



Key Innovative Industries in Taiwan

New Generation Automobiles



Information
Security

New Generation
Automobiles

Communications
Industry

Circular Economy

Green Energy

Biopharmacy

Smart Machinery

Semiconductors

Internet of Things

International Logistics
and E-commerce



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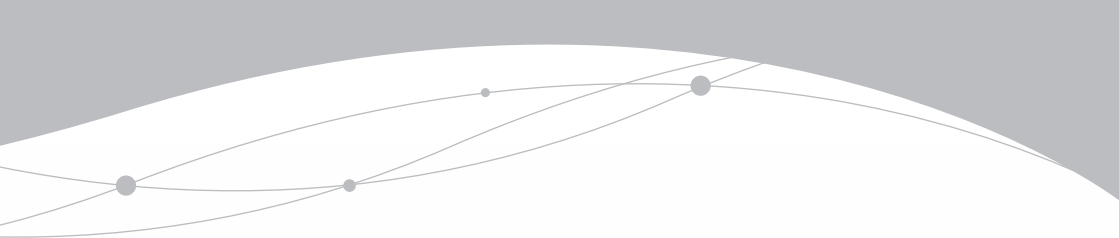
Policy Initiatives

As climate change sparks international concern, Taiwan has taken aggressive action to improve air quality and adopted specific targets in this regard. In 2017 we adopted the Air Pollution Prevention Initiative Plan, which set a target of a 50% reduction of suspended particulate matter by 2019. The Initiative Plan also introduces a plan for phased introduction of electric vehicles, including complete conversion to electric vehicles in government fleets and new buses by 2030, and full electrification of all new cars sold by 2040.

President Tsai Ing-wen later announced in April 2021 that Taiwan aims to achieve net zero transformation by 2050, and the National Development Council announced the Pathway to Net-Zero Emissions in 2050 in March 2022. The transportation sector is set to undergo the electrification transformation and the Pathway reiterated targets including the electrification of all city buses by 2030 and 100% electrification of automobiles and motorcycles by 2040. It also promoted electric government vehicle fleets, subsidies for purchasing electric taxis, and subsidies or discounts for purchase of electric vehicles produced in Taiwan to create domestic market demand.

With regards to autonomous driving, our government is using advanced driver assistance systems (ADAS) as the basis for legislative amendments designed to improve traffic safety. To keep pace with global progress, Taiwan's national legislature in 2018 passed the Unmanned Vehicles Technology Innovative Experimentation Act. Drawing upon the regulatory sandbox spirit, this act provides a statutory basis for loosely regulated experimental efforts to develop new types of unmanned vehicle technologies.

The regulatory sandbox approach seeks to facilitate the development of a new generation automobile industry by allowing for industrial, academic, and research entities in Taiwan to cooperate on experiments regarding new self-driving vehicle technologies, services, and business models within specifically prescribed areas where regulatory restrictions have been eased to a minimum.



The Changhua Coastal Industrial Park, for example, provides self-driving shuttle buses that operate between tourism factories, and is operating a 5G intelligent transportation area in Danhai New Town. Both of these projects are being undertaken on an experimental basis.

The current closed-course self-driving vehicle demonstration facility in Taiwan include the following:

1. "Taiwan CAR Lab" in Shalun, Tainan occupies a site of 1.75 hectares and tests vehicles having the dimensions of a mid-sized bus or smaller. Road test items simulate driving conditions on Taiwan's roads, with vehicles moving at a speed of roughly 30 kph or slower.
2. A phase-one testing ground at the Hutoushan Innovation Hub in Taoyuan City covers a site of 1.8 hectares, and relies on the Internet of Vehicles (IoV) & Smart Driving Center and Information Security IoT Center to test autonomous vehicles under a wide variety of simulated environments. This is also the first 5G IoV park in Taiwan that allows self-driving vehicles to communicate with roadside equipment.

Taiwan has begun to pour resources into innovative autonomous vehicle R&D work. Legislation governing autonomous vehicles has been passed. At both the central and local levels, our government is actively working to establish autonomous vehicle testing grounds. The proactive and ambitious stance taken by the Taiwan government has won it a place for the first time on the KMPG 2020 Autonomous Vehicles Readiness Index, where it ranks 13 - ahead of Germany, France, and Australia.

