SIGAR

Special Inspector General for Afghanistan Reconstruction

SIGAR 20-27 Inspection Report

USAID's Power Transmission Expansion and Connectivity Project in Afghanistan: The Ghazni and Sayedabad Substations are Complete, but Construction Deficiencies Create Safety Hazards and Could Disrupt Electrical Power

FEBRUARY

2020

SIGAR

Special Inspector General for Afghanistan Reconstruction

WHAT SIGAR REVIEWED

On December 5, 2012, the U.S. Agency for International Development (USAID) issued an implementation letter for the Power Transmission Expansion and Connectivity (PTEC) project in Afghanistan. Da Afghanistan Breshna Sherkat (DABS), the Afghan government's electrical utility, is responsible for implementing PTEC in collaboration with the Afghan Ministry of Finance. PTEC's main objective is to connect Kabul's and Kandahar's respective power grids by building new transmission lines and substations. USAID expects that the new infrastructure will transmit excess power southward from Kabul to supply power for 2.4 million Afghans.

On March 26, 2014, as part of PTEC's energy infrastructure construction component, DABS awarded KEC International Limited (KEC), an Indian company, a $46.1 million design-build contract to construct electrical substations in Ghazni and Sayedabad. As a result of two contract modifications, the project's completion date was extended from December 31, 2016, to August 31, 2017. USAID also contracted with Tetra Tech Inc. to provide project management, engineering support, and quality assurance services for the project. KEC completed the project on August 31, 2017.

The objectives of this inspection were to determine whether the PTEC electrical power substations in Ghazni and Sayedabad (1) were constructed in accordance with contract requirements and applicable construction standards, and (2) are being used and maintained.

February 2020

USAID's Power Transmission Expansion and Connectivity Project in Afghanistan: The Ghazni and Sayedabad Substations are Complete, but Construction Deficiencies Create Safety Hazards and Could Disrupt Electrical Power

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WHAT SIGAR FOUND

SIGAR conducted site visits to the Ghazni and Sayedabad electrical substations in May and June 2018. From those site visits, SIGAR identified eight construction deficiencies that create safety hazards and could cause disruptions in electrical power transmission. Specifically, at both substations, KEC did not

1. Adequately repair the deficiently designed gantry towers supporting high-voltage equipment. This raises concerns about the towers' structural strength. If a tower collapses, it could damage the substation, disrupt the flow of electricity, and seriously injure or kill anyone in the vicinity.
2. Install galvanized iron enclosures with a watertight seal for high-voltage electrical cables. These cables could fail, creating a short circuit and safety hazard for workers.
3. Label the cables, creating a safety hazard and making it difficult for maintenance staff to identify which cables need repairs or testing.
4. Install the required 6-inch diameter cable ports with watertight seals. As a result, moisture can enter the area containing high-voltage cables and cause short-circuits and power outages.
5. Properly install washers and nuts on some foundation base plates, which support steel structures holding high-voltage equipment. As a result, these structures are at risk of collapsing, which could destroy substation equipment, disrupt power, and seriously injure or kill anyone in the vicinity.
6. Obtain authorization to connect different size electrical cables to one another. Instead, KEC installed and connected different size cables and wrapped them in electrical tape. This prevents higher-voltage current from passing through the cables and could cause a fire.
7. Install electrical conduit with the required mechanical protection to limit wear. Damaged cables exposed to hot, cold, or wet conditions can lead to a short circuit, electrocution, or equipment failure.
8. Install the remaining 8 of the 42 required grounding pits, or properly connect grounding cables in 11 of the 34 already-constructed grounding pits. This could result in equipment malfunction or failure if a lightning strike occurs.

SIGAR also found that KEC did not correct 11 punch list items identified by USAID and Tetra Tech, 6 at the Ghazni substation and 5 at the Sayedabad substation. These include an unfilled excavated area, broken grounding pits, an incorrectly placed chimney hole for a wood stove, an uncovered storm water channel, non-working telephones at both substations, unlabeled panel board circuits, uninstalled cables, a damaged bus post supporting structure, leaking oil from transformers, and missing water heater safety plugs. During

the warranty period, which expired on March 10, 2019, SIGAR advised USAID and Tetra Tech that these construction deficiencies and punch items existed, but KEC had not corrected them. According to USAID officials, DABS has not fully paid KEC for the contract because the final invoice, totaling $1,002,525.71, is still under review.

