

CLIMATE INVESTMENT FUNDS

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CLEAN TECHNOLOGY FUND INVESTMENT PLAN FOR TURKEY

Table of Contents

I.	INTRODUCTION	1
II.	CTF INVESTMENT PLAN	1
1.	Country and Sector Context	1
	Turkey’s Greenhouse Gas Emission, International Context and Comparisons	2
	Energy Supply and Emissions	3
2.	Identification of Priority Sectors fir GHG Reduction Interventions	6
	Emission Reduction Scenarios	6
	NCCC Reference Case	6
	Accelerated Emission Reduction Case	8
	Clean Electricity Generation	8
	Reduce Losses in Electricity Networks	9
	Improve Efficiency of Electricity and Energy Consumption	9
	Generate Clean Energy from Waste	10
	Emission Reduction Stretch Case	11
	Areas for Further Emission Reductions	11
3.	Rationale for Selected Sector for CTF Co-financing	12
	Renewable Energy	13
	SmartGrid	13
	Energy Efficiency	13
4.	Enabling Policy and Regulatory Environment	16
	Legal and Regulatory Framework	16
	Electricity Sector	16
	Renewable Energy	17
	Energy Efficiency	18
5.	Implementation Potential, including Risk Assessment	19
6.	Financing Plan and Instruments	21
	Donor Coordination	22
Charts 1&2: Changes in GHG Emissions of Annex 1 Countries		23
Annex 1: Technologies in Turkey’s CTF Investment Plan		25
Annex 2: Second Renewable/Energy Efficiency Project		29
Annex 3: IFC and EBRD RE/EE Project(s)		32
Annex 4: TEIAS Transmission Project		36
Annex 5: WB SME & Public Sector RE/EE Project		39

I. INTRODUCTION

1. The Clean Technology Fund (CTF)¹ Investment Plan is a “business plan” agreed among the Government of Turkey, the World Bank (WB), the International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) in order to provide support for the low carbon objectives in Turkey’s 9th Development Plan (2007-13); the 1st National Communication on Climate Change (NCCC)², and related strategies, legislation and programs. This multi-year business plan identifies Turkey’s programs that are proposed to be co-financed by the CTF jointly with the WB, IFC and EBRD. The Investment Plan is proposed to be presented to the CTF Trust Fund Committee in January 2009.

2. The CTF Investment Plan is considered a dynamic document, with the flexibility to consider changing circumstances and new opportunities. Such flexibility is particularly important during the current period of uncertainty associated with worsening global economic conditions and financial markets. The Investment Plan is based on the NCCC projections and planning through 2020 while the Plan itself has a much shorter implementation period as the projects are expected to take about five years. CTF rules require resubmission to the Trust Fund Committee in the event of changes in the sectors/subsectors selected for CTF support, or requested increases in the resource envelope. Turkey expects to make such a submission in 2010, to seek additional CTF resources for Phase II of the Investment Plan (Section 6, page 20) along with the envisioned presentation of the findings of Turkey’s next Climate Change Action Plan and the 2nd NCCC (expected to become available by mid-2010).

II. CTF INVESTMENT PLAN

1. Country and Sector Context

3. The vision in the Ninth Development Plan (2007-13) is “Turkey, a country of information society, growing in stability, sharing more equitably, globally competitive and fully completed her coherence with the European Union”. Turkey’s long-term development goals focus on transforming the economic and social structure to become an influential regional economic power; improving health, education and income distribution; strengthening scientific and technological capacity; enhancing the effectiveness of infrastructure services and environmental protection. The medium-term economic policy and reform program that underpins these goals is articulated in the Ninth Development Plan and is implemented through annual programs and complemented by

¹ The Clean Technology Fund invests in projects and programs that contribute to the demonstration, deployment and transfer of low carbon technologies with a significant potential for long term greenhouse gas emission savings. A CTF Trust Fund Committee oversees the operations of the Fund. The World Bank (IBRD) is the Trustee of the Fund.

² The 1st National Communication on Climate Change (NCCC), January 2007, under the United Nations Framework Convention on Climate Change (UNFCCC).

annual EU Pre-Accession Economic Programs capturing policy actions and structural reform priorities related to EU accession. Turkey sees the EU accession process as an important opportunity to harmonize with international norms and standards.

4. Turkey is a functioning market economy. Since 2002, domestic and external factors have allowed Turkey to maintain fast, stable economic growth averaging nearly 7 percent in the period 2003-07. This has been supported by (a) broad political stability; (b) a well managed economy promoting strong fiscal discipline and independent monetary policy; (c) a strong reform program crossing multiple sectors including energy; (d) until 2008 high liquidity and ready monetary flows to emerging markets such as Turkey; and (e) the use of external anchors such as IMF programs, policy based lending through the World Bank, and the EU accession process. Given worsening global economic conditions, Turkey faces lower growth and significant downside risks in the near term although the Government expects Turkey to return to a high-growth path in the medium term.

Turkey's Greenhouse Gas Emissions, International Context and Comparisons

5. Turkey made an important decision in UNFCCC's 2001 Conference of the Parties in Marrakech to delete its name from the list of Annex 2 countries, starting its process of becoming an Annex 1 country, seeking recognition of its special circumstances (OECD member, yet with per capita emissions at only a fraction of OECD average). UNFCCC officially recognized these special circumstances and granted accession of Turkey to Annex 1 status on May 24, 2004 as the 189th Party to the Convention, thus obligating Turkey to address its commitments. In January 2007, Turkey submitted its first National Communication on Climate Change (NCCC). In June 2008 the Commission on Environment of the Turkish Grand National Assembly approved a draft law to enable Turkey's accession to the Kyoto Protocol. Parliamentary ratification is awaited. If this law were to be approved by Parliament and enacted, Turkey would still need to negotiate an amendment to Annex B of the Protocol to include an emissions target and have the amendment ratified by 75 percent of Parties before Turkey could engage in the flexible mechanisms under the Kyoto Protocol.

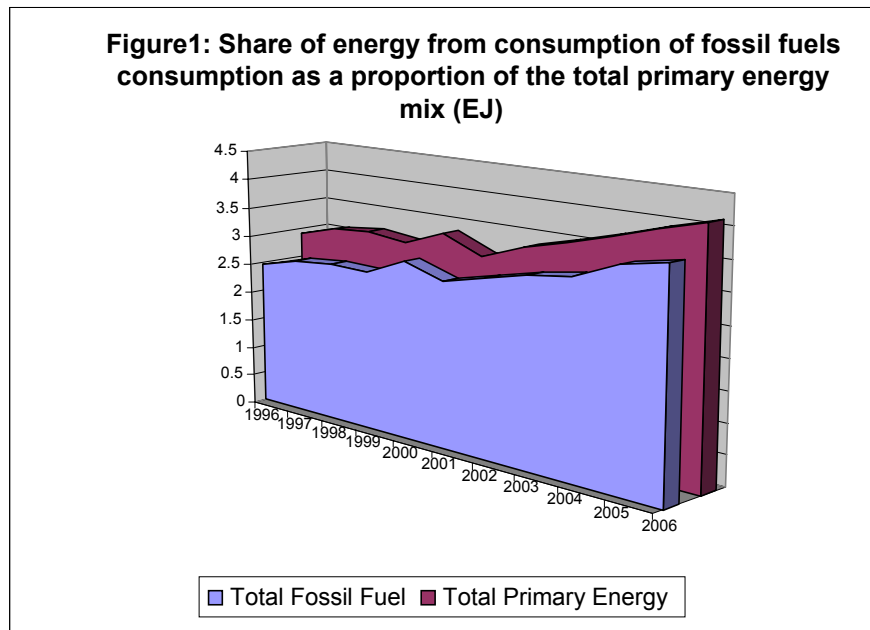
6. **Turkey's growth in total Greenhouse Gas (GHG) emissions from 1990-2006 has been among the highest among Annex 1 parties**, having grown from 126 to 256 million tons of CO₂eq. Turkey's emissions are the 12th highest among Annex 1 countries and 23rd highest in the world at 0.8% of global emissions. The two charts after the main text (pages 22-23) show the changes (increases and reductions) in GHG emissions including and excluding Land Use and Land Use Change and Forestry (LULUCF) of all Annex 1 countries. The growth of Turkey's GHG emissions, including LULUCF, is the second highest after Sweden; excluding LULUCF, Turkey's emissions growth is the highest among Annex 1 countries.

7. The growth in emissions is caused by the rising energy demand (driven by Turkey's rapid economic growth, industrialization and steady population growth) and reliance on fossil fuels, as detailed below. Turkey's energy intensity at 318 toe/Euro

million is well below the world average of 412 but clearly higher than the EU27 average of 182. Selected country comparators: Japan 139, Germany 163, France 176, USA 278, Mexico 363, Brazil 409, China 1,082, India 1,091, and Russia 2,417 [2005 figures]. CO₂ emissions per capita in 2005 were much lower in Turkey at 3.5 tCO₂ than EU27 average of about 9.3 tCO₂/capita. However, while per capita emissions have been stable in the EU, Turkish emissions have increased from 2.5 tCO₂ in 1990 and are projected to continue to rise in the future. Turkey's emissions are about 0.37 mt CO₂e/\$billion GDP in PPP terms.³

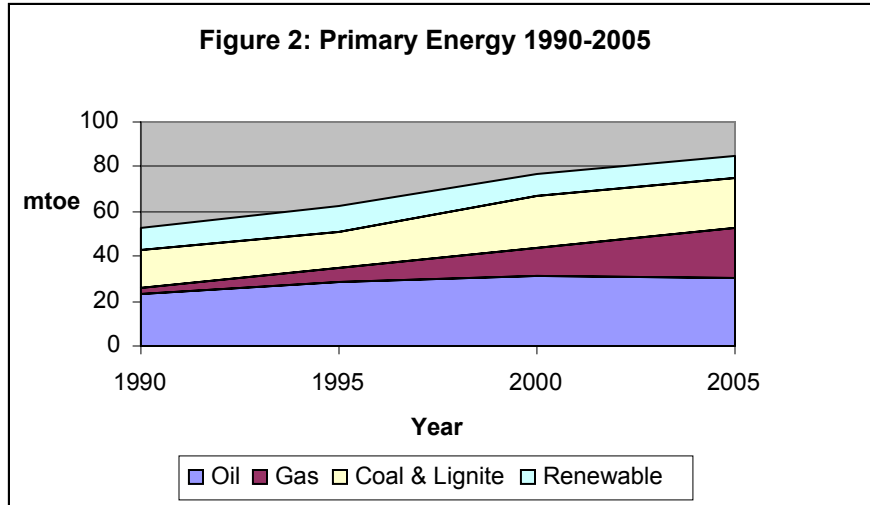
Energy Supply and Emissions

8. Strong economic growth and rising living standards have resulted in a growing energy demand (3.2%/annum in 1995-2005) and even stronger electricity demand (6.5%/annum). Energy demand has been met primarily by fossil fuels, 88% of the total in 2005 (Figure 1).

