ELECTRIC VEHICLES – MOBILITY IN TURKEY

The Emerging Market and Opportunities – update

May 2015

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Introduction

The first electric vehicles (EVs) were sold in Turkey in 2012. This received a lot of attention from the Turkish government. EVs were included in the strategy documents and action plans of almost all ministries and public institutions. The Turkish government’s desire to have a “Local Brand Vehicle” before the 100th year of the establishment of the Republic in 2023 and preferably an “EV” attracted the interest of Turkish industry and entrepreneurs. This was seen as an emerging market and the embassy has produced a detailed report about these developments in April 2013.

After two years, the present report aims to provide an update about the current situation of the EV market.

The development of a national EV is said to be followed closely by Mr Fikri Isik, the minister of Science, Industry and Technology. He is expected to make an announcement end May and share with the public the progress achieved in national EV studies.

It has already been made public that research and development of a national EV will come from TUBITAK- The Scientific and Technological Research Council of Turkey. Engineering and design will be done by a private company in which TUBITAK is involved. Production will be realised by the private sector completely. The government will introduce incentives also for the production stage of the EVs.

The EV market in Turkey is growing very slowly. The number of EVs on the road is negligible. This is partly attributed to the short distances that can be covered by an EV and by driver habits. It is observed that Turkish people like to drive their own cars even when going on long distances and currently available batteries do not support such long trips. Lack of charging infrastructure does not help either. In the first four months of 2015, 30 electric cars were sold.

Institutional and regulatory framework for electric mobility in Turkey

The 10th development plan of Turkey, covering the period between 2014 and 2018, was adopted by Parliament and mentions that the automotive industry is among the priority sectors. Under main objectives and principles, it is explicitly mentioned that:
“in the automotive industry, domestic share of value-added will be increased by covering a larger span of the supply chain, including design/R&D, manufacturing and sales/marketing activities in their entirety. Development of new environment friendly technologies will be supported. Collaboration and integration of the sector with other sectors such as electronics, software, electrical machinery, basic metals and defence industry will be improved. Branding will be encouraged by means of concept vehicles designed for the needs of both domestic and global markets”.

25 Priority Transformation Programmes are identified under the 10th Development Plan and relevant action plans have been announced in November 2014:

- **Reducing Import Dependency** mentions that prototype battery development for electric vehicles will be realised.
- **Commercialisation in Priority Technology Areas** says that technological product investments and prototype development processes in priority sectors will be supported. Clustering activities will be encouraged.
- **Energy Efficiency Improvement** says that Intelligent Transport Systems will be expanded. Use of public transport, small engine volume and electric and hybrid vehicles will be disseminated.

The Medium Term Programme, covering the period between 2015 and 2017, mentions that the automotive industry will continue to be among the leading sectors of Turkey’s export strategy. Amongst others, the electrical car manufacturing domestic production capacity will be increased by strengthening R&D and an investment incentives system.

The Ministry of the Environment and Urban Planning develops policies concerning clean vehicle technology as well as alternative fuel uses.

Above mentioned plans and programmes signify that development of electric vehicle technology will receive active support from the Turkish government in the coming period.

**Ministry of Science, Industry and Technology (MoSI&T)** has recently announced the new Turkish Industrial Strategy Document, covering the period between 2015 and 2018. This will be followed by the new Turkish Automotive Sector Strategy Document, covering the period between 2015 and 2018. This will be adopted after the approval of the Economic Coordination Council. This is expected to be end 2015.

The Automotive Strategy Department of the MoSI&T will focus on the preparation of relevant regulations regarding EV charging infrastructure in coordination with the ministry of Energy and Natural Resources, the Energy Market Regulatory Authority (EMRA) and the Directorate General of Metrology and Standardisation of MoSI&T. These regulations will
bring clarification to where the charging infrastructure can be established and how they can be licensed.

**Overview of R&D developments and activities**

The Automotive Technology Platform has published a strategic research and activity report end of 2014 in which they performed a SWOT analysis of the, amongst others, EV market in Turkey. Subsequently, they propose several actions to be taken leading up to 2023 mainly related to R&D in order to develop EV technologies. In the future they expect and aim:

- To spread the use of electric and hybrid vehicles.
- To develop locally sourced spare parts for electric and hybrid vehicles.
- To catch up to the international level of technology regarding electric vehicles.
- To invest in R&D with the aim of commercialising electric vehicles and their components.
- To develop incentives as well as a sufficient infrastructure as to present the benefits of using EVs.
- To be less dependent on imports of components.
- To increase R&D investments in electric vehicles.

As challenges they see:

- There is not enough knowledge about critical components.
- There is not enough infrastructure.
- The needed infrastructure is expensive to develop.
- Critical raw materials need to be imported.
- R&D investments and R&D personnel numbers are low.
- Worldwide firms active in the development of EVs have bigger capital means.
- There is no national car brand.
- There is no trusted EV brand in the world yet.

