

VALIDATION REPORT

FOR

AKINCI HYDROELECTRIC POWER PLANT, TURKEY



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Version	1
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Summary:

TÜV Rheinland (V/VB) has been contracted for the Validation of the Akinci HPP with a total installed capacity of 99 MWe against the VCS Standard version 3.4. The Validation is performed by applying CDM methodology ACM0002 “Large-scale Consolidated Methodology: Grid-connected Electricity Generation From Renewable Sources” version 15.0 in combination with the latest methodological tools and guidelines. During the desk review VSC PD, emission reduction calculation workbook, investment analysis workbook, common practice workbook and supporting evidence were assessed, resulting in a list of Clarification and Corrective Action Requests (CL/CAR). The last is enclosed as Appendix A to the current Validation Report as integral part of the VR providing information on how particular issues were resolved and Validated. In order to be in compliance with VCS requirements, the obligatory on-site assessment was conducted on 27th-28th/10/2014 at the project site in Tokat.

Finally, based on the performed documents review, responses to CLs/CARs, disclosure of confidential substantial information and revision of the project design document the issuance of a Validation Report with a positive Validation Statement without qualifications was achieved. GHG emissions data and information are fairly represented without material discrepancies and assertions made in the project design document are free of material omissions or misstatement.

The V/VB states that the Akinci HPP project is in line with the VCS version 3.4 requirements and is identified to be additional in accordance with the CDM methodology ACM0002 v15.0.

6 FAR have been issued which shall be observed by the Verifying DOE

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1 INTRODUCTION

The Validation report summarises outcomes of the assessment of the Akinci HPP project, i.e. evaluation of project description document, additionality assessment and emission reduction calculations, against the VCS standard version 3.4 criteria by means of CDM Methodology ACM0002 v15.0 and referred methodological tools and guidelines as well as criteria given to provide for consistency in project operations, monitoring and reporting.

Roles and Responsibilities:

TÜV Rheinland, referred to as: V/VB, Validation Team

Name	Position	Scope	Location
Roland Wollenweber	Auditor	1, 5, 6	Cologne/ Germany
Norbert Heidelmann	TR	1, 3, 6	Cologne/ Germany

Fırat Elektrik Üretim Ve Ticaret A.Ş., referred to as: project owner (PO) or project proponent (PP), whereas the latter is operationally represented by Ekobil Environmental Services and Consulting Ltd.

1.1 Objective

Validation of project documentation is the 2nd major step in development of the VCS project cycle. It is the PPs responsibility to develop the VCS PD and contract an approved V/VB for the Validation process. The objective of a Validation is to have an independent third party assessing project design, i.e. VCS PD, emission reduction calculations, monitoring plan, etc., and projects compliance with VCS version 3.4 as well as with relevant UNFCCC and host country criteria. In particular, the V/VB ensures that the VCS PD, including monitoring plan, additionality analysis and emission reduction calculations, is comprehensive, accurate and credible and meets the identified criteria.

Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of a project's quality and intended amount of voluntary emission reductions (VERs) or so-called voluntary carbon units (VCUs).

1.2 Scope and Criteria

The Validation scope is defined as an independent and objective review of the project description (VCS PD), which includes among others the assessment of monitoring plan, emission reduction calculations and additionality assessment.

Validation is performed in compliance with VCS criteria stated in the VCS standard v3.4 and VCS program guide v3.5. In addition criteria stipulated by the approved methodology ACM0002 "Large-scale Consolidated Methodology: Grid-connected Electricity Generation from Renewable Sources" version 15.0 and the methodological tools "Tool to calculate the emission factor for an electricity system" v4.0 and "Tool for the demonstration and assessment of additionality" v7.0, since the mentioned are implemented in project description.

The Validation is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Level of Assurance

The final Validation is based on the latest project description, VCS PD v2.00, dated 26/11/2014, supporting documents disclosed to the V/VB, own background research and investigations and information collected through performing interviews during on-site assessment. The Validation Opinion¹ is based on the sources of information as identified in section 1.2 and all relevant supporting project documentation submitted by the PP.

The Validation Conclusion (See Validation conclusion 4) is made to a reasonable assurance level, and a materiality threshold of 5% (normal project size < 300.00 tonnes/a) is applied for identification of material omissions as required by VCS v3.4 paragraph 5.3.1 item 4. In general it shall be adhered to the procedures as defined in ISO 14064-3.

1.4 Summary Description of the Project

The proposed project activity, Akinci Hydroelectric Power Plant (HPP) is a run-off river type HPP. This could be verified on-site and by reviewing /25/. It has an installed capacity of 99 MWe facilitating three vertical shaft Francis turbines with a nominal output of 3 x 33 MWe. This was not verified by physical evidence as the power house is not yet established. The feasibility studies and licensing confirm this project size which is why at the time of Validation this is acceptable. On 28/03/2012 the Energy Market Regulatory Authority (EMRA) issued the Energy Generation License for the Akinci HPP to Firat Enerji.

Akinci HPP was not yet commissioned and is estimated to annually generate 439,360 MWh /16/ of renewable energy. Based on the latest available CDM methodologies on grid-connected electricity generation from renewable sources, the PO estimated the combined emission factor of the Turkish national electricity grid of $EF_{CM,grid} = 0.514 \text{ tCO}_2/\text{MWh}$ and determined an annual average net emission reduction generated by the proposed project activity of 225,831 tCO₂e.

Important milestones for the proposed project activity are listed in Table 1 whereas the correctness of the content, applicability and date was verified by reviewing the submitted documents themselves. The documents below were used to verify:

- Compliance with laws and regulations
- Investment decision date
- Investment analysis input parameters
- Project start date

Table 1: Milestone of Akinci HPP

18/03/2008	EIA certification is awarded to the Akinci HPP. This was verified by reviewing /19/.
06/08/2013	Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Firat for Akinci HPP. This was verified by reviewing /29/ and /31/.
28/03/2012	Akinci HPP Generation Licence, granted by Energy Market Regulatory Authority, Licence No: EÜ/3749-1/2297.

¹ The Validation Opinion is defined as Validation Statement following ISO 14064 definitions. In this report Validation Statement, Validation Opinion and Validation Conclusion are used as synonyms, whereas strictly speaking the Validation Conclusion results in a Validation Statement accordingly.

08/03/2013 ²	Stock purchase agreement to acquire the project. The contract was reviewed /18/ and correctly references to the project name and title reference.
24/09/2014	First instalment of loan
04/11/2014	Listing representation for Akinci HPP to the VCS registry /26/.
27/10/2014	Site-visit at Amasya.

2 VALIDATION PROCESS

2.1 Method and Criteria

Validation of Akinci HPP has been performed in accordance to the internal procedures of TÜV Rheinland for Validation of VCS projects, which strictly follows ISO 14046-3. The Validation body holds ANSI accreditation to ISO 14065³. During preparation stage following tasks are completed:

- Selection of an appropriate Validation team
- Development of the audit plan
- Preparation of project and standard specific Validation protocol, which shows in a transparent manner, criteria and requirements, means of Validation and the results from validating the different identified issues

The core Validation consisted of the following phases:

- desk review of the project design document and complementary documents
- on-site visit (site inspection) and follow-up interviews with project stakeholders
- resolution of outstanding issues including material discrepancies and the issuance of the draft Validation report
- Internal technical review and issuance of final Validation report.

The following sections outline each step in more detail.

² Date of investment decision, as in the sense of CDM methodology

³ TÜV Rheinland was awarded a Certificate of Accreditation by ANSI on 22/06/2012

2.2 Document Review

The desk review phase is characterised by the assessment of project description, emission reduction workbooks and the additionality assessment, i.e. financial analysis (described further below) substantiated by additional supportive documents, all of which have been provided by the carbon consultant.

It shall be mentioned that the table below is an essential part of Validation as most of the substantially required information was extracted from here. It shall be noted that wherever the reference number is cited (“/xx/”) this has to be interpreted that the V/VB reviewed this reference and Validated/Verified statements made in conjunction with this citing by reviewing the document and positively accepting the evidence found therein with regard to the proof needed to accept such statements.

