

# A clean, secure future: Reshaping Turkey's energy sector



Islamic Development Bank Group

**No country can progress without a secure energy supply. And the surest way to guarantee that is to generate power nationally. Turkey has limited fossil-fuel reserves other than coal, but has huge potential in renewable resources, including hydroelectric, solar and wind power, among others.**

Turkey has long been a net energy importer, mostly buying gas from Russia, Iran and Azerbaijan. But this has been a significant drain on foreign exchange and is vulnerable to supply disruptions. And as the demand for energy grows – by 6–7 per cent each year<sup>1</sup> – it has become increasingly important for Turkey to diversify its energy sources and increase the national contribution, while also pursuing greater efficiency to manage the growth in energy demand.

In recent years, Turkey has dramatically stepped up efforts to develop its renewable-energy resources through private investments. Between 2012 and 2015, the Islamic Development Bank (IsDB) provided financing for the energy sector, supporting four renewable-energy development projects and six energy-efficiency projects. These are now making significant contributions to Turkey's energy mix, while providing many additional benefits as well.

Turbines at the Sincik wind power project.



## A nationally strategic sector

Renewable energy is the Government of Turkey's focus for the energy sector. For example, Turkey aims to increase its production of solar power by up to 10 gigawatts (GW) and wind power by up to 16 GW by 2030, alongside efforts to increase energy efficiency in several productive sectors.<sup>2</sup>

To contribute towards these national goals, IsDB extended a Financing Facility that enabled four renewable-energy projects – two hydropower dams, one solar plant and one wind plant – and six energy-efficiency projects to be realized. These were spread across Turkey (see map, opposite).

Under this Facility approach, IsDB worked through an implementing partner. The Türkiye Sınai Kalkınma Bankası (TSKB, known in English as the Industrial Development Bank of Turkey) is one of Turkey's leading development and investment banks and was the first bank to finance renewable-energy projects in the country. Its expertise and experience in this sector proved extremely valuable, with almost

all the projects being completed on budget and on schedule.

The combined cost of the 10 projects was US\$641.2 million. IsDB provided US\$100 million, using a Restricted Mudarabah mode of financing for the first time (see box, opposite). International co-financiers were the World Bank, the International Finance Corporation, the European Investment Bank and KfW (Kreditanstalt für Wiederaufbau). Turkish lenders included Türkiye Garanti Bankası, Türkiye İş Bankası and Yapı ve Kredi Bankası.

The combined impact of these projects greatly exceeded the initial targets. The renewable-energy plants have the capacity to provide 370 megawatts (MW) against a target of 150 MW, and their combined supply to the National Grid already exceeds 500 gigawatt hours (GWh) per year. Meanwhile, the energy-efficiency projects have already saved by 1,006,000 tonnes of greenhouse gases<sup>3</sup> (the target was 300,000 tonnes).

### The energy projects by numbers . . .

**US\$100 million** – IsDB's contribution to the Facility

**370 MW** – the combined capacity of the renewable-energy projects

**1,006,000 tonnes** – the annual reduction in greenhouse gas emissions

**0.5 per cent** – the combined contribution to Turkey's overall reduction in greenhouse gas emissions

**225 GWh** – the annual combined energy savings of the six energy-efficiency projects

Figures provided by TSKB

## IsDB's renewable energy and energy efficiency projects in Turkey



### A new approach to Islamic financing

This was the first time IsDB used Restricted Mudarabah financing. Under a *Mudarabah* mode of financing, a *Rab al-maal* (in this case, IsDB) provides capital to a *Mudarib* (in this case, TSKB) to invest in business enterprises, as per the agreed criteria. This approach eliminated the need for IsDB to enter into individual financing agreements for each sub-project being financed. It also gave a lot of freedom to TSKB as the local executing agency (*Mudarib*), for example to use its own procedures for appraisal, quality assessment and risk assessment, as well as the procurement of goods and services.