As an approach to these challenges they see:

- Better cooperation between universities and the industry.
- To increase the level and number of qualified personnel for R&D and well as basic and fundamental research.
- To send students to universities and research centres abroad.
- To further develop the laboratory infrastructure, mainly related to homologation & certification tests in order to be less dependent on foreign partners.
- To have more Turkish experts in international standard setting organisations.
- To prefer the use of a national designed brand.
Specific actions to be taken are aimed to decrease costs, increase charging capacity, increase electric drive and system efficiencies and to build the infrastructure in order to gain a widespread use of electric vehicles. More specifically the actions are as follows:

1. The development of electric engines and drive systems.
   a. The development of infrastructure that allows testing of electric engines and drive systems.
   b. To catch up to international standards regarding technology for the development and production of a local electric engine.
   c. To be able to design and build internal software for the electric engine control unit according to safety standards.
   d. To develop electric engines that can be fitted inside wheels.
   e. To increase the efficiency of electric engines and related components from 90% to 94%.
   f. To develop smaller engines that have the same output (1.1 kW/kg until 1.4 kW/kg).
   g. To develop engines at lower costs (from 30 dollar per kW to 8 dollar per kW).

2. The development of smart cars.
   a. To improve the vehicle control unit and the vehicles energy management.
   b. To develop battery management systems.
   c. To develop thermal battery management systems.

3. The development of energy storage systems.
   a. To increase R&D in battery technology and to increase the support of the government for the development of such technologies.
   b. To establish battery test centres.
   c. To increase the number charging cycles and to increase the lifespan of batteries.
   d. To establish the infrastructure for the development and production of lithium batteries.
   e. To find the optimum level of battery temperature for battery efficiency.
   f. To develop recycling methods for lithium batteries.
   g. To catch up to international standards regarding battery technology (500 dollar/kWh, 100Wh/kg, 400W/kg).
   h. In order to be able to compete, catch up to costs per battery capacity (125 dollar/kWh, 250 Wh/kg, 2000W/kg).

4. The development of charging station infrastructure
   a. To provide the possibility to charge at home.
   b. To improve the availability of charging stations (in big cities 1 station in every 30km).
   c. To provide management of smart grids.
   d. To increase the availability of fast charging stations.
e. To develop a dynamic charging infrastructure for cars that are moving in order to reach the zero emission goals of certain specifically chosen regions.
f. To develop a contactless charging infrastructure.

5. The development of lightweight vehicles.
   a. To develop electric cars by converting conventional cars to electric cars.
   b. To decrease the weight of the car’s body work by 35%.
   c. To optimize the design and weight of inside equipment and decrease the weight by 5%.
   d. To decrease the weight of chassis and suspension components by 25%.

6. The encouragement of EV usage.
   a. To increase R&D support programmes for EVs.
   b. To support R&D projects related to battery technology.
   c. To encourage production of components.
   d. In order to encourage the usage of hybrid and electric vehicles, increase the usage of such vehicles by the government.
   e. In order to increase the EV usage, encourage the development of incentives such as lower taxes etc.
   f. Incentives needs to be given in order to develop the charging infrastructure.
   g. Special zero emission regions need to be established.

The automotive sector is one of Turkey’s designated top sectors and a sector in which the country feels that it has built up a considerable knowledge base. In its efforts to focus its innovation and R&D investments, Turkey developed technology roadmaps for all its top sectors. While these roadmaps are not publicly available, it is possible to see what kind of technology development is pursued by looking at the calls for proposals published by TUBITAK, the Scientific and Technological Research Council of Turkey. Three call programmes support development of electric vehicles and their components:

1. TUBITAK-TEYDEB is a call programme specifically aimed at the private sector. Under this programme calls have been published that specifically focus on hybrid and electric vehicle technology, energy management systems/software and system integration, engine, control and driver systems. More specifically:
   a. Electric engine/generator and driver systems for electric and hybrid drive systems.
   b. Power management control systems, equipment and algorithms for electric and hybrid vehicles.
32 projects have been granted for a total of 29.6 million TL

2. TUBITAK-ARDEB is mainly targeted at basic and fundamental research at universities and in 2012 8 projects were granted for a total of 4 million TL related to battery technology and control systems as well as electric engines.
3. Under the 1007 programme (under which so called landmark projects are launched), the MoSİT launched its National EV project. The call launched February 18th 2013 and consists of two stages. For the first stage 20 consortia applied of which 10 proceeded to the second stage. It has not been published yet which consortia successfully completed the second stage but four projects will be supported for a period of four years, after which a prototype must have been built. The call foresees a funding rate of 100%. The call focuses on several technologies to be developed locally:

a. The design of the car, integrated as well as detailed.
b. Battery technology, focused on cell technology and components (anode, cathode, electrolyte, separator) battery module, systems and packaging as well as battery management system.
c. The development of electric engines, drive systems, transfer components, high voltage components, DC/DC convertor.
d. Vehicle control systems related to energy, vehicle dynamics, active safety, vehicle management & diagnostics, cooling & heating as well as energy recovery.