WHAT SIGAR RECOMMENDS

To protect U.S. investment in the Ghazni and Sayedabad substations, and provide a safe work environment, SIGAR recommends that the USAID Mission Director for Afghanistan, in coordination with Tetra Tech, work with DABS and the Afghan Ministry of Finance to direct KEC to take the following actions, and report the results back to SIGAR within 60 days:

1. **Correct the construction deficiencies at both substations by**
    a. **providing metal enclosures for the high-voltage electrical cables;**
    b. **installing identification tags on all electrical cables;**
    c. **installing cable entry ports for all electrical cables;**
    d. **properly installing and securing foundation base plates for the steel structures supporting high-voltage equipment;**
    e. **replacing all deficiently designed and failing gantry towers that support high-voltage electrical equipment;**
    f. **providing protective enclosures for wiring running above or below ground;**
    g. **installing the same size cable when connecting to conductors; and**
    h. **installing the electrical grounding system according to the contract requirements.**
2. **Correct the remaining six punch list items at the Ghazni substation and five items at the Sayedabad substation by**
    a. **filling in the excavated area near the control buildings' storage area;**
    b. **adding covers for the five grounding pits without them and repairing the two broken grounding pits;**
    c. **correctly placing the chimney hole for the southwest guard tower's wood stove;**
    d. **adding covers to the concrete storm water channels;**
    e. **making the telephones operational;**
    f. **labeling panel board circuits;**
    g. **installing cables for the high-density polyethylene pipes;**
    h. **repairing and aligning the bus post insulators' supporting structure;**
    i. **repairing the power transformers that are leaking oil; and**
    j. **adding safety plugs to the water heaters.**

SIGAR also recommends that the USAID Mission Director for Afghanistan work with DABS and the Ministry of Finance to

3. **Withhold the final invoice payment until KEC corrects the construction deficiencies and punch list items, and, if not corrected, return the withheld funds to the U.S. Treasury or use the funds to complete the work with another contractor.**

SIGAR provided a draft of this report to USAID for review and comment. USAID, in coordination with Tetra Tech, provided written comments. USAID agreed with our recommendations. USAID stated that KEC corrected all but one deficiency and two punch list items. According to USAID, Tetra Tech has not yet verified that KEC corrected all of the deficiencies and punch list items, but given favorable weather conditions, Tetra Tech plans to verify them by May 31, 2020. USAID also stated that it will deduct the amount of any uncorrected deficiencies from KEC's 5 percent defect liability invoice. SIGAR will keep the corresponding three recommendations open until KEC corrects all of the deficiencies and Tetra Tech verifies that KEC has made them, or until USAID imposes a financial penalty for any uncorrected deficiencies.

SIGAR | Office of the Special Inspector General for Afghanistan Reconstruction

February 13, 2020

The Honorable Mark Green
Administrator, U.S. Agency for International Development

Mr. Peter Natiello
USAID Mission Director for Afghanistan

This report discusses the results of SIGAR's inspection of the Power Transmission Expansion and Connectivity project's electrical power substations at Ghazni City in Ghazni province and the Sayedabad district in Wardak province.

During May and June 2018 site visits, we found that KEC International Limited (KEC) had completed both substations. However, we found eight construction deficiencies. For example, we found the size and quality of the welds supporting the gantry towers to be inadequate—welds were not smooth, contained gaps and holes, and were not the required thickness. We also identified 34 punch list items that KEC had not corrected. These deficiencies resulted from KEC not adhering to the contract requirements. The deficiencies created safety hazards and could disrupt the flow of electricity to Afghan citizens and businesses.

On December 3, 2018, we advised U.S. Agency for International Development (USAID) and its management support contractor, Tetra Tech Inc., of these deficiencies so KEC could address them before the warranty expired on March 10, 2019. On July 26, 2019, we conducted a follow-up site visit to the substations and found that KEC had not corrected the eight construction deficiencies we identified or 11 of the punch list items. USAID officials told us that Da Afghanistan Breshna Sherkat (DABS), the Afghan government's electrical utility, has not fully paid KEC for the contract because the final invoice for $1,002,525.71 is still under review.

We are making three recommendations in this report. We recommend that the USAID Mission Director for Afghanistan, in coordination with Tetra Tech Inc., work with DABS and the Afghan Ministry of Finance to (1) direct KEC to correct the construction deficiencies; (2) direct KEC to correct the remaining punch list items at both substations; and (3) withhold the final invoice payment until KEC corrects the construction deficiencies and punch list items, and, if not corrected, return the withheld funds to the U.S. Treasury or use the funds to complete the work with another contractor.

We provided a draft of this report to USAID for review and comment. USAID, in coordination Tetra Tech, provided written comments, which are reproduced in appendix II. USAID agreed with our recommendations. USAID stated that KEC corrected all but one deficiency and two punch list items. According to USAID, Tetra Tech has not yet verified that KEC has corrected all of the deficiencies and punch list items, but given favorable weather conditions, Tetra Tech plans to verify them by May 31, 2020. USAID also stated that it will deduct the amount of any uncorrected deficiencies from KEC's 5 percent defect liability invoice. SIGAR will keep the corresponding three recommendations open until KEC corrects all of the deficiencies and Tetra Tech verifies that KEC has made them, or until USAID imposes a financial penalty for any uncorrected deficiencies.

