



Pearson
BTEC

COMAU

In conversation with... Comau
Wednesday 18 May, 10.00am (BST)

Today's speakers



Andrew Lloyd
Comau



Phil Myers
Pearson BTEC

Pearson BTEC and Comau

Pearson partners with world leading employers, sector bodies and industry experts to offer learning programmes including qualifications and resources that fulfil specific skillsets required by industry. These partnerships allow us to maintain content relevance and global reach.

Pearson BTEC has worked in partnership with Comau, global leaders in delivering advance industrial automation products and systems – to provide learners with qualifications and resources to help in their understanding of Electrical Automotive Manufacture and Robotic Operations.



E-mobility

Andrew Lloyd | Comau



Index

Global trends

Overview of global trends in automotive manufacture away from petrol towards electrical - and how the electrical market has grown.

Battery technology development

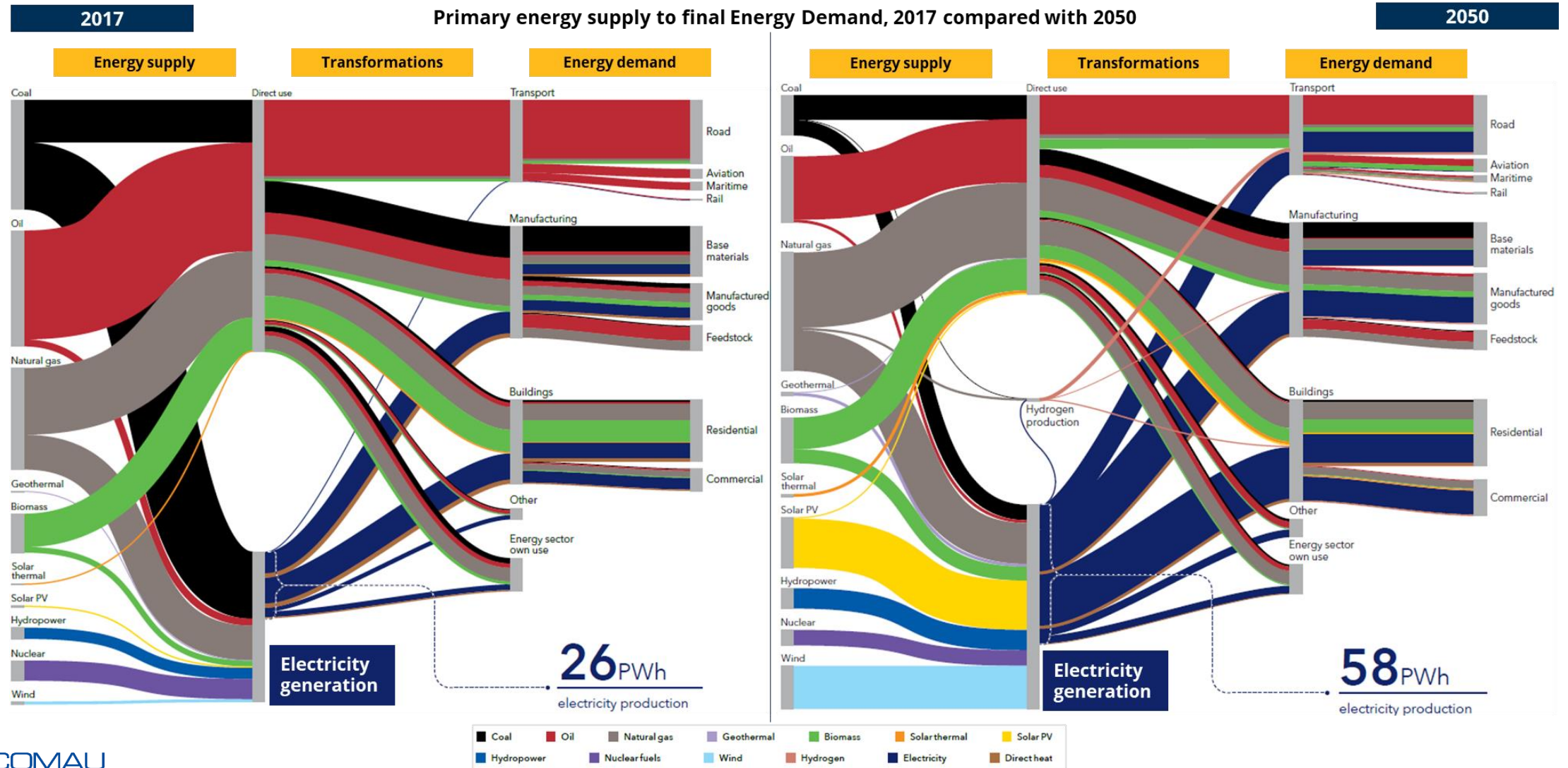
Developments in battery technology (as far as IP allows) and how technology is supporting (impacting) mass growth.