The Restricted Mudarabah Facility complies with *Sharia* principles and is operationally compatible and administratively competitive with the Financing Facilities being extended by other development partners. It is also highly efficient and has client-friendly implementation mechanisms. These attributes will benefit IsDB's future operations in member countries, allowing them to develop their own energy-sector projects. In particular, it will increase IsDB's outreach to rural communities through local financial intermediaries.

In this Facility, TSKB used its extensive knowledge of Turkey's energy sector to identify a pipeline of suitable, high-quality projects. The Restricted Mudarabah Facility gave the bank the flexibility it needed to screen and select the projects according to stringent criteria and continuously monitor them during implementation, yet still disburse funds swiftly. "This was key to the success of the agreement between TSKB and IsDB," says Mr Burak Akgüç, TSKB's Executive Vice President. "We could activate our broader vision under a single financing facility."

The Restricted Mudarabah Facility is

# highly efficient

and has a client-friendly  
implementation mechanism



The Göktaş II hydroelectric dam.

## Building more than dams

Two of the hydroelectricity dams supported by the Facility – Göktaş I and Göktaş II – lie in a valley deep in the mountains north of Adana. The project's combined capacity, once both dams are operational, will be 276 MW. But the people living in the valley are already feeling the power of the project.

A 52-km road, built under the Facility to provide access to these dams, has helped to open up the entire region. People living in the seven villages nearby have seen their lives transformed by this and the three new bridges that cross the Zamanti

River. These have connected the previously isolated settlements to larger towns and cities (especially Adana and Kozan) and to each other, making it easier for people to meet and trade.

Before, it could take villagers up to four hours to reach Kozan, often on foot; now, journeys by motorbike or car take around 1.5 hours. This means that people can access hospitals, schools and other services more quickly.

This was not just a fortunate side effect: developing this region was central to the plans of Bereket Enerji, the company constructing the dams. This is demonstrated by its decision to extend the access road to reach two villages, Köprücük and Işıkkaya, that are situated beyond the dams. It understood that local support for the project would be essential, and improving the region's infrastructure would help to realize this.

## Jobs and training for remote villagers

Bereket also created new jobs in the region, with around 450 staff employed during the construction phase (reaching 800 staff during the peak construction period). Of these, 40 people will be employed permanently. The company prioritized employing local people, with 60 per cent coming from the nearby villages.



Mr Ahmet Yilmaz.

One of these is Mr Ahmet Yilmaz, from Boztahta village, who works as a general foreman. "There have been many benefits from the project," he says. "Help to build schools, mosques, roads, health centres

... these are remote villages, but we are now connected to larger towns."

But the new employment opportunities have been the major change, he confirms. "Previously people were mostly goat herders or seasonal workers in a nearby chrome mine. But the salaries [in construction] are higher."

## More power at Prokon

Alongside large renewable-energy schemes, the Facility supported smaller projects that allowed companies to generate their own electricity. One beneficiary was Prokon, an engineering and manufacturing company located just outside Ankara.



Mr Murat Kögmen, Prokon's General Manager.

In March 2013, with financial support from the Facility (including US\$350,000 from IsDB), Prokon installed 2,040 solar panels on the roof of its workshop. This was one of the first solar-power projects of this scale in Turkey.

"It was a chance to test the realities of solar power in our country," explains Mr Murat Kögmen, Prokon's General Manager.

And solar power has huge potential in Turkey. The panels generate around 75–95 MW during the peak months of July and August. Between April 2013 and February 2016, Prokon generated

around 1,835 MWh from the panels in total. The investment has been so successful, in fact, that Prokon now sells excess clean energy back to the National Grid. The company has earned around US\$250,000 in the first three years – an immediate return on its investment.

Indeed, this pilot phase proved so successful that Prokon added a further 760 kilowatts (kW) of solar-power capacity in 2015, and recently commissioned a 6 MW solar-power project to be built in the near future.