Moreover production feasibility needs to be researched.

TUBITAK’s Marmara Research Centre (TUBITAK MAM) consists of an Energy Institute (EE) and has a “Vehicle Technologies Group”, dedicated to R&D studies for the development of hybrid and electric vehicles. Research areas focus on electric control systems, electric drive systems, battery and energy storage technologies (focusing on lithium-ion batteries) as well as smart battery power systems. Turkey is a member country of the International Energy Agency (IEA). In the past, this research group built prototypes for electric vehicles as well as light commercial hybrid vehicles. TUBITAK MAM- Energy Institute-Vehicle Technologies Group is the National Contact Point for Turkey and contributes to the annual IEA-HEV report. The 2015 edition of this report has just been published on the website of IEA- www.ieahev.org and information on Turkey can be reviewed on pages 257 and 261.

Turkey fully participates in Horizon 2020, EUREKA (including ITEA3 and Eurostars) as well as COST actions. TUBITAK is the National Contact Point for these framework programs. TUBITAK assists parties in finding project partners. Relevant National Contact Points for fields related to EVs are as follows:

- **Safe, Clean and Efficient Energy**
  Ilknur Yılmaz – ncpenergy@tubitak.gov.tr

- **Smart, Clean and Integrated Transport**
Both KocSistem as well as Turkcell Technology are core group members of ITEA3 (www.itea3.org).

There are 12 Automotive R&D companies that are in operation, licenced under Law Nr. 5746 regarding the Encouragement of R&D Activities. These are:

<table>
<thead>
<tr>
<th>Name of company</th>
<th>Location of R&amp;D Centre</th>
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<tbody>
<tr>
<td>Temsa Global Sanayi ve Ticaret A.Ş. – <a href="http://www.temsa.com.tr">www.temsa.com.tr</a></td>
<td>Turkey</td>
</tr>
<tr>
<td>Bozankaya Otomotiv Makine İmalat İthalat ve İhracat A.Ş.</td>
<td>Turkey</td>
</tr>
<tr>
<td>Man Türkiye A.Ş.</td>
<td>Germany</td>
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<tr>
<td>Türk Traktör ve Ziraat Makineleri A.Ş.</td>
<td>Turkey-The NL</td>
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<tr>
<td>Oyak-Renault Otomobil Fabrikaları A.Ş.</td>
<td>France</td>
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<td>Tofaş Türk Otomobil Fabrikası A.Ş.</td>
<td>Italy</td>
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<tr>
<td>Ford Otomotiv Sanayi (Sancaktepe) A.Ş.</td>
<td>USA</td>
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<td>Mercedes Benz Türk A.Ş.</td>
<td>Germany</td>
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<tr>
<td>BMC Otomotiv Sanayi ve Ticaret A.Ş.</td>
<td>Turkey</td>
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<tr>
<td>Anadolu Isuzu Otomotiv Sanayi ve Ticaret A.Ş.</td>
<td>Turkey</td>
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<tr>
<td>Ford Otomotiv Sanayi (Gölcük) A.Ş.</td>
<td>USA</td>
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<td>Otokar Otomotiv ve Savunma Sanayi A.Ş.</td>
<td>Turkey</td>
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Source: MoSI&T, General Directorate of Science and Technology, May 2015

Universities that stand out with their studies contributing to the progress in the EV technologies are:

Hacettepe University – www.hacettepe.edu.tr

It was announced in May 2015 that HU-GO will be ready for serial production within one or two months. HU-GO, is a single seater ultra-light electric vehicle designed and manufactured in the Automotive Engineering Department of Hacettepe University at Ankara by a team lead by Prof. Engin Tanık and Prof. Volkan Parlaktas. The main goal of the project is to prove that a light electric vehicle can have an acceptable range without requiring heavy and expensive batteries. LiFePO4 type batteries are used in the HU-GO. Contrary to its rivals, the HU-GO has a battery pack that weighs only 53 kg, which is sufficient for a range of 100 kilometres. With its energy consumption of 50 Wh/km, HU-GO is
one of the least energy consuming four-wheeled vehicles in the world. HU-GO can be fully charged in 4 hours, from a standard household outlet. Also with regenerative braking, the vehicle can charge its batteries by converting kinetic energy to electric energy, when the throttle pedal is released.

