

**International Solar Energy Arena
January 23rd, 2009, Istanbul
STEAM (Strategic Technical Economic Research Center)**

Good morning. Sayın Bakanım. Members of Parliament. Ladies and Gentlemen.

Slide 1: Opening slide

- Renewable energy, including solar energy, is an important domestic resource that Turkey can tap, in order to power its economic growth in the future.
- **This morning I will talk about the high potential of scaling up renewable energy as a major opportunity, and about the role of solar energy in Turkey in particular.**

Slide 2: Growth of energy demand in Turkey has been met by fossil fuels

- Turkey has seen robust economic growth since the 2001 crisis.
- As a result, **energy demand also grew rapidly**: by about 6.5-7% every year over the last 6 years. And over the medium term, after the current downturn, energy demand is expected to continue growing at comparable rates.
- In the recent past, energy supply has not kept pace with energy demand growth. But looking to the future, **Turkey's energy supply must continue growing** to meet the rising energy demand and support continued robust economic growth.
- **The current economic downturn in Turkey, as a result of the global economic and financial crisis, gives Turkey some breathing space ...**
... **but only temporarily**, for investments to catch up.
- This slides also shows that, so far, **Turkey's rising energy demand has been met largely by fossil fuels**: 91% in 2008 and growing.

Slide 3: High Fossil Fuel Use Drives Turkey's GHG Emissions...

- Because of the high share of fossil fuels in energy production & consumption, the **energy sector is by far the largest contributor to Greenhouse Gas emissions in Turkey**: 227.4 million tons CO₂ equivalent, or 77% of the total.

Slide 4: ... and [It Drives] High GHG Emissions Growth
... and [It Drives] Turkey's High Energy Import Dependency

- Turkey's absolute Greenhouse Gas emissions are not extraordinarily high: they are now the 23rd highest in the world at 0.8% of global emissions.
- **But Turkey's growth in Greenhouse Gas emissions has been among the highest in the world:** it doubled between 1990 and 2006, from 126 to 256 million tons of CO₂ equivalent.
- This is because of the combination of robust economic growth and Turkey's moderately high energy *intensity*—which is 60-70 percent above the EU 27 average. (TR: 318, EU27: 182, world: 412 toe/Euro million).
- **And not only that: most of the fossil fuel supply has to be imported.**
 - This comes at a **high financial cost** (although prices are now much lower again—but only temporarily).
 - And it also means an increased reliance on other countries, and thus **reduced energy security**.

Slide 5: Opportunity: Turkey Can Scale Up Renewable Energy Dramatically

- **Turkey has a Major Opportunity – Turkey has high potential renewable energy capacity and can scale up renewable energy use dramatically.**
- Turkey unique geographic position gives it **significant wind energy potential:** about 40,000 MW, of which about 20,000 MW is targeted by 2020.
- Turkey has **immense hydro potential**. The target is 30,000 MW by 2020.
- Turkey has **considerable geothermal resources**, up to about 600 MW for electricity generation and much more, about 30,000 MW, for heating.
- **And Turkey also has significant solar potential**, and is in the process of estimating the potential.

Turkey's strategy is to use *all* available resources in an environmentally sustainable way. Part of this strategy is to maximize the use of renewable resources, in order to ensure energy security and reduce GHG emissions. We, the World Bank, strongly welcome and support this strategy.

- The Renewable Energy Law, Geothermal Law, the Energy Efficiency Law all reflect this strategy. So does Turkey's communication to the UNFCCC, the First National Communication on Climate Change, January 2007.
- Turkey is currently preparing to sign the Kyoto Protocol and thereby join the global response to climate change. With this step, Turkey will join the majority of nations who are working towards reducing global GHG emissions to fight climate change, which will help Turkey and will help the world in the long run.

Turkey is also working with the World Bank and with EBRD to use the newly established international Clean Technology Fund. This Clean Technology Fund aims at supporting the use of innovative technologies to reduce GHG emissions. Turkey is finalizing a Renewable Energy and Energy Efficiency project, which we hope may become the first to receive financing from the Fund.

Slide 6: Solar Power: Huge Global Potential, Largely Uncharted

- Available solar energy resources are estimated at 120,000 TW (total global consumption is only about 15 TW) – though not all of this is recoverable.

Slide 7: Solar Power: Both PV and CSP Applications Have Potential

- There is great potential worldwide for solar energy use.
- ... for both of the two major technologies, photovoltaic (PV) electricity and concentrating solar power (CSP) ...
- This slide shows examples from Spain, Portugal, and the US.

Slide 8: Global Solar Energy Use: Small, but Growing Rapidly....