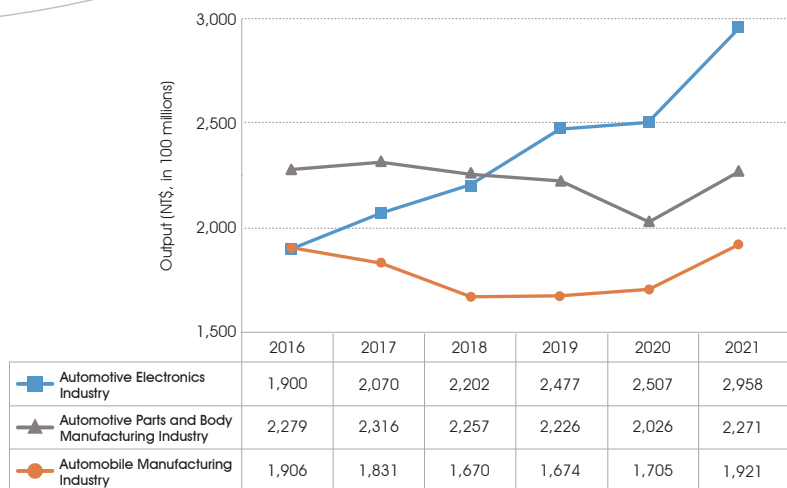
Overview of Industrial Development

1 | Output Value |

Total output of Taiwan's auto-manufacturing sector came to NT\$192.1 billion in 2021. Meanwhile, the total output of the auto components sector was NT\$227.1 billion, and for the automotive electronics sector it was NT\$295.8 billion. The combined total output value came to NT\$715 billion (see Fig. 1) for the three sectors. For the past two years, the automotive electronics sector has posted the biggest growth in our industry, and the sector single-handedly accounted for over 40% of total auto industry output value in 2021.

In terms of product categories, Taiwan mainly produces small family cars (2,000 cc or smaller), and Taiwan's component makers mainly produce auto lights, body and stamping parts, tires, and wheel rims. Automotive electronics mainly consist of driver information systems (e.g., ADAS, multimedia screen, and GPS), electric motor, and transmission systems. In addition to high domestic sales, Taiwan-made auto components are also exported in large quantities to markets in North America and Europe. Taiwan is also a significant player in the aftermarket and OEM markets, and some Taiwanese manufacturers have worked their way into the supply chains of international automakers of the likes of Tesla and Ford. As firms in Taiwan's ICT and related sectors are making an active effort to break into the fields of automotive electronics, autonomous vehicle technology, and new energy, Taiwan is in a very strong position to develop new generation automobiles.





Source: Taiwan Transportation Vehicle Manufacturers Association, Industry, Science and Technology International Strategy Center, ITRI.

Figure 1 Production Value of Taiwan's Automobile Industry in 2016-2021

2 | Industry Value Chains |

After several decades of development, Taiwan's auto industry has built up strong capability for the manufacturing of conventional vehicles, and our firms have long-standing cooperative ties with major manufacturers, as well as contractors. As a result, a very comprehensive auto industry supply chain has formed in Taiwan. In recent years, due to development trends in intelligence and autonomy, Taiwanese makers of auto components have been taking aggressive steps to position themselves in the field of new generation automobiles. Automotive electronics makers are also capitalizing on their competitive advantages to become members of the supply chains of big-name international auto makers.

Fig. 2 shows that the supply chain in Taiwan's electric vehicle sector has attracted the participation of firms specializing in: materials; components and modules; systems and subsystems; systems integration; and finished vehicle assembly. Firms that supply components and modules are especially numerous.

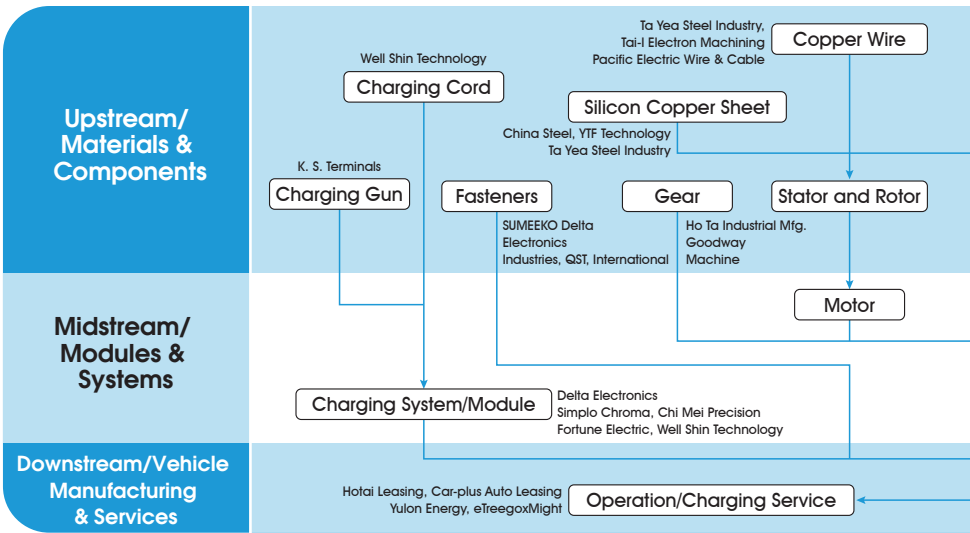
Taiwan also has a comprehensive automotive electronics industry chain, as shown in Fig. 3.

1. Battery and drive system

Taiwanese firms are able to provide cathode and anode materials, ion membranes, separators, electrolytes, and other such materials and battery cell parts. There are also firms that provide battery modules and battery systems. As for powertrains, Taiwanese firms can provide motors and motor controllers, upstream gears, stators, and power elements/modules. Taiwanese firms also provide automotive chips.