Global skills

Job roles in electrical automotive manufacture and maintenance, how the profile is changing with reduced maintenance needs.



Energy Industry Outlook from the Paris agreement



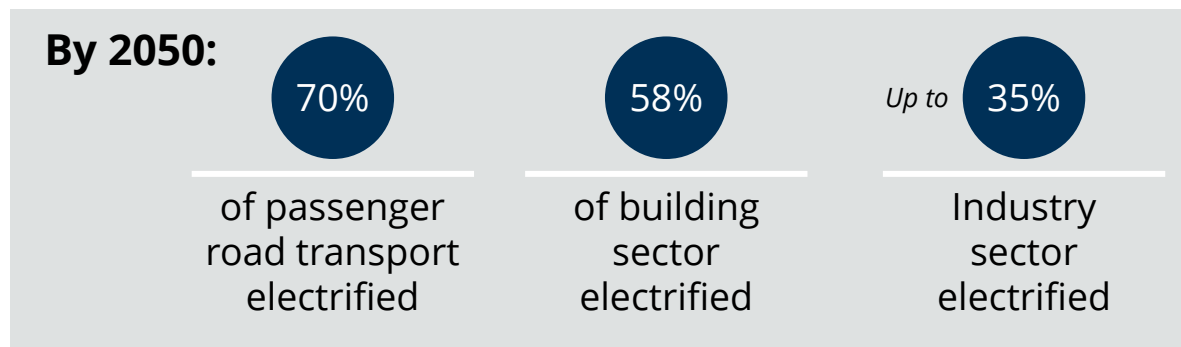
An electrified future – fast forward to 2050

Electrification is emerging as a key solution for reducing emissions but only **if paired with clean electricity**, which increasingly can be sourced at the lowest cost from **renewable power**.

Electricity would progressively become the central energy carrier, growing from a **20% share** of final consumption today to an almost **50% share by 2050**.

Renewable power would be able to provide the bulk of global power demand (**86%**) **economically**.

It is estimated that gross electricity consumption would double from **29PWh** today to **58PWh* by 2050**.



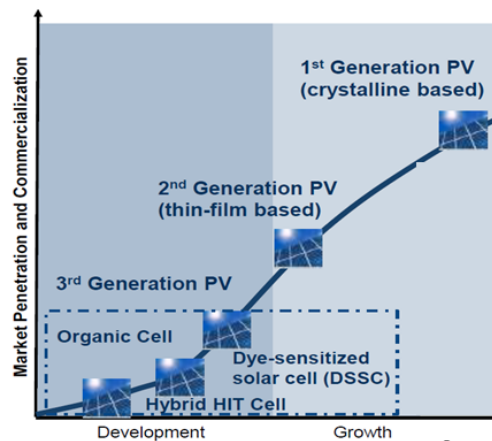
The planning for the electrified future is already underway

Key Technology Trends

Electricity Supply

SOLAR PV

Solar PV Technology Curve



Source: F&S, 2018

3rd Generation solar cells are in the development phase.

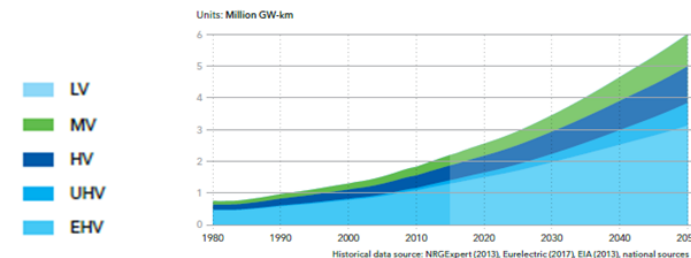
WIND

- **Larger turbines** and 'supersized' blades.
- The process of integrating solar PV and wind accelerates rapidly to 2030.

Electricity Transformation

GRID

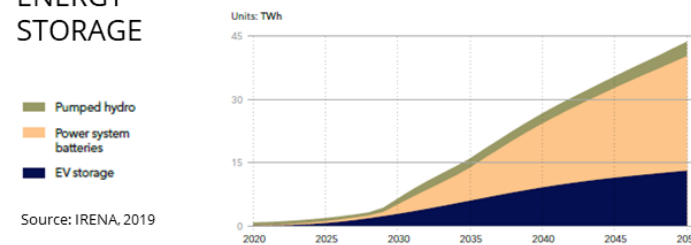
World power line capacity by voltage class



Major Grid Extension: strong ultra-high voltage (UHV), extra-high voltage (EHV) and high voltage (HV) transmission backbone will be required to satisfy electricity transport and trading needs.