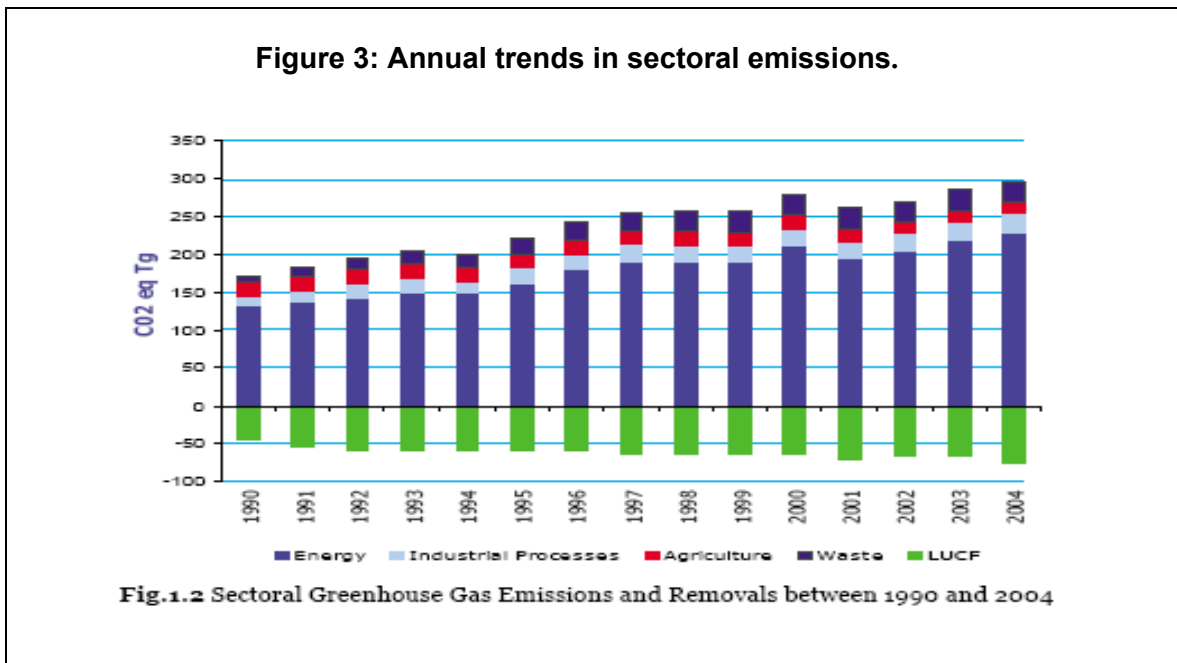


9. Growth has been met in particular by the increasing use of natural gas (Figure 2). Renewables (hydro and biomass) provided 12% in 2005 – compared to 8.5% in the EU27. Of Turkey's total primary energy supply of 85.2 mtoe (2005), imports accounted for 72% (significantly up from 59% in 1995 and 52% in 1990) – EU27 average is 52%.

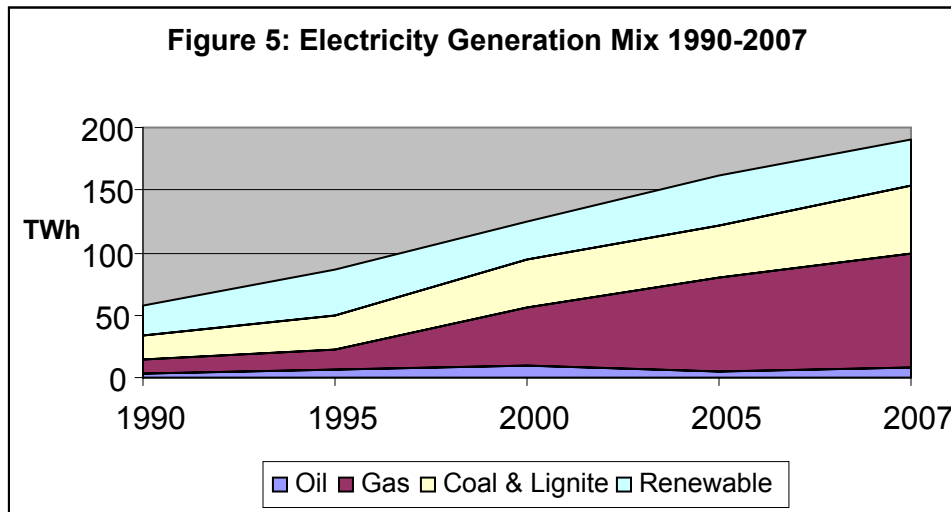
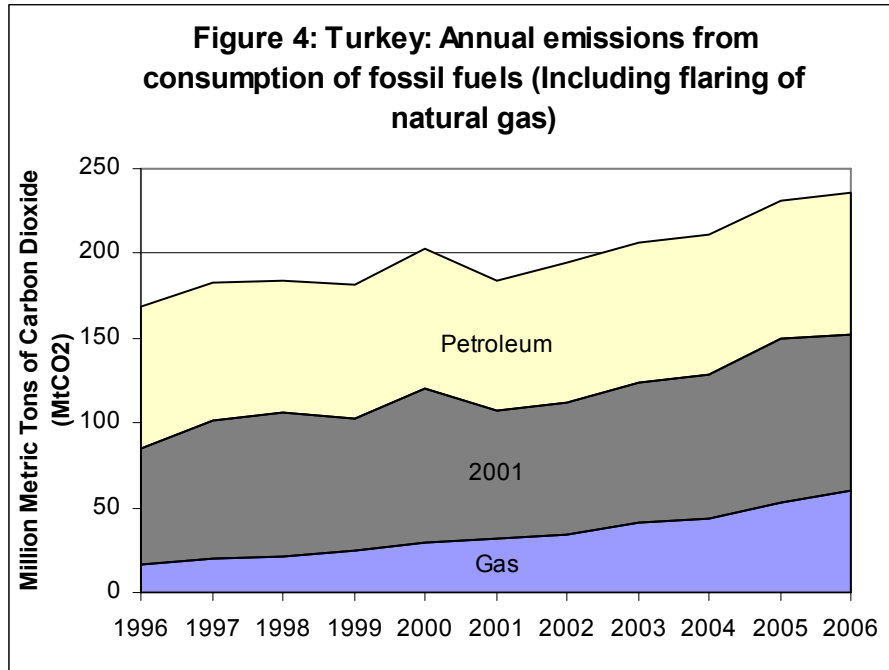
³ All figures in this paragraph from "EU Energy and Transport in figures", 2007/2008 edition, except Turkey's CO₂e emissions / \$billion GDP in PPP terms (WB staff estimate).



10. Energy sector (energy production and use) is the largest contributor to emission with 227.4 mt CO₂e or 77% of the total - (Figure 3). Waste disposal and industry (non-energy emissions) have the next largest shares at 9.3% and 8.9% respectively. In 2004, CO₂ made the largest contribution to total emissions (81.6 percent) with methane having the next largest share (15.6 percent).



11. **The growth of emissions would have been even greater, but for the major increase in the use of gas**, which has contained the use of coal and lignite (see Figure 4). In the electricity supply, the share of gas increased from about 20% in 1995 to 48% in 2007 (Figure 5). Complementing this shift to gas in the power sector, Turkey has carried out a nation-wide gasification program: in 2002, only nine Turkish provinces had access to gas, by the end of 2009; all 81 provinces will have been connected to the gas network.



12. Turkey's overall CO₂ emissions are forecast to continue to grow significantly in the period to 2020, driven by the electricity and industrial sectors. Emission trends in the electric power sector show projected growth of over 8% per annum in the business-as-usual case. This is driven by electricity demand (which will continue to exceed average energy demand growth rates) and continued reliance on solid fuels. Turkey's lower carbon development trajectory (scenarios are discussed in section 2) focuses primarily on energy efficiency and renewable energy options. Over time, nuclear power is also expected to play an important role in decreasing CO₂ emissions. In contrast to past trends, the growth in the use of gas will decelerate and the share of gas in the electricity generation mix will decline substantially, as energy security considerations are forcing

Turkey to limit its reliance on gas until the current gas import uncertainties have been addressed in a satisfactory manner – this is an European-level energy security issue, involving Turkey both as a major gas importer and as a transit country of gas from the Caspian and the Middle East to Europe. Turkey will working with the EU to examine options to accelerate gas development in the region.

2. **Identification of Priority Sectors for GHG Reduction Interventions**

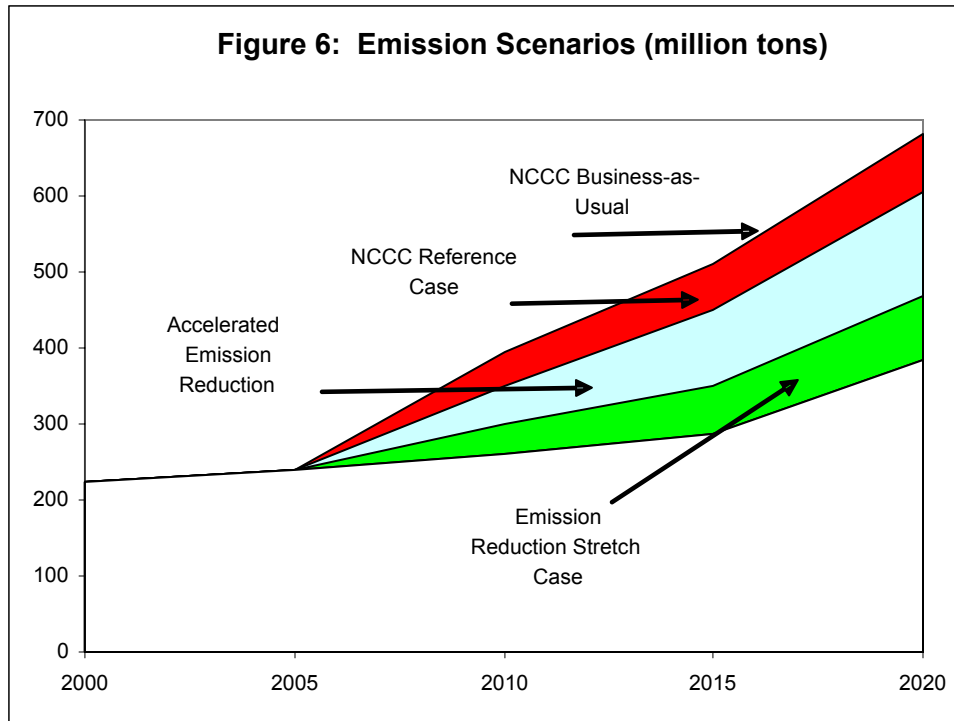
13. Turkey is facing the prospect of electricity supply-demand imbalances in the near future and gas import constraints in the medium-term, and has the challenge to ensure an adequate and reliable supply of energy, efficiently provided to consumers at a reasonable cost. Given the tightening electricity and gas supply/demand balances, the sizeable contribution of the energy sector to Turkey’s CO₂ emissions, and the cost-effectiveness of energy conservation, energy has been identified as the key sector for greenhouse gas mitigation interventions. Furthermore, this energy efficiency – energy security – environment nexus is consistent with the energy and climate goals of the European Union and effectively contributes to Turkey’s EU accession process.

Emission Reduction Scenarios

14. Table 1 and Figure 6 summarize the emission reduction impacts of the three main scenarios below the business-as-usual (BAU) case. The scenarios – the NCCC Reference Case, the Accelerated Emission Reduction Case and the Emission Reduction Stretch Case - and the corresponding emission reduction interventions (wedges) are discussed below.

Table 1: **Emission Scenarios for 2020**

	CO₂ mt	% of BAU
Business-as-Usual (BAU) Case	682.7	
NCCC Reference Case	604.6	-11
Accelerated Emission Reduction Case	468.6	-31
Emission Reduction Stretch Case	384.2	-44



(a) NCCC Reference Case (11% below Business-as-Usual emissions)

15. The Government's NCCC Reference Case incorporates three main measures not included in the business-as-usual case:

- **More than doubling Turkey's renewable electricity generation capacity:** (a) 13,500 MW (about 37% of economic potential) of Turkey's hydro potential has been developed, mostly by the public sector, with an encouraging entry of the private sector in the past few years. The Government's target in the NCCC Reference Case is to reach 30,000 MW by 2020 at the latest, mostly by private sector development of new facilities and complemented by the public sector largely through rehabilitation and capacity upgrading at existing plants; and (b) Also included is a target for non-hydro renewable generation capacity (mostly wind) to reach 3,000 MW. The analysis of this built-in renewable wedge shows a CO₂ reduction of about 49 mt (about 7% of 2020 emissions).
- **Introducing nuclear power in electricity generation,** to reach a minimum of 5% by 2020 (and 20% by 2030). Turkey has no nuclear power plants at the moment. NCCC Reference Case assumes that 4,500 MW of nuclear capacity is built by 2020. The analysis of this built-in nuclear wedge shows a CO₂ reduction of about 20 mt (about 3% of 2020 emissions); and
- **Modal shifts in transport from road to rail,** reducing the transport sector's energy consumption. The analysis of this built-in transport wedge shows a CO₂ reduction by about 9 mt (about 1.4% of 2020 emissions).