2. Automakers

Foxtron, a joint venture between Yulon and Hon Hai, successfully developed the electric bus Model T and plans to launch the electric passenger



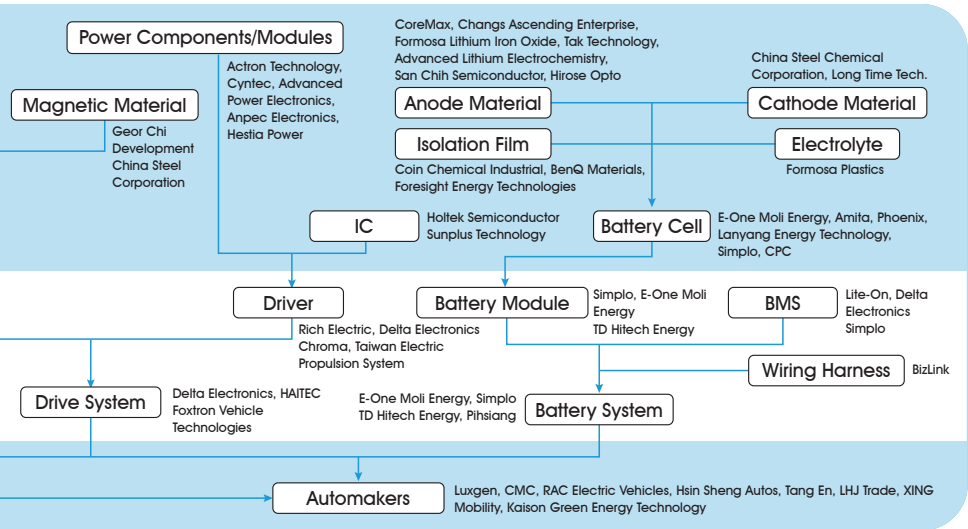
Source: Industry, Science and Technology International Strategy Center, ITRI.

Figure 2 Taiwan Electric Vehicle Industry Chain

car Model C in October 2022. Kuozui Motors began producing hybrid vehicles in 2019 and has commenced trial mass production of electric vehicles in Taiwan. RAC Electric Vehicles has the ability to independently design and manufacture electric buses.

3. Automotive Electronics Industry Chain

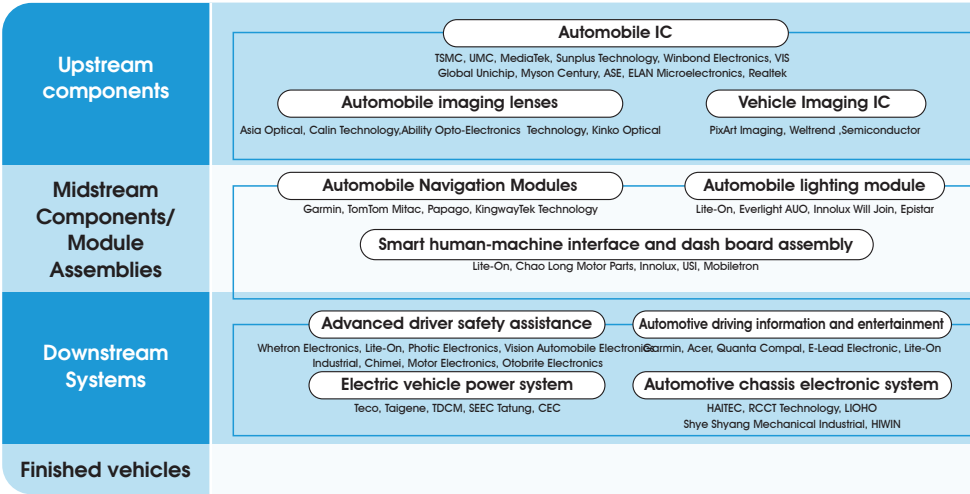
Upstream components for automotive electronics include automotive chips, automobile imaging lenses, automotive connector/wiring harness, battery cells/modules, and automobile diodes/relays. Midstream components/module assemblies include automobile navigation modules, automobile lighting module, automobile imaging lenses, electric drive systems, automobile display panels, smart human-machine interface and dash board assembly, automobile radar, automobile transmission/deceleration, and electric motors/modules. Downstream systems include advanced driver safety assistance, automotive driving information and entertainment, automobile illumination systems, automobile



security systems, electric vehicle power systems, automotive chassis electronic systems, electric vehicle charging, and vehicle-to-everything (V2X).

Taiwanese companies are present in each sector. For example, Nuvoton Technology is a MCU producer that has developed new products such as amplifier chips for vehicles, battery monitoring system (BMS) chips, and time of flight (ToF) sensors. After its purchase of Panasonic's semiconductor plant in 2020, Nuvoton has successfully entered Toyota and Tesla's supply chain and became one of the top 7 MCU plants in the world in 2021.

oToBrite expanded development in AI autonomous driving computer vision technology systems and advanced driver assistance systems (ADAS) and produced automotive electronics such as ECU, camera lenses, and computer vision AI software. The computer vision AI warning system will enter the European market, and the company is targeting the Japanese market for its driver monitoring system.