ENERGY STORAGE

World storage capacity available to the grid



Source: IRENA, 2019

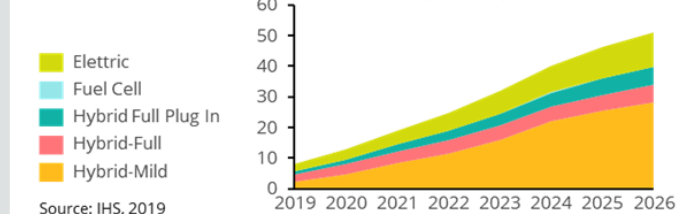
Battery storage tech to grow. **Lithium ion (Li-ion)** the most cost effective, **Solid-state** in the next five to 10 years, **Redox flow** batteries beyond 2030. EV for vehicle-to-grid (**V2G**) services.

Growth of Batteries being used along with **solar PV**.

Electricity Demand

TRANSPORT

World Electrified Light Vehicle Production (M units)



Source: IHS, 2019

Substantial shift towards EVs, mostly within **light-vehicles** (Electric buses too), much **smaller rail** demand and a small amount of electrification of maritime and aviation.

BUILDINGS

Advances in **heat pumps** technologies.
LED lighting, Home automation and smart thermostats.

MANUFACTURING

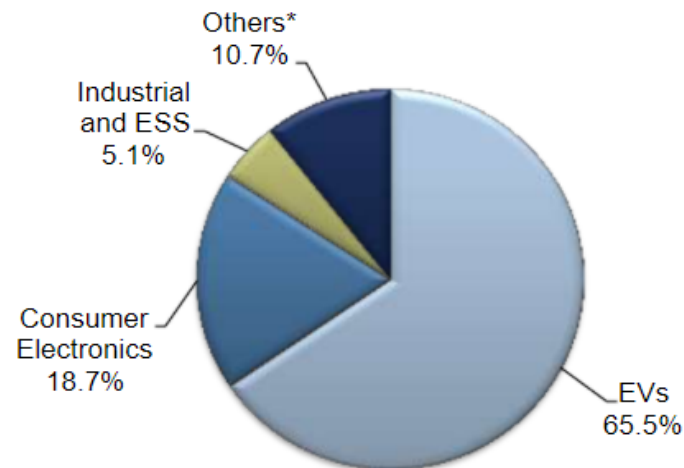
Manufacturing energy demand being met by electricity was 26% in 2018 and is set to grow to 45% in 2050. Electrification of heat in manufacturing will take the form of heat pumps and direct electrical heating.

Demand vs. Supply

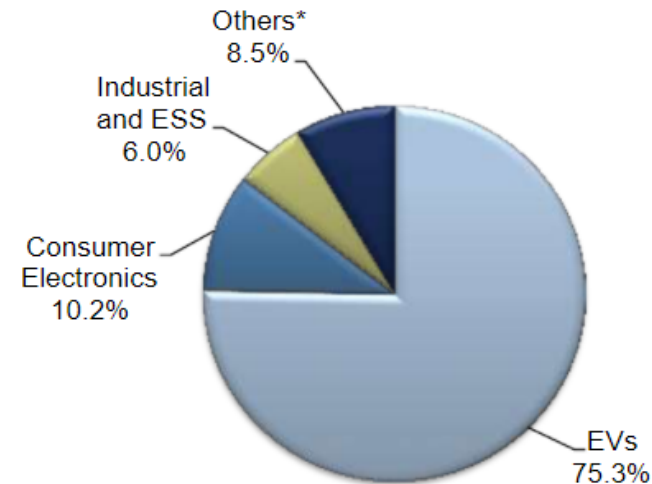
Battery Cell Automation Equipment Market

Key Takeaway: Growth in the EVs segment is expected to outpace that in the consumer electronics segment by thereby further strengthening its dominance in the market by nearly 8.3% between 2020 and 2026.

Total Li-ion Battery Materials Market: Percent Revenue by Application, Global, 2019
\$15.49 Billion



Total Li-ion Battery Materials Market: Percent Revenue Forecast by Application, Global, 2026
\$36.56 Billion



Nearly 500x more smartphones were produced as compared to EV production volumes in 2019. However, an EV battery weighs nearly 15,000x more than a smartphone battery.