More importantly, the experience gained during this pilot project has enabled Prokon to pursue the development and manufacture of solar-power equipment as a new line of business. It has begun to test a solar-tracking system that enables panels to rotate and 'follow' the sun, thereby generating more power. A prototype has been made and Prokon is already comparing the results against fixed panels; the company expects the new systems to produce 15–18 per cent more power. "This company is always looking to explore new opportunities," confirms Mr Kögmen – and the pilot project provided this opportunity.

Solar panels on the roof of Prokon's workshop.



## Re-using heat to reduce costs

While diversifying its energy supply, Turkey also needs to manage demand. The country's energy intensity<sup>4</sup> is around twice that of the European Union average. Reducing this will lower energy costs and help Turkish companies to become more competitive globally.

This was a major incentive for Batisöke Çimento, a cement company that installed a waste heat recovery system at its plant near Aydın. This system, which recycles the heat produced by the clinker-producing process to generate electricity (see box), has a capacity of 5.5 MW and cost around US\$14 million to install (of which IsDB provided US\$5 million).

The successful installation means that the system now provides a significant chunk of the plant's electricity needs: 30 per cent in 2015. On average, this saves Batisöke around US\$4 per tonne in electricity costs. As the plant produces around 2,250 tonnes of clinker a day, this is around US\$9,000 saved per day – or US\$3 million a year.

By reducing input costs, Batisöke has become more competitive. Thanks in part to rising revenues, it is now building a new plant next to the current one – and a waste heat recovery system will also be installed there.

### How waste heat creates power

The system uses the heat emitted during the process of making clinker – the product from which cement is made. Clinker is produced by heating raw materials – limestone, iron ore and clay – in a kiln at temperatures of up to 1,400°C. Hot air is collected through extractor fans, from the kiln as well as the clinker-cooling area.

Some is re-used to pre-heat the raw materials before they enter the kiln, but the rest generates electricity. Water is added to produce steam, which then powers a steam turbine to generate electricity.



The waste heat recovery system at Bolu Çimento.

## Cementing reputations

Bolu Çimento had a similar aim when it installed its system during 2013 and 2014. The installed capacity of its system is 5.8 MW and in 2015 it provided 45 GWh of electricity – 25 per cent of the plant's annual needs.

But while its main motivation was cost-related – the system saves Bolu around US\$3 million a year – the system is also proving good for the brand. “Our vision is to become a cleaner manufacturer, using cleaner energy and conducting cleaner operations,” declares Mr Enis Tanju Oymak, the Technical Service Manager. “We are building a reputation for this in Turkey, through this and other measures such as solar power.”

## Cheaper, more efficient steel production

The Facility also supported energy-efficiency projects in the steel sector. Turkey was the world's eighth-largest steel-producing nation in 2014 (with around 34 million tonnes), making it a highly strategic sector for managing energy demand.

One company taking the lead is Koç Çelik. In 2014, it installed an oxygen-burning system at its plant in Osmaniye. IsDB provided US\$4 million of the total US\$11 million cost. The system increases the amount of oxygen entering the furnace during the melting process. This makes the *chemical* energy processes involved more efficient – thus reducing the amount of *electrical* energy needed.

Electricity use has fallen from around 400 kilowatt hours (kWh) per tonne produced to less than 340 kWh. As electricity is the major cost in steel production, this is a significant boost. The total savings vary depending on the price of



Storage tanks for oxygen, nitrogen gas and liquid argon, part of the oxygen-burning system installed by the Facility.

electricity, but have ranged from US\$6–14 per tonne since installation.

Another major improvement is in production efficiency. The time needed to produce 100 tonnes has reduced from 55 minutes to 40 minutes, on average. There are also significant environmental benefits, as using less electricity means lower carbon emissions. And the new system created employment in the region, providing 25 new jobs.