**Istanbul University:** Its e-vehicle project is called: Proje Yerel T – [www.projeyerel.com](http://www.projeyerel.com) (available in English) - 2+1 passenger capacity and a 500 km range using a 30 kWh battery. The vehicle utilizes composite materials that reduces the weight to 500 kg and can reach speeds up to 120 km/h. The university announced that the T-1 can be charged in 4 hours with Level 2 charging and in 8 hours with conventional house plugs. The vehicle won TÜBİTAK’s “Electromobility Race” by being the most efficient vehicle among the 30 competitors from universities around the country. It also completed a 800 kilometer tour around the country. The car uses conventional battery and engine technology. There are no plans to transform this prototype into production status and for now this remains a one-off. During the Turkish Innovation Week 2014, where The Netherlands was partner country, this car was displayed next to the TU/Ecomotive ISA car.

Istanbul University also participated in the World Solar Challenge, where they finished 8th in 2011. The team plans to participate in the 2015 edition again.

**İstanbul Technical University (ITU) – [www.itu.edu.tr](http://www.itu.edu.tr)**: ITU Energy Institute – [www.enerji.edu.tr](http://www.enerji.edu.tr) has studies on energy technologies. Automotive Technology R&D Centre (OTAM) – [www.otam.com.tr](http://www.otam.com.tr) has been founded by the collaboration of Automotive Manufacturers Organization (OSD), The Scientific and Technical Research Council of Turkey (TÜBİTAK) and Istanbul Technical University (ITU) in 2004. In 2007, OTAM became a corporation with the shareholders ITU, OSD, Association of Automotive Parts and Components Manufacturers (TAYSAD) and Uludağ Automotive Industry Exporters Union (OIB). OTAM AŞ carries out of pre-production R&D studies, product testing jobs of the automotive industry and its suppliers. It operates now as an engineering service company and is seen as one of the success stories regarding academic-industry collaboration.

**Middle East Technical University (METU).** [www.biltir.metu.edu.tr](http://www.biltir.metu.edu.tr). METU’s BILTIR facilitie, conduct activities regarding automotive industrial design, safety and smart transport systems amongst several others.

**Okan University-** [www.okan.edu.tr](http://www.okan.edu.tr) : It has a Transport Technologies and Intelligent Automotive Systems Application and Research Centre that performs or contribute in research and development in the areas of intelligent vehicles, intelligent transportation systems, other unmanned vehicles, robots, robot groups, advanced automotive technologies, electric transportation technologies, fuel cells, vehicle technologies that use solar cells and similar clean and renewable energies, development and application of complicated
simulation and virtual environments. This centre developed projects regarding autonomous driving as well cooperative driving and related sensor technologies.

Yıldız Technical University – www.yildiz.edu.tr: It has a number of application and research centres where smart vehicle/transport technologies and energy technologies are produced. Eg. Alternative fuelled vehicle project: www.ae2project.com


Suleyman Demirel University (SDU) in Isparta – CAD-CAM Research and Application Centre: SDU has signed a co-operation agreement in March 2015 with QT Holding and Teknos Grup Otomotiv – www.teknosgrup.com.tr for the developement of an EV.

Dokuz Eylül University in Izmir: Its e-vehicle is called DEMOBİL - http://demobil.org/site/tr/index.html

Bozok University in Yozgat – www.bozok.edu.tr: Its e-vehicle is called BOZOK-E

Progress in Electric Vehicle (EV) market in Turkey - Update
EV production and conversion initiatives
The 2013 report of the embassy lists a number of EV production initiatives of existing automotive manufacturers located in Turkey, as well as some entrepreneurs. Most of these initiatives seem to have failed to achieve any success so far, but some companies are keen on developing new technologies. Below there is an update with additional information.

OYAK Renault – www.oyak-renault.com.tr: stopped its EV production of the Fluence Z.E. with the argument that market conditions are not yet ready. Many people/institutions returned their EVs to Renault. Renault’s concept of selling EVs and renting out their batteries on a fee basis was not a success, also because the car was not designed as an EV and had therefore ill handling characteristics. Moreover, the company behind the renting out of the batteries went bankrupt. They have a lot of second hand EVs for sale. Renault has ZOE and Twizy EV models (imported), but there is not much demand for them either.

BMW: As of 2015, BMW started selling their i3 electric and i8 hybrid sportscar in Turkey. As an accessory you can buy a Wallcharger for home use with your BMW for fast charging, but it also works with normal sockets and it cooperates with Esarj for a nationwide network of charging stations.
FIAT (TOFAŞ) – www.tofas.com.tr - In order not to lag behind of technological developments, TOFAS benefited from TUBITAK incentives and developed 3-4 types of prototype EVs. These ideas are shelved because the company does not find it feasible: a) batteries are expensive, b) distance coverage with the current batteries is less than 200 km. R&D studies are needed on developing cheaper energy storage systems, fuel cells, and to increase the distance coverage of EVs. TOFAŞ is ready to join forces with third parties in R&D. Contact person: Mr. Kemal Ekbiç, Head of Advanced R&D team – E-mail: Kemal.ekbic@tofas.com.tr – Tel: +549 596 77 56