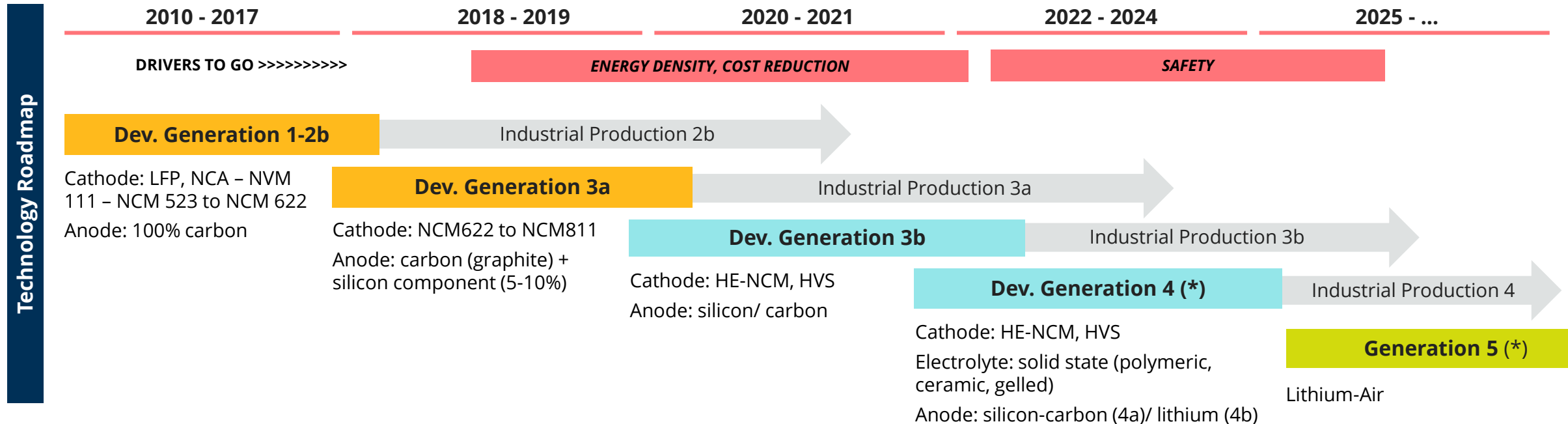
*Others include medical and healthcare devices, electric bikes, and portable tools.

Note: All figures are rounded. The base year is 2019. Source: Frost & Sullivan











Battery cell technology roadmap

3 main pillars on cell manufacturing technology:

1. Current generation Li-ion technology (gen 1 – gen 3a)
2. Next generation Solid state technology (gen 3b and gen 4)
3. Post-Li-ion technology (Na-ion, Li-Sulfur, Li-metal, Li-air)



Five Innovations announced during Tesla Battery Day

Levers	Cell Design 	Cell Factory 	Anode Materials 	Cathode Materials 	Cell Vehicle Integration 
Key changes	Developed tab-less architecture with new 4860 form factor; redesigned mfg. processes to increase line speed	Eliminating wet solvent from electrode, high-speed continuous motion cell assembly, higher efficiency in formation	Used raw metallurgical silicon in anode and innovatively designed for chemical expansion during charging	Replacing cobalt with high-nickel; using iron & nickel-manganese for lower range portfolio; vertical integration into cathode mfg.	Redesigned vehicle body structure to use battery pack as structural component between single-piece-casted front & rear body; reduced car body mass by 10%
\$/kWh savings	14%	18%	5%	12%	7%
Range increase	14%	-	20%	4%	14%
Capex/GWh reduction	7%	34%	4%	16%	8%
Industry implications	Solves problem unique to cylindrical cells; necessary to match pouch & prismatic	Advances in mfg. & scale pushing industry boundary well ahead of peers	Changes in anode in line with known industry trends & progression	Changes in cathode in line with known industry trends & progression	Novel unibody frame to race ahead of peers on pack efficiency & range
Level of disruption					

Global Skills



THE ADECCO GROUP

The Adecco Group is the world's leading talent advisory and solutions company. We are driven by a powerful purpose – making the future work for everyone. Our services help people fulfil – and exceed – their potential, building employability and connecting people with opportunities. Our solutions enable our clients to optimise their talent needs and organisational models to achieve their goals. While our advocacy and firm commitment to operating responsibly aims to build a better world of work for all.

- By 2030, the automotive industry will likely look completely different than it does now – and companies are chasing that growth and the new workforce that comes with it.
- As a result, traditional automakers are moving to embrace new strategies. It's becoming increasingly clear that building internal resilience and ensuring business continuity requires a deeper, more meaningful and holistic assessment of companies' talent strategies.
- In May, experts from The Adecco Group and leading automotive manufacturers got together for a roundtable discussion on upskilling and reskilling talent, having a plan to future-proof their workforce, and the importance of diversity in hiring. You can watch the full webinar below.
- 5 key elements emerge from the webinar

1. Workers entering the automotive industry can't have just one specialty. They need to have a variety of skillsets.

In the next 10 years, automotive companies will need more workers trained in automation, robotics, and Artificial Intelligence (AI).