The following table outlines the documents reviewed as part of the Validation process; the dates indicate either the date of document issuance, review (where the document bears no date) or submission:

Ref No.	Reference Document	Date
/1/	Project Description template, v3.2	08/10/2013
/2/	VCS Program Guide, v3.5	08/10/2013
/3/	VCS Standard, v3.4	08/10/2013
/4/	VCS Program Definitions, v3.5	08/10/2013
/5/	ACM0002 “Large-scale Consolidated Methodology Grid-connected electricity generation from renewable sources” Version 15.0	04/10/2013
/6/	TOOL07 “Methodological tool: Tool to calculate the emission factor for an electricity system” Version 04.0	04/10/2013
/7/	TOOL01 “Methodological tool: Tool for the demonstration and assessment of additionality” Version 07.0.0	23/11/2012
/8/	EB62 Annex 5 “Guidelines on the assessment of investment analysis”, Version 05	15/07/2011
/9/	CDM-EB73-A08-CLAR Clarification: Applicability of the “Guidelines on the assessment of investment analysis” Version 01.0	31/05/2013
/10/	EB69 Annex 8 “Guidelines on common practice” Version 02.0	13/09/2012
/11/	EB66 Annex 63 “Glossary of CDM terms” Version 6.0	02/03/2012
/12/	VCS PD Akinci Hydroelectric Power Plant i. Version 1.00 ii. Version 2.00	06/11/2014 26/11/2014
/13/	IRR calculation for Akinci Hydroelectric Power Plant, Turkey i. Version 1.00 ii. Version 2.00	06/11/2014 26/11/2014
/14/	Baseline and ER calculations study Akinci Hydroelectric Power Plant, Turkey i. Version “Turkish Grid EF-2010-2011-2012-Akinci.xlsx”	21/10/2014

/15/	Expropriation decision of the energy market regulatory board, No. 1767/7	18/09/2008
/16/	Revised feasibility report. The report is a justification report of the Ministry of Energy and Natural Resources. Power installation capacity is 99 MW.	07/2014
/17/	Construction start-up notification of Firat Elektrik.	26/07/2013
/18/	Stock Purchase Agreement between CONFIDENTIAL and BRK Enerji Yatirim A.S. The full agreement was submitted to the Validation Team and was reviewed. The date can be clearly confirmed.	08/03/2013
/19/	EIA certificate by the Ministry of Environment and Forestry, Nr. 1457. The certificate is issued for the HEP and dam structures and is valid for all affected districts.	18/03/2008
/20/	EIA transfer confirmation by the Ministry of Environment and Forestry to transfer the title to Firat Elektrik.	09/07/2012
/21/	Full "Final EIA Report" issued by Eti Elektrik. The report is consistent with the first FSR report.	2008
/22/	Notification of the Forest and Water Works Department listing the HEPP located at Yesilirmak used for Common Practice analysis.	11/04/2012
/23/	Forest and Water works Ministry, State Hydraulic Works, DSI hand over protocol for the project	16/12/2013
/24/	Regulator area plan. The maximum surface area is 314.579.091 km ² . The file had been digitally submitted as CAD file and as well as kml file (see/25/). The kml file has been reviewed as a cross-check and compared to the site during the visit (only location as structures were not present during the site visit)	28/10/2014
/25/	Kml file of the reservoir area	..
/26/	Listing representation by Firat Enerji for Akinci Hydroelectric Power Plant, Turkey https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Pipeline&a=3&i=1380&lat=40%2E393771&lon=37%2E324463&bp=1	04/11/2014
/27/	Loan payment amortization table. This table had been submitted directly on-site and was reviewed there. It shows and justifies the timing and amount of cash-flow facilitated as loan.	24/09/2014
/28/	EMRA Generation Licence <i>for 49 years of operation</i> i. Akinci HPP Generation Licence, granted by Energy Market Regulatory Authority, dated 28/03/2012, Licence No: EÜ/3749-1/2297. Power capacity 3*33 MWe. Generation capacity 439.270.000 kWh	28/03/2012
/29/	Water Usage Agreement between General Directorate of State Hydraulic Works of Ankara and Akinci Elektrik for Akinci HPP.	15/12/2011
/30/	Feasibility Study Report for Akinci Hydroelectric Power Plant, Turkey. Made by the	

	General Directorate of Forest and State Water Works for Eti Elektrik. Indicates a generation capacity (firm) of 439,360 MWh. The report lists the investment costs on page 92 to sum up to 250,767,171USD.	08/2011
/31/	Amended Water Usage Agreement indicating a power capacity of 99 MWe.	06/08/2013
/32/	Turkish Electricity Transmission Corporation; Research Planning and Coordination Department (2012) 10-year projection of Turkish electrical energy generation capacity (2012-2021) http://www.epdk.gov.tr/documents/elektrik/rapor_yayin/Elk_Yayin_Uretim_Kapasite_Projeksiyonu_2012_2021.pdf	07/2012
/33/	Turkish Electricity Transmission Corporation; Research Planning and Coordination Department (2013) 5-years projection of Turkish electricity generation capacity (2013-2017) http://www.epdk.gov.tr/documents/elektrik/rapor_yayin/UretimKapasiteProjeksiyonu_2013_2017.pdf	11/2013
/34/	ELECTRICITY MARKET BALANCING AND SETTLEMENT REGULATION TEIAS	2004
/35/	Haselsteiner, R., Heimerl, St., Kohler, B., Recla, R., Bilmez, C., Mesci, Ü. and Arch, Al. (2009) Efficient Design, Construction and Maintenance of Hydropower Plants in Turkey.	2009
/36/	The Law on Utilization of Renewable Energy Resources numbered 5346.	2005
/37/	ENERGY MARKET REGULATORY AUTHORITY (2011) Electricity Market Report 2010	17/11/2011
/38/	Damodaran, Aswath (2011) Equity Risk Premium (ERP): Determinants, Estimation and Implications – The 2011 Edition. Stern School of Business http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1769064	February 2011
/39/	IEA ETSAP (2010) Technology Brief E12; Hydropower http://www.iea-etsap.org/web/e-techds/pdf/e07-hydropower-gs-gct.pdf	May 2010
/40/	IRENA (2012) Renewable Energy Technologies: Cost analysis series; Volume 1: Power Sector; Issue3/5; Hydropower http://www.irena.org/DocumentDownloads/Publications/RE_Technologies_Cost_Analysis-HYDROPOWER.pdf	June 2012
/41/	ICE/TSE 62053-22: Electricity metering equipment (a.c) – Particular requirements - Part 22: Static meters for active energy (Classes 0,2 S and 0,5 S) https://intweb.tse.org.tr/TSEIntWeb/Standard/Standard/Standard.aspx?081118051115108051104119110104055047105102120088111043113104073086088122106098111043069103078065	29/04/2005
/42/	Gözen, Mustafa; Istanbul University Journal of the School of Business Administration (2012) Determining the cost of capital for Turkish electricity distribution utilities: Analysis and recommendations	2012

2.3 Interviews

During the site inspection the Validation Team carried out interviews with project representatives, carbon consultant, and relevant project stakeholders as indicated below.

Name	Organisation	Topic
Dr. Aslı Sezer Özçelik (Consultant / PDD Developer)	Ekobil	- Project start; - Project implementation; - Local permits and local requirements - Applied project technology - Physical conditions - Project history - Project barriers - Project status - Discussion on additionality, baseline scenario and emission reduction calculation; - Feasibility study; - Environmental and social impacts and/or community benefits; - Financial issues; - Supporting documents; - Substantiation of loan and loan conditions;
Öner Güzel (Project Work Camp Manager) And Veli Özerdem (Project Engineer)	Ey-Tur	- Project history and implementation; - Technical issues and detailed functioning - Construction dates and project finalization - Turbines and hydraulic works - Metering devices and situation - Data management
Mr Azmi Küçükkeleş (Manager)	BRK Group	- Carbon Project design management - Supporting documents - Company management details - Information related to the Fırat business development

2.4 Site Inspections

The audit schedule was provided to PO on 24.10.2014 and agreed upon, after the listing representation was sent to the VCS.

The on-site inspection took place on 27/10/2014 at the project site (Akinci HPP in Tokat) in the republic of Turkey. The objective of the on-site audit is

- to confirm correctness of project description per VCS PD, including project components and location and especially the production capacity of the plant and implementation of monitoring.
- to acquire details on the project development and operation, and
- to prove validity and authenticity of delivered supporting documents.

The site inspection was carried out by means of interviews with PO, Plant manager and engineers, as indicated in section 2.3 (above).

2.5 Resolution of Findings

In the process of project Validation, 18 initial findings have been identified and recorded in a CAR list, which has been communicated to the PO. Subsequently the PO responded to the raised issues by providing clarification, disclosing additional supporting evidences to the V/VB and accordingly revising VCS PD, investment analysis and emission reduction calculations. The second version of the calculations of IRR had a major calculation error which was not included further in the CAR list but was resolved by directly communicating with the PP. Eventually all recognised outstanding issues have been resolved and the resolution process has been tracked in CAR/CL table, which is included as Appendix A. **The CAR list is an integral part of Validation and the Validation Team Conclusion therein represents the means of Validation of the subjects identified in the CAR list.**

In addition 6 FAR have been issued which shall be observed by the Verifying DOE.