OTOKAR – www.otokar.com.tr - OTOKAR’s Doruk Elektra bus (EV) has been tested at the historical peninsula route of Istanbul in 2013. Since then, OTOKAR is trying to promote this bus with other municipalities. It has recently been tested by Samsun Municipality as well. Biggest challenges are the lack of charging infrastructure and the lack of parking areas for electric buses. A bus can run for around 200 kms on a flat area. In case of slopes, the distance decreases. Buses cannot be sent to the main parking areas for recharging. Recharging time is 6 hrs. Also batteries of such EVs are more expensive than the vehicles themselves. It is not affordable. OTOKAR’s R&D studies are continuing. Studies which would make recharging possible when the car is running could be interesting. Contact: Tarkan Burak, Marketing Manager.

ETOX – www.etox.com.tr - ETOX has developed a prototype EV, but it requires considerable budget and investment to start serial production. They cannot enter into this business without any government incentives. ETOX’s EV makes around 150 km. ETOX keeps on investigating possibilities to improve its design and to use new materials, eg. light composite. They cooperate with various universities such as the Middle East Technical University, Yıldırım Beyazıt etc. ETOX is now working on developing a micro-car for 1-2 persons. It also cooperates with an engineering company in the U.K. (Lotus) and a well-known designer, Mr. Murat Günak, the designer of Mercedes-Benz. Contact: Mr. Ozer Arslan, R&D and Engineering Manager - E-mail. ozerarslan@ertexoto.com; Tel. +90 505 883 88 07

BD OTO – www.bdato.com – E-mail: info@bdoto.com
BD is active in the distribution, production and charging of EVs and focuses on light commercial vehicles. BD Oto says that their EVs are ready for export markets. It has European Type Approval. BD is ready to discuss business possibilities with interested Dutch companies. BD has a sales and service network throughout Turkey and some Eastern European countries, distributing BYD and FISKER branded cars. Interested in “electrification of transport” . BD focuses on converting light commercial vehicles out of its Italian and Turkish assembly lines. The product range covers both van and combi type vehicles having GVW between 1.5t – 3.5t. The vehicles have both Level-2 and Level-3 charging options on-
board to increase the mobility in commercial use. BD has started the serial production in 2012 for Turkish and European markets.

BD also has a battery pack assembly production in Italy/Turkey firstly serving its own light commercial production with the intention of doing pack-assembly for other serial-productions. Next to this, BD is starting up a recycling plant for lithium-ion and other batteries. In addition, BD installs and retains the ownership of EV charging stations in top locations in Turkey to provide a charging service to its e-mobility customers.

BD’s EVs are used by its own fleet company, as well as rented out to some courier companies in Turkey; eg. TNT, Aras Cargo. BD has currently 71 charging stations.

BD has tried to promote EV taxi-minibuses (yellow taxi-dolmuş in Istanbul). This project failed because the local administrations did not provide permits for the establishment of charging stations along the taxi-minibus routes.

KARSAN – www.karsan.com.tr
KARSAN is one of the oldest automotive manufacturers of Turkey. It had developed a prototype EV called “ConceptV1” through the Hexagon Studio – www.hexagonstudio.com.tr which is an independent engineering company. Because of the lack of government incentives for production, KARSAN did not start any serial production.

Concept V1 was developed as an EV-taxi/passenger car that will serve people with reduced mobility such as elderly people, wheelchair users’, those with strollers and prams. KARSAN’s Concept V1 was shortlisted for New York taxi tender. KARSAN is now preparing for London Taxi tender that will be held in 2015. Concept V1 is adjusted to the British traffic system.

HEXAGON STUDIO – www.hexagonstudio.com.tr
It is the largest independent design and engineering house, established in 2006 to serve automotive (mobility) and defence industries for both local and international OEMs and suppliers. It not only works for KARSAN, but also intensively for defence industry and other transport related companies on a project basis.

Contact: Mr. Unal Elbeyli, Business development manager – E-mail: unalelbeyli@hexagonstudio.com.tr
Tel: +90 262 673 21 00 (Address: TAYSAD (Automotive Spare Parts Association) Organised Industrial Zone, 1. Cadde 15. Yol, No.7 – 41420 – Cayirova – Kocaeli.

Begler was established in the Eskisehir Technology Development Zone in November 2012 by Hisarlar (www.hisarlar.com.tr) and Gate Electronik (www.gatelektonik.com.tr) for the sole
purpose of developing an electric vehicle. Its R&D Manager Melih Yildiz says that Begler’s efforts are currently interrupted. Yildiz continues developing relevant EV technologies under TAED -Technology Research company– http://taed.com.tr


TAED Technology Research is established to provide services and products on systems engineering, power electronics, control systems, electric energy storage systems to the customers who are interested in developing their own products. TAED’s shareholders are all academics.