(b) Accelerated Emission Reduction Case (31% below Business-as-Usual emissions)

16. The Government has identified energy efficiency (the more efficient generation and use of electricity in particular) and accelerated development of renewable energy (the increased use of low-carbon sources for electricity generation in particular) as the most attractive interventions to further reduce emissions from the NCCC Reference Case. The Government's key measures in its energy efficiency – energy security – environment strategy nexus include:

- **Clean up electricity generation:** acceleration of renewable energy development; efficiency improvement in existing power generation facilities and utilization of advanced technologies in new facilities;
- **Reduce losses in electricity networks:** loss reduction (efficiency improvement) in electricity distribution; maintaining the already efficient performance of the transmission system operator TEIAS; and developing TEIAS capability to effectively integrate rapidly increasing supplies of intermittent wind electricity;
- **Improve the efficiency of electricity and energy consumption** in industries, commercial sector, households and the public sector; and
- **Capture methane and generate clean energy from waste:** mitigate highly potent methane emissions at landfills.

These four areas are discussed below:

(i) Clean Electricity Generation

17. **Renewable Electricity.** The Government's accelerated renewable energy target calls for Turkey to raise non-hydro renewable energy (mostly wind) from 3,000 MW (reference case) to 20,000 MW by 2020 at the latest, mostly by private sector development of new facilities and complemented by the public sector largely through rehabilitation and capacity upgrading at existing plants. The estimated renewable electricity investment cost in the renewable energy wedge is about \$26.4 billion. However, investment requirements in thermal capacity are reduced and the cost of operations (mostly fuel) and maintenance are also reduced as no-fuel-cost wind and solar and low-fuel-cost biomass and geothermal replace higher fuel cost coal, lignite and gas. Generation expansion planning studies show that projected electricity demand can be met with an incremental cost of about \$7.8 billion. **Turkey's CO₂ emissions in the power sector in 2020 would be 49 mt (22%) below the reference power case (total cumulative CO₂ emissions by 2020 are reduced by about 17%). Given the high weight of the power sector in Turkey's overall emissions, this translates to a 7% reduction in overall emissions in 2020.** Taking into account these investment and O&M savings, **the net cost of GHG mitigation becomes \$6/ ton of CO₂ avoided.**

18. **Cleaning Up Thermal Power.** A comprehensive program to clean up thermal power is underway. Existing coal-fired plants are being retrofitted with flue gas desulphurization (FGD), electrostatic precipitators, improvements in ash-handling, etc.

despite the high investment requirements. Seven existing coal-fired plants do not yet have FGD, primarily due to resource constraints. Most of these plants are expected to be privatized, and it is planned that the new owners will be required to carry out specified environmental upgrades (including installation of FGD) within a stipulated timeframe after privatization. Recently completed coal-fired plants have been constructed either with fluidized bed technology (Çan Thermal Power Plant) or with FGD (Afşin-Elbistan B Thermal Power Plant). Furthermore, a number of existing oil-fired plants are being converted to gas-fired gas turbines and/or combined cycle plants. Finally, new thermal power plants are being constructed to comply with applicable Turkish legislation, which largely follows the EU's Large Combustion Plant Directive but currently permits higher emission limits. No attempt has been made to develop capital cost estimates or estimate the benefits of what could be accomplished in terms of emission mitigation or cost of CO₂ saved. CTF support is not proposed at this time.

(ii) Reduce Losses in Electricity Networks

19. TEDAS, the state-owned distribution company, has technical and commercial losses of 14% of electricity purchased or about 21.9 TWh in 2007. This represents about 13.7 mt of CO₂e per year which has been rising slowly as modest reductions in losses have been offset by the steadily increasing electricity demand. The privatization of TEDAS' distribution regions has started very successfully. Their new private owners are expected to upgrade the distribution systems which have suffered over the past decade from low levels of investment and may also be more successful in reducing theft. Distribution losses are likely to be reduced more rapidly in the next few years as the distribution regions are privatized. TEDAS estimates that a 5% point distribution loss reduction, to around 9%, would cost about \$1.6 billion. Assuming that 1/3 of the losses are theft and are converted to paid sales instead of reduced consumption, the remaining 2/3 actual reduction would save about 3.3 mt of CO₂e per year. The estimated cost of emission reduction is about \$24/ ton of CO₂ emissions eliminated. CTF support is not proposed at this time.

(iii) Improve Efficiency of Electricity and Energy Consumption

20. **More Efficient Use of Electricity and Other Sources of Energy.** Under energy efficiency legislation and recent and forthcoming regulation (see Section 4, pages 16-17), the Government is promoting the efficient use of energy across the board: in large industries, in small and medium-scale enterprises (SMEs), in households, in transport, and in the public sector. Industrial interventions vary widely but for example programs to replace old inefficient electric motors and the introduction of variable speed drive systems are effective and applicable across subsectors. Residential interventions will focus on fluorescent bulbs (an ongoing program), appliance standards (in particular refrigerators) and insulation. Public sector interventions will focus on lighting and insulation.

21. **The Energy Efficiency Wedge.** Studies carried out by the EIE and the WB show that it is possible to significantly reduce electricity consumption through improved

efficiency in the use of electricity. NCCC presents a Demand Side Management (DSM) case (an electricity efficiency energy wedge) analyzing the impacts of a 15% reduction in industrial electricity consumption and 10% reduction of electricity consumption in residential applications. In line with international experience, the results of the implementation of such measures would be highly beneficial – a win-win for the economy and the environment. **Turkey's CO₂ emissions in 2020 would be 75 mt (11%) below the business-as-usual case, with total cumulative CO₂ emissions by 2020 are reduced by about 7.1%.** Incremental cost is -\$15.5 billion, indicating that the estimated US\$1 billion investment costs of these low-cost electricity efficiency measures are more than compensated by savings in electricity generation. Improved energy efficiency is therefore a net benefit to the economy: **emission reduction through energy conservation actually benefits the economy by about \$31.6/ton of CO₂ avoided.** Energy efficiency investments typically have attractive economic rates of return and often also financial rates of returns which seem attractive but fail to meet the investment thresholds of investors: barriers including the high transaction costs and lack of suitable financing arrangements that have prevented the application of these win-win energy-environment technologies are discussed in Section 3 (pages 13-14).

(iv) Generate Clean Energy from Waste

22. Waste disposal accounts for over 9% of Turkey's GHG emissions. Most of this is landfill gas, which is about half methane, exhausted to the atmosphere. Systems of controlled storage, composting, incineration and recycling are not common. NCCC estimates that only 30% of waste is being stored in controlled environments. These issues are being addressed as part of Turkey's National Program for Adoption of EU Acquis and include measures such as decommissioning of old dumpsites, installation of new landfill sites, creation of collection and recycling systems, composting and incineration facilities, etc. The collection and use of landfill gas for electricity generation and heating is included in the Accelerated Emission Reduction Case, to promote the wider use of this technology which has been successfully introduced in Ankara.

23. **Landfill Gas Wedge.** About 15-16 mt of municipal waste is collected annually in Turkey at 36 landfills. They produce landfill gas, about one half of which is methane (about 21 times as potent a greenhouse gas as CO₂). Using the Ankara Landfill (Mamak) and its generating plants (implemented under the Renewable Energy Project) as an example, the establishment of generating plants for the entire 16 mt of landfill waste would reduce emissions by about 12 mt CO₂e per year or 240 mt CO₂e over the 20 year expected life of the equipment. This would have a capital cost of about \$925 million or **about \$ 4/ton of CO₂ avoided.** The plants in the largest cities such as Ankara and Istanbul would be profitable since these plants would benefit from economies of scale and be able to sell electricity, and possibly hot water. The viability is reduced and the cost of emission mitigation is increased in medium sized and smaller cities.

(c) **Emission Reduction Stretch Case (44% below Business-as-Usual emissions)**

24. Although the implementation of the measures in the Accelerated Emission Reduction Case already yields a very significant 31% emission reduction compared to business-as-usual, even deeper emission cuts are feasible, subject to even greater financial and related implementation support. The Emission Reduction Stretch Case illustrates how emissions could be brought to 44% below the business-as-usual, through (a) further electricity and energy efficiency improvements; and (b) modal shifts in transport:

25. **Further Electricity and Energy Efficiency Improvements.** The Electricity Efficiency Wedge in the Accelerated Emission Reduction Case considered a 15% reduction in industrial electricity consumption and 10% reduction of electricity consumption in residential applications. Though significant in terms of energy savings and emission reductions, this efficiency wedge is only a conservative first step. Saving potential well beyond these figures exists in both sectors. In addition, surveys suggest significant saving potential in the commercial and public sectors, particularly in lighting and building insulation. It is safe to assume that the efficiency wedge of the Accelerated Emission Reduction Case could be replicated in terms of energy savings and emissions reductions, at an investment cost well below the \$15.5 billion potential investment and O&M savings – meaning that **Turkey’s CO2 emissions in 2020 could be cut by another 75 mt (another 11%) below the business-as-usual case, still at a net benefit (cost saving) to the economy.** This is assumed in the Emission Reduction Stretch Case.

26. **Further Emission Reductions in Transport.** While domestic vehicle ownership rates have been rising, they remain lower than OECD/ EU averages and will continue to increase. Countering the resulting increase in consumption and emissions, Turkey has taken steps to align domestic transport regulations with the EU, to introduce catalytic convertors, fuel and emissions standards. New engine technologies are being introduced and older cars are being replaced and removed from service. A major transport program, also in terms of environmental benefits, is the construction of two tunnels beneath the Bosphorus in Istanbul. The construction of the first tunnel started in 2004 and the contract for the second was awarded in late 2008. Emissions from transport are projected to remain stable as a percent of overall emissions in the NCCC Reference Case. More aggressive measures – including more stringent efficiency standards, car taxation based on emissions, and further shifts from road to rail transport – could be considered to achieve emission reductions, probably well above the 9 mt (about 1.4% of 2020 emissions) gains built into the NCCC Reference Case compared to the business-as-usual case. The replication of the 9 mt wedge is assumed in the Emission Reduction Stretch Case. CTF support is not proposed at this time.

(d) **Areas for Further Emission Reductions**

27. Though (c) above is called an Emission Reduction Stretch Case, Turkey would need to accomplish even more to stop the growth of emissions and eventually start reducing emissions back towards current levels – as discussed in Section 1, Turkey’s

emissions have grown the fastest among all Annex 1 countries and even in the Stretch Case, Emissions continue to increase. Six potential wedges have been identified: (1) the acceleration and deepening of the energy efficiency program – for one or even two additional 75 mt energy efficiency wedges. Further energy savings and emission reductions, through more significant but still economically viable investments including process changes in industries, can probably be identified, along with further improvements in residential, commercial and public sector energy applications, particularly in lighting and building insulation and appliances; (2) resolving the gas import constraint – this will probably need a European solution, not by Turkey alone – to allow Turkey to lift the gas constraint in the power sector instead of using more coal and lignite; (3) carbon capture and storage –again a European solution is needed; (4) nuclear power development beyond the first 4,500 MW (20 mt) wedge; (5) transport sector – tightening of vehicle fuel and emission standards for conventional vehicles plus the mainstreaming of hybrids and electric cars; and (6) LULUCF, in particularly forestry – forests cover about 27% of Turkey, and up to one half is in need of rehabilitation and protection. A combination of most if not all of these measures will be required if Turkey is to bring its emission back towards to the current level and below as may be required from future commitments including post-2012 Kyoto and EU accession negotiations to reflect EU’s new 20/20 by 2020 program for Turkey. The large-scale utilization and full impact of these measures would be realized only beyond 2020. These six potential wedges are proposed to be analyzed and their priorities established in Turkey’s next Climate Change Action Plan and the 2nd NCCC in 2010.