2.6 Forward Action Requests

FAR 1: The location of the weir as visited and confirmed to be correct during the site visit. The DOE shall verify the location of the power house and the connection to this project to identify the project clearly.

FAR 2: No metering devices for monitoring of electricity could be identified because of the projects early stage. The DOE shall identify:

- the meter location
- the meter serial numbers
- the meter connection to the plant by verifying the single line diagram

FAR 3: The monitoring procedures implementation shall be verified by the DOE to be applied according to the Monitoring Plan and methodology requirements.

FAR 4: The power generation capacity shall be verified by physical evidence of the turbines in the power house

FAR 5: The project start date shall be verified in consistency with the description in the PDD. The real project start date as well as the crediting period shall be recorded (and amended if necessary) both in the Monitoring Report and the Verification Report.

FAR 6: The electricity meter calibration shall be checked initially for the first MP.

3 VALIDATION FINDINGS

3.1 Project Details

The outcomes of the Validation process and the V/VB opinion on the Akinci HPP are summarised below, as required per VCS Standard, v3.4 /3/

- Project scope, type, technologies and measures implemented, and eligibility of the project

Proposed project activity is proved to refer to sectoral scope 1: Energy industries (renewable and non-renewable sources), by scrutinising the VCS PD /12/ and additional project distinctive documents such as EMRA Generation Licence /28/, Feasibility Study Report /30/, DSI water Usage Agreement, etc. Based on the mentioned documents as well as in the process of the site inspection, the Validation Team witnessed that the project is designed as described in the VCS PD and is operational as Hydroelectric Power Plant, which delivers electricity to the Turkish national grid, i.e. proposed project activity belongs to the type electricity generation from renewable sources.

During the site inspection, the Validation Team witnessed that the proposed project activity is an hydroelectric power plant, not yet operational, using a run-off structure at the sites in Tokat, which utilizes water of the Kelkit River in the Black Sea region as shown in the VCS PD. It was observed that a

provisional project site exists and construction works were identified at the given locations. The installed capacity of 99 MWe was confirmed by document review but not by physical evidence at the power station. This confirms the information provided in the VCS PD /12/ and substantiated by the EMRA generation licence /28/ and FSR report /30/, where total installed capacity of Akinci HPP is stated to be 99 MWe, and estimated annual electricity generation of 439,360 MWh.

The representative of the PO, Ms Özcelik, declared as part of the follow-up interview that the proposed project activity is not grouped, but a stand-alone project, which consists of 1 generation unit (plant site) from a single project activity. The visit to the project site and inspection of project components and common practice analysis as well as the contractual basis support the statement. In addition, the flow diagram of the project activity, which was also submitted to the V/VB was thoroughly explained by Akinci HPP's Plant Manager.

In addition, the Validation Team witnessed that the proposed project activity fulfils VCS program specific issues⁴, i.e.

- Handle CO₂, one of the six Kyoto protocol greenhouse gasses
 - VSC project design and Validation report are provided in English, site inspection and interviews are also conducted in English.
 - PP claims real and measurable emission reduction credits.
 - PP applies for 10 years crediting period
 - Project is submitted to VCS registry within 2 years after operation as the project is not yet operational.
- Project proponent

FIRAT ELEKTRİK ÜRETİM VE TİCARET A.Ş. is identified as project proponent (PP) and project owner (PO) within the VCS PD /12/, by reference to the EMRA generation licence /28/, Water Usage Agreement /29/ and other permits.

In addition, the project is developed as renewable energy project under the Voluntary Carbon Standard (VCS) by Dr. Sezer Özçelik, Carbon Expert of Ekobil, who was intensively involved in the preparation of VCS PD /12/, ER calculations /14/, Additionality Analysis /13/ as well as Common Practice analysis and attended the obligatory on-site *audit*.

- Project start date

The starting date of the proposed project is identified as 12 February 2017, which is the first date of delivering electricity generated by the Akinci HPP to the Turkish national grid. The date must be substantiated by the Temporary Acceptance Protocol, which will be issued by the Ministry of Energy and Natural Resources of the Republic of Turkey. Taking into account the VCS Standard v3.4 /3/ section 3.8 and the definition of project start date per VCS Program Definition v3.5 /4/ and the listed evidences, the project start date indicated in the VCS PD /12/ is confirmed to be accurately identified at this stage.

⁴ Refer to section 2 of the VCS Standard v3.4

- Project crediting period

The PP selected a project crediting period of 10 years, beginning from 12/02/2017-11.02.2027 (both days inclusive), which is in compliance with the VCS Standard v3.4 /3/ section 3.9.1.

- Project scale and estimated GHG emission reductions or removals

In compliance with the VCS Standard v3.4 /3/ and substantiated by the emission reduction calculation, which are validated and proved as accurate by the V/VB in the subsequent sections, the proposed project activity is referred to as project with normal scale ("project", VCS definitions), since the expected annual GHG emission reductions are estimated to be 225,831 tCO₂e and the capacity was proven to be 99 MW which was verified by visual inspection during the on-site assessment. The estimated emission reductions are generally based on the expected annual electricity production which has been taken from the FSR /30/ and was verified to be 439,360 MWh. The value is accepted by the V/VB and considered more appropriate than the values given in the initial FSR (see document review table) as more recent and more accurate data and assumptions are used herein.

With regard to the CDM methodology, which is implied for the assessment of project additionality and for the determination of emission reductions, Akinci HPP is classified as large scale project, i.e. project's installed capacity (99 MWe) goes beyond the 15 MW benchmark as defined in the Glossary of CDM terms v6.0 /11/.

- Project activities

As observed during the site inspection, Akinci HPP is a run-off river type hydro project with one intake dam structure at Kelkit River and one powerhouse station. The project uses water from the weir intake (see **Figure 1**) whereas the power generation is integrated in a dedicated power house.



Figure 1: Future weir location viewed from the nearby surface road, image tag: 40°23'50"N 37°19'3"E

The total installed capacity of 99 MWe and estimated annual electricity generation of 439,360 MWh/year are accordingly identified within the VCS PD /12/, based on the FSR and EMRA Generation Licence /28/.

Project location

The proposed project activity is located on the Kelkit River, in the Tokat province (Black Sea region). During the site inspection, geographic coordinates of the future weir location are confirmed to be as indicated in the VCS PD /12/ by checking the coordinates with a GPS receiver (see below).

Place	Latitude	Longitude
Weir Location	40°23'44.16"N	37°18'55.93"E

- Conditions prior to project initiation

The conditions prior to the project initiation can be found in the FSR /30/ and the revised study /16/. As reportedly and evidently (site-visit) no activity had taken place the project is a greenfield project.

- Project compliance with applicable laws, statutes and other regulatory frameworks

Projects compliance with the regulation of the host country (i.e. the Republic of Turkey) was demonstrated within VCS PD /12/ section 1.11, where all relevant legally binding regulation are listed as Annexes to the VCS PD. The EMRA Generation Licence /28/, the EIA exempt Certificate for Akinci Hydroelectric Power Plant /19/ and the Water Usage Agreement are some of obligatory documents. It is a known fact to the V/VB that without legal compliance the PO would not have acquired those licenses and statements; hence it is assessed as proven that legal compliance has been established explicitly by reviewing the documents as in section 2.2 and confirming their applicability to the project:

- Ownership and other programs

By reference to EMRA generation licence /28/ and other legal document, the Validation Team confirms that the project owner is accurately indicated in the VCS PD /12/ as FIRAT ELEKTRİK ÜRETİM VE TİCARET A.Ş.

The interviews with PO representatives during site inspection provided positive evidence that the project has not participated or sought participation and is not registered under other GHG Programs and has not generated any other form of environmental credits. The project was also not found by the Validation Team in the registry of market, APX, CSA and GS or the VCS.

3.2 Application of Methodology

3.2.1 Title and Reference

The latest version of Official methodology ACM0002 “Large-scale Consolidated Methodology: Grid-connected Electricity Generation from Renewable Sources” Version 15.0 /5/ (hereafter ACM0002 v15) is used to develop the proposed project activity under VCS. Additionally methodology related tools and relevant guidelines are applied, namely

- TOOL07 “Methodological tool: Tool to calculate the emission factor for an electricity system” Version 04.0 /6/
- TOOL01 “Methodological tool: Tool for the demonstration and assessment of additionality” Version 07.0.0 /7/

- EB62 Annex 5 “Guidelines on the assessment of investment analysis”, Version 05 /8/
- EB69 Annex 8 “Guidelines on common practice” Version 02.0 /10/

3.2.2 Applicability

The selected approved methodology ACM0002 v15.0 /5/ covers large scale projects activities which occur as grid-connected electricity generation from renewable sources. The applicability of the methodology to the proposed project activity is discussed in detail in the VCS PD /12/, following the applicability criteria listed within the methodology.