Melih Yildiz is the R&D Manager: E-mail: myildiz@taed.com.tr ; myildiz@begler.com.tr; myildiz@gmail.com.tr

**TORUK CARS** – [www.torukcars](http://www.torukcars)

Toruk Cars was an alliance of engineers and designers, collaborating to develop an electric car.

The initiative came from an engineer working at Airbus and Ugur Sahin Design (NL).

Companies involved were:

- Ugur Sahin Design – [www.ugursahimdesign.com](http://www.ugursahimdesign.com)
- Tepas – [www.tepas.com](http://www.tepas.com) for electric motor supply
- Enko – [http://enkoelektronik.com](http://enkoelektronik.com) for electronic driver and related controlling systems
- Yigit Aku – [www.yigitaku.com](http://www.yigitaku.com) for batteries
- Basar – [www.basarelektromekanik.com.tr](http://www.basarelektromekanik.com.tr) for welding automation
- Avrotas – [www.avrotas.com](http://www.avrotas.com) as design partner
- Sismak – [www.sismak.com](http://www.sismak.com) for steering parts
- Canbay Systems Software – [www.canbay.eu](http://www.canbay.eu)

This initiative ceased to exist when the engineers that initiated the group lost their appetite and stopped their efforts. Some of the above mentioned companies continue their R&D studies individually or in cooperation with other groups.

**Canbay Systems Software**/ Mr. Unal Canbay – [www.canbay.eu](http://www.canbay.eu) – used to be the R&D manager for Toruk Cars, developing the controlling software that is crucial for EVs. Mr. Canbay is ready to discuss business possibilities. He is also a board member of a new Technology Development Zone that has recently been established between Ordu and Samsun (at the Black Sea) and trying to attract the interest of technological companies there.

Contact: Ünal Canbay, Research & Development - Tel: +90 506 439 49 49 – E-mail; unal.canbay@canbay.eu

**ASELSAN** – [www.aselsan.com.tr](http://www.aselsan.com.tr) and **TEMSA** – [www.temsa.com.tr](http://www.temsa.com.tr) have signed an agreement in March 2015 to develop an electrical bus. It is agreed that components
produced by Aselsan will be developed and adapted to the transport vehicles of TEMSA. ASELSAN’s know-how and expertise is based on defence sector. It develops electric components such as motor and motor drivers, battery and battery management systems, vehicle control and steering systems, radar, night vision systems, ultrasonic sensors, communication systems.

TEMSA produces transport vehicles. TEMSA recently announced that it will add an electrical bus to its own product range. This model, named MD9 ElectriCITY, will be launched at UITP Congress in Milan between 8 and 10 June. This bus runs completely on electric energy. It completes its route by making quick charges at the bus stop and at the final destination.

ASELSAN and TEMSA will focus on producing a 100% made in Turkey bus, with all parts such as motors, gearbox, the electric motors, inverters and converters are designed domestically. They will apply to TUBITAK for “Avenue” a 12 metres electric bus, as well as for the MD9 ElectricCITY electric 9 metres bus.

Contact: Mr. Alper Baykut, R&D Manager – Tel: +90 533 433 02 80 – E-mail: alper.baykut@dmaoto.com

DMA was established as a spin-off of the company Derindere Otomotiv in 2007. It had extensive R&D studies for the development of EV technologies and eventually managed to produce its own EV in 2013, which was then promoted as the “first and the only EV in Turkey with a Type Approval Certificate from the Turkish Standard Institute”. DMA used Toyota Corolla vehicles for this purpose and created an electric Corolla which could run for 280 km on a single charge. Its engine and batteries came from abroad. The electric brain units and corresponding software were developed by DMA engineers in Turkey.

In 2015, DMA managed to produce a second generation EV with distance coverage of 420 km on a single charge with 53 kw. DMA sees this as a success compared to Tesla that runs 350 km with 85kw. According to North European driving cycle, DMA runs 396 km and according to Istanbul driving cycle, it makes 384 km. It has a maximum speed of 160 km/hr and daily electric consumption is 12 TL. It costs around 180,000 TL. Batteries can be charged within two hours. Second generation DMA models do not need charging stations. DMA believes that that cost will decrease when serial production starts.

DMA uses lithium batteries from China and engines from the USA. DMA developed the rest of the high technology products: energy storage systems (ESS), electrical controlled design, card design and software.
DMA produces around 25 EVs per month. Some of its EVs are used in its own rent-a-car fleet company. DMA has an R&D Centre at Istanbul Technical University (İTÜ) - ARI Teknokent.

DMA’s other EV initiatives are worth mentioning:

**Electrical Taxi:** DMA Toyata Corolla ELECTRICAL TAXI received type approval and was sold to a taxi operator in October 2014. DMA offers three year/100,000 km guarantee to this new model. According to DMA, Caglayan Justice Palace (Istanbul) would like to have a taxi station in front of the building with a capacity of 100 e-taxis. DMA hopes that the company which they have provided DMA’s e-taxi will win this tender.