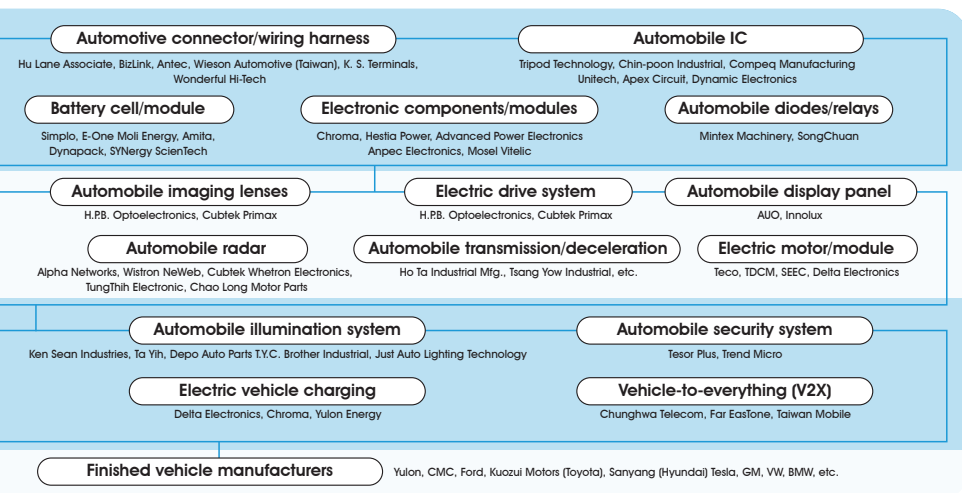
Source: Industry, Science and Technology International Strategy Center, ITRI.

Figure 3 Taiwan's automotive electronics industry chain

3 | Industrial Clusters |

1. Clusters in Northern Taiwan

Taiwan's main stronghold of the auto industry is in the north, where there is a comprehensive industrial supply chain. Assemblers of complete vehicles include Gogoro, Sanyang Industry, Yulon Motor, China Motor, RAC Electric Vehicles, Ford Lio Ho Motor, and Kuozui Motors. There are specialists in the manufacture of auto bodies, such as Hsin Sheng Autos. Makers of drive motors, control modules, electric vehicle auxiliary systems, electric vehicle power storage systems, power management systems, other key technologies and systems for electric vehicles, and niche electric vehicles¹ include iconic companies such as Delta Electronics and Foxtron Vehicle Technologies (refer to Figure 4).





2. Clusters in Central Taiwan

Central Taiwan has always been home to an important industrial cluster in the precision machinery sector. This cluster includes makers of drive motors, control modules, electric vehicle auxiliary systems, electric vehicle power storage systems, power management systems, other key technologies and systems for electric vehicles, and niche electric vehicles. Among these firms, Mobiletron is one of the best known, and Formosa Smart Energy Tech has successfully developed lithium iron phosphate battery cells and modules.

3. Clusters in Southern Taiwan

Well-known firms in the industrial clusters of southern Taiwan are active in many different sectors. Companies that assemble finished vehicles include Master Transportation (electric bus manufacturing) and KYMCO (motorcycle manufacturing). Makers of electric vehicle components manufacture drive motors, control modules, electric vehicle power storage systems, power management systems, other key technologies and systems for electric vehicles, and niche electric vehicles. Makers of electric vehicle structural components include Honley Auto Parts (specializes in hot stamping of auto body components).

1 Niche EVs are EV models designed for specific market segments and are characterized by their variety, personalization, customization, and modular power packages. Electric pallet trucks, electric dune buggies, electric forklifts and electric golf cars all fall under the niche EV category.

North District Vendors

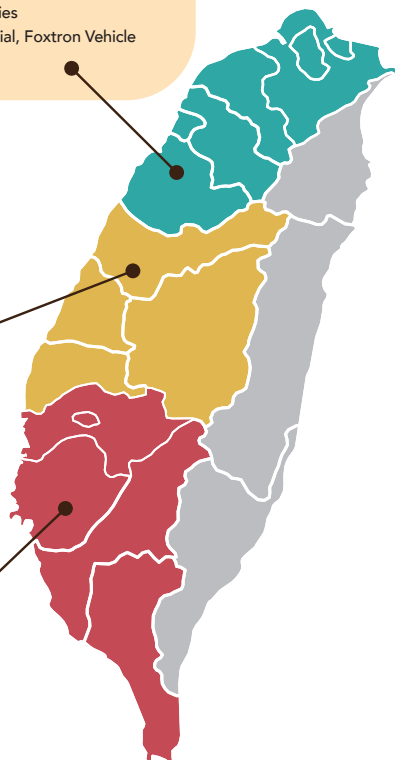
Drive motor and control module : Delta, Teco, Seec, Taigene, Evt, Tatung
Electric vehicle accessory system : Teco, Taigene, Delta Electronics, DENSO
Electric vehicle energy storage system & Power management system : Amita, Simplo, Phoenix, Delta Electronics, TAIWAN YUASA, Gogoro, Celxpert, Dynapack, Darfon Electronics, ProLogium, Lite-On, XING Mobility
Key technologies and systems integration of other electric vehicles : Delta Electronics, Chroma, LIOHO, Foxtron Vehicle Technologies
Niche electric vehicle : Elebike, Advanced Seating Industrial, Foxtron Vehicle Technologies

Central District Vendors

Drive motor and control module : Rhymebus, FUKUTA, Adlee
Electric vehicle accessory system : Rhymebus
Electric vehicle energy storage system & Power management system : Mobiletron, Changs Ascending Enterprise, Formosa Smart Energy Tech
Key technologies and systems integration of other electric vehicles : TPG, Chiau Cheng
Niche electric vehicle : Merida, Taiwan Helio, RAC Electric Vehicles

South District Vendors

Drive motor and control module : Hwameei, RICH ELECTRIC, SAC
Electric vehicle accessory system : N/A
Electric vehicle energy storage system & Power management system : E-One Moli Energy, C-LiFe Technologies, Foxconn
Key technologies and systems integration of other electric vehicles : JUULI
Niche electric vehicle : Kymco, Pillar Spoke, Master Transportation, Tang En



Source: Industry, Science and Technology International Strategy Center, ITRI.