- **In 2007, grid-connected solar photovoltaic (PV) electricity was the fastest growing energy source worldwide**– it grew by 83% to reach 8,700 MW.
- In addition, photovoltaic solar energy is used “off-grid” for water heating. Total worldwide solar heating capacity is estimated at about 88 GW. [This is about double Turkey’s total electricity generation capacity of around 40 GW.] China is the world leader, with Turkey a distant second but growing steadily.
- Large-scale solar power (mainly concentrating solar power or CSP) is relatively new with only about 500 MW operational, 90% of which is in the USA.
- There are major plans for expansion in large-scale solar – 550 MW are under construction around the world, and plans for another 3000 MW have been announced, mainly in the USA and Spain.
- **The experience of Spain can be very valuable for Turkey:** Spain has a similar geographic location, has similar size, and has advanced its development through the process of EU accession and as an EU member. In the area of wind energy integration Turkey is already collaborating with Spain and making use of its experience. This may also be useful for solar energy.

Slide 9: Turkey: High Solar Energy Potential ...

- **This map of Europe shows that Turkey has significant solar energy potential, on a par with Spain and Portugal.**
- The Government has prepared a **Solar Map** of Turkey, like the well-known wind energy map.
- An even more detailed assessment will be important, in order to determine the magnitude of the solar energy potential, and also the extent to which it can be economically and technically developed over time.

Slide 10: ... though Costs are Still High

- Solar technologies are still being tried out commercially – PVs are in use mainly for residential heating purposes, and CSP is still in a nascent stage.
- **Therefore, globally, solar energy is still expensive**
 - Solar PV costs about US\$ 7,500/ kW – 8-10 times as much as a combined cycle gas plant.
 - CSP is also very expensive – US\$ 2,500/ kW
- Significant feed-in tariffs are needed for solar plants to break even – US cents 30-40/ kWh, along with other incentives such as tax, depreciation etc.

Slide 11: Enabling Environment for Private Solar Power Investment in Turkey

- **Turkey has already begun putting in place the basic enabling environment for private investment in solar power:**
 - The **Renewable Energy Law** provides the basic framework.
 - The **regulatory framework set by EMRA is working well**, as seen for private hydro. Licensing of private hydro projects and hydro capacity under construction have increased steadily over the past few years.
- **Some additional aspects are now the focus of attention**, and the Government is working on these aspects as well—which we will hear about later today:
 - **First, solar needs higher feed-in tariffs than currently in the Law.**
 - As I mentioned, the feed-in tariffs can be as high as US cents 40/ kWh on a levelized basis over a 20-year economic life.
 - The costs of solar technology are falling across the world, so the tariff needed for break-even in Turkey may also fall over time.
 - **Second, experience in countries such as the USA, Germany, and Spain shows that concessional financing or similar incentives may be needed in the initial years to help to attract private investment.**
 - Germany for instance, provided EUR 1.7 billion of concessional loans for PV procurement in early-2000. Feed-in tariffs in

Germany are particularly high, at about eurocents 45-57/ kWh (though they reduce by about 5% every year).

- The USA, particularly California, has several incentive programs for PV, such as direct cash support for such projects (in cases, as high as US\$ 2.5/ Watt), also tax incentives.
- **Third, well-researched estimates of solar potential will be important in Turkey.** This would include detailed assessments of the technical, economic, financial feasibility of solar generation in specific regions.
- **Fourth, when seeking to attract private investors, regulatory arrangements for providing licenses will need to be specified up-front** to potential investors, along with details on the technology aspects, eligibility requirements and evaluation criteria, etc. Turkey can build and apply the lessons learned with wind energy to solar energy.

In closing, I would like to highlight once more the Bank's strong support for renewable energy and our readiness to continue and expand our renewable energy partnership with the Turkish government and the private sector.

- Turkey's Ongoing Renewable Energy Project, with World Bank support, has helped finance about 600 MW of new private renewable energy
- Turkey and the Bank are currently finalizing a follow-on project to expand this support and also support energy efficiency. As I mentioned, we hope to access resources from the new Clean Technology Fund for this project—especially for private sector energy efficiency projects and for promoting newer technologies such as solar and biomass.
- We also help with policy advisory work, for instance on the integration of wind energy into the transmission grid.
- Our sister institutions, IFC and MIGA, also finance insure private sector renewable projects, particularly hydro projects.
- And we look forward to expanding our partnership and support for solar energy, both through financing and by sharing experience and technical support as Turkey further develops an enabling environment for private solar investments.

Thank you. Teşekkür ederim.