3. Rationale for Selected Sector for CTF Co-financing

28. Given the tightening electricity and gas supply/demand balances, the sizeable contribution of the energy sector to Turkey’s CO₂ emissions, and the cost effectiveness of energy conservation, energy has been identified as the key sector for interventions under the CTF with a focus on the demonstration, deployment and transfer of low carbon technologies for renewable electricity generation and conservation. Furthermore, this energy efficiency – energy security – environment nexus is consistent with the energy and climate goals of the European Union and effectively contributes to Turkey’s EU accession process.

29. The NCCC defines Turkey’s fundamental strategy to achieve its energy policy objectives as “encouraging private/foreign investments”. Accordingly, the Turkish government is implementing a private sector oriented energy strategy and is taking necessary steps to create an enabling environment for clean energy investments. As one of the leading fast-growing emerging economies, Turkey is highly in need of financing to realize its potential to implement environmentally responsible investments. However, due to the economic and financial barriers the investments in clean technologies have been less than sufficient so far. Moreover, recent deterioration of global financial conditions may lead to limitations on financing for Turkey as well as other countries. Increased borrowing costs and reduced access to external finance may represent disincentives for entities carrying out clean technology projects. Within this framework, CTF with its guiding role may provide the necessary incentive in the initial stages of the

clean technology programs/projects and help Turkey to move faster towards the goal of achieving the Accelerated Emission Reduction Case by triggering and accelerating new investments. The blending of CTF concessional financing with World Bank Group and EBRD lending and Turkey's own resources would make investments financially attractive and create a highly leveraged impact in the energy sector. Thus, the proposed CTF financing plan is an important support for Turkey's efforts to achieve reduction in GHG emissions.

30. The Government is implementing the NCCC Reference Case which takes Turkey 11% below the emission level of the business-as-usual (BAU) case. **The Government is seeking CTF support to move from the NCCC Reference Case to the Accelerated Emission Reduction Case (31% below BAU),** and in energy efficiency towards the Emission Reduction Stretch Case (44% below BAU).

31. The Government of Turkey proposes to assign available CTF resources as follows:

- **Renewable Energy:** private sector investment in renewable energy (other than large-scale hydro), including wind, biomass, geothermal and solar, as well as small-scale hydro (up to 10 MW);
- **SmartGrid** (improved grid management) for intermittent renewable energy in particular wind power and solar; and
- **Energy Efficiency** in industries (large and SMEs), commercial, residential and the public sectors.

32. Interventions will be selective, flexible and will include a range of private and public sector activities. Policy, legislative, regulatory and market/pricing measures have been introduced (see Section 4, pages 15-17) and will be applied to promote and support necessary investments and the creation of functional markets. The key features of the three CTF areas are summarized in Table 2. Technologies supported in the CTF Investment Program are discussed in Annex 1 and the envisioned projects in Annexes 2-5.

Table 2: Key Features of Turkey's Proposed CTF Program

Rationale for CTF Support	Renewable Energy (RE)	SmartGrid	Energy Efficiency (EE)
Basis for Selectivity/Priority.	Low unit cost of \$6/ton and high total mitigation potential.	Facilitates large-scale intermittent renewable energy generation.	Net benefit (negative unit cost) and very high total mitigation potential.
GHG savings of the CTF Program.	3.1 mt / annum.	Included in RE.	4.0 mt / annum.
Outcomes	About 800 MW of additional renewable capacity.	Included in RE.	Energy savings of 16,500 TCal/ year.
Total GHG savings	49 mt in 2020 – 8%	Facilitates wind, solar.	75 mt in 2020 – 12%

Rationale for CTF Support	Renewable Energy (RE)	SmartGrid	Energy Efficiency (EE)
thru Transformation from the NCCC Reference Case to the Accelerated Emission Reduction Case.	below the NCCC Reference Case.		below the NCCC Reference Case. And another 75 mt in 2020, for a total of 150 mt or -24% of BAU, in the Emission Reduction Stretch Case.
Transformation.	CTF supports the new RE framework, accelerates wind and small-scale hydro, and demonstrates the potential for other renewable technologies.	CTF enables TEIAS to introduce SmartGrid technology into its power system.	CTF eases barriers and demonstrates the potential for energy efficiency across industries, and commercial, residential and public sectors.
Regulatory Framework.	Yes. Established under the 2005 Renewable Energy Law and its amendments and the 2001 Electricity Market Law and its amendments.	Yes. Established under the 2001 Electricity Market Law and its amendments.	Yes. Established under the 2007 Energy Efficiency Law. Regulations issued in 2008.
Why not business as usual?	Large-scale application still limited to large hydro and large investors, insufficient FRRs for other projects. Barriers including high transactions costs and lack of financing are discussed below and in Annex 1.	SmartGrid is an emerging high-tech solution to grid problems caused by intermittent renewable energy (discussed further in Annex 1 and Annex 4).	Application in Turkey still limited mostly to selected large industries, and energy-efficient bulbs in households. Barriers including high transactions costs and lack of financing are discussed below and in Annex 1.
Co-benefits (in addition to GHG mitigation).	Business and employment generation, clean air, energy security. Details in Annex 1 including social and local environmental benefits.	Energy security, improved reliability of power supply.	Business and employment generation, clean air, energy security, improved competitiveness. Details in Annex 1 including social and local environmental benefits.
Within the Country Partnership Strategy of the World Bank Group.	Yes.	Yes.	Yes (industrial, commercial and public sector EE). No (residential) within the current IBRD financing envelope.
Within the Country Strategy of EBRD.	Yes.	No.	Yes (industrial and commercial; public sector through ESCOs). No

Rationale for CTF Support	Renewable Energy (RE)	SmartGrid	Energy Efficiency (EE)
			(residential).
NCCC priority area.	Yes. Built into the NCCC Reference Case and expanded for the Accelerated Emission Reduction Case.	Yes (indirectly through RE and EE).	Yes. The main NCCC case, included in the Accelerated Emission Reduction Case.

33. The World Bank Group's and EBRD's experience with renewable and energy efficiency investments in other countries shows that many projects which may be financially viable remain unimplemented because of various combination of five key barriers:

- (a) **Inadequate awareness of the benefits of energy efficiency and perceived high technical and financial risks of such projects among industry.** Industry, particularly medium and large industry, may in cases perceive energy efficiency projects to be technically risky and not bringing about commensurate financial returns, particularly when compared to the kind of financial returns expected from other investment options. Lack of familiarity with the range of energy efficiency technologies and processes, and energy conservation investment best practices as well as the under-appreciation of financial benefits from energy conservation investments are primarily responsible for the high risk perception among industrial enterprises;
- (b) **Insufficient capacity for evaluating renewable energy and energy efficiency projects among banks, and their perception of high financial risks of such projects.** There is a lack of adequate debt financing for such projects, primarily because banks are not familiar with such projects in Turkey. The internal capacity for identification of such projects, their evaluation and further processing is also low as a result. In Turkey, this is further exacerbated by the absence of financing of suitable tenor and cost – financing available in the Turkish market is short-term and high-cost financing. For industries, banks prefer new investments, or investments that raise productivity or capacity, rather than investments aimed at reducing costs or improving efficiency;
- (c) **Insufficient institutional capacity for managing the regulatory framework for energy efficiency.** The capability of the regulatory arrangements to effectively implement the Government's energy efficiency policies and programs needs to be scaled up to meet the new challenges posed by the EE Law and the secondary regulations. This is a significant challenge, as witnessed in other countries that have embarked on the path to scaling up energy efficiency, and needs significant capacity building support in initial years;

- (d) **High transaction costs in developing renewable energy and energy efficiency investments.** The transaction cost of developing renewable energy (other than large hydro and wind) and energy efficiency investments faced by industry as well as by banks is usually high. Such costs can arise from energy audits, feasibility studies, sometimes the need to shut down processes in order to rehabilitate or replace parts. These costs are further enhanced by the lack of adequate familiarity and experience with identifying and preparing such projects both within industry as well as in banks; and
- (e) One of the key limitations for wider project implementation of renewable energy and EE financing is the **lack of financial resources and proper lending facilities**, particularly for small-scale projects and SMEs. Financial institutions view renewable energy and the EE sector as higher risks, due to lack of technical capacity on the part of lenders to evaluate such projects and potential borrowers being unable to establish bankability of their projects. CTF will be instrumental in attracting the attention of the financial institutions to this new field, providing necessary know-how to help develop institutional capacity and developing a competitive market for these products.

4. Enabling Policy and Regulatory Environment

34. **Legal and regulatory framework.** Turkey has taken a proactive stance to address issues of energy security, supply demand imbalance, alignment with EU directives and environmental management through a number of new laws that have been enacted since 2001. The Ministry of Energy and Natural Resources (MENR) is responsible for sector strategy and policy formulation. The Ministry is supported by the main regulatory institution for the energy sector - the Energy Market Regulatory Agency (EMRA) – and the General Directorate of Electrical Power Resources Survey and Development Administration (EIE). They work closely with the Treasury, State Planning Organization, and the Ministry of Environment and Forestry, the lead agency for climate policy. The following paragraphs provide an overview of the legal and regulatory framework for Turkey’s energy sector as it relates to the proposed CTF investments.

35. **Electricity Sector.** The Electricity Market Law was passed in 2001 and was substantially amended in 2008. It is complemented by the recently updated Electricity Market and Supply Security Strategy (not yet formally approved). The objective of the Strategy is for Turkey to meet its growing electricity demand in an efficient and sustainable manner, ensure supply security and minimize environmental impacts. In the short to medium term the Strategy focuses on accelerating measures to address the supply-demand imbalance in a market-driven manner, without resorting to sovereign-guaranteed IPPs or significantly enhanced public investments. The Strategy includes a range of measures to improve both efficiency in the supply and consumption of electricity and the supply-demand balance, such as:

- revising electricity tariffs to cover supply costs and introducing a cost-based automatic mechanism for future tariff adjustments to reflect changes in supply

costs, thereby encouraging more efficient consumption patterns and improving the incentives for private investment;

- reducing electricity theft and improving collections (particularly from municipalities) - thereby reducing demand, improving consumption efficiency and improving the incentives for private investment;
- ensuring adequate investments in the transmission and distribution networks to enhance capacity and reliability, and reduce technical losses - thereby improving the efficiency of electricity supply;
- rehabilitating existing generation plants to increase reliability and efficiency - thereby reducing the need for investments in new generation capacity;
- privatizing the distribution network and selected generation plants, improving the functioning of the wholesale market, introducing a capacity mechanism and undertaking other measures to add additional generation capacity - thereby enhancing the role of the private sector and creating the structure for attracting enhanced private sector investments for new generation capacity.

36. **The Electricity Strategy** confirms the following main transitory steps and final targets for Turkey's ongoing (WB-supported) program to develop its electricity market:

- Bilateral contracting between buyers and sellers (between eligible customers and suppliers, between Disco/retailers in representation of captive consumers and suppliers, and between wholesale suppliers and generators) will continue and will account for an increasing share of total power supply;
- The current balancing and settlement system (BSR) with day ahead bidding and scheduling administered by TEİAŞ Market Operator unit (PMUM) and real time pay-as-bid balancing administered by the National Load Dispatch Center (NLDC) of TEİAŞ will be developed progressively by 2010 into a separate and complementary day-ahead market to be operated by the market operator (expected to be a TEİAŞ subsidiary with adequate financing and administrative autonomy) and a real-time balancing market operated by the TEİAŞ NLDC;
- Furthermore, in order to improve the security of supply, the Government is working to introduce a capacity mechanism (capacity obligations and trading of related capacity certificates) to complement market-based energy trading (bilateral contracts and the day-ahead market mentioned above). The Strategy requires regulations for the capacity mechanism to be issued in 2009; and
- Finally, the Strategy provides for extending the use of transitional contracts until the end of 2012 in line with the recent amendment of the Electricity Market Law to facilitate the orderly completion of the unbundling and privatization program.