Figure 4 Taiwan's EV Industry Cluster

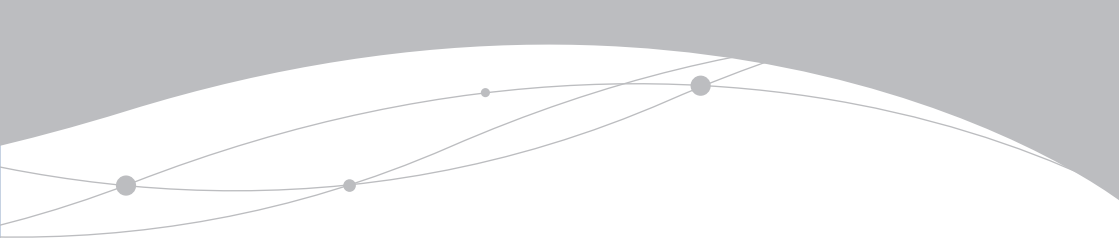
Potential Investment and Collaboration Opportunities in Taiwan

1 | Best R&D and Testing Facilities for New Generation Automobiles

Taiwan is densely populated and has a very complex transportation environment. Road traffic is a mix of pedestrians, motorcycles and automobiles compounded by a population where the use of ICT products in everyday life is very common. Taiwan can leverage international cooperation to enhance technical capabilities to become a demonstration site for the development of next-generation automobiles. Examples include new business models for interdisciplinary cooperation and pilot operation of new energy vehicles.

Compared to other countries currently developing self-driving vehicles, Taiwan has testing environments that are more complex and suited to the





development of self-driving or autonomous vehicles. In addition, promulgation of the Unmanned Vehicles Technology Innovative Experimentation Act has created conditions that are even more conducive to the creation of autonomous vehicle test environments. This will make it easier for foreign firms to come to Taiwan to engage in product development and testing.

The development of electric vehicles and self-driving vehicles has brought huge changes to automotive electronics technology. Demand for an Internet of Vehicles (IoV) is projected to grow immensely, and the associated need for cybersecurity has become a very important issue. In the field of new generation automobiles, it is true that the mainland China market offers huge business opportunities and plentiful development resources, but comprehensive network security protection has become more important due to the development of self-driving vehicles and IoV technologies. Taiwan offers strong cybersecurity technologies and extensive experience in cyber defense, making it a strong partner in the development of new generation automobiles and testing sites.

In addition, the Electromagnetic Compatibility (EMC) Testing Laboratory at Taiwan's Automotive Research & Testing Center (ARTC) is the most comprehensive laboratory of its kind in all of Asia. This lab is able to test electric buses, passenger cars, and motorcycles, and also carries out key system/parts tests that focus on such things as electromagnetic interference and electromagnetic susceptibility. The EMC Testing Laboratory is certified by the American Association for Laboratory Accreditation (A2LA), General Motors (GM), Ford, FCA, Fisker, Jaguar & Land Rover, and Harley-Davidson and can directly help manufacturers to obtain internationally recognized EMC test reports.

In the future, as vehicles go electric and the Internet of Vehicles (IoV) takes shape, more and more vehicles will undergo EMC testing. A firm that chooses to carry out product development in Taiwan will be able to efficiently carry out testing and product improvement.



2

Link up with ICT Industry, Seize upon Business Opportunities

A very wide swath of industry is involved in new generation automobiles. For both electric vehicles and autonomous vehicles, there are new types of technology where breakthroughs are still needed, and the barriers to entry in this type of R&D are high. Makers of conventional vehicles cannot develop new generation automobiles on their own, nor can high-tech firms manage it independently. Any firm wanting to make new generation automobiles must search for partners to engage in cross-sector and inter-disciplinary cooperation if they want to make breakthroughs in emerging technologies.

Moreover, technological cooperation will have to involve cross-border partnerships. Taiwan's ICT industry has world-class R&D and manufacturing capabilities and has put years of work into electric vehicles, developing applications in such areas as vehicle safety, mobility assistance, multimedia communications, and automotive chips. Major international automakers have deep trust in our ICT industry's manufacturing capabilities.

Taiwan is forming supply chains that will be capable of providing the key components needed for the new generation automobiles. Components include various sensing and positioning products, such as cameras, radar, and IoV communication modules. Taiwanese firms already have a long and successful track record of providing products to international manufacturers, and more firms are getting involved in such fields as LiDAR, HD maps, and automotive Ethernet chipset design. In the process, they are creating even stronger business opportunities in systems integration.

Development of new generation automobile technologies, growing consumer consciousness regarding green energy and environmental protection, and increased demand for active vehicle safety have triggered a sharp rise in demand for vehicle sensing technologies. Taiwan's ICT manufacturers are in position to partner with major international automakers to develop new generation automobiles.