The requirements for talent working in the automotive industry is shifting, too. Autonomous vehicles are expected to be on the road by 2030, requiring an entirely new skillset in machine learning, computer vision, sensor processing, and more to design the guiding intelligence of autonomous cars. Electric vehicles, too, will continue to have a big impact on the automotive industry.

Jan Gupta, President of Modis, said that many years ago, when he first started out in engineering, , a mechanical engineer, an electrical engineer, and an IT programmer were three totally different people with different skill sets.

“This time is over,” Gupta explained. “An engineer today must understand all three skill sets, and more importantly, he or she has to understand all three skill sets in the products or process.”

“At the end, deep knowledge of data analytics, artificial intelligence, and more, is key for connected cars of tomorrow. The development and the production process have changed too,” Gupta said.

2. Reskilling and upskilling is crucial – especially because you won't find all the talent you need on the market.

Companies will need to upskill or reskill their workforce to meet the demand for different types of engineers, specialists, service teams, and much more – leading to a big impact on their talent strategies.

The reality of today's job market? There's a lack of talent on the market, Gupta said, especially with the skill set for tomorrow.

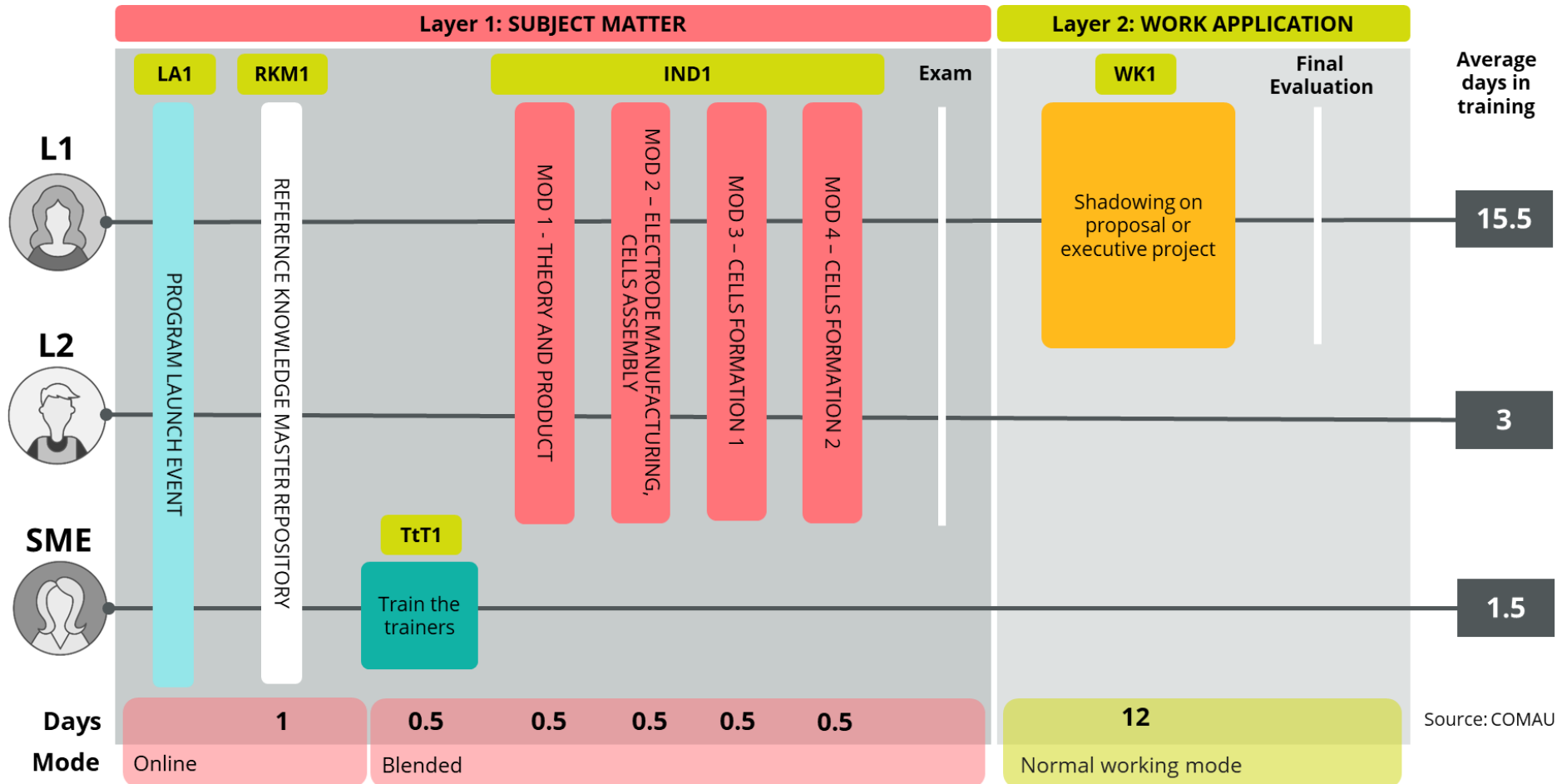
"We have to analyse our current skill set and we have to reskill and train our people, because the capacity of engineers who can develop new cars with a focus on user experience – you will not find them on the market," Gupta said. "You will not find enough."