37. **Renewable Energy.** A Renewable Energy Law enacted in 2005 is designed to help reduce risk perceptions of potential investors in generation and enhance the attractiveness of the Turkish electricity market. It triggered great interest in wind

development in particular and attracted expressions of interest amounting to 78,000 MW. A road map for receiving and evaluating applications for wind power plants and issuing the related licenses has been issued by EMRA and TEIAS has prepared an investment plan to accommodate 15,000 MW wind power. Additional support measures are proposed to further promote other renewable electricity generation, though an amendment of the Renewable Energy Law submitted to the Parliament in November 2008. The amendment would raise the current €5.5 cent/kWh guaranteed price for the sale of electrical energy generated from renewable energy resources for new plants for all renewable technologies except hydro. Increases are expected to be particularly significant for biomass and solar. The renewable energy wedge in the Accelerated Emission Reduction Case presents the impact of accomplishing Turkey's renewable energy targets.

38. **Energy Efficiency.** The Energy Efficiency Law enacted in 2007 promotes efficient energy use, loss prevention, lessening the burden of energy costs on the economy, increased yield in the use of energy resources and environmental protection. The Law targets industrial facilities, building and services sectors, as well as the power sector (generation, transmission and distribution networks). The Law has four pillars: establish an administrative structure and tasks for delivering energy efficiency services across sectors; promote training and awareness; implement penalties for misconduct; and provide incentives to increase energy efficiency and renewable energy use.

39. Energy efficiency regulations issued in 2008 cover:

- Supply side management including measures to improve efficiency in electricity generation, transmission and distribution;
- Increased energy efficiency in the public and transport sectors;
- Support to businesses to augment ongoing energy efficiency efforts including implementation of voluntary measures;
- Training, research and development; and
- Energy performance in buildings.

40. Household appliances, commercial and other end-use equipment are mainly covered by the European Union labeling and product information requirements; national regulations were updated by the Ministry of Industry and Trade with effect from January 2008. Producers and importers are required to include energy efficiency information in a separate section of related operating manuals.

41. Market/commercial incentives for industries to invest in energy efficiency and to improve their energy utilization have strengthened: (a) energy price adjustments, resulting from international oil and gas price developments and domestic requirements for cost-reflecting tariffs, provide strong price signals; and (b) slowdown of the economy will shift attention from capacity expansion to cost-effectiveness, including energy.

42. The energy efficiency wedge in the Accelerated Emission Reduction Case presents only a partial initial impact of accomplishing Turkey's energy efficiency targets. The strategy, through the law, regulations and support measures, aims at going beyond

that initial target, to the Emission Reduction Stretch Case and beyond over time (Section 2(d)).

5. **Implementation Potential, including Risk Assessment**

43. Overall implementation risk is assessed to be Moderate⁴ (Table 3).

44. Turkey has a proven implementation record of World Bank financed projects in the energy sector – as well as across sectors. The National Transmission Grid project, implemented by TEIAS, closed in December 2007 with a highly satisfactory rating from Independent Evaluation Group (IEG). Even more relevant is the Renewable Energy Project. It was launched in 2004 and is rated satisfactory. The project objective is to increase privately owned and operated distributed power generation from renewable sources, without the need for government guarantees, within the market-based framework of the Turkish Electricity Market Law. The project is exceeding all three performance indicators, renewable generation capacity added, renewable electricity generated and CO2 emissions reduced.

45. Turkey ranks 59 of 181 economies on the ease of doing business index (*IFC doing Business 2009*) and 10 of 25 countries in ECA; scores on “dealing with construction permits” and “employing workers” lower the ranking. Procedures, time and cost of construction are worse than OECD averages but significantly better than regional averages.

Table 3: Risks and Mitigation

Potential risks	Rating after mitigation	Description
Macro-economic framework	S	<p>Risks are substantial due to vulnerability to international liquidity problems and an abrupt capital outflow and a significant economic downturn is possible due to high financing needs and current account deficits. Turkey’s economic outlook for 2008-09 is thus highly affected by global credit conditions. One of the main measures on the fiscal side is to link spending to revenues in view of the downside risk to growth and revenue projections. The Government is committed to implement a multi-year MTFP and reforms and economic program continue to be anchored by EU accession process.</p> <p>Turkey is expected to return to a high-growth path in the medium to long term. Energy demand, particularly electricity and gas demand has grown and is expected to continue to grow rapidly. The Electricity Strategy sets targets to contain the use of gas in power generation and energy demand may be constrained by available supply in the short to medium term. The prospects for CTF project to be successful are excellent in renewable electricity generation</p>

⁴ Rating of 4: high (H), Substantial (S), Moderate (M), Low (L)

Potential risks	Rating after mitigation	Description
		(and related smart grids for wind power management), clean coal, and energy conservation, particularly electricity and gas conservation.
Country engagement with WB	L	The current CPS is fully aligned with the Ninth Development Plan and the Bank maintains a strong dialogue on policy and program issues.
Country governance	M	Political risks include: domestic political differences, upcoming municipal elections, border tensions and geopolitical events in neighboring regions. Turkey's single-party Government with a 2/3 majority has leverage to push through difficult reforms while the governance structure is anchored by the leadership's commitment to EU accession as a priority. Turkey's election to the UN Security Council as a non permanent member reinforces its role as regional peace broker and strategic foreign policy actor.
Systemic corruption	M	Corruption levels are similar to many EU member countries. Noticeable efforts to reduce corruption include legislation on public procurement, civil service ethics, freedom of information, ratification of major conventions.
Sector policies and institutions	M	The new electricity strategy and related legislative and regulatory measures provide strong support for RE and EE initiatives. Turkey's electricity market provides a functioning market place for trading renewable electricity.
Implementing agencies	M	Local capacity to build and operate hydro and wind power facilities and implement industrial projects including building retrofits and construction has been demonstrated as have the skills of the domestic financial sector to assess and supervise RE projects although financial assessment of EE activities is emerging. EUAS and private developers have demonstrated capacity in the generation sector and TEIAS in transmission system control management. The decentralized nature and smaller size of RE and EE interventions mitigate impacts on power sector performance due to possible delays or failures of individual projects (except for the inevitable variation of wind, for which a SmartGrid approach is proposed). Technical assistance and external expertise will be sourced for SmartGrid development and to support assessment of EE opportunities- donor interest has been established (Section 6).
Technology	M	CTF will utilize hydro, wind, and some EE technologies that have already been proven in country. CTF will also utilize technologies with a proven track record outside Turkey in the case other EE technologies; SmartGrid; and biomass, solar and geothermal technologies.
Safeguards	M	WB/IFC/EBRD safeguards policies will apply to all interventions. TSKB, TKB and HalkBank and TEIAS are already applying them under ongoing projects.
Overall Rating	M	

6. Financing Plan and Instruments

46. Turkey seeks US\$400 million of CTF financing, representing about 10% of the US\$3,850 million in overall financing needs (Table 4). This will leverage US\$1,900 million in multilateral support and US\$1,550 million from Turkey:

Table 4: CTF Financing Plan (\$ million)

Project / Financing Source	Turkey <u>1/</u>	World Bank	IFC/EBRI	CTF	Total Cost
PHASE I					
RE/EE2 (phase I)	530	500		100	1,130
IFC/EBRD RE/EE (phase I)	170		250	100	520
TEIAS Transmission incl. SmartGrid for CTF	100	300		50	450
Total (phase I)	800	800	250	250	2,100
PHASE II					
RE/EE2 (phase II)	320	300		30	650
IFC/EBRD RE/EE (phase II)	130		150	20	300
SME & Public Sector RE/EE	300	400		100	800
Total (phase II)	750	700	150	150	1,750
Total CTF Program	1,550	1,500	400	400	3,850

1/ The Government, banks (incl. TSKB, TKB, HalkBank, etc.), investors, and TEIAS

47. Recognizing the CTF framework and overall CTF resources, the program is presented in two phases. The \$250 million Phase I is based on currently projected CTF availability and the agreed Turkey Country Partnership Strategy (CPS). The \$150 million Phase II represents an additional CTF program which is dependent *inter alia* on additional CTF availability and accommodation within the IBRD financing envelope for Turkey as it evolves.

48. Turkey's CTF proposal includes financing for project preparation as follows: (a) CTF debt financing for the preparation of subprojects for financing under the RE/EE2 and IFC/EBRD RE/EE projects; and (b) CTF grant financing up to \$1 million for the preparation of the SmartGrid component for the TEIAS project.

49. A carbon revenue stream has not been used as part of the financing plan as Turkey is not yet a Party to the Kyoto Protocol (page 2). Turkey is able to sell into the voluntary carbon market and several projects under the Renewable Energy Law are doing so although at lower prices.

50. **Donor Coordination.** The Treasury organized a donor coordination meeting in Ankara on December 4, to present the CTF and the Government's priorities for the use of CTF to support Turkey's climate change mitigation objectives. A draft of Table 4 was presented and discussed. The proposed focus on renewable energy development and energy efficiency was uniformly endorsed by the participants - AFD, JICA, KfW, UNDP and the EC Delegation. All of them have and/or plan to have financing and technical assistance activities in these areas in Turkey. They endorsed Turkey's proposed CTF program and welcomed Treasury's coordination of donor/IFI assistance in these priority areas.

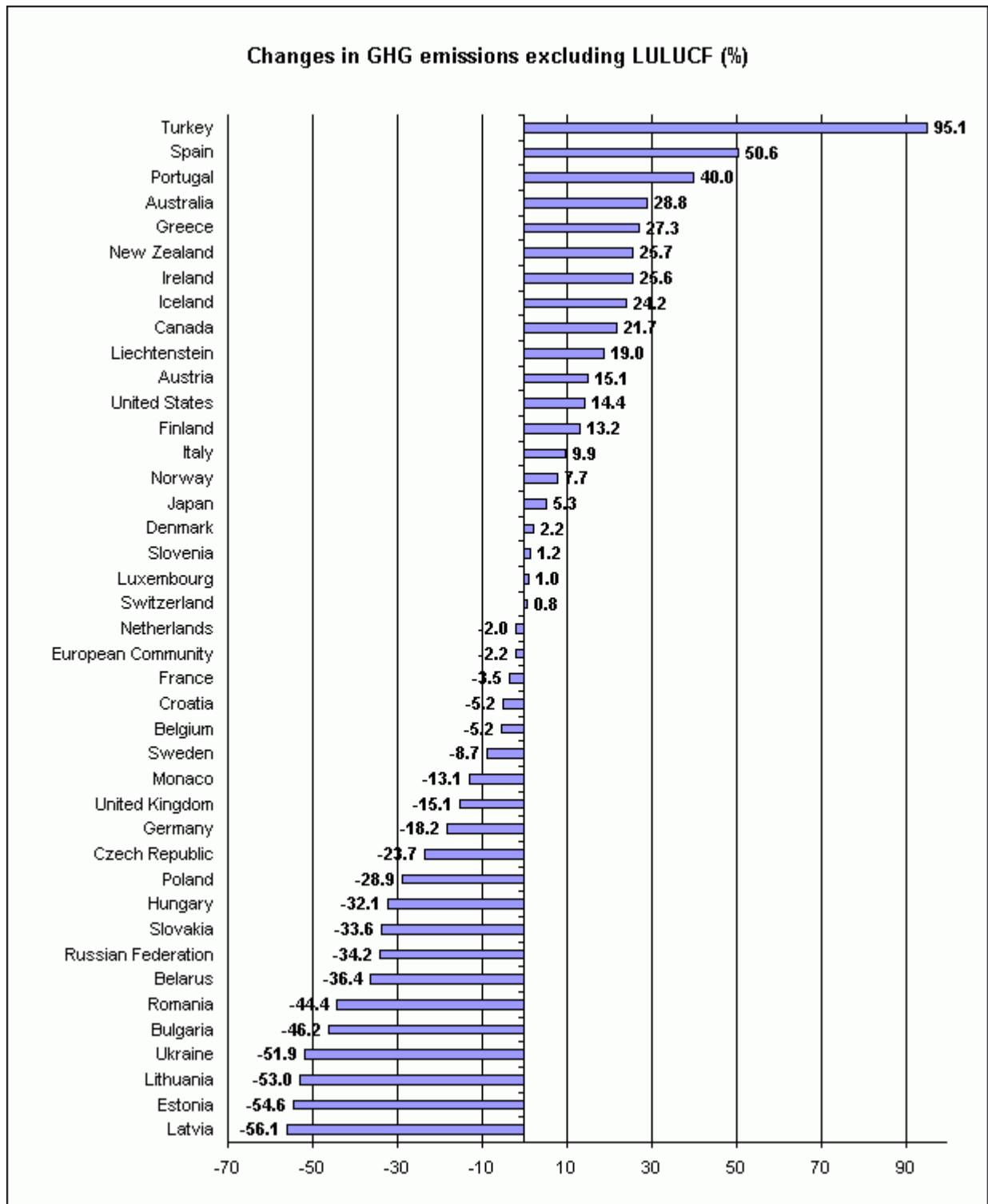
51. The next Climate Change Action Plan and the 2nd NCCC. UNDP informed the meeting about UNDP/GEF support for the preparation of Turkey's next Climate Change Action Plan and the 2nd National Communication on Climate Change and welcomed the WB/IFC/EBRD CTF team's proposal to participate in the preparation process as far as UNDP is concerned – the Ministry of Environment and Forestry extended the same invitation separately during the CTF mission. The Action Plan and the 2nd NCCC are expected to become available in 2010 and *inter alia* facilitate Turkey's envisioned CTF phase II request for additional CTF resources.