The Validation Team determined the applicability of ACM0002 v15.0 /5/ to the Akinci HPP considering the methodology-specific conditions as follows:

Applicability criteria of the methodology ACM0002 v15.0.0	Criteria fulfilled	Determination by the Validation team
This methodology is applicable to grid-connected renewable power generation project activities that a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); b) involve a capacity addition c) involve a retrofit of (an) existing plant(s) d) involve a replacement of (an) existing plant(s)	☒ Yes ☐ No	Per EMRA generation licence /28/, EIA certificate /19/, Water Usage Agreement /29/ and FSR /30/, the project is developed as hydroelectric power plant, which delivers electricity to the Turkish national grid. In addition during the site inspection it was experienced that the power plant is commissioned and supplies electricity to the grid. According to the Feasibility Study Report /30/, the project was developed as a green field project. This could also be observed from the EIA study where photos of an apparent greenfield site are included. To b), c) and d) – N.A.
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	☒ Yes ☐ No	According to the EMRA generation licence /28/ and the FSR /30/, the proposed project activity is developed and operated as hydroelectric power plant with a dam.

Applicability criteria of the methodology ACM0002 v15.0.0	Criteria fulfilled	Determination by the Validation team
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	☒ Yes ☐ No	N.A.
In case of hydro Power Plants one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m²; • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m²	☒ Yes ☐ No	Akinci HPP is a green-field project (see above), i.e. no power plant or reservoirs existed before the project activity. Hence the project is designed as a hydro power plant with a dam structure, resulting in a single reservoir, which could be confirmed during the site inspection. Ms Özcelik provided explanations on calculation of power density, parameters that were applied and references. The calculation was redone as below: The production capacity is evidently 99 MW. According to the FSR /30/ the maximum surface area is 314,579 m². The result is 314.71 W/m², which is greater than the benchmark of 4W/m² and smaller than 10 W/m². Underlying documentation was the volume-area-diagram submitted in FSR and the kml files of the weir design /25/, /24/. The surface area was double checked using the kml file of the reservoir area by including it in google-maps. Because of the physical nature of the weir and geography it is obvious that the surface are of the reservoir cannot be higher than the design area.
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m ² all the following conditions must apply.	☒ Yes ☐ No	N/A

Applicability criteria of the methodology ACM0002 v15.0.0	Criteria fulfilled	Determination by the Validation team
The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m².	☒ Yes ☐ No	In the revised FSR /30/, the proposed project does not involve switching from fossil fuel to renewable energy source, neither is it a biomass fired power plant. Nothing was present at the project site before the activity. This was revealed by reviewing the FSR. Furthermore, It was already revealed that the power plant entails a new reservoir with a power density > 4 W/m².
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	☒ Yes ☐ No	N.A. Proposed project activity was confirmed to be green-field. See above.

Provided that all applicability criteria defined within the approved methodology ACM0002 v15.0 are proved to be fulfilled, the Validation Team reasons that the selected methodology is applicable for the proposed project activity.

3.2.3 Project Boundary

According to the ACM0002 v15.0 /5/, “The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system⁵ that the CDM project power plant is connected to.” During the site inspection and interviews with plant leader, it was determined that electricity generated in the power plant is transferred to the substation. From there, the electricity is supplied to the Turkish national grid via 3 lines, i.e. thus the project boundary is accurately characterized within the VCS PD /12/ section 2.3 and no further elaboration is needed since the set-up for a HPP is very generic. Furthermore, emission sources and gasses included in or excluded from the project boundary are clearly identified within Table 3 of the VCS PD, so that CO₂ is justified to be the main GHG resulting in the baseline scenario.

⁵ Refer to the latest approved version of the “Tool to calculate the emission factor for an electricity system” for definition of an electricity system.

3.2.4 Baseline Scenario

The baseline scenario for a new grid-connected renewable power plant is prescribed by the selected methodology ACM0002 v15.0 /5/ as

“Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”

and accordingly implemented within the project description that the project activity was confirmed to be a new grid-connected renewable power plant. Therefore, it is applied that the “baseline emissions are equal to power generated by the project activity that is delivered to the Turkish national grid, multiplied by the baseline emissions factor (EFy) which is calculated as the Combined Margin (CM)”.

The reported baseline scenario is consistent with the ACM0002 v15.0 /5/.

3.2.5 Additionality

According to the VCS standard v3.4 /3/ “Additionality shall be demonstrated and assessed in accordance with the requirements set out in the methodology applied to the project.” Consequently the selected approved methodology ACM0002 v15.0 /5/ together with the referred methodological TOOL01 “Tool for the Demonstration and Assessment of Additionality” v07 /7/, “Guidelines on the assessment of investment analysis” v05 /8/ and the Clarification on Applicability of the Guidelines /9/, are used for the demonstration of additionality of Akinci HPP. In the additionality tool v07 /7/ the assessment is performed in 3 steps, i.e. Step 1: Identification of alternatives to the project activity consistent with the mandatory laws and regulations; Step 2: Investment analysis and Step 4: Common practice analysis. Step 3: Barrier analysis is optional and is to be performed in case that the project activity deems likely to be the most financially attractive, which apparently is not the case.

Investment Decision:

As indicated in the Table 1: Milestone of Akinci HPP (section 1.4 of the document), the stock purchase contract /18/ was signed on 08/03/2013 which is the first actual commitment of PO to the proposed project activity. The loan agreement and construction starts or purchase agreements had been signed later which is why the date chosen, which is earlier, is reasonable. It is accepted as reasonable that this is the investment decision date because a later investment decision date would lead to a higher benchmark, which is why this date is also accepted as being conservative (see CAR 8).

The Validation Team examined the provided additionality assessment within the VCS PD /12/ and the supplementary “IRR calculation for Akinci HPP” workbook /13/. Details on the assessment are provided in the following subchapters.

- Step 1: Alternatives

One of the 3 identified scenarios is determined to be credible and realistic alternative to the proposed project activity, namely

“Continuation of the current situation (in the situation that Akinci HPP is not built)”

which corresponds to the prescribed baseline scenario. Within the VCS PD, the PP describes this scenario. Since the methodology ACM0002 directly defines the baseline as above and only requires “...to

identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity...” The Validation Team concludes that the baseline scenario itself constitutes this alternative. Upon the knowledge of the Validation Team and the competence of PO representatives, the continuation of current situation (without any project) is consistent with all relevant mandatory laws and regulations which are listed in the VCS PD /12/ section 1.11 and provided as Annex therein.

- Step 2: Investment analysis

The benchmark approach (Option III) was selected by the PP to be the only applicable and most appropriate method for assessment of the projects additionality, where the financial indicator was identified to be the internal rate of return on equity (Equity IRR) after taxation (after taxation because the PP chose to use the default values annexed to the CDM Guidelines on assessment of investment analysis v05 /8/). The benchmark option is applicable and justified as the “Investment Cost Comparison” cannot be applied because of the alternative scenario definition “Continuation of the current situation” and Simple Cost Analysis cannot be applied to projects generating tangible assets as economic revenue.

Benchmark:

The PP in line with the requirements selected a corresponding benchmark as expected return on equity on a Post-Tax basis, which is also suggested by the Guidelines on assessment of investment analysis v05 /8/.

The guidelines of EB62 provide a table with default values for expected return on equity. Turkey is not listed in the table as country. However this is irrelevant as the values in the columns only depend on the Moody's index of the country. The PP therefore compared the Moody's index of Turkey with the table provided and chose the benchmark accordingly. The V/VB confirms that:

- The Moody's index chosen was the one published and available at the time of investment decision (Ba1 until May 16 2013)
 - o This was verified by looking up the historic published Ratings on Moody's website
- The Index corresponds to the benchmark of Ba1 countries
 - o This was verified by looking up the value in the table
- The benchmark is applicable to the scope of the PP project.
 - o This was verified by looking up the value in the table

Thus the expected cost of equity is determined at 11.2 % according to the table of EB62. No other detailed discussion was necessary as the default value was chosen.

Furthermore the V/VB observed that the implemented equity and debt portion originate from the feasibility study for Akinci HPP, which is relevant at the time of investment decision.