**Battery and EV production/cooperation with China:** DMA acknowledges that the battery is an important component of the EV and lithium reserves used to produce are lithium batteries are vastly found in China. After two years of negotiations, in November 2014, DMA has signed an agreement for cooperation with China Aviation (CA), a state company. China Aviation Lithium Battery (CALB), a company of CA, and DMA established a joint venture in April 2015, called CADMA, with 51 – 49% shares respectively. Accordingly, they will soon start production of EVs in China with Chinese lithium batteries and DMA technology.

As of 2017, all car manufacturers in China will be required to allocate 1% of their production range to EVs. This convinced DMA to enter into this business in China. DMA desires to establish a battery production factory of CADMA in Turkey in the future. CADMA targets at achieving 1 billion USD of turnover within five years.

**Cooperation with Turkish auto-designers:** DMA co-operates with Onuk Design - [www.onuk.com](http://www.onuk.com)

Onuk has obtained type approval for its new S56-G sports car which can speed up to 250 km/hr and can run for 650 km. DMA has developed the electric version of this car: E56-G. This will be promoted during the Auto Show between 22 and 31 May in Istanbul (TUYAP Fairs).

**E-car sharing:** A company called MOBICAR started a car-sharing business in Turkey. Recently, DMA has acquired this company and started e-car sharing with 3 vehicles, as a pilot project. People can rent these cars from ITU Technopark and have to return them back there. DMA intends to increase its e-car sharing business to 200 vehicles in 2016 and establish some stations where people can leave the cars. This will enable people to rent cars for a few hours.

DMA has heard that Zipcar ([www.zipcar.com.tr](http://www.zipcar.com.tr)) will co-operate with AVIS (Otokoc) for car-sharing and they will also start e-car sharing with Renault Zoe.
EV Clustering activities: DMA has an R&D Centre at Istanbul Technical University (İTÜ) - ARI Teknokent. Together, they have initiated an EV clustering study, inspired by the cluster subsidy programmes introduced by the Ministry of Science, Industry and Technology. Intention is to conduct R&D studies around electric, hybrid, alternative fuelled vehicle technologies, renewable energy and energy storage, fuel economy and energy efficiency and smart grids. It will also co-operate with SOLARBABA – Turkey’s Solar Energy Platform – www.solarbaba.com.

This cluster is not yet officially announced. Minister Isik is expected to make the announcement on 26 May. Companies listed under this EV cluster:

İTÜ ARI Teknokent – www.ariteknokent.com.tr
İstanbul Sanayi Odası (İstanbul Chamber of Industry) – www.iso.org.tr
Aselsan – www.aselsan.com.tr
Bplas – www.bplas.com.tr
Coşkunöz Metal Form – www.coskunoz.com.tr
Eteration – www.etaration.com
FEV – www.fev.com
İnnoted Teknoloji A.Ş. – www.innoted.com
Marvin – http://drivemarvin.com
Mavisis Teknoloji – www.mavisis.com
Onuk Tasarım – www.onuk.com
ölçan A.Ş. – www.olcsan.com
Özgün Makina Sanayi ve Tic.Ltd.Şti. – www.ozgunmakina.com.tr
Sargetek Ltd.Şti. – www.sargetek.com.tr
Turkcell Teknoloji – www.turkcellteknoloji.com.tr
Veese

Final remarks about DMA: Production in the NL can be considered by DMA should there be an interested Dutch car body producer. This can be branded as a Dutch E-car worldwide. Also, DMA is interested in any type of cooperation on energy storage systems.

ONUK TASARIM – ONUK DESIGN - www.onuk.com
Contact: Mr. Ekber Onuk - E-mail: kaanonuk@onuk.com
Ekber Onuk is known to be the one of the designers of Anadolu-STC cars – an innovative sports car. He has established this company in 1993 to build the car with a unique design, ahead-of-time dynamics and almost flawless engineering. Onuk has managed to design, produce and obtain the type approval of a sportscar called S56. Its electric version was produced by DMA OTO. Onuk is also active in defence projects, commercial and naval crafts, utilising advanced composite technologies.

Many companies and R&D studies are focusing on the development of batteries and energy storage systems. Research focuses mainly focuses on Lithium-Ion batteries. Some are:
Yigit Aku – [www.yigitaku.com](http://www.yigitaku.com),
Inci Aku – [www.inciaku.com](http://www.inciaku.com),
Mutlu Aku – [www.mutluaku.com](http://www.mutluaku.com)
Aim Enerji Teknolojileri – [www.aimenerji.com](http://www.aimenerji.com) – Contact: Mr. Kerem Turhan – E-mail: kerem.turhan@aimenerji.com - Aim Energy no longer has any connections with Ericom. Aim Energy continues its R&D studies in the ARI Technopark of Istabul Technical University. Focuses on the development of energy storage systems for EVs. Also involved in the R&D studies of Triga Nuclear Research Reactor development.

