

TURKEY'S ENERGY FUTURE CALLS FOR INNOVATION AND EFFICIENCY

For all countries, an inclusive set of critical principles and policies are critical for the future of the energy industry. Dow's Energy Plan is following the conserve, optimize, accelerate, and transition (COAT) approach that will help us create a platform for a more sustainable energy plan in the future, which is also converging with Turkey's National Energy and Mining Policy that was declared in 2017. Energy efficiency is a critical component for Turkey to increase its competitiveness and reduce its external dependence. Dow's energy efficient technologies are based on the highest global standards and recognized by global awards. These technologies are being used in Turkey, and our solutions have successfully addressed Turkey's strategic growth areas and created value consistently.

Luciano Poli*



TURKISH POLICY
QUARTERLY

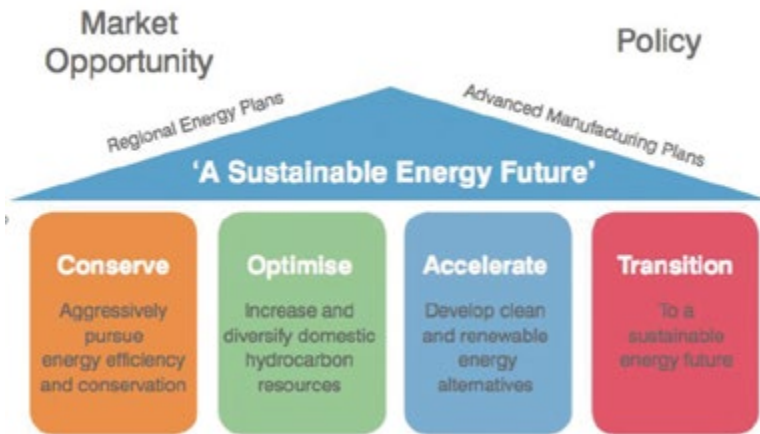
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As the global population continues to grow, demand for energy continues to increase dramatically, presenting a number of challenges around energy capacity, security, and sustainability. Although the world has seen several technological breakthroughs in recent years for both generating and storing energy, the economics of energy remains highly competitive as nations work to meet the ever-growing demand.

In the face of this demand pressure, both private and public sectors stand to gain from efficiency focused approaches to energy policies. Operating in such an environment we, as Dow, believe that the future of energy is directly linked to an all-inclusive set of critical principles. We have outlined these principles in our Energy Plan, through which we can achieve a sustainable energy future. These principles are:

- **Conserve** by aggressively pursuing energy efficiency
- **Optimize**, increase, and diversify domestic hydrocarbon resources
- **Accelerate** the development of cost-effective clean energy alternatives
- **Transition** to a sustainable energy future



We believe these principles are critical for a sustainable energy future that is able to ensure increased energy supply and security, while at the same time ensuring environmental protection. An effective transition to this energy future will also unlock more capabilities for the manufacturing sector that use energy resources both as fuel and feedstock.

Today, the manufacturing sector applies innovative technologies to produce modern materials and solutions for the world’s most pressing challenges by adding value to

raw energy inputs as the building blocks for many of the products we use on a daily basis. Dow is a prime example of manufacturing companies operating in Turkey that are working towards turning global challenges into innovative solutions that meet the needs of today and the future. As an investor in Turkey since 1971, Dow has aligned its operations with Turkey's approach to energy—without a dependence on the hydrocarbon resources but instead drawing upon Turkey's strengths as a smart logistics hub and serving its diversified industries and geocentric location with technology-based solutions.

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Turkey continues to build on this successful approach to the diversification of its energy supply by playing to its strengths. Most recently highlighted in the National Energy and Mining Policy of Turkey in 2017 Turkey demonstrates a strong alignment with the strategy and principles outlined by Dow.

The Effect of Diversified Energy Policy on Turkey's Future

Based on three main pillars, Turkey's National Energy and Mining Policy places a specific focus on security of supply, indigenization, and the foreseeable energy market. The plan outlined by the Ministry of Energy, envisions 32,000 megawatts of production capacity in hydropower, 10,000 megawatts from wind, 3,000 megawatts from solar, 1,000 megawatts in geothermal, and 700 megawatts from biomass.¹ In addition to diversification of energy sources on local resources, the plan clearly sets forth an exciting prospect for increasing the share of renewables in the total energy mix in Turkey.