Therefore, the Validation team confirms that the calculated benchmark for the proposed project activity in the republic of Turkey for expected return on equity at the time of investment decision equals 11.20%, which was demonstrated to be credible and conservative.

A detailed workbook on the financial analysis for the Akinci HPP /13/ is provided to the Validation team. The file demonstrates the calculation of the benchmark and the internal rate of return on project, including all assumptions, references and intermediate calculations. The calculations and assumptions have been reviewed for correctness and traced back to the original source. The parameters are presented in

transparent and traceable manner, so that the Validation Team was able to prove the correctness and credibility of any input data and assumption.

Confidential information such as details of the Loan agreement and amortization tables and construction agreements were disclosed to the Validation team in order to substantiate actual values and/or prove the accuracy of assumptions, which are employed in the investment analysis.

The most important parameters, incl. source, value and substantiation are listed below. All financial figures in USD except where otherwise indicated.

Parameter 1	Total investment cost
Value applied for the IRR calculation:	\$250,767,171
Source of the value:	Initial Feasibility Study Report (ref. section 2.2)
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	The investment cost for Akinci HPP is applied as in the Initial FSR, including costs for civil/construction works, electromechanical equipment, and expropriation. The single values have been taken from the FSR. Other substantial costs for the investment are not considered. This is conservative. V/VB confirms that the investment cost, which is considered for the calculation of equity IRR for the proposed project activity, has been available at the time of investment decision. The investment decision date is determined as 08/03/2013, therefore the time between data availability of the FSR which was issued in 08/2011 and investment decision is reasonably short and the decision was taken before the FSR. This is in compliance with <i>TOOL01 Tool for the demonstration and assessment of additionality v07 /7/</i> and <i>Guidelines on the assessment of investment analysis v05 /8/</i> The pointed figure result in cost per unit energy of 2,533 \$/kW , which is comparable to the unit investment cost for green-field hydro power plant estimated by the IEA ETSAP /39/ for the year 2010, namely 1,750 to 6,250 USD/kW. It is also indicated that the unit cost is not country specific and very site-specific. The International renewable Energy Agency (IRENA) /40/ published in 2012 similar typical installed cost, i.e. 1,300 to 8,000 USD/kW. Hence the Validation Team confirms that a plausibility check was conducted as shown above and that the value achieved [in \$/kW] is in the lower quarter, meaning the value is conservative.
Parameter 2	Annual operation cost (excl. insurance)
Value applied for the IRR calculation:	\$10,596,081

Source of the value:	FSR. Public Database Number of Staff employed
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	The V/VB confirms that OM costs, incorporated in the calculation of equity IRR for Akinci HPP are composed of two items: labor costs and maintenance costs. The labor costs are calculated by multiplying the costs category of the employee with the reported number of employees in that category. This was verified by accessing the public source for the employee costs calculation, entering the category and comparing the values chosen. The entire calculation is then re-calculated in Excel. The number of employees was verified by reviewing the insurance list of all employees for the project. The maintenance costs were calculated by the PO based on standard accounting principles. The value was verified by re-calculation and by reviewing the FSR. The Value indicated in the FSR gives arrange. The value chosen is on the lower end, hence conservative. The average O&M costs for the proposed project activity are summing up to 4.23% of total investment costs, which is within the range estimated by the IRENA /40/ research, i.e typical O&M cost correspond to 1% to 5% of total investment. The calculation of the O&M costs was thoroughly checked by the Validation Team, with the outcome that provided estimations are reasonable and based on reliable sources. It shall be noted that the value is very conservative given the benchmark above.

Parameter 3	Loan – to – equity ratio
Value applied for the IRR calculation:	4.1
Source of the value:	Internal calculation sheet directly submitted by the PO during the site visit.
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	The value is derived from a loan amortization sheet that was provided by the PO based on which a calculation of the loan has been made. The review of this sheet is plausible and an interview with the project management confirmed the assumption that had been made at the time of investment decision.

Parameter 4	Electricity feed in tariff
Value applied for the IRR calculation:	0.073 \$/kWh

Source of the value:	Renewable Energy Law feed in tariff
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	The implemented electricity feed in tariff does not correspond to the guaranteed electricity feed in tariff for HPP ensured by EMRA with the Law on Utilization of Renewable Energy Resources /36/ but is higher. This is conservative. It has been justified as the only reasonable assumption at the time of investment decision where the FSR was available and electricity price is highly dependent on the market demand and supply and electricity generation for hydroelectric power plant is dependent on climatic conditions and river water regime. In particular higher electricity price is experienced in the summer months when the HPP experience lower electricity generation.

Parameter 5	Electricity generation
Value applied for the IRR calculation:	439,360 MWh/a
Source of the value:	- Feasibility Report /30/ - Plant factor of the proposed project activity (within the FSR)
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	The expected annual electricity generation is justified by the location, river regime and other specific characteristic of the proposed project activity inside the FSR. Also it was the only assumption available based on the latest version of the feasibility assessment before the time of investment decision which was then revised. The Validation team confirms the timing of the FSR and investment decision and reviewed the values inside the FSR to be correct.

Parameter 6	Operational lifetime (investment analysis horizon)
Value applied for the IRR calculation:	20 years
Source of the value:	Assumption made by PO according to methodology and underlying guideline.
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	The operational lifetime of the Akinci HPP is defined to 50 years including the construction phase, which is shorter than a typical technical lifetime of the technology (ca.45 years). The investment analysis is performed according to Guidelines /8/ over the 20 years operational lifetime and the residual book value of the project activity was taken into consideration by project IRR calculation. The calculation of the residual book value was reviewed and found to be consistent with the assumptions made regarding technical lifetime. A correct depreciation approach has been applied.

Parameter 7	Residual book value
Value applied for the IRR calculation:	\$94,631,764
Source of the value:	calculation made by PO
Justification by the Validation team according to §113 of VVM: (cross checking and comparison as applicable)	Calculation of the residual book value is based on the assumption that EM equipment is depreciated at 16% for 15 years and 84% for 40 for other installations. Those assumptions are found to be conservative meaning that after 20 years the physical assets are still worth more than 35% of the initial investment.

By means of transparent calculations displayed in the workbook, it is demonstrated that the internal rate of return on project for Akinci HPP after taxation corresponds to 7.27 %. The calculation was redone by tracing the excel cells and reviewing formulae and values applied. As already discussed, the Validation Team examined the input parameters, assumptions and any relevant statement accordingly and confirm the accuracy of the calculated parameter. Furthermore, the so established IRR for the proposed project activity is consistent with the benchmark, meaning both values are on Post-Tax basis.

Finally the proposed project activity is evaluated as financially unattractive since the estimated IRR, 7.27 % is lower than the 11.20% benchmark, which is the expected return on equity for the investment in the republic of Turkey in the energy sector.

Sensitivity analysis was performed by the carbon consultant, showing that the deviation of the 3 key parameters⁶, in particular investment costs, operation costs and electricity revenues, by +/- 10% leads to IRR in the range from 5.40% to 10.39%

- Step 4: Common practice analysis

The common practice analysis is a credibility check to complement the investment analysis and follows the sub-steps identified in the “*Tool for the demonstration and assessment of additionality*”v07 /7/ and the “*Guidelines on Common Practice*” v02 /10/.

The analysis itself has been transparently laid out within the VCS Project Description. In addition, during the site visit, Ms Özcelik clarified the performed common practice analysis, explaining the rationale behind each step.