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SIGAR conducted this inspection under the authority of Public Law No. 110-181, as amended, and the Inspector General Act of 1978, as amended; and in accordance with the *Quality Standards for Inspection and Evaluation,* published by the Council of the Inspectors General on Integrity and Efficiency.

John F. Sopko
Special Inspector General
for Afghanistan Reconstruction

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ABBREVIATIONS

DABS	Da Afghanistan Breshna Sherkat
PTEC	Power Transmission Expansion and Connectivity
USAID	U.S. Agency for International Development

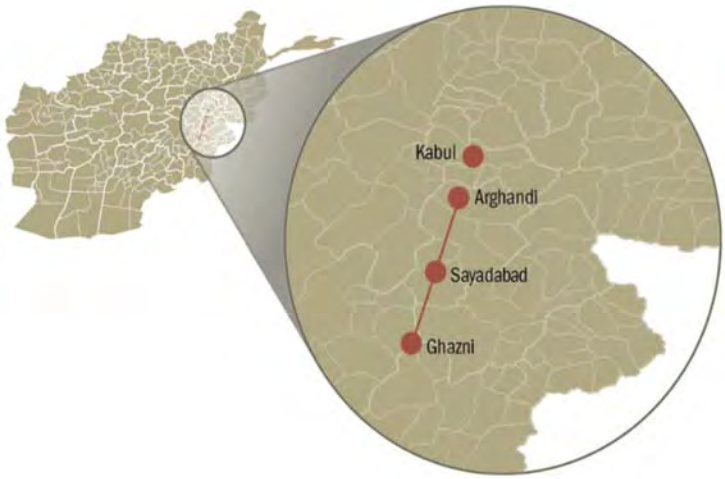
The U.S. Agency for International Development (USAID) initiated its $861.7 million Power Transmission Expansion and Connectivity (PTEC) project in 2011 as one of several donor-funded efforts designed to expand and improve Afghanistan's national power grid. On December 5, 2012, USAID issued an implementation letter to fund the project.[1] According to the letter, the 10-year project included up to $317 million in on-budget funding and is expected to be completed in December 2023.[2] Da Afghanistan Breshna Sherkat (DABS), the Afghan government's electrical utility company, is responsible for implementing PTEC in collaboration with the Afghan Ministry of Finance. PTEC's main objective is to connect the Kabul and Kandahar power grids by building new transmission lines and substations. USAID expects that the new infrastructure will transmit excess power southward from Kabul to meet the needs of Kandahar and other population centers along the way. According to USAID, PTEC is expected to supply power for 2.4 million Afghans.

PTEC consists of three components: energy infrastructure construction, DABS commercialization, and private-sector energy development. On March 26, 2014, as part of the energy infrastructure construction component, DABS awarded KEC International Limited (KEC), an Indian company, a $46.1 million design-build contract to construct electrical substations at Ghazni City in Ghazni province, and the Sayedabad district in Wardak province (see figure 1).[3] In addition, USAID provided DABS with $2 million as provisional funding to address any unforeseen challenges, security issues, and change orders, and to reconcile final unit quantities and procure equipment and supplies.

The project's scope of work required KEC to design, build, test, and commission the Ghazni and Sayedabad substations.[4] The Ghazni and Sayedabad substations were equipped with transformers to stepdown 220-kilovolt electricity to 20-kilovolt electricity.[5]

DABS and KEC modified the contract twice, which extended the project's original December 31, 2016, completion date to August 31, 2017. KEC completed the Ghazni and Sayedabad substations on August 31, 2017. According to the contract, the warranty covered either 18 months from the completion date or 1 year from the substations' date of

Figure 1 - Relative Location of Ghazni and Sayedabad Substations



Source: SIGAR analysis of contract documents.

[1] An implementation letter is formal correspondence between USAID and another party following an agreement that obligates funding. The implementation letter for this PTEC project, IL-22-1, was dated approximately 16 months after USAID initiated PTEC in August 2011. See SIGAR, *USACE's Local National Quality Assurance Program: USACE Used Qualified Personnel to Monitor Construction in Afghanistan and Is Taking Steps to Improve Contractor Reporting*, SIGAR 19-60-AR, September 12, 2019.

[2] SIGAR defines on-budget assistance as funding given directly into Afghanistan's national budget, provided the Afghan government uses that funding only for specific purposes

[3] The contract number is DABS/92/ICB/004-Lot-2.