Turkey's firm commitment to the diversification of its energy supply clearly shows the government's action-oriented plan towards optimizing the country's resources. The goals of increasing and diversifying domestic hydrocarbon resources, outlined as the indigenization pillar, will by default ensure Turkey's ability to meet the energy demand.

¹ “‘Milli Enerji ve Maden Politikası’ Tanıtım Programı,” [‘National Energy and Mining Policy’ Introductory Program] Republic of Turkey Ministry of Energy and Natural Resources, <http://www.enerji.gov.tr/tr-TR/Bakanlik-Haberleri/Milli-Enerji-Ve-Maden-Politikasi-Tanitim-Programi>

The population in Turkey continues to grow at a rapid pace, leading to increasing demands across sectors. This leads to strong growth in the industrial sector; and, consequently, it has registered the highest energy demand growth among OECD countries² in the last 15 years. Considering that Turkey meets approximately 70 percent of its energy demand with imported energy sources, optimization is even more important. It has, therefore, placed a special emphasis on its domestic coal sources and the Ministry has set a goal of generating 60 billion kWh of electricity using domestic coal by 2019, while simultaneously concentrating and investing on R&D for environmentally friendly technologies in generation and usage.

The investment in enhanced energy generation technologies is also necessary for the development of clean energy alternatives that are simultaneously cost-effective. At Dow, we believe that developing the energy generation channels of the future should be supported by the combination of appropriate technologies and incentives. Turkey already has strong capacity in conventional hydropower and is moving ahead to further develop its capacities in modern renewable energy sources such as solar, wind, and biomass.

In this regard, it is worth noting that Turkey is well on its way to achieving its capacity goal for the share of wind energy in its total mix by 2023. The installed capacity for wind energy in Turkey has already reached a capacity of approximately 6,300 megawatts as of November 2017³ and it is clear that the policies and goals are being accelerated through the completed Renewable Energy Resource Area (YEKA) tenders both in solar and in wind energy. Turkey is well suited to these sustainable energy production methods. Through even more ambitious policy goals, Turkey could more rapidly diversify its energy production to fully exploit its geographic advantages, produce energy, and increase its energy security while also protecting the environment.

While Turkey does not possess natural gas and petroleum resources itself, its role as an energy corridor and location near many oil and gas producing nations make natural gas and petroleum an important part of the country's energy mix—nearly 72 percent of the world's treatable reserves are positioned in regions that are close to Turkey.⁴ This requires bold and visionary initiatives to tap into this potential. We have recently witnessed the fruition of such a vision with the inauguration of the Trans-Anatolian Natural Gas Pipeline Project (TANAP), where Turkey has taken steps towards

² "Turkey's Energy Profile and Strategy," Republic of Turkey Ministry of Foreign Affairs, <http://www.mfa.gov.tr/turkeys-energy-strategy.en.mfa>

³ "Enerji Bakanı Albayrak: YEKDEM 2020'de sona erecek," [Minister of Energy Albayrak: YEKDEM will end in 2020] *Dünya*, 9 November 2017, <https://www.dunya.com/ekonomi/enerji-bakani-albayrak-yekdem-2020de-sona-erecek-haberi-389100>

⁴ "Petroleum," Republic of Turkey Ministry of Energy and Natural Resources, <http://www.enerji.gov.tr/en-US/Pages/Petroleum>

fulfilling its potential for transferring the rich energy resources of the Caspian to the consumer markets in Europe. This partnership between Turkey and Azerbaijan⁵ once again shows that despite possessing no sizeable hydrocarbon resources itself, through proactive policy initiatives, Turkey has the ability to exploit its geographic location.

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Through such initiatives and policies, Turkey is showing how it optimizes hydrocarbon resources while accelerating the development of cost-effective clean energy alternatives, in order to transition to a sustainable energy future. At Dow, we stand ready to provide the capacity and technological support to ensure that the necessary fourth pillar for the transition is supported; namely, conservancy.

Dow’s Inherent Strengths: Energy Conservancy and Sustainability

The rationale for energy efficiency and conservancy is clear. According to the United Nations, by the year 2050, the global population will grow to nine billion people—all needing access to food, clean water, sanitation, shelter, mobility, education, and healthcare. The next few decades will, therefore, see a considerable increase in the demand for energy. Meeting this demand, while protecting the planet is one of the major challenges facing mankind.