The V/VB confirms that the analysis is performed in line with the *Guidelines on Common Practice* v02 /10/, namely each step was performed to the best knowledge of the PO, so that

- The Yesilirmak catchment area was considered as geographical scope for the common practice analysis for Akinci HPP project.
 - After reviewing the study the V/VB can confirm the following.
 - A distinction between the catchment areas is made on a political, geographical and technical level.
 - There are distinctions for the practices of river basin management

⁶ Regarding the „Guidelines on the Assessment of investment analysis“ v05 /8/

- The Yesilirmak RB development project has been initiated because substantial issues were identified within that catchment area compared to others
- It was also discussed during the on-site meeting which distinctions can be made. The outcome is reflected in the PP response.
- Under step 1: The range 49.5 to 148.5 MWe was determined as applicable output range, which is calculated as +/- 50% of the installed capacity of Akinci HPP project.
- Under step 2: the similar projects were identified in line with the guidelines, so that they fulfil following criteria:
 - a) Located within the catchment area
 - b) Power generation based on renewable energy, since the proposed project activity is renewable energy project
 - c) N.A. since no technology switch measure is implemented.
 - d) Electricity generation from renewable energy sources
 - e) installed capacity within the range 49.5 to 148.5 MWe, as determined in step1
 - f) projects connected to Turkey's national electricity grid at the end of 2012. Evidently, the project is not yet operational.
- The source of the projects listed was reviewed as indicated on page 22 of the PDD.
- Under step 3: all VER projects, as well as projects submitted for registration or undergoing Validation, as per the knowledge of PO, were excluded, so that the number of remaining projects is obtained, namely $N_{all}=3$.
- Under step 4: the number of projects which apply different technology, per definition of the Guidelines, was determined so that power plant that apply different technology in terms of energy source (i.e. hydro) and investment climate on the date of investment decision. Therefore $N_{diff}=3$, because the other projects were evidently state-developed.
 - This was verified by reviewing the licenses of the projects.
- Under step 5: based on the determined parameters, the factor was calculated as

$$F = 1 - \frac{N_{diff}}{N_{all}} = 1 - 1 = 0$$

Finally the PO demonstrated and the Validation Team confirms that in accordance to the *Guidelines on Common Practice v02 /8/*, the share of projects similar to Akinci HPP, i.e. using similar measure/technology and delivering the same output or capacity, is 0. Since the identified factor $F=0$ is lower than the referenced $F=0.2$ and the number of similar projects $N_{all} - N_{diff} = 0$, is smaller than 3, the Akinci HPP is determined not to be a common practice activity in the Republic of Turkey according to the guideline as both criteria need to be fulfilled. To verify the common practice analysis the V/V team used a spreadsheet including all official plants as published by TEIAS. After that a filter and list function was applied according to the above criteria which led to the final results of the parameters.

• Conclusion

The Validation Team confirms that the proposed project activity according to the methodological approach is financially unattractive, achieving an internal rate of return on project after tax of 7.27 % whereas the selected benchmark is 11.20% which is the expected return on equity for the investment in the republic of Turkey.

Therefore, Akinci HPP project activity is demonstrated to be additional.

3.2.6 Quantification of GHG Emission Reductions and Removals

As it has been identified in section 3.2.1 of the report, emission reductions and removals resulting from Akinci HPP are identified according to the approved CDM methodology ACM0002 v15.0 /5/ and the referred methodological tool “Tool to calculate the emission factor for an electricity system” v04 /6/ as

$$ER_y = BE_y - PE_y$$

The V/VB examined the emission reduction calculations against the relevant indicated methodology and methodological tools, and concluded that all assumptions applied for the calculation of ER are sufficiently explained. In addition, all involved data and parameters are listed in section 4.1. ‘Data and parameters available at Validation’ and in section 4.2 ‘Data and parameters monitored’ of VCS PD of Akinci HPP /12/, including short description of the data/parameter, source of the data/parameter, value(s) applied and justification of the choice or measurement methods and procedure.

3.2.6.1 Quantification of baseline emissions

In order to determine the baseline emissions, the combined margin (CM) is calculated based on the “Tool to calculate the emission factor for an electricity system” v04 /6/. The described steps for identification of operating margin (OM) and build margin (BM) and all relevant assumptions are sufficiently documented within the VCS PD /12/ and accordingly applied within the ER calculation workbook (Baseline Study Akinci HPP /14/). The choice of data vintage and calculation methods are justified in an understandable manner. All calculation on OM, BM and CM are performed by means of excel file and the resulted workbook on emission reduction calculation /14/ was provided to the Validation team for Validation. The mentioned workbook is explored, data sources are examined and calculations are repeated in a separate workbook. Consequently the following has been observed:

- All used data are referenced and based on reliable sources; this is verified by reviewing the original raw-data.
- Workbook cells are traceable and the calculations are presented in a transparent and unbiased manner; this is verified by tracing the calculation result back to the sourcing using a step-by-step approach.
- The country specific and most recent data available at the time of submission of PDD to the Validation body are applied; this was verified by accessing the website sources (as a date of publication is indicated)
- Calculations are performed in complete accordance with the mentioned tool. This is verified by following the instruction of the tool step-by-step in parallel while reviewing the excel-workbook data.
- The ex-ante data vintage has been selected for both the OM and BM calculation.

Identification of the relevant electricity systems

The Turkish National Grid has been correctly used as it is the only way to determine the grid, since no other boundary criteria can be applied. This was verified by checking at all times that all power plants connected (TIEAS) have been considered in the calculations.

Imported electricity

It was verified by reviewing the disclosed amount of imported electricity by TEIAS and observing that this amount was included in the OM calculations with an emission factor of 0.

Simple OM method

The simple OM method was used. This is justified as was verified by reviewing the share of LCMR sources: [http://www.teias.gov.tr/TürkiyeElektrikIstatistikleri/istatistik2012/kgucunkullanım\(14-22\)/14.xls](http://www.teias.gov.tr/TürkiyeElektrikIstatistikleri/istatistik2012/kgucunkullanım(14-22)/14.xls).

OM and BM calculations.

This is verified by following the instruction of the tool step-by-step in parallel while reviewing the excel-workbook data. Finally the OM emission factor is determined as $EF_{grid,OMsimple} = 0.681 \text{ tCO}_{2,eq}/\text{MWh}$ and BM emission factor as $EF_{grid,BM} = 0.347 \text{ tCO}_{2,eq}/\text{MWh}$, which by applying the default values for weighting on OM and BM (i.e. $w_{OM}=0.5$ and $w_{BM}=0.5$) result in combined margin emission factor $EF_{grid,CM} = 0.514 \text{ tCO}_{2,eq}/\text{MWh}$. Upon the experience of the Validation Team on emission factor, the determined value is realistic and comparable to similar projects in the host country whereas being rather conservative. The calculations are based on most recently available data, i.e. for the year 2012, 2011 and 2010.

Per ACM0002 v15.0 /5/, baseline emissions (BE_y) are the product of net electricity supplied to the grid as a result of the implementation of the CDM project activity ($EG_{BL,y}$) and CO2 emission factor of the grid ($EF_{grid,CM,y}$), in particular for Akinci HPP

$$BE_y = EG_{BL,y} \times EF_{grid,CM,y} \cong 225,831 \text{ tCO}_{2,eq}/\text{year}$$

3.2.6.2 Quantification of project emissions

In general renewable power generation project are considered to have zero GHG emissions, i.e. $PE_y=0$. Since the Akinci HPP is a hydroelectric power plant with a run-off river weir the power density is so high that it is irrelevant for determination of the project emissions.

For determination of project emissions from water reservoirs of hydro power plants ($PE_{HP,y}$), the selected CDM methodology ACM0002 v15.0 /5/ suggests that

- in case $4 \text{ W/m}^2 < \text{Power density of the single or multiple reservoirs} \leq 10 \text{ W/m}^2$

$$PE_{HP,y} = (EF_{Res} * TEG_y) / 1000;$$

- in case Power density of the single or multiple reservoirs $> 10 \text{ W/m}^2$

$$PE_{HP,y} = 0 \text{ tCO}_{2,eq}/\text{MWh}.$$

The power density (PD) of the project activity was determined to be $>100 \text{ W/m}^2$, where the Validation Team proved by cross check that all calculations are based on relevant formula from the methodology ACM0002 v15.0 and all input data refer to reliable sources, i.e. reservoirs' area and installed capacity are taken from the revised FSR /30/ and the reservoir diagram. Furthermore a kml file of the project area was double-checked.

The Validation Team confirms that project emission is estimated to be $PE_{HP,y} = 0 \text{ tCO}_{2,eq}/\text{MWh}$ based on the power density applied.

In addition, it is necessary to mention that according to the selected methodology ACM0002 v15, "the use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected".

3.2.6.3 Quantification of leakage

Akinci HPP is a green field project activity, thus no leakage emissions related to the project are expected and regarded.

3.2.6.4 Summary of net GHG emission reductions or removals

Akinci HPP was considered to induce GHG emission reductions, which as per approved methodology ACM0002 v15.0 /5/ are estimated as $ER_y = BE_y - PE_y$ (where ER_y = emission reductions in year y; BE_y = baseline emissions in year y and PE_y = project emissions in year y).

So that :

$$ER_y = BE_y - PE_y = 225,831 \text{ tCO}_{2,\text{eq}}/\text{year}$$

Therefore, for the entire crediting period of 10 years (see definition of crediting period), the Akinci HPP has estimated net GHG ER of 2,258,310 tCO_{2,eq}.

The Validation Team confirms that the emission reduction calculations are performed properly, by applying the latest version of the approved CDM methodology ACM0002 v15.0 /5/ and the referred methodological tool “Tool to calculate the emission factor for an electricity system” v04 /6/, which are accepted by the VCS standard. As already demonstrated in *section 2.2 ‘Applicability of methodology’* of VCS PD /12/ and discussed in *section 3.2.2 ‘Applicability’* of the current document, Akinci HPP is proved to fulfil all eligibility criteria listed under the methodology. Furthermore, considering the experience of the Validation Team with renewable electricity generation projects, the estimated annual GHG emission reductions are assessed as reasonable.