Foxconn, for example, has partnered with Fisker, a US maker of electric vehicles, in the creation of Project PEAR and produces electric vehicles on behalf of Fisker on an OEM basis. The company signed an OEM production and joint venture agreement with Lordstown Motors, a producer of commercial electric pickup trucks in the United States, to produce commercial electric vehicles for the global market. Foxconn set up a joint venture with Geely to produce electric vehicles for the American startup company Faraday Future on an OEM basis. The company also entered into a strategic partnership with Stellantis, the fourth largest auto producer in the world, to jointly develop and produce electric vehicles and key components.

3

Comprehensive Production Services for Finished Vehicles and Components

To comply with mandated limits on exhaust emissions, Taiwanese automakers have expended great effort to develop and adjust production equipment, which has continually improved their overall manufacturing capabilities. Certain companies are already capable of independent manufacturing of finished electric vehicles. Taiwan's auto makers have relatively flexible production lines and can provide comprehensive manufacturing services for special auto models that are produced in small batches. They could serve as excellent partners to international automakers during the pilot production phase.

Next, Taiwanese auto makers are high-level producers of auto components, and have strong technologies for the production of EV lithium batteries, drive motors, reduction gears, power storage systems, power control modules, power control systems, and telematics. Many Taiwanese manufacturers provide EV components for cars like Tesla and the BMW Mini-E. It is clear that Taiwanese suppliers of auto components have an excellent international reputation. In addition, Taiwan can also produce cathode and anode materials, copper and aluminum foil, and electrolyte for lithium batteries. In the future,

as the technologies needed for new generation automobiles continue to be developed, Taiwanese makers of components will be able to rely on their superior R&D capabilities to continue providing products to major international aut makers to meet needs of new technologies and new fields.

Due to impacts from the pandemic, shortages in automobile chips, logistic risks, and geopolitical risks, automotive plants must often reduce or suspend production of both components and finished vehicles. This has highlights the need for more secure supply chains and has made it clear to the automotive industry that widely dispersed production bases are prevailing future trend. Taiwan is uniquely positioned and highly qualified to serve as a regional supply center for major international automakers. Foreign firms can, on the one hand, make good use of the existing foundation laid by Taiwanese ICT firms and makers of auto components. At the same time, they can also diversify supply chain risks by setting up a Taiwan-centered regional production network that serves as a backup production base or supply source for important components.



Investment Incentive Measures

1 | Tax Incentives |

The income tax rate for profit-seeking enterprises in Taiwan is 20%. To encourage foreign investments Taiwan, support industrial innovation, and promote industry-academia collaboration, Taiwan offers the following preferential taxes to foreign companies (Table 1):

Table 1 Preferential Taxes

Item	Preferential Measures
Employee Stock Compensation	<ul style="list-style-type: none">• A company employee who has obtained stock compensation worth a combined total of less than NT\$5 million and continuously held the stock while remaining in the company's employ for at least two years may choose to be taxed on the market price of the stock at either the time the stock was obtained or the time the stock is sold, whichever is lower.
Research, Development, or Introduction of Technologies or Machinery Equipment	<ul style="list-style-type: none">• Up to 15% of the company's R&D expenditures may be deducted from its profit-seeking enterprise income tax for current year; or up to 10% of such expenditures may be credited over three years against the profit-seeking enterprise income tax payable by the company.• Royalty payments to foreign companies for imported new production technologies or products that use patents, copyrights, or other special rights owned by foreign companies are, with the approval of the Industrial Development Bureau, MOEA, exempt from the corporate income tax.• Companies are exempt from import tariffs for importing any machinery equipment that local manufacturers cannot produce.

Item	Preferential Measures
Investment in Smart Machinery / 5G / Information Security	<ul style="list-style-type: none"> ● Smart machinery: Use of big data, AI, and IoT in brand-new hardware, software, technology, or technical services for automatic schedules, flexible, or mixed-model production lines. ● 5G: Investments in new hardware, software, technology, or technical services that are related to 5G communication systems. ● Information security: Companies' investments and purchases of brand-new hardware, software, technology, or technical services for information and communication security products or services are included in the scope of investment offsetting. ● For investments between NT\$1 million and NT\$1 billion, companies can choose from either "5% of investment spending deducted from profit-seeking enterprise income tax (current FY)" or "3% of investment spending deducted from profit-seeking enterprise income tax, if the total spending is spread over three years" may be selected, but the total amount deducted may not exceed 30% of corporate income tax that year. ● Applicable until December 31st, 2024.
Special Foreign Professionals	<ul style="list-style-type: none"> ● Special foreign professionals who meet certain criteria are eligible for a 50% deduction of total income tax for amounts exceeding NT\$3 million.
Industrial Park Locations	<ul style="list-style-type: none"> ● Companies that set up operations in export processing zones, science industrial parks, or free trade ports are eligible for exemptions on import duties, commodity tax, and business tax for the import of machinery and equipment, ingredients, fuel, materials, and semi-finished products for their own use.
Others	<ul style="list-style-type: none"> ● Companies that use undistributed earnings to engage in substantive investments may exclude the invested amount when calculating their profit-seeking enterprise income tax.