**EV charging infrastructure**
Since 2013, there are only a few private companies operating in this field: These are:
ESARJ – [www.esarj.com](http://www.esarj.com),
FULLCHARGER – [www.fullcharger.com](http://www.fullcharger.com),
YESIL GUC – [www.yesilgucenerji.com](http://www.yesilgucenerji.com),
GERSAN A.S. – http://www.g-charge.com.tr and
BD OTO – [www.bdoto.com](http://www.bdoto.com)

These companies often build their charging stations at shopping malls, car parking areas, hotels and supply home charging units. There are not yet any charging stations installed on public roads. It is estimated there are between 100 and 200 charging stations in Turkey. TESLA has announced it will install fast charging stations in nine cities in Turkey.
The Ministry of Industry, Science and Technology will be focusing on the development of relevant legislation in the coming period. The question where can charging stations be established, how the charging stations are to be licensed will be addressed in these regulations.
Local authorities say that the limited number of electric vehicles on the roads keeps them away from making any investments in this field. They are waiting for the relevant regulations of the ministry.

The 10th Development Plan (2014 – 2018) and Priority Transformation Programmes stipulate that Intelligent Transport Systems will be expanded. Accordingly, use of public transport, small engine volume and electric and hybrid vehicles will be disseminated. Taking into consideration the targets set by the 10th development plan, municipalities are expected to pay more attention to the developments in e-vehicle market and adjust their plans accordingly.

**Pilot projects and regional developments**
A number of pilot projects were carried out in Istanbul on public bus transport or minibus transport. Beyond the pilot phase, nothing has happened. Lack of charging infrastructure constituted a barrier for such initiatives. EVs are not yet used in public transport. There are no electric buses or minibuses running in the cities. Only one electric taxi (e-Toyota Corolla) has been registered by Istanbul municipality.

Istanbul Metropolitan Municipality’s Transport department has some concept studies regarding electric public transport, including car sharing. Their surveys regarding charging stations are continuing. The company DMA has a pilot project on e-car sharing in Istanbul – see section IV-a.

It is rumoured that a company is preparing a proposal for the electrification of service (staff/school) buses.

**Trade Fairs**

**Intertraffic Istanbul 2015**
International Traffic Fair
www.intertraffic.com
Organiser: Amsterdam RAI

**Istanbul Autoshow 2015**
www.istanbulautoshow2015.com
Dates: 22 – 31 May
Organiser: TUYAP Fairs

**Relevant contacts**

**Automotive Technology Platform (OTEP)** – www.otep.org.tr
Established in (end)-2008. Its members are from automotive industry, R&D companies, university, public and private sector representatives. OTEP more acts as an advisory board, providing guidance for the sector policies and initiatives.
Automotive Manufacturers Association (OSD) - www.osd.org.tr
OSD is established in 1974. Aim is to improve the manufacture of various motor vehicles made in Turkey, including passenger cars, trucks, pick-ups, trailers, buses, minibuses, tractors and developing the industry as a whole.

Automotive Distributors Association (ODD) - www.odd.org.tr
ODD is established in 1987. It has 32 members that represent 49 international automotive brands.

Authorised Automotive Dealers Association (OYDER) – www.oyder-tr.org
OYDER is established in 1989. All 3S (Sales, Service, Spare part) REcognised Dealers are members.

Automotive Consumers Association (OTD) – www.otd.com.tr
OTD aims to increase satisfaction of Turkish automotive consumers and develop Turkish Automotive Sector.

Association of Automotive Parts and Components Manufacturers (TAYSAD) – www.taysad.org.tr
TAYSAD is established in 1978. It has 322 member companies that act as suppliers to the automotive industry.

Uludag Automotive Industry Exporters Union (OIB) – www.uiib.org.tr
OIB is established in 1991. It has at present 2808 active members. OIB is the only representative institution for automotive exporters.

Points of contact

In Turkey:

Those interested in obtaining further information are invited to contact the Embassy of the Kingdom of the Netherlands in Ankara. For questions related to trade, market situation, laws & regulation you can contact the economic and commercial department of the Embassy.

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For questions related to cooperation in the field of basic & fundamental research, (international) R&D cooperation and innovation, you can contact the Advisor for Innovation, Technology and Science:
Rory Nuijens
Advisor for Innovation, Technology and Science
T +90-312-409-1819
www.hollandturkeytrade.com
Email: ankara@ianetwerk.nl

In the Netherlands:
Companies that are interested in obtaining further information about the instruments for supporting Dutch industry in doing business in foreign markets are advised to approach RVO in the Netherlands.

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