Attachments:

Charts 1 & 2: Changes in GHG Emissions of Annex 1 Countries

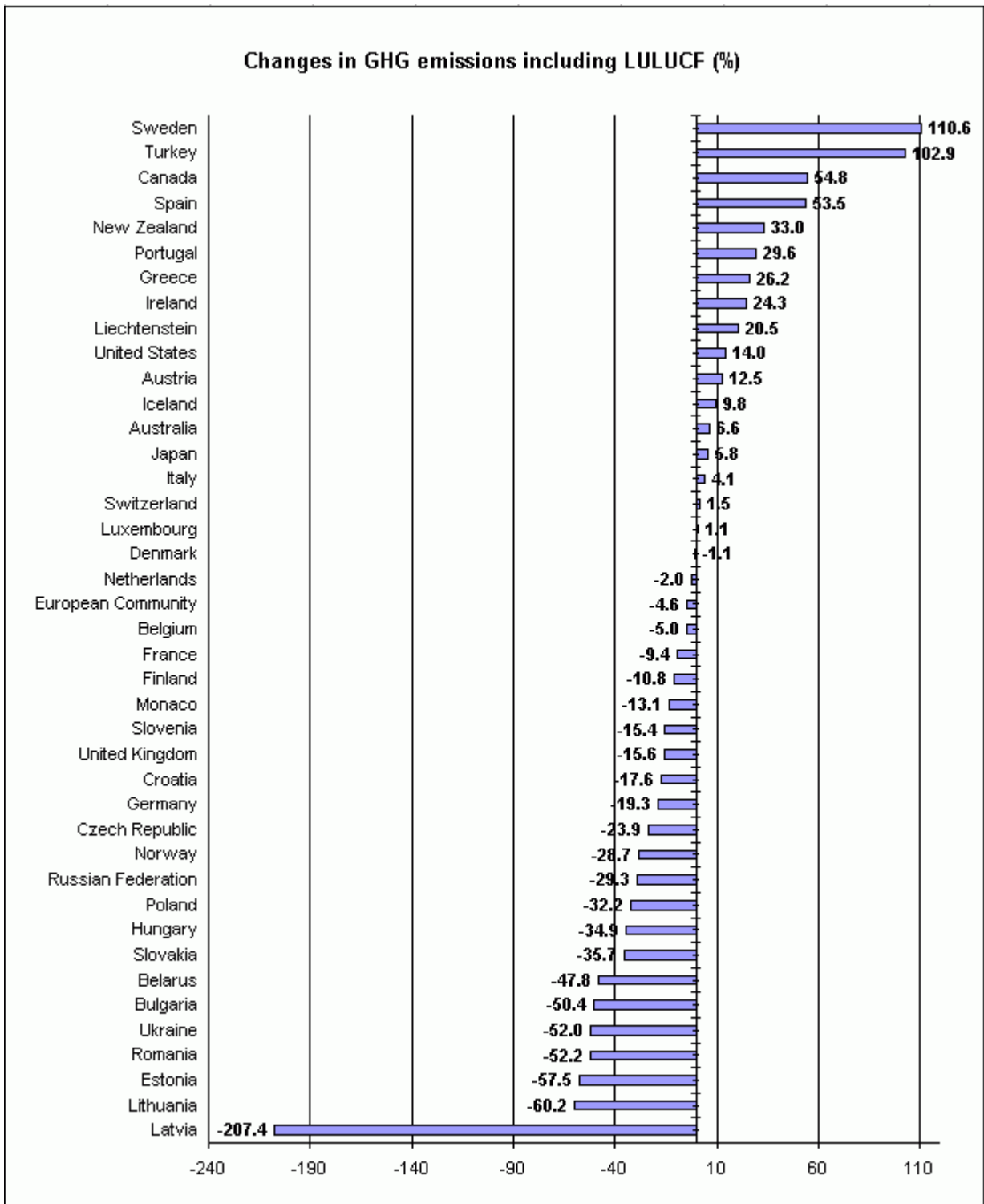
- Annex 1: Technologies in Turkey's CTF Investment Plan
- Annex 2: Second Renewable/Energy Efficiency Project
- Annex 3: IFC and EBRD RE/EE Project(s)
- Annex 4: TEIAS Transmission Project
- Annex 5: WB SME & Public Sector RE/EE Project

Chart 1:



Source: UNFCCC

Chart 2:



Source: UNFCCC

Annex 1: Technologies in Turkey's CTF Investment Plan

1. CTF will help attract financiers and investors and accelerate the deployment of renewable technologies such as wind, solar, biomass and geothermal, as well as small-scale hydro, to scale up implementation more aggressively. Similarly CTF will help attract financiers and investors to promote energy efficiency investments, given the significant barriers that are faced by such investments in Turkey (and elsewhere) in the absence of grants and/or subsidized financing. Technologies are discussed below:

(a) Renewable Energy

2. As presented in Section 2(a) and Tables 1-2, in view of the low cost of mitigation (\$6/ton) and the high absolute volume of potential CO₂ reduction, one of the two areas of focus of Turkey's CTF program is on renewable electricity generation. **CTF support is proposed to be focused on the promotion of private sector investment in all renewable energy development, including wind, biomass, geothermal and solar, as well as small-scale hydro development.**

3. **Hydro:** Large-scale private hydro development has now been established in Turkey and does not need CTF support. CTF support is proposed for small-scale small (up to 10 MW) hydro, to help accelerate the development of this important renewable resource. CTF would focus on smaller projects and smaller investors to widen the investor base and diversify project locations.

4. **Wind:** Wind is emerging in Turkey (about 350 MW now in operation) and its development will be accelerated with CTF support, to help Turkey scale-up its wind program to reach the 20,000 MW target for wind by 2020. In addition CTF support is proposed for TEİAŞ for improved management of the variations and other impacts of wind generation in the power grid, discussed below.

5. The success of private hydro and wind development, achieved in part with the financing support under the Renewable Energy Project, has built confidence and momentum for the wider development of other renewable energy sources in Turkey. The new Electricity Strategy and related legislative, regulatory and market measures (Section 4) provide strong support for these new technologies, including the development of the electricity market and special support measures for renewable energy (including price support, especially significant for biomass and solar electricity).

6. **Biomass:** Turkey's biomass potential is estimated at about 15 million tons of oil equivalent (mtoe) per annum. Biomass (wood, animal and plant waste) has traditionally been used as fuel for cooking and heating in rural areas of Turkey. About 6 mtoe is currently estimated as being used, accounting for about 23% of Turkey's indigenous primary energy production. Most of this is in the form of wood. With the proposed significant increase in the support price for biomass power (see Section 4), it is expected that biomass power projects will attract increasing attention from prospective private developers and proposals are expected to be submitted in the near future. No such projects were submitted under the first Renewable Energy Resources Project. It is

proposed that electricity generation, combined heat and power production and district heating projects using biomass be eligible for CTF support.

7. The need for CTF support is primarily because plants that generate heat or electricity using biomass are much more expensive to construct than plants that use natural gas or fuel oil, primarily because they have to handle a lot more material, due to the lower heating value and variations of the biomass. The large capital cost difference (which should fall as biomass plants become more common) usually makes construction of such plants uneconomic without subsidies including the proposed support tariff or concessional financing or both.

8. **Geothermal:** Turkey has considerable geothermal resources, up to about 600 MW for electricity generation and much greater (about 30,000 MW thermal for heating applications). Turkey's current geothermal electricity generation capacity is about 30 MW. Four projects, total of 71 MW, are under way with financing under the Renewable Energy Project. Turkey's target is to develop the 600 MW by 2020. The sites for these plants are limited by the requirement that substantial amounts of very hot fluids (water, brine) be available. While Turkey is a seismically active area with lots of hot water most of it is too low temperature to support a geothermal project using the technology currently available. Geothermal projects are fairly expensive at \$2500- \$4000 per kW-considerably more expensive than combined cycle plants or most coal fired power plant. They also generally tend to be fairly small: those financed by the Bank range from 6 MW to 47 MW. Nevertheless if there is a major source of very hot geothermal water or brine, plants based on this water or brine are quite economic because the fuel is free. Their impact on the GHG emissions is positive since no fossil fuels are burnt. The potential for geothermal heating in Turkey is quite large but not well developed. Currently there are about 15 district heating systems using geothermal hot water. These systems serve around 60,000 customers. If funds were available many of these systems could be expanded and new systems built.

9. **Solar:** Turkey is geographically well located for solar energy utilization. Solar energy potential is estimated at 87 mtoe/annum. Solar energy is being used for domestic hot water production. It is proposed that solar electricity projects be eligible for CTF support. No such projects were submitted under the Renewable Energy Project. With the proposed significant increase in the support price for solar power (see Section 4), it is expected that solar projects will attract increasing attention from prospective private developers and proposals are expected to be submitted in the near future.

10. Solar photovoltaic (PV) power is generally uneconomic except for remote locations where it is very expensive to connect to the grid. The main reason is the high cost of building such facilities. The 2006 Bank study showed that solar PV capacity costs about \$7,500 per kW or over 10 times as much as a combined cycle plant. Also solar PV power is only available (unless there is storage) when there is sun. Concentrated Solar Power (CSP) is also expensive (higher than \$2,500/kW) but considerably less so than PV and it is much closer to being economic. While these technologies are not attractive generally, they are improving steadily and CSP solar may emerge over the next few years

as an attractive new technology. CTF financing would be considered for developers willing to take the risk of building such a plant. Neither technology is likely to make a major contribution to Turkish electricity supply in the short run, but they might in the long term. They of course do have the advantage that there are no GHG emissions.