2 | Subsidies |

1. Global Innovation Partnership Initiatives Program

Foreign companies that complement Taiwan's industries are encouraged to invest in Taiwan's R&D innovation and work with Taiwanese companies to jointly develop forward-looking technologies, key technologies, or integrated technologies beyond our current capacities. Such businesses could exert a key influence on Taiwanese industry by: (a) inspiring R&D work on industrial technologies as well as the establishment and development of supply chains; (b) improving R&D efficiency; (c) accelerating the timetable from R&D to production; and (d) contributing actively to the expansion of international markets. Foreign companies successful in endeavors relating to this program will be eligible, upon approval from the MOEA, for subsidies of up to 50% of total R&D expenditures.

2. Pioneers for Innovation Leadership on Technology Program

The program aims to transform Taiwan into a high-tech R&D center and encourage leading international manufacturers to establish cutting-edge R&D bases in Taiwan, empowering their work in forward-looking technologies in Taiwan and connecting with Taiwan's supply chain, thereby creating a division of labor in the areas of research, co-creation, and development, with an eye to strengthening the technological competitiveness of Taiwan's leading industries and accelerating the formation of clusters in emerging industries. Program funding of up to 50% of total expenditures may be granted for any project that has been approved by the Ministry of Economic Affairs.

Areas of implementation include: (1) Emerging semiconductors (e.g., next-generation memory, high-frequency and high-power semiconductors technologies, etc.); (2) Next-generation communications (e.g., open 5G network architecture, low earth orbit (LEO) satellite communications, etc.); (3) Artificial intelligence (e.g., new AI models and platform technologies, etc.).

3. Industrial Upgrading Innovation Platform Guidance Program

To guide industries in Taiwan to develop high-value products and encourage corporations to enter the high-end market to increase the industry's added value, the Industrial Development Bureau, Ministry of Economic Affairs, and the Ministry of Science and Technology are promoting the "Taiwan Industry Innovation Platform Program". The program provides companies that have R&D teams in Taiwan with funding of up to 50% of the budget for R&D projects proposed independently.





Leading Taiwanese Companies

1 | Materials and Components |

Chang Chun Petroleum (CCP), established in 1964, mainly provides electro-deposited copper foil, which is one type of material used in automotive lithium batteries. This company's copper foil measures as thin as 5 microns and greatly improves battery performance. The world's five biggest suppliers of lithium batteries are all customers of Chang Chun Petroleum, and fully 60% of all Tesla electric vehicles manufactured in the US have batteries that make use of CCP's copper foil. Today, CCP commands a 25% share of the global market for the copper foil used in EV batteries.

Honley Auto Parts, established in 2014, mainly manufactures and assembles hot-stamped auto body components and structural components (e.g., A pillars, B pillars, doorbeams, bumpers, roof rails, and rocker panels). Hot-stamped components have the advantages of being thin, lightweight, and safe and can meet the need to make electric vehicles lighter and safer.

ProLogium was established in 2006 as a producer of lithium ceramic battery cells. Currently, the company focuses on the development of oxide solid-state batteries. ProLogium products are safe and have high energy density that attract proposals for strategic cooperation from international auto companies. The company is planning to invest in mass production and commercialization of solid-state batteries for vehicles.



2 | Modules and Systems |

Pegatron Corporation, established in 2008, has long supplied German automakers with automotive electronics products, such as car entertainment systems, remote recording devices, and advanced driver assistance systems. In recent years the company has branched out into the EV field, and provides electronic control units and partition solutions or sub-system solutions. Pegatron's customers include Tesla, Audi, and Toyota, and for some of them Pegatron has risen to the status of a Tier 1 supplier.

TungThih Electronic Co., established in 1979, mainly develops advanced driver assistance systems and is the world's third-largest supplier of backup radar. The company also develops ultrasonic radar and automotive mirror solutions. TungThih's customers include Tesla, Ford, GM, SAIC Volkswagen, and PSA.

Delta Electronics, established in 1971, mainly supplies EV drivetrains and charging equipment. Delta Electronics and GKN Automotive, a British drivetrain supplier, are cooperating on joint development of next-generation eDrive technology that will combine GKN Automotive's eMotor and gearbox systems with motor drives supplied by Delta Electronics. This new technology will reduce systems weight and packaging volume while simplifying assembly processes, and is projected to capture a 10% share of the global market for EV power systems. Delta Electronics has obtained safety and standards certifications in the EU, the US, mainland China, and Taiwan for the charging equipment (including bi-directional chargers, including rapid DC chargers, AC chargers, and charging stations) that it provides.

XING Mobility, established in 2015, holds a patent for its immersion-cooled modular battery technology, which uses a high-power density modular design to achieve rapid cooling while sharply reducing weight and volume. It currently targets the commercial and industrial electric vehicle market and develops patented immersion-cooled modular battery systems for vehicles used in construction, architecture, and mining that traditionally use diesel engines by helping to convert traditional internal combustion engines to battery systems.



3 | Braking Systems |

RAC Electric Vehicles, established in 2005, is a Taiwanese maker of electric commercial vehicles and sells an EV bus (the RAC bus). The company has the ability to independently design and manufacture electric buses, and has technologies for three electric systems (batteries, electric motor, electric control). The following are just some of the technologies for which it has obtained a patent: an EV bus power control system; an EV bus battery abnormality detection system; a battery configuration structure for low-floor chassis electric buses; a motor drive mechanism for electric buses; and a condensing device for electric bus air conditioning.