In response to this challenge, Dow continues to reduce its environmental footprint by delivering ever-increasing value to customers and society through our products and solutions, as well as developing a blueprint for a sustainable planet and society. Dow has embarked on the third stage of its sustainability journey with its ambitious 2025 Sustainability Goals. Through these goals, we are collaborating with like-minded partners to advance the well-being of humanity by helping lead the transition to a sustainable planet and society.

Our initiatives to this end have been recognized in various ways: Most recently in 2017, we received the 11th US Environmental Protection Agency Presidential Green Chemistry Challenge Award, two Edison Awards for Breakthrough Technologies, and Ten Prestigious 2017 R&D 100 Awards from R&D Magazine.

⁵ “About Us,” TANAP, <https://www.tanap.com/corporate/about-us/>

Such accolades are rooted in Dow's long history of leadership in energy efficiency and conservation that goes back for decades. Dow's energy consumption efficiency, measured in Btu⁶ per pound of product, has improved more than 40 percent since 1990, and since that time, the company has saved a cumulative 24 billion dollars and 5,200 trillion Btu. In addition to improving its environmental footprint, Dow has also been able to improve its customers' sustainability and energy efficiency track record as well.

The transformative effect of Dow innovations was most recently showcased in one of the world's most influential platforms. As a Worldwide Partner and Official Chemistry Company of the Olympic Movement and the Official Carbon Partner of the International Olympic Committee, projects implemented by Dow in collaboration with the Sochi 2014 and Rio 2016 Organizing Committees have already contributed to a reduction in greenhouse gases amounting to 3.64 million metric tons of carbon dioxide equivalent (CO₂e) to date. By 2026, the reductions are projected to exceed six million metric tons of CO₂.⁷

These massive reductions were achieved not only in the Olympic villages of Sochi and Rio, but in all residential and industrial areas in the two cities in true collaboration spirit. We believe that to transition towards a low carbon world, we all must change the way we live and work. For our part, we will do what we do best: innovate, adapt, and collaborate. We must lead by example and work with others to help lead the transition to a more sustainable planet and society. This has been our approach in Turkey as well from the first day we started our operations 47 years ago.

Dow's Commitment to Efficiency and Value Generation in Turkey

Over the course of our engagement in Turkey and through our various investments, Dow solutions has supported and been part of many industries such as automotive, packaging, construction, wire and cable, furniture, and domestic appliance products. Through such varied industries, we have continued to provide the solutions that are key to advancing human progress. Across all of the diverse industries we serve, Dow solutions always had the intrinsic focus of energy efficiency.

With manufacturing, transportation and other commercial sectors being highly dependent on imported oil to meet energy requirements, and the ensuing vulnerability to global oil price fluctuations, improving the country's efficient use of energy

⁶ British Thermal Unit.

⁷ DOW, "Dow Launches Collaborative Blueprint for Unlocking Carbon Reductions," 17 July 2017, <https://www.dow.com/en-us/sports/news-and-events/dow-unlocking-carbon-reductions-blueprint?>

resources will also increase competitiveness and help bridge the gap of the current account deficit of a country like Turkey.

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One area in which we have delivered continuous innovation has been the automotive sector, where mass reduction has met mass production. Through solutions provided by the Dow Automotive Systems, our customers achieve up to 50 percent weight savings and 95 percent parts consolidation objectives with the added benefit of improved manufacturing efficiencies.⁸ As the world moves toward transportation models with sustainable energy resources at its heart, Dow solutions provide the much-needed light weighting features for the automobiles of today and the future. As an established player in the globally successful Turkish automobile industry, Dow commends the initiatives by the Turkish government to further foster the growth of the domestic car project and looks forward to this exciting next step for the Turkish automobile industry. Through its solutions—ranging from Polyurethane systems to under the hood applications in rubber and silicones—Dow is ready to contribute to this important initiative that will reshape the Turkish car industry.

Dow's innovation also extends to the transformative mega projects undertaken by Turkey, and we remain committed to providing our technology-based solutions to increase the energy efficiency, durability, and overall sustainability of Turkey's infrastructure. Dow has been working together with the Turkish General Directorate of Highways, TÜBİTAK (Scientific and Technological Research Council of Turkey), and Turkish paint producers since 2012 to help initiate the shift to waterborne road markings in Turkey. These efforts have made Turkey one of the leading countries in Europe (after the Scandinavian region) in converting solvent-borne traffic paints to the waterborne alternative. It is estimated that 60 percent of the traffic-marking paint used in Turkey today is now water-based. Locally produced in Gebze, Dow's FASTRACK™ binders have generated healthy, sustainable, and safe solutions on roads and infrastructure projects in Turkey.