11. **Social and Local Environmental Benefits of Renewable Energy.** In addition to global GHG reduction benefits, renewable energy development has significant national-level environment benefits through emission reductions, leading to improved air quality and contributing to improved health and better quality of life. Employment benefits are also significant, particularly in biomass production and utilization and hydro development, and also in other renewable projects compared to the alternatives in Turkey - the construction of large coal and gas fired power stations. Moreover, renewable energy projects developed in the poorer areas of the county, such as the mountains for hydro, thus serving to help the poorer parts of the population. Finally, Turkish companies will account for the major part of the construction and are also expected to be able to compete for equipment supplies. The exports of renewable energy equipment and project services have the potential to become a source of employment and export revenue.

(b) SmartGrid for Improved Wind Power Management

12. Wind development is off to a good start and the NCCC Reference Case includes 3,000 MW of non-hydro (mostly wind) renewable energy by 2020. The Government's Accelerated Emission Reduction Case supported by the CTF, calls for 20,000 MW by 2020. Wind power at the scale indicated above will create major challenges to the power system, in terms of required grid connections, transmission system reinforcement and grid management of large-scale non-dispatchable⁵ and intermittent generation (due to the inevitable variations in wind power generation). Similar issues are challenging utilities in Europe and the USA. Along with "conventional" transmission grid and system control reinforcements and interconnections⁶, these challenges are being addressed by the European Technology Platform SmartGrids and the IntelliGrid Program of the Electric Power Research Institute (EPRI) in the USA⁷. CTF co-financing is proposed to help TEİAŞ define and start the implementation of its SmartGrid, under the forthcoming WB-supported TEİAŞ Transmission Project, to help promote and foster large-scale integration of renewable energy resources in a manner that meets the requirements of grid security and economic efficiency.

⁵ Many RE technologies, unlike other power plants, can not be dispatched to respond to electricity demand. This makes system stability harder to maintain, thus requiring a technology like SmartGrid to compensate.

⁶ TEİAŞ has analyzed its transmission system and the overall power system, and has an investment plan to accommodate up to 15,000 MW of intermittent renewable energy (which takes TEİAŞ to 2015, at the minimum, by which time TEİAŞ will prepare an investment plan for further intermittent electricity as and when it is actually needed).

⁷ The European Technology Platform SmartGrids brings together European utilities, technology providers/manufacturers, regulators and government agencies. EPRI's IntelliGrid Program brings together a large number of US and two European electric utilities, technology providers, and agencies including the US Department of Energy.

13. **Social and Local Environmental Benefits** – see section above on the social and environmental benefits of wind power under renewable energy.

(c) Energy Efficiency

14. As presented in Section 2(b) and Tables 1-2, in view of the net benefit and high absolute volume of potential CO₂ reduction, one of the two areas of focus of Turkey's CTF program is on energy efficiency. **CTF support is proposed for the promotion of the efficient use of energy, electricity in particular, in industrial, commercial and residential applications as well as in the public sector.**

15. Under energy efficiency legislation and recent and forthcoming regulations (see Section 4), the Government is promoting the efficient use of energy in all sectors: in large industries as well as small and medium-scale enterprises (SMEs), in commercial establishments and households, in transport, and in the public sector. Residential interventions will focus on fluorescent bulbs (an ongoing program), enforcement of appliance standards (in particular refrigerators) and insulation. Commercial and public sector interventions will focus on lighting, improved efficiency of heating and cooling/air-conditioning systems, and insulation. Significant potential for energy efficiency improvements exists in the industry sector (including iron and steel, cement, textiles, chemicals) where a switch-over to new process technologies, as well as replacement of generic equipment (like motors, compressors, pumps) can produce substantial energy savings. Consumption in Turkish steel and cement plants could be cost-effectively reduced by 22% and 28% respectively. There is also considerable potential in other less energy-intensive industries such as textiles.

16. **Social and Local Environmental Benefits.** In addition to global GHG reduction benefits, energy conservation has significant national-level environment benefits through emission reductions, leading to improved air quality and contributing to improved health and better quality of life. Employment benefits are also significant. Energy efficiency projects are typically small and decentralized, labor-intensive compared to their alternatives in Turkey, the construction of large thermal power stations. Turkish companies will account for the major part of installation works and are also expected to be able to compete for equipment supplies.

Annex 2: Second Renewable/Energy Efficiency Project

1. **Problem Statement.** Electricity demand in Turkey is increasing rapidly and additional generating capacity and increased focus on energy efficiency are urgently required to avoid shortfalls. The additions of conventional power generation capacities and continued growth in energy consumption is having predictable fallout for the environment. During the period from 1998 to 2005, carbon dioxide emissions from thermal power generation have increased significantly (by 45%), albeit at a slower rate than the increase in electricity supply. Total greenhouse gas emissions rose from about 170 million tons of CO₂ equivalent in 1990 to about 300 million tons in 2005. Emissions are projected to continue to increase and exceed 600 million tons by 2020 in the reference scenario.

2. **Proposed Transformation.** The use of CTF will enable the acceleration of renewable energy deployment and the reduction of the high costs of renewable energy from certain technologies such as solar, thus encouraging new investments. CTF funds are also proposed to be utilized to reduce the transaction costs and other financial barriers that may be preventing energy efficiency investments from taking place. By doing so, it is envisaged that CTF funds will assist in enabling the mainstreaming of low-carbon, sustainable energy generation and consumption, thereby reducing the carbon footprint of the energy sector in the country over the long term. The Project proposes to do so by funding the projects that fulfill the eligibility criteria through two Participating Financial Institutions (PFIs), Türkiye Sınai Kalkınma Bankası (TSKB) and Türkiye Kalkınma Bankası (TKB), whose client bases are mainly in the industrial sector. Both PFIs have the experience and institutional capacity to support the adoption of sustainable energy practices by their clients, in addition to the ability to assess and finance these projects. At present, after including the ongoing Project, financing available for renewable energy is about US\$ 70-75 million on average every year. With the proposed Project, the annual financing available will still be below the level necessary, but will increase significantly to US\$ 180-185 million per year.

3. CTF resources would increase RE capacity by 20%, supporting Turkey's transformational wind power target of 19,000 MW by 2020, its ambitious goals of increasing the share of renewable energy to 25% and implementing energy efficiency measures that result in GHG emissions 44% below the Business As Usual case. The project would result in annual CO₂ emissions reduction of about 2.6 million tons CO₂ per year, with a replication potential that could result in emissions savings of about 200 million tons CO₂ in 2020, which would be about 33% below the Business as Usual Scenario for Turkey.

4. **Implementation Readiness.** The Second Renewable/Energy Efficiency Project is in the Country Partnership Strategy of Turkey-IBRD for FY 2009. The project is proposed for presentation to the IBRD Board in the 3rd quarter of FY 2009.

5. Both PFIs have significant capacity in implementing similar projects, as they have successfully implemented Renewable Energy Project with the World Bank.

Additionally, both PFIs already have sizable pipeline of projects, with some projects having already started and awaiting retroactive financing.

6. **Rationale for CTF Financing.** Significant potential for energy efficiency improvements exists in the industry sector (including iron and steel, cement, textiles, chemicals) where a switch-over to new process technologies, as well as replacement of generic equipment (like motors, compressors, pumps) can produce substantial energy savings. Consumption in Turkish steel and cement plants could be cost-effectively reduced by 22% and 28% respectively. There is also considerable potential in other less energy-intensive industries such as textiles.

7. In addition to global GHG reduction benefits, energy conservation has significant national-level environment benefits through emission reductions, leading to improved air quality and contributing to improved health and better quality of life. Employment benefits are also significant. Energy efficiency projects are typically small and decentralized, labor-intensive compared to their alternatives in Turkey, the construction of large thermal power stations. Turkish companies will account for the major part of installation works and are also expected to be able to compete for equipment supplies.

8. CTF will help attract financiers and investors and accelerate the deployment of renewable technologies such as wind, solar, biomass and geothermal, as well as small-scale hydro, to scale up implementation more aggressively. Similarly CTF will help attract financiers and investors to promote energy efficiency investments, given the significant barriers that are faced by such investments in Turkey (and elsewhere) in the absence of grants and/or subsidized financing.

Financing Plan – Phase I (see Table 4)

Project / Financing Source

(US\$ million)	Turkey *	World Bank	IFC/EBRD	CTF	Total Cost
RE/EE2	530	500		100	1,130

*Banks (TSKB, TKB, etc.) and investors

Project Preparation Timetable (Phase I)

The project is expected to be prepared along the following timeframe:

Government concept approval/WB concept review	October 2008
Project preparation	October – December 2008
Regional Operations Committee	December 17, 2008
Appraisal/ Negotiations	January – February 2009
Approval	March 2009
Project Completion	June 2016

Financing Plan – Phase II (see Table 4)**Project / Financing Source**

(US\$ million)	Turkey *	World Bank	IFC/EBRD	CTF	Total Cost
RE/EE2	320	300		30	650

*Banks (TSKB, TKB, etc.) and investors

Project Preparation Timetable (Phase II)

9. The timetable is to be determined, *inter alia* based on additional CTF availability and accommodation within the IBRD financing envelope for Turkey as it evolves.

Annex 3: IFC/EBRD RE/EE Project(s)

1. EBRD's and IFC's approach to climate change in the electricity sector includes two major components: (a) increased focus on demand side management and end-user efficiency (Section A below); and (b) encouraging low carbon distributed generation (Section B). In line with this approach and the objectives of the CTF, the project pipeline focuses on improving the efficiency on the electricity/energy consumption side, in particular the SME sector and municipalities, and diversifying the existing generation capacity with new renewable energy resources. The use of CTF for renewable energy resources will be focused on the underutilized resources in the country such as: wind, biomass and biogas, geothermal, solar and small-scale hydro.

A. Energy Efficiency Financing

2. ***Problem Statement.*** There is a significant funding gap in the area of energy efficiency (EE) financing in Turkey. The country is currently at the lower end of the development curve regarding EE activities. With its young population, Turkey's pace of urbanization and economic development has been fast. Energy demand per person and CO₂ emissions have grown significantly, placing it among the growing power markets of the world over the last two decades. To control these problems for sustainable development, energy related policies have become priorities for the Government. However, EE has not become a priority for the Turkish private sector yet due to two major reasons: (i) the lack of know-how and experience in this field; (ii) the lack of access to finance in the EE and in particular to the SME market segment.

3. ***Proposed Transformation.*** The Government wants to reduce the energy intensity of GDP and to improve the EE of the economy. According to estimates of the Ministry of Energy and Natural Resources (MENR), Turkey has an energy conservation potential equal to 12-14 mtoe/year, or nearly 15-20% of total consumption and US\$3 billion could be saved through conservation measures. The objective is to scale up and mainstream funding for EE products through financial intermediaries to deliver measurable economic, environmental and social benefits. IFC and EBRD will also seek to provide direct financing to recently privatized Electricity Distribution Companies and newly (or to-be) established Energy Saving Companies ("ESCOs") for their investment plans in the field of EE.

4. ***Implementation Readiness.*** Use of financial intermediaries is a successful business model applied by IFC and EBRD in various regions. EBRD runs such schemes in new EU Member States, Ukraine, Georgia, Russia, and most recently in the Western Balkans. IFC has recently invested in Yapi Kredi Lease Energy Efficiency to catalyze the development of Turkey's nascent EE market by supporting the creation of a new EE business line in a leading financial institution with extensive reach into the SME segment and the institutional capacity to successfully establish a business line in EE financing. This investment can be used as a model for other major financial institutions and expanded with a more targeted approach based on this experience. In Turkey, these financial institutions are mostly owned by local conglomerates which have control of the

leading industrial establishments. Therefore, an EE initiative with the participation of these groups can cause a domino effect and have industry wide impact.

5. Also, until recently the electricity distribution companies were fully Government controlled entities. However, four out of the 21 companies were tendered by the Government in 2008 (two of them are already being operated by private companies) and the rest are expected to be privatized in 2009/2010. One of the first priorities of these companies will be improving the EE after the completion of transfer of operation rights. These sponsors who are investing in the energy sector are also considering establishing ESCOs to provide complementary services to the industry. Until now the biggest barrier against these initiatives in the private sector was the delayed reform process. However, with the recent progress of reforms the only barriers remaining are know-how and the availability of the EE financing.