### Success factors

- **An experienced partner.** TSKB has provided more than US\$2.9 billion to 133 renewable-energy projects and US\$400 million to 63 energy-efficiency projects in Turkey. This wealth of expertise proved invaluable.
- **Immediate returns.** Many projects provided quick economic gains for beneficiaries. Companies installing energy-efficiency equipment have seen their electricity costs fall by up to 30 per cent, while the four renewable-energy projects are providing cheaper electricity than the National Grid.
- **An efficient financing approach.** The Restricted Mudarabah mode of financing, pioneered by IsDB in this project, is highly suitable for Turkey and enabled the money to reach beneficiaries quickly.
- **Leverage for further investment.** The Facility approach helped to secure a further US\$425 million of co-financing from other donors, achieving a greater overall impact.

**“Companies in Turkey are becoming more aware of the need to use energy more efficiently; partly for environmental reasons, partly for cost savings”**

– Mrs Zisan Eris, Manager, Izmir TSKB Office

## Lessons learnt

The 10 projects under this Facility have had a huge combined impact. Together, the renewable-energy projects have a capacity of 370 MW; by February 2016, they had reduced greenhouse gas emissions by 1,006,000 tonnes. Meanwhile, the energy-efficiency investments combined save more than 225 GWh of energy each year.

These changes are making the companies involved more competitive internationally, while contributing towards global efforts to fight climate change. Furthermore, Turkey is making huge strides towards achieving its energy-security targets.

More renewable-energy and energy-efficiency projects are needed for Turkey to strengthen its energy sector further. With this in mind, IsDB has approved a further US\$220 million Financing Facility. TSKB has already identified potential efficiency projects in other sectors, including petrochemicals, plastics and food processing.

Learning from the success factors identified in this Facility will be essential. But if future projects can build on these early successes, Turkey can look forward to a cleaner, more secure and efficient energy future.

- 1 Source: Republic of Turkey's Intended Nationally Defined Contribution (INDC) to the UNFCCC. See: [www4.unfccc.int/submissions/INDC/Published%20Documents/Turkey/1/The\\_IND\\_C\\_of\\_TURKEY\\_v.15.19.30.pdf](http://www4.unfccc.int/submissions/INDC/Published%20Documents/Turkey/1/The_IND_C_of_TURKEY_v.15.19.30.pdf)
- 2 Ibid.
- 3 Measured as CO<sub>2</sub> equivalent.
- 4 A measure of the energy efficiency of a nation's economy, calculated as units of energy per unit of gross domestic product.

Solar panels at Prokon.

## Acknowledgements

This story is part of a series in the IsDB Success Stories Special Programme, implemented under the guidance and direction of H.E. the Vice President (Operations), Dr Mansur Muhtar, and the Director of the Operations Policy and Services Department (OPSD), Mr Anasse Aissami. The preparation of this success story was managed by Dr Intizar Hussain and Mr Muhammad Ismail of the Operations Policy and Compliance (OPC) Division of the OPSD at IsDB Headquarters in Jeddah, Saudi Arabia.

This success story document is based on the 'Project Implementation Assessment and Support Report (PIASR) on the Renewable Energy Program in Turkey' (2015), and the 'Report and Recommendations of the President on a Proposed Financing Facility to Turkey Industrial Development Bank (TSKB) for Renewable Energy Program in Turkey' (2010) prepared by the Infrastructure Department. The story was supplemented by additional material from field visits to the country by Mr Suffyan Bashir of the OPSD, Mr Tolga Yakar of the Turkey Country Gateway Office and Green Ink, facilitated by TSKB (February 2016).

All direct and indirect contributions by colleagues (in particular Mr Saleh Jelassi, Mr Farid Khan and Mr Kakhorjon Aminov) and partners of IsDB for the successful implementation and evaluation of the project, and for the preparation of this document, are gratefully acknowledged. Particular thanks are due to Mr Burak Saygılı and Mr Emre Köle from TSKB for their support during the field visit.

## Contact:

Manager, Operations Policy and Compliance Division  
Operations Policy and Services Department  
Islamic Development Bank Group

8111 King Khalid St, Jeddah 22332-2444, Kingdom of Saudi Arabia

Email: [idbarchives@isdb.org](mailto:idbarchives@isdb.org) | Tel: +966 12 6361400 | [www.isdb.org](http://www.isdb.org)