New generations of tech and automotive workers will not want to work at one company their entire lives, either, Gupta pointed out. They do want to have an impact, though, and they want to focus on meaningful projects. That attitude is something companies need to take into account when hiring.

Candidates, too, need to realize that they should upskill and reskill themselves to remain attractive in their industries.

Crash programme on battery cells

Learning Architecture



3. Change in the automotive industry is happening fast - that's why it's so important to anticipate the needs of your business.

By 2030, the automotive industry will likely look completely different than it does now – and companies are chasing that growth, and the new workforce that comes with it.

Change is coming fast, Dr Martin Rabe, CHRO at MAN. said, and companies need to shift their approach to match that pace of change.

Franck Bernard, Group Workforce and Labour Relations Director at Stellantis, said the pace of change was the true challenge.

“One of the biggest challenges for us is the speed of the change. It’s not so easy to tackle even for really agile companies like Stellantis,” Bernard said.

Bernard added that one of the ways they are anticipating the future is focusing on social responsibility.

“We want to be green, we want to be competitive, and we want to offer to our clients something really relevant to reach their expectations,” Bernard said.

4. *Having a transformation plan and strategy is crucial*

An action plan is crucial for any automotive company. The transformation in the automotive industry will impact just about every facet of the industry, and every layer in the ecosystem, Alain Dehaze, CEO at Adecco, said, but so many companies do not have a plan.

“Have a strategy, have a plan, because many of them don’t,” Dehaze said. “You are never successful when you don’t know where you want to go.”

The shift towards a more digitized future in the automotive industry will involve reskilling a huge amount of the workforce in a short period of time. Most companies aren’t always equipped to handle that big change so quickly.

“That’s the real challenge” Dehaze said. “Because on the other side, you have this new competition coming in. they are starting from a white page and they’re starting extremely fast.”

One of the most important challenges at MAN, Rabe said, is steering this transformation – not just in terms of automotive sector, but also the digitization and the entire company. Part of that transformation begins with HR.

5. *Diversity isn't just a buzzword.*

When automotive makers hire new employees, they're looking to build out a much more diverse workforce than ever before, according to Gupta. Diversity is no longer just a buzzword for automotive makers.

"The time of automotive development centres full of male, mechanical engineers in their mid 40s is over," Gupta said. "At the end, our clients look for diverse talents who understand the merger of engineering and IT skills. We call it at MODIS smart industry."

Rabe said diversity has become an increasingly important factor for the company as well; the company works intensely to get more diverse teams in their company.

Conclusion

- Electrification is gaining momentum across many industrial and domestic sectors.
- On Highway transportation is a front runner in the transformation and driving a range of investments, technological developments and skill challenges.
- The technologies are still developing, renewable energy industries such as Solar, Wind and Hydrogen as well as Battery Cells face important developments to keep up with the demands.
- The transformation to electrical vehicles is creating a different mix of skills and competencies, leading to an ever changing picture of employment requirements and needs.
- The need for rounded skills, incorporating technical, marketing and business competences are becoming more prevalent in the minds of potential employers.

Pearson BTEC International Level 3 Qualifications in Electrical Automotive Manufacture

Phil Myers | Pearson BTEC



Pearson BTEC International Level 3 Qualifications in Electrical Automotive Manufacture

Developed in partnership with Comau.

Diploma (720 GLH) and Extended Diploma (1080 GLH) sizes.

Consist of core of mandatory Manufacture units:

- Mechanical Principles
- Delivery of Engineering Processes Safely as a Team
- Product Design and Manufacture in Engineering
- Modern Manufacturing Systems
- Electrical and Electronic Principles.