6. ***Rationale for CTF Financing.*** One of the key limitations for wider implementation of EE financing is the lack of financial resources and proper lending facilities, particularly for small-scale projects and SMEs. Financial institutions view the EE sector as higher risk, due to lack of technical capacity on the part of lenders to evaluate such projects and potential borrowers being unable to establish bankability of their projects. CTF will be instrumental in attracting the attention of the financial institutions to this new field, providing necessary know-how and developing a competitive market for these products. CTF can be used as a tool to justify the difference between a short-term quick fix and the long-term effective solution for the companies considering the EE investments. CTF can have an impact on their evaluation and encourage them to go for the highest impact opportunities rather than short-term solutions.

Financing Plan (phase I and phase II) – of which about 2/3 in phase I (Table 4)

	Turkey	IBRD	IFC/EBRD	CTF	Total
EE Financing	180		240	72	492

Project Preparation Timetable

7. Expected start of implementation is 3rd Q 2009 and duration four years (2009-2013).

B. Renewable Energy Financing

8. ***Problem Statement.*** Turkey is highly dependent on energy imports, and world energy price volatility is affecting the country's economy. Major domestic source of energy is coal, production and use of which creates substantial environmental problems on local, regional and global levels. To reduce the supply risks caused by increasing imports, encouraging the use of domestic energy is a high priority on the government's agenda.

9. ***Proposed Transformation.*** Turkey has substantial renewable energy potential. Already now renewables make the second-largest contribution to domestic energy production after coal. More than half of renewables are used locally as biomass and waste with low efficiency and with high environmental problems. The unused renewable energy potential is still very high, higher than that one which has already been utilized. Nevertheless a major interest of investors is concentrated on large hydro and wind energy projects while distributed power generation using small hydro, biomass, biogas as well as renewable heat production using biomass, geothermal and solar energy and applying up-to-date technologies (to replace electricity and coal in space and water heating) is still of a limited interest of investors.

10. The objective is to scale up and mainstream funding for small-scale renewable energy projects through financial intermediaries to deliver measurable economic, environmental and social benefits. IFC and EBRD will also seek to provide direct financing to medium-sized project under newly promoted scheme of a Direct Lending Facility.

11. ***Implementation Readiness.*** Use of financial intermediaries is a successful business model applied by EBRD in various regions. EBRD applies such scheme in some new EU Member States and implementing is the most recently in the Western Balkans. IFC has applied successful programs in ECA region latest being Russia Sustainable Energy Finance Program to create sustainable capacity in the Russian financial sector to finance EE projects, including RE. The principal objective is to create a sustainable commercial lending market which will continue in the absence of IFC credit lines. This approach can be used as a model for Turkish financial institutions. Electricity and heat produced using small-scale RE sources will be mostly for own consumption by SMEs and export of excess electricity to the grid. In addition, the Direct Lending Facility would target private investors interested in financing medium-scale RE sources for sale to the grid.

12. ***Rationale for CTF Financing.*** One of the key limitations for wider project implementation is the lack of financial resources and proper lending facilities, particularly for small-scale projects. Financial institutions view the RE sector as higher risk, due to lack of technical capacity on the part of lenders to evaluate such projects and potential borrowers being unable to establish bankability of their projects. CTF will be instrumental in attracting the attention of the financial institutions to this new field, providing necessary know-how and developing a competitive market for these products.

13. Similar like in case of EE projects, also in case of RE projects CTF can be used as a tool to justify the difference between a short-term quick fix and the long-term effective solution for the companies considering the RE investments. CTF can have an impact on their evaluation and encourage them to go for the highest impact opportunities rather than short-term solutions.

Financing Plan (phase I and phase II) – of which about 2/3 in phase I (Table 4)

	Turkey	IBRD	IFC/EBRD	CTF	Total
EE Financing	120		160	48	328

Project Preparation Timetable

14. Expected start of implementation is 3rd Q 2009 and duration four years (2009-2013).

Annex 4: TEIAS Transmission Project

1. **Problem Statement.** Electricity demand in Turkey is increasing rapidly (at about 7-8% per year over the last 5 years. The transmission system is witnessing increased strain on its network because of this higher than anticipated growth in electricity demand, particularly in the west and south-west of Turkey, but also increasingly in the east. Transmission lines are increasingly loaded, in some cases beyond levels that would be considered efficient from a reliability and system security perspective. Interruptions and voltage drops, though still few, are increasingly frequent.

2. At the same time, the Government's strategy calls for 15,000 MW of wind power by 2015 and 20,000 MW by 2020 – this capacity would offset the need for new lignite and coal fired power plants. This scale of wind development will create major challenges to the power system, in terms of required grid connections, transmission system reinforcement and grid management of large-scale intermittent generation (due to the inevitable variations in wind power generation). Similar issues are challenging utilities in Europe and the USA, and significant research is currently ongoing on suitable power grid system controls to ensure efficient integration of intermittent wind generation. In this situation, incremental transmission investments are essential for system efficiency, reliability, and security. TEIAS' load flow studies under different scenarios of demand and supply growth show that it will require additional investments of about US\$ 600-800 million over the next four years, of which about US\$ 400 million is estimated to be needed for efficient wind energy integration. IBRD is involved in supporting transmission system expansion, improvement in system and market operation, and in load dispatch through advisory support, two ongoing loans and a new loan planned for FY 2010.

3. **Proposed Transformation.** CTF resources are proposed to be blended with the next IBRD transmission loan which will support transmission expansion and strengthening for, among other reasons, support for wind energy integration into the grid. CTF resources specifically are proposed to be utilized for assisting TEİAŞ, the Turkish transmission company, in design and implementation of the next generation of modern grid management and control systems which can enable large-scale integration of wind energy resources. IBRD resources would focus on expansion of “conventional” transmission grid and system control reinforcements and interconnections.

4. In Europe and the USA, the challenges posed by wind generation are sought to be addressed through similar “intelligent” grids, which can respond to the challenges placed by growing intermittent wind generation, increasing demand, etc. These systems are currently under development by the European Technology Platform (SmartGrid) and Electric Power Research Institute (EPRI) in the USA⁸ (the IntelliGrid Program).

⁸ The European Technology Platform SmartGrids brings together European utilities, technology providers/manufacturers, regulators and government agencies. EPRI's IntelliGrid Program brings together a large number of US and two European electric utilities, technology providers, and agencies including the US Department of Energy.

5. Forecasts by TEİAŞ show that if wind energy development materializes as planned – 15,000 MW by 2015 and 20,000 MW by 2020 – then the incremental reduction in CO₂ emissions would be about 35 million tons per year in 2015 and about 49 million tons per year starting 2020.

6. **Implementation Readiness.** The IBRD transmission project is in the Country Partnership Strategy of Turkey-IBRD for FY 2010. The various investments proposed under this project have been included in TEİAŞ' investment plan and have also been approved by the Government. Over the next few months, discussions will continue over provision of budget allocations for these investments, spread over 2010-2014. The project is proposed for presentation to the IBRD Board in the 3rd quarter of FY 2010.

7. TEİAŞ has significant capacity in implementing complex transmission projects, including in the areas of load dispatch, system operation and control, and market management. TEİAŞ also has significant experience with IBRD policies, having implemented several projects (in addition to the two that are currently ongoing) with IBRD financing.

8. **Rationale for CTF Financing.** In order for this significant level of wind energy to be implemented and utilized, significant effort needs to be placed in parallel, in developing and implementing a smart-grid solution in Turkey. Since this is a very innovative and complex concept, which is only now being tried in Europe and the USA, it would be beneficial to utilize CTF financing for this effort, given the concessional nature of CTF. Use of CTF resources in this endeavor would yield very significant results in terms of reduction of GHG emissions.

9. In addition to GHG reduction benefits, the implementation of the smart-grid and the development of wind energy have significant national-level benefits. It would help offset increased imports of natural gas, which would save the government important foreign currency, thus freeing up resources for social welfare and economic activities. Wind energy development also entails significant employment benefits, as indigenization levels increase and domestic industry develops to provide supplies and construction support.

Financing Plan

Project / Financing Source

(US\$ million)	TEİAŞ	World Bank	IFC/EBRD	CTF	Total Cost
	100	300		50	450

Project Preparation Timetable

10. The project is expected to be prepared along the following timeframe:

Government concept approval/ Bank concept review	August 2009
Project preparation	September – November 2009
Appraisal/ Negotiations	February 2010
Approval	March 2010
Project Completion	June 2015

Annex 5: SME and Public Sector Renewable/ Energy Efficiency Project

1. **Problem Statement.** Electricity demand in Turkey is increasing rapidly and additional generating capacity and increased focus on energy efficiency are urgently required to avoid shortfalls. The additions of conventional power generation capacities and continued growth in energy consumption is having predictable fallout for the environment. During the period from 1998 to 2005, carbon dioxide emissions from thermal power generation have increased significantly (by 45%), albeit at a slower rate than the increase in electricity supply. Total greenhouse gas emissions rose from about 170 million tons of CO₂ equivalent in 1990 to about 300 million tons in 2005. Emissions are projected to continue to increase and exceed 600 million tons by 2020 in the reference scenario.
2. **Proposed Transformation.** The use of CTF will enable the high costs of renewable energy from certain technologies such as solar and landfill/waste to be reduced, thus encouraging new investments. CTF funds are also proposed to be utilized to reduce the transaction costs and other financial barriers that may be preventing energy efficiency investments from taking place. By doing so, it is envisaged that CTF funds will assist in enabling the mainstreaming of low-carbon, sustainable energy generation and consumption, thereby reducing the carbon footprint of the energy sector in the country over the long term. The Project proposes to do so by funding the projects that fulfill the eligibility criteria through two proposed Participating Financial Institutions (PFIs), Turkiye Halk Bankasi (HalkBank) and Turkiye Vakiflar Bankasi (VakifBank), whose client bases are mainly in the SME and public sector. Both PFIs have the experience and institutional capacity to support the adoption of sustainable energy practices by their clients, in addition to the ability to assess and finance these projects.
3. The Project will also support the government policy of promoting energy efficiency in SMEs and small businesses. The government will start a support program for small scale energy efficiency investments from January 2009, including training and budgetary support. The project will not only supplement the limited resources allocated to the program compared to the energy efficiency potential, but will also scale up the effort through the PFIs who have the client base and branch network to promote energy efficiency investment on a national level.
4. **Implementation Readiness.** The project is at the concept stage. The expected implementation start date will be in FY 2010.
5. **Rationale for CTF Financing.** Significant potential for energy efficiency improvements exists in the industry sector (including iron and steel, cement, textiles, chemicals) where a switch-over to new process technologies, as well as replacement of generic equipment (like motors, compressors, pumps) can produce substantial energy savings. Consumption in Turkish steel and cement plants could be cost-effectively reduced by 22% and 28% respectively. There is also considerable potential in other less energy-intensive industries such as textiles.

6. In addition to GHG reduction benefits, energy conservation has significant national-level environment benefits through emission reductions, leading to improved air quality and contributing to improved health and better quality of life. Employment benefits are also significant. Energy efficiency projects are typically small and decentralized, labor-intensive compared to their alternatives in Turkey, the construction of large thermal power stations. Turkish companies will account for the major part of installation works and are also expected to be able to compete for equipment supplies.

Financing Plan

Project / Financing Source

(US\$ million)	Turkey *	World Bank	IFC/EBRD	CTF	Total Cost
SME & Public RE/EE	300	400	0	100	800

*Government, banks (incl. HalkBank, VakifBank etc.) and investors.

Project Preparation Timetable

7. The timetable is to be determined, *inter alia* based on additional CTF availability and accommodation within the IBRD financing envelope for Turkey as it evolves.