3.2.6.5 Uncertainties associated with the calculation of emissions

All data presented in the baseline calculations are provided from official sources. Therefore, uncertainties of data sets were not estimated. There are no uncertainties in the calculations.

3.2.6.6 Documentation used as the basis for assumptions and sources of data

All data presented in the baseline calculations are provided from official sources, all accessible through the internet. Assumptions as such that were based on certain documentation were not identified. All implemented data are referenced and based on reliable sources; All sources are correctly quoted and interpreted.

The single components of the equation have been assessed by the V/VB in the previous sections, providing details on the applied formulas. All steps required for the calculation of baseline-, project- and leakage emissions for Akinci HPP project are sufficiently documented and the choice of data vintage and calculation methods are justified in a readily comprehensible manner within the VCS PD /12/. The calculation are performed by means of excel workbook (Baseline and ER calculations study Akinci Hydroelectric Power Plant, Turkey /14/), which was delivered to the V/VB and thoroughly discussed with PP in the course of site visit. Furthermore, the mentioned workbook is explored, data sources are examined and calculations are repeated in a separate workbook by the V/VB. Consequently, the following is observed:

- All implemented data are referenced and based on reliable sources; All sources are correctly quoted and interpreted
- Workbook cells are traceable and the calculations are presented in transparent and unbiased manner;
- Calculations are performed in complete accordance with the CDM methodologies ACM0002 v15.0 /5/ and TOOL07 “Methodological tool: Tool to calculate the emission factor for an electricity system” Version 04.0 /6/. All calculations are presented in comprehensible and replicable manner.
- The country specific and most recent data available at the time of submission of VCS PD to the Validation body are applied; otherwise default values, which are acknowledged by CDM, are used.
- The data for which ex-ante data vintage has been selected are clearly listed in *section 4.1 ‘Data and Parameters Available at Validation’* of VCS PD /12/, indicating that the values for those parameters are determined at the time of Validation and would not be altered during the entire crediting period.

3.2.7 Methodology Deviations

The Validation Team assessed the proposed project activity and related project description in detail and confirms that the selected methodology and methodological tools are implemented accurately without any deviations, except for the parameter “surface area of the weir-reservoir” because of the reasons explained under section 3.2.2.

3.2.8 Monitoring Plan

Assessment of the monitoring plan for the proposed project activity is an essential part of the Validation process and basis for the verification of the GHG emission reductions. For that reason a considerable part of the site inspection is focused on the project monitoring.

Since at the time of on-site visit, Akinci HPP has not been operational, all relevant metering devices have not been installed and the Validation Team was not able to observe them, their position and calibration, etc.

For the purpose of Validation therefore the PP explained in depth the concept of the designated monitoring plan and provided the Validation Team with substantial details from project design phase. The parameters to be monitored are described below. The monitoring procedures have been assessed according to the description in the PDD and it is confirmed that the monitoring in general meets methodology requirements (except for the deviation, see above). A FAR was issued to safeguard correct implementation of this monitoring strategy during verification.

3.2.8.1 Data and parameters available at Validation

The following 6 parameters are used for the calculations of emission reduction created by the Akinci HPP and are available at the time of project Validation.

- $FC_{i,y}$ amount of fuel i consumed by relevant power plant in Turkey in years 2010 - 2012
- $NCV_{i,y}$ – net calorific values for fossil fuel type i in years 2010 - 2012
- $EF_{CO_2,i,y}$ - CO_2 emission factor of fossil fuel type i in year y , based on IPCC default values

- EG_y - Net electricity generated in the project electricity system in other words, net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y .
- $EG_{m,y}$ - Net electricity generated and delivered to the national grid of Turkey by power unit m in years 2010 – 2012
- $EG_{import,y}$ - Quantity of electricity imports in year y for years in the 3-year period of (2010 – 2012).
- $\eta_{m,y}$ - Specific electrical efficiency for all relevant energy sources (natural gas, lignite, coal/anthracite, fuel/motor oil), based on default values from the TOOL07 “Methodological tool: Tool to calculate the emission factor for an electricity system” Version 04.0 /6/
- CAP_{BM} - Capacity additions forming the sample group of power units used to calculate the build margin

As it has been already mentioned, the operating emission factor and the build emission factor are calculated ex-ante. Therefore, the applied parameters are determined or/and monitored once per crediting period.

In line with the approved methodology ACM0002 v15.0 /5/, the parameters are listed in the VSC PD, together with the applied value, source of data and justification of data/description of measurement methods and procedures. The list is determined to be exhaustive, providing important information and guarantee on data consistency and reliability.

3.2.8.2 Data and parameters monitored

The applied ex-post parameters are subject to regular measurement, namely once per monitoring period. In the case of the proposed project, 3 parameters are included in the monitoring plan, i.e.

- $EG_{PP-self\ consumption, y}$ - Quantity of electricity imported by the power plant from the Grid for self-consumption, in year y .
- $EG_{PP-Gross\ Generation, y}$ - Quantity of electricity exported by the power plant to the Grid in year y
- Cap_{PJ} - Installed capacity of the hydro power plant after the implementation of the project activity

Description of measurement for each of the identified parameters and procedures to be applied, as well as frequency of monitoring, is included in the monitoring plan. The PO is aware of its obligation to archive the recorded data for at least 2 years after the last crediting period.

It is indicated in the VCS PD /12/ ...”The main and back-up electricity meter will be bi-directional for quantifying the electricity delivered by the Project Activity to the grid”. This statement must be especially confirmed during the site inspection at verification. The V/VB shall witness that the two-way metering devices are installed at the Akinci project site or sub-stations.

In summary, the Validation team is convinced of compliance of the monitoring plan with the requirements of the selected approved methodology ACM0002 v15.0 /5/ and all supplementary implemented methodologies, and tools such as “Tool to calculate the emission factor for an electricity system” v04 /6/. As a consequence of the discussions during the on-site assessment, the Validation Team considers the planned monitoring arrangements as described in the monitoring plan appropriate.

3.3 Non-Permanence Risk Analysis

N.A.

3.4 Environmental Impact

The entire project undertaking received an EIA certificate by the Ministry of Environment and Forestry. The certificate is issued for the HEP and weir structures and is valid for all affected districts. The project has to apply all other relevant environmental laws and the associated permits have been reviewed and are identified in section 2.2.

3.5 Comments by Stakeholders

It is the Validation Team opinion that the local stakeholders were accurately identified and appropriate invited to the stakeholders' meeting. Page 49 and 50 of the VCS PD list invited stakeholders and relevant activities. Stakeholders' comments were not taken into account during this initial Validation except with regard to personnel for the operation of the power plant itself.

4 VALIDATION CONCLUSION

Fırat Elektrik Üretim Ve Ticaret A.Ş.

Cumhuriyet Cad. 48/3-B

Harbiye, 34367, Şişli - İstanbul

Turkey

08/12/2014

RE: Validation Statement – Akinci HPP, Turkey under VCS, first crediting period from 12/02/2017-11.02.2027.

Fırat Elektrik Üretim v. Tic. A.S. with registered office in İstanbul/ Turkey, has contracted TÜV Rheinland to review and validate the VCS PD and all assertions related to the GHG project under VCS v.3.4. The GHG assertions, revealed in the VCS PD v1.01 /12/ issued on 26/11/2014, indicate annual achievable GHG emission reductions of 225,831 t CO₂e.

By generating electricity using renewable resources, the project is likely to result in reductions of GHG emissions by partially displacing the electricity that would have been generated using fossil fuels. Investment analysis demonstrates that the proposed project activity is neither the financially attractive nor a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity. Given that the project is implemented and maintained as designed, the project is likely to achieve the estimated amount of emission reductions.

The Validation of the GHG assertion is conducted in accordance with the requirements of the VCS standard v3.4, the standard ISO 14064-3 and the approved UNFCCC methodology ACM002 v15.0 to a reasonable level of assurance by applying a materiality threshold of 5%. In the course of the Validation process the VCS PD, substantiations and any additional supportive documents are reviewed and the outcomes are reflected in Chapter 3.2 in this Validation Report issued on 08/12/2014.

The Validation Team came to the conclusion that based on our review and all available documentation the GHG assertion is made in accordance with the requirements of the VCS program and is materially correct and fairly represents the GHG emissions data and information without material discrepancies.