New electrical automotive engineering units.

Optional units covering general engineering topics, and petrol vehicle content.

Electrical Automotive units

Battery Manufacturing

- Know about batteries used in electric and hybrid vehicles
- Understand the operating principles of electric and hybrid vehicle batteries
- Explore electric and hybrid vehicle battery manufacturing
- Know about safe working practices when manufacturing electric and hybrid batteries.

Electric and hybrid vehicle motors

- Know about the design and functioning processes of hybrid and electric vehicle motor drive systems
- Know about electric vehicle motor types, construction and operation
- Know about electric vehicle motor manufacturing equipment and processes
- Understand safety and manufacturing ergonomics relevant to electric vehicle motor manufacturing.

Electrical Automotive units

Electric vehicle drives

- Know about the operating principles of electric vehicle drive systems
- Know about the operating principles of hybrid vehicle transmission systems
- Understand electric and hybrid vehicle transmission manufacture and assembly
- Understand safe working practices when manufacturing electric and hybrid vehicle transmission systems.

E-mobility

- Know infrastructure necessary to support full electric and hybrid vehicle integration
- Know policies that manage the transition to environmentally supportive transport
- Understand end of life requirements of electric and hybrid vehicles
- Understand other efficient fuel systems available for vehicles.

Assessment

The qualification is comprised of units, each with its own Learning Outcomes.

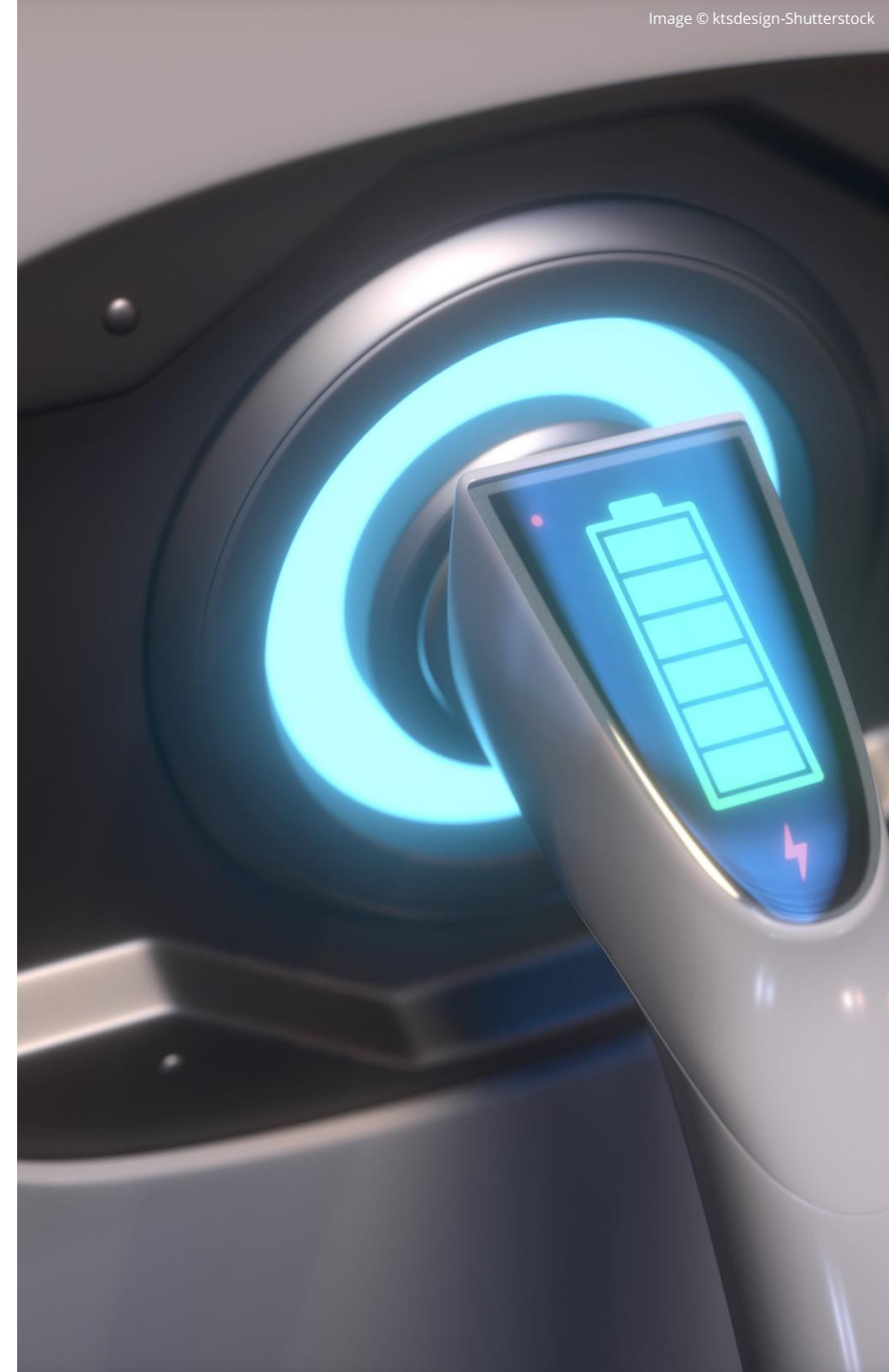
Assessment Criteria allow for demonstration of learners' knowledge, understanding and skills in each area to achieve each Learning Outcome.

