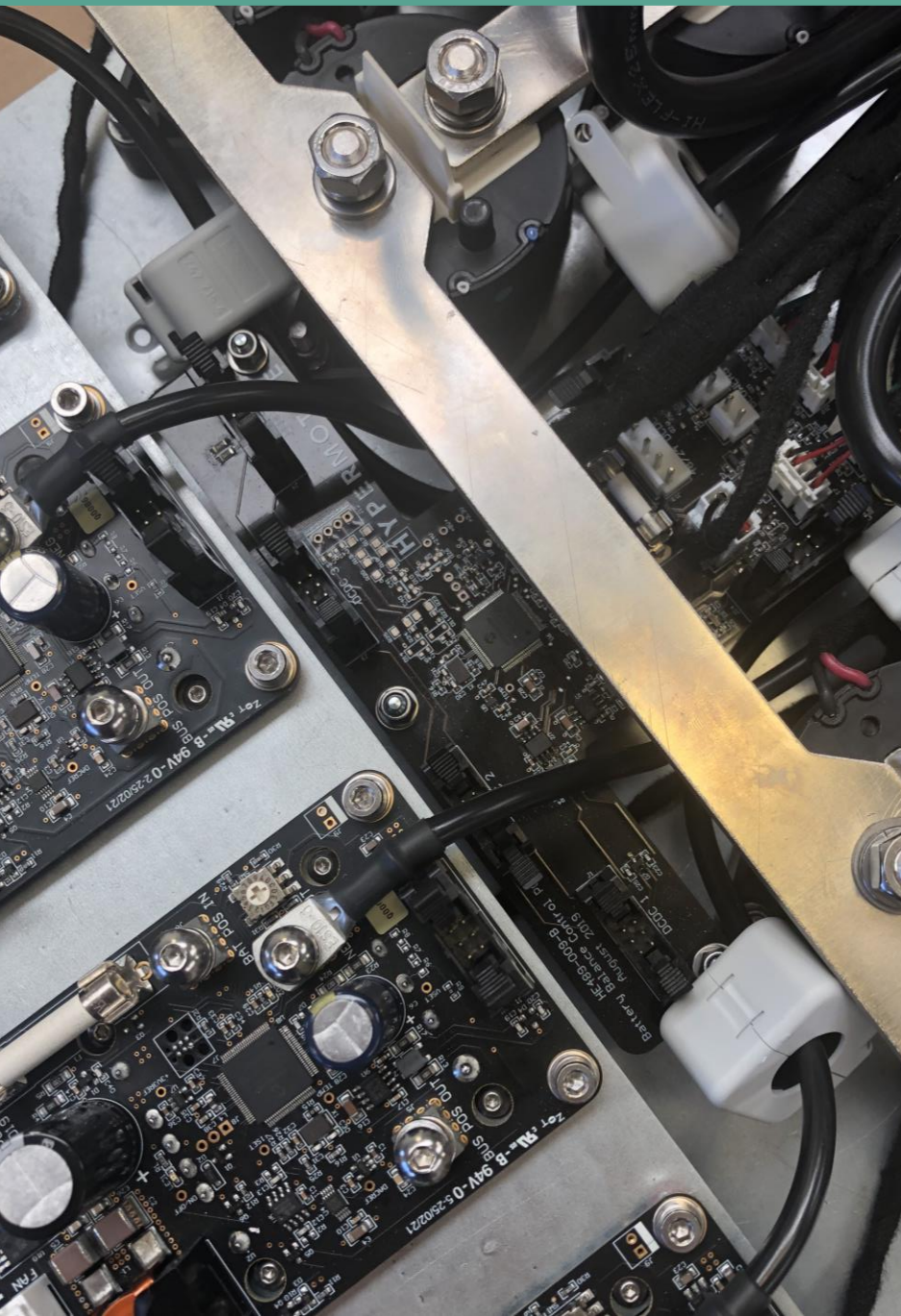
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WHAT DO WE NEED?



**WE NEED EXPERTS...**

to unify these systems effectively



## HOWEVER...

### THERE AREN'T ENOUGH

- We can't satisfy current demand of market for integration

### WHAT ABOUT FUTURE DEMAND?

- The market *must* grow to hit net zero 2050

### AND FUTURE CAPABILITIES?

- New specialisms
  - Cyber security, hydrogen storage, etc

### WE ARE AT RISK

- Lack of skills and resources

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WHAT CAN WE DO ABOUT IT?

## THE STEPS WE CAN TAKE

**MORE EXPERTS!**

- Inform
- Educate & train
- Promote

**COMMONALITIES**

- Drive standards and common systems
  - Global harmonisation

**AUTOMATION**

- Reduce complexity & time
- Package expertise

**COLLABORATION**

- Shared risk & reward
- Independence

## TECHNOLOGIES

Investing in the future

- Holistic family of Intelligent Integration Technologies
- Automates engineering process with embedded expertise



**THANK YOU**