Cologne 08/12/2014



TL/Auditor

APPENDIX A

Table 2: List of Requests for Corrective Action (CAR) and Clarification (CL)

CAR/CL	Observation (CAR/CL)	Reference	Summary of project owner response	Validation team conclusion
CAR 1.	The project start date is defined as the date when the project starts to deliver electricity to the grid. There cannot be two dates as in "...whichever will be earlier". Please specify one (expected date) and include the description which event this is. (e.g. the acceptance test by ministry) See VCS Standard 3.7.	PDD p. 5:	The project has changed hands and the present title holder took the project over as documented in Document 1 on March 8, 2013. So one can consider the earliest investment decision date as March 8 2013. Please see the updated Table 1. On the otherhand if we consider the investment decision date as March 8,2013, the Moody's index for turkey was then Ba1, and the corresponding Equity IRR benchmark would be 12 except Azerbaijan that is given an Equity IRR benchmark of 11.20. For a conservative approach we are changing the benchmark as 11.20 , see version 2.0 of the financial anlysis and the PDD.	The answer does not directly correspond to the question but the Validation Team, after the site visit has agreed to indicate the start date clearly in the PDD based on the expected commissioning date. The Validation Team confirms and considers this date to be the only plausible start date of the project available. The statement related to the timing of investment decision will be taken into account where relevant.
CAR 2.	ER table: The average annual ER value is inconsistent with the annual value	PDD p.6	This was a typing error, all the numbers are made consistent in version 2.0 of the VCS-PD.	After discussion and several reviews the value has now been consistently applied using the figures from the feasibility study throughout. This is acceptable and plausible with the

				investment decision date.
CAR 3.	Please revise the coordintaes in the table 2	PDD p. 7:	Corrected please see version 2.0 of the VCS PD	The coordinates have been updated and double checked during the on-site visit.
CAR 4.	Please revise the catchment area of table 2	PDD p. 7:	We have checked the catchment area, and it is correct. Catchment area is defined as the entire drainage area of the Kelkit river that will supply the annual estimated total water flow of 2010.63hm ³ /year. To avoid confusion we changed the wording as drainage area.	This was a misinterpretation and the issue could be resolved during the review of documentation.
CAR 5.	gross head is different in the text section above	PDD p. 7:	Corrected please see version 2.0 of the VCS PD.	Corrected
CAR 6.	Please revise the coordintaes of the planned weir and power house locations	PDD p. 9:	The coordinates of the weir are corrected those that indicate the location of the power house were correct.	Corrected
CAR 7.	Please revise the power density calculations. The surface area must be substantiated with technical drawings of the landscaping plan or equivalent digital files shall be submitted.	PDD p. 13:	Please see annex 5 of the VCS PD-version 2.0. As indicated on that drawing the aerial extent of the reservoir lake is 314,579.91 m ² . Accordingly the power density calculation is updated in version 2.0.	The power density calculation is now consistent and based on a plausible, traceable document, i.e. the design drawing of the intake pond. The calculations are based on the geographical features of the area and are correct.

CAR 8.	Further elaboration is needed why the information about construction activities is the investment decision date. The decision could also have been taken earlier. A testimonial or supporting evidence is needed that the investment decision was not earlier. Informing any institution is not sufficient as an evidence. Note that this does NOT mean the date is not acceptable- but it must be substantiated or an earlier date must be excluded. It was noted that BRK Group took over Firat in May 2013. This could be considered as decision to invest – if not it must be justified. This is particularly important as on June 20th 2012 the rating had been Ba1 where the benchmark would be 11.2 (lower)	PDD p. 17:	BRK Group took over Firat on March 8 th , 2013 as substantiated by the Stock Purchase agreement. We have revised our arguments and considered that particular date as the investment decision date as indicated in table 1 via a footnote. And we have changed the benchmark to 11.2, as was also explained above in CAR1.	This was discussed in CAR 1 and also discussed during the on-site visit. From the Validation Teams point of view the new date is more plausible and conservative, especially as the benchmark is lower using the earlier date.
CAR 9.	Please revise this sentence. Of course a particular Moody index is comparable to the same Moody index. It is clear what is meant but please revise how you arrived to choose one particular benchmark in the default list	PDD p. 17:	Revised and more explanation provided in version 2.0 of the VCS-PD.	Corrected. The rationale behind the selection is clear.
CAR 10.	Annual power generation capacity is inconsistent. Please clearly indicate the source of EG values with reference (pages etc...) and consider the timing as well	PDD p. 18:	The installed capacity of the PA is 99MWe as shown in the project license, and the expected annual total generation is 439,360 MWh.as shown on page 29 of the design change report presented to the DSI. The numbers given in the VCS-PD version 2.0 are made consistent accordingly.	The power generation figures are now based on the true FSR values and have been used consistently in the PDD.
CAR 11.	Annual ER is inconsistent	PDD p. 18:	Corrected please see version 2.0 of the VCS-PD.	Corrected
CAR 12.	The total investment costs could not be traced back in the FSR. Please make clear	PDD p. 18:	Since the scan of the feasibility report dated March 2011 is large	The discussion with the PO during the site visit revealed the calculation

	references		it was divided into sections. The table we have utilized for investment cost is on chapter 9, page 9-4. Which is the pdf page number 92 in the document titled: "1.10.5.2 Akinci FS Sections 6-11.pdf" The proper referencing is added to the investent analysis and version 2.0 of the PD.	approach. The figures could be traced back to its original source in the FSR. The values have been re-calculated and are correct.
CAR 13.	The Loan agreement could not be reviewed hence the equity/loan ratio and timing could not be verified. Please provide	PDD p. 18:	The negotiated loan agreement was closed and signed very recently, as a result we have asked the BRK Group finance department to provide us with the Loan pay back table they have used in their estimations. They have provided that table and we have attached it as document Titled "FinanceInvDec.xls", we have replaced the finance numbers according to these numbers, in version 2.00 of the akinci-financial analysis.	As the calculations shall be made based on information available at the time of investment decision the loan agreement is accepted to be irrelevant. The submitted loan table was based on the POs assumption at the time of investment decision. This is in line with the methodological requirements. The Validation Team accepts the testimonial of the PO as no other evidence can be produced. The assumption supports the conservativeness principle as a high amount of loan leads to a higher IRR compared to a very low loan ratio.
CAR 14.	the IRR function has been applied for 22 years. The reason is apparently that the project will be operational in 2017. This date must be explained. Please make consistent with PDD value of 20 years or adapt PDD	Invest Ana.:	The investment analysis is intended to reflect the situation for a time frame of 20 years after the operation start date, so the investement analysis is corrected accordingly and the explanation in	The analysis shall be carried out in line with typical equity parameters starting with the projects financial commitment/expenditure. The investment analysis would have had no yield or profit in the first two

			the PDD has been made more clear.	years. The adaptation made by the PO avoids this problem and is now directly applied for 20 years.
CAR 15.	Line 15 depreciation results in negative operational profit in year 1 2016. Why is the depreciation started here. Depreciation date must be substantiated.	Invest. Ana.:	Corrected Please see version 2.0	This was corrected and is now done correctly for all years.
CAR 16.	Line 31 deductible VAT, the VAT is taken as cash to equity after gross profit is positive, but from column K on the formula in the cell changes. It is not clear why. This seems inconsistent	Invest. Ana.:	The projects investment costs results in a total VAT of \$33,222,884.58, and as the project starts operating and selling electricity there also occurs a VAT due to the electricity sales. Each year that VAT is deducted until the amount of total deduction reaches the project's VAT. So after column K there is no deduction. (the VAT starts to be paid to the tax office).	This was not understood correctly by the Validation Team. The explanation clarifies, the CAR is irrelevant.
CAR 17.	This explanation of how the investments costs were calculated is unclear. It is understood that the estimate is based on 2010 unit figured adjusted by considering the FSR info. This must be clearly substantiated and the adjustment approach shall be described in the PDD. It must be visible why this was conservative and how. In the excel sheet it is indicated that the costs have been taken directly from the FSR	PDD p. 20, section 2:	Investment cost is taken from the FSR, and in the FSR the relevant tables also referred to above are mentioned to consider year 2010 DSI unit values. DSI announces unit values to be utilized in Feasibility study reports.	The PDD now clearly refers to the values taken from the FSR. Also calculation sheets refer to the same source. The Validation team double checked the values of the FSR and found them to be correct.
CAR 18.	The entire monitoring section shall be updated according to the targeted implementation and the parameters available		Please see version 2.00 of the VCS-PD the entire monitoring section is re-written to reflect the parameters available.	The monitoring is in line with the applied methodology.