Learners complete an integrated assignment, which should be completed after each unit.



Resources

- Pearson BTEC International Level 3 Engineering eBooks - cover the mandatory core content.
- Specially designed resources cover Electrical Automotive units including diagrams, exercises and videos (demonstration).
- Authorised assignment briefs and schemes of work.



BTEC International Level 3 in EAM - Unit 60:

Electric and Hybrid Vehicle Motors • Unit 1 of 2

Unit 60: Electric and Hybrid Vehicle Motors

7/46

Print Download

Introduction ✓ ▶

Learning Aim A

6/45 ▼

Module 1

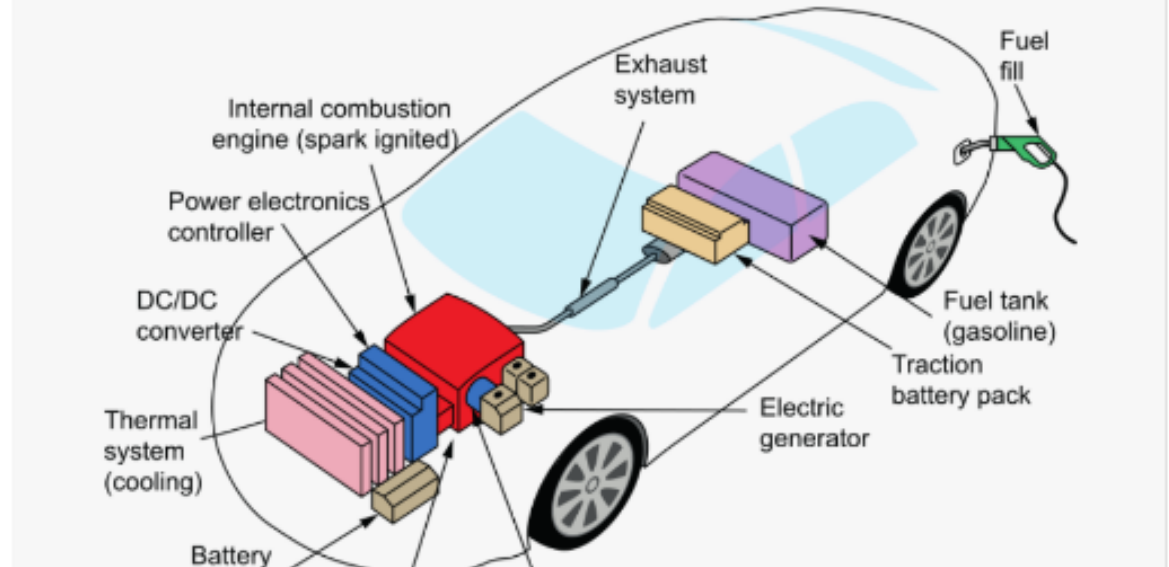
6/13

Plagiarism ✓

Discussion 1.1

Plenary- Unit expectations ✓

A1 Power and Drive systems used in hybrid vehicles



Supporting Progression

The qualifications are designed for:

- Learners who may be progressing directly into employment in electrical automotive manufacture.
- Learners looking to progress into HE level or advanced apprenticeship level courses in electrical automotive manufacture.



Supporting Teacher Delivery



This qualification is ideally suited to blended learning, due to a good mix of written, online and practical tasks.



Resources developed to support units including eBook, online materials, assignment briefs and schemes of work.



Links with EAM employers will help learners develop skills in practical units.



Supports progression to industry or HE/Level 4.

Your questions

1. I'm an experienced teacher but I am not an electric auto specialist, can I teach the new units?
2. What does the digital content look like on screen, could I see a demo?
3. If I am a registered centre for BTEC, how easy will it be to apply to offer this course, will I need a separate SV visit?
4. What courses could learners progress to after completion of this course?





Pearson
BTEC



COMAU