Last but not least, Dow's contributions to energy efficiency, to sustainable infrastructure, and to the Turkish economy all meet at a critical intersection point: carbon fiber. Today, the growth for the carbon fiber demand in the wind energy sector—to manufacture wind turbines that will generate electricity at costs that either meet or

⁸ Dow, “Mass Reduction for Mass Production,” <https://www.dow.com/en-us/transportation/solutions/composites>

beat traditional generation technologies—is on the rise. As one of the most exciting materials of our century, carbon fiber is manufactured in only a few countries in the world. Turkey stands in prime position to take advantage of such an opportunity, since one of such sites is positioned in Turkey: our Joint Venture with the Akkok Group, DowAksa.

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DowAksa’s low-weight, high-strength carbon fiber offers solutions to many industrial users in the energy sector, and carbon fiber has a transcending impact that goes beyond the energy sector. This cutting-edge material provides a central building block for moving beyond the simple manufacturing processes to advanced manufacturing processes, where more value-added products are generated through the use of state of the art technologies and knowledge from specialized fields including chemistry, nanotechnology, and biology.⁹ The effect of the full application of such a resource will not only impact the output value of the manufacturing process, but also have wide-ranging effects on employment with a better utilized and skilled labor force.

DowAksa also collaborates with downstream manufacturers, including the world’s largest wind turbine producer to develop solutions for wind blades that will help reduce the complexity and increase the efficiency of wind energy production. The opportunities presented by carbon fiber are transformative for the industry and accordingly, the Turkish government has formally recognized the strategic value of this material by granting DowAksa with the project-based super incentives to further develop its capacity and global competitiveness. The full development of carbon fiber manufacturing will make Turkey a more competitive contender in the global market.

Finally, we believe that one of Turkey’s great energy sources is its young and dynamic workforce. As a science company, in line with our global commitment to “Building the Workforce of Tomorrow” and to further contribute to Turkey’s young population, we created the “Chemistry of Teaching” social responsibility project in Turkey in 2013. This was achieved through cooperation with the Teachers Academy Foundation (ÖRAV) and the Ministry of National Education. Through

⁹ Ihsan Necipoğlu, “Advanced Manufacturing as the Key to Sustainability,” *Turkish Policy Quarterly*, Vol. 14, No. 2 (2015), <http://turkishpolicy.com/article/755/advanced-manufacturing-as-the-key-to-sustainability-summer-2015>

this project, we support high school teachers by sharing the latest methods in the field of Science, Technology, Engineering and Mathematics (STEM) training, including examples from the latest chemistry products, processes, and technologies. Between 2013 and 2017, we have reached 760 chemistry teachers and 65,000 students from 582 schools in 16 different provinces. We are proud that this project received the “Effectiveness” Award in the field of Corporate Social Responsibility from the Turkish Confederation of Employers Associations in 2017.

While we are confident in our technologies today, we remain further confident in Turkey's ability to carry the flag of innovation in the future through the strength of such STEM engagements. The realization of concepts such as sustainability and innovation requires long-term vision and commitment, which applies for both countries and for companies alike. As Dow, we believe that successful STEM education initiatives and systems lay the foundations for these essential concepts.

Conclusion

The principles outlined in our Energy Plan for the future of energy are simple but by no means easy; often they require a combination of factors such as the right level of investments, stringent policies, and talented people.

I am confident that the benefits of both Dow's and Turkey's approach to the future of energy and Turkey's vision for the same will continue to converge, and both Turkey and Dow fully realize the opportunities ahead when the enabling environment for success is set. As a geopolitically significant country at the crossroads of the world, Turkey will remain at the heart of Dow's growth strategy. Its role in the multi-dimensional energy dynamics of the region, along with its vibrant manufacturing sector, dynamic young population, and advantageous location ensure that Turkey will remain a key market for those both to its west and east. As Dow, we will remain committed to supporting Turkey's 2023 and 2050 goals through our solutions as we work to continue our successful journey of growth together.