Foxtron Vehicle Technologies was established in 2020 as a joint venture between the Yulon Group and Foxconn. Foxtron Vehicle Technologies combines the Yulon Group's finished vehicle autonomous R&D platform with Foxconn's supply chain systems, components manufacturing, mechanical design expertise, and systems integration capabilities. Foxtron Vehicle Technologies develops new energy vehicles and key sub-systems, and is promoting a model for an open and shared MIH EV platform. The Model T electric buses developed by Foxtron have been delivered to Kaohsiung Transportation Company for operations. The company has also planned the mass production of the Model C electric SUV and Model E electric sedan, demonstrating its capacity for the production of electric vehicles and technology development.

The Automotive Research & Testing Center (ARTC), working hand-in-hand with 20 companies, has developed the WinBus, Taiwan's first home-grown self-driving electric minibus. This is Taiwan's first unmanned vehicle that meets the standard for SAE Level 4 autonomous driving. Its maximum speed is 50 km/h, and has a range of 70 kilometers on a single charge. The Winbus has been used in the Lugang-Changhua Coastal Industrial Park shuttle services and plans have been formulated for operations in Kaohsiung and Penghu.

Examples of Successes Achieved by Foreign Companies

1 | Production and Technology |

Toyota Tsusho has acquired a stake in Fukuta Electric & Machinery, and the two entities plan to cooperate in developing motors for electric vehicles and plug-in hybrid vehicles (PHV). Kuozei Motors, which builds Toyotas under license for the domestic market, invested NT\$6 billion in 2019 to upgrade its production lines to begin turning out hybrid vehicles.

Denso, a large Japanese automotive components manufacturer, took an equity stake some time ago in Cryomax Cooling System, which mainly produced auto radiators under the Cryomax brand and exported them as aftermarket products to Europe, North America, and mainland China. More recently, Cryomax has begun to sell OES components via Denso, and has gained technical assistance from Denso to develop condensers. In the future, it will develop condensers for electric vehicles.

Mercedes-Benz invested in ProLogium and signed a partnership agreement to jointly develop solid-state battery cells specifically for electric vehicles. It plans to set up battery production capacity in Europe and certain Mercedes-Benz vehicles will use ProLogium's solid-state battery technology.

American company Optimal-EV has set up Optimal Mobility Intelligence Co., Ltd. in Taiwan and commenced collaboration with the Automotive Research & Testing Center to transfer level 3 integration technologies to the American commercial electric vehicle produce Optimal EV. The company has helped Taiwanese companies enter the international OEM supply chain system and plans to complete commercialization and mass production in 2023.



Japanese company Nidec set up a joint venture with Foxconn and Foxtron Vehicle Technologies in 2022 for the joint development, production, and sales of motor products. Nidec also provides Foxtron Vehicle Technologies with a stable source of motor systems and other vehicle electrical systems.

2 | Inter-Disciplinary Industrial Cooperation |

In November 2019 Sumitomo Corporation invested in RAC Electric Vehicles, spending NT\$126 million to obtain a 7% equity stake. Sumitomo will rely on RAC to perform electric bus manufacturing and related services, while RAC will rely on Sumitomo's global marketing and services network to expand its international markets. In October 2021, RAC announced that it will develop, design, and produce electric buses that meet Japanese regulations with Sumitomo, and they have plans to start a pilot program on the business premises of Nishi-Nippon Railroad before expanding in Japan. In addition, XING Mobility announced a strategic partnership with HKS April in 2021 to use the battery and motor system products and services of XING Mobility and HKS's experience in tuning high-performance vehicle and commercial vehicles for joint development of vehicle electrification and tuning technologies.

3 | R&D and Testing Facilities |

NVIDIA, a US maker of graphics chips, has signed a letter of intent to engage in cooperation with the National Applied Research Laboratories (NARLabs), which is directly under Taiwan's Ministry of Science and Technology. NVIDIA took part in efforts to develop Taiwan's autonomous vehicle industry and cooperated with Taiwan CAR Lab on technology applications, including self-driving vehicle simulation software, decision-making system, and self-driving vehicle body.

TUV Rheinland also worked with Taiwan CAR Lab to set up a verification environment in Taiwan that meets international standards. It helps Taiwanese companies with product verification and accelerates their entry into the international vehicle supply chain system. German company Bosch commenced the development of automotive electronic sensors in Taiwan and joined the MIH open platform for electric vehicles, which provides power system, steering system, and brake system solutions for electric vehicles. The power system and e-axle integrates motor, power electronics, and transmission of electric vehicles.



4 | Talent Development |

The Volkswagen Group Taiwan Training Academy was established in 2015 in the Xizhi District of New Taipei City and is Volkswagen's biggest training institution in Asia outside of mainland China. Recently entering Taiwan's electric vehicle market, Volkswagen established the e-Mobility Center to train professionals with special expertise in maintenance of Taiwan-made electric vehicles and to engage in cooperation with Delta Electronics on the development of EV charging infrastructure. In addition, Honda Taiwan is cooperating with technical and vocational schools in Pingtung County to train technicians and provide young graduates with employment opportunities.

Mercedes Benz seeks to fully implement Go Electric objectives and provide more digital services. It has created a brand-new training center in Taiwan to ensure the quality of services provided by technical personnel and sales representatives, expand component logistics centers, and increase the capacity of components and supply stability. It also implements management with digital integration and maintains real-time connections with the global parts logistics network.





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