[4] Substations are part of an electrical generation, transmission, and distribution system that transforms voltage from high to low, or low to high. Electricity suppliers design and build substations to manage electricity transmission by switching or routing it to different locations, and the power can flow through several substations at different voltage levels between the generating station and the consumer. Substations contain a multitude of equipment, such as primary and secondary power lines, disconnect switches, transformers, circuit breakers, ground wire and cables, lightning arresters, and control buildings.

[5] Higher voltage transmission lines send electric power over long distances, while lower voltage lines send electric power to end-users. To transition electric power from a higher voltage line to a lower voltage line or vice versa, the voltage must be "stepped down" or "stepped up," respectively, at a substation.

operational acceptance, whichever occurred first. The warranty started on September 16, 2017, which was also the commissioning date, and ended on March 10, 2019. USAID also contracted with Tetra Tech Inc. (Tetra Tech), a U.S. firm, to provide day-to-day project management, engineering support, and quality assurance services over the project on behalf of USAID.

The objectives of this inspection were to determine whether the PTEC electrical power substations at Ghazni and Sayedabad (1) were constructed in accordance with contract requirements and applicable construction standards, and (2) are being used and maintained.

We conducted our work in Kabul, and at the Ghazni and Sayedabad substations in Afghanistan from October 2017 through February 2020, in accordance with the *Quality Standards for Inspection and Evaluation*, published by the Council of the Inspectors General on Integrity and Efficiency. Our professional engineers conducted the engineering assessment in accordance with the National Society of Professional Engineers' *Code of Ethics for Engineers*. Appendix I contains a discussion of our scope and methodology.

THE GHAZNI AND SAYEDABAD SUBSTATIONS HAVE EIGHT CONSTRUCTION DEFICIENCIES THAT CREATE SAFETY HAZARDS, AND KEC HAS NOT CORRECTED ALL OF THE PUNCH LIST ITEMS

We visited the Ghazni and Sayedabad substations eight times from May through June 2018, and found eight construction deficiencies at both substations that create safety hazards.[6] Specifically, we found that the size and quality of the welds supporting gantry towers to be inadequate; the welds were not smooth, contained gaps and holes, were not the required thickness, and were painted silver to look like they met requirements. KEC also did not build metal enclosures for high-voltage electrical cables at either substation. For the six remaining deficiencies, KEC did not

1. install cable entry ports for the high-voltage electrical cables;
2. properly install and secure the foundation base plates for the steel structures supporting high-voltage equipment;
3. make adequate repairs to the deficiently designed gantry towers that support high-voltage electrical equipment;[7]
4. provide adequate protective enclosures for wiring running above or below ground;
5. use the same size cable when connecting to conductors, but instead used different size cables without authorization and spliced them with tape; and
6. install the electrical grounding system according to the contract requirements.

During our site visits, we also found that KEC did not correct 34 punch list items.[8]

On December 3, 2018, we met with USAID and Tetra Tech officials to provide details on the construction deficiencies and punch list items that we found during our site visits so KEC could address them before the warranty expired on March 10, 2019. USAID and Tetra Tech officials stated that KEC would correct the construction deficiencies and punch list items, and provide SIGAR with documentation on actions taken to correct the deficiencies.

[6] Our site visits occurred on May 27 and 28, June 1, and June 24-28, 2018.

[7] Per Zamil Towers & Galvanizing Co, a gantry guides "the power conductor from the last tower near the substation to the electrical equipment in the substation…structure consists of a number of columns and girders." (Zamil Steel, "Substation Structures," accessed December 17, 2019, https://zamilsteel.com/tng/en/substation-structures.)

[8] A punch list a list of unfinished items that the contractor is required to complete before receiving final payment under the contract.

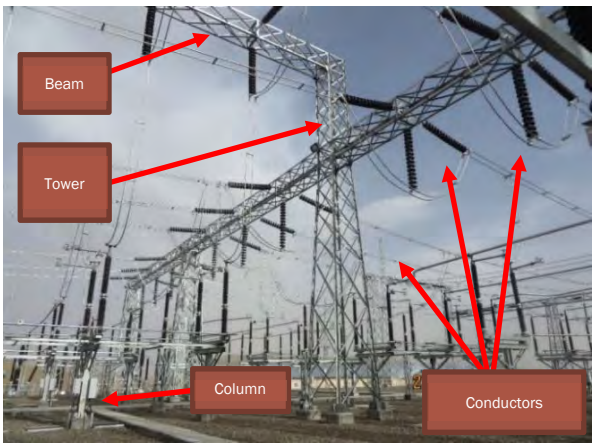
On July 26, 2019, we conducted follow-up site visits to both substations and found that KEC had not corrected the 8 construction deficiencies, and 17 of the 34 punch list items. For example, regarding the punch list items, we found that 90 percent of the circuits in the electrical panel boards had no labels in the control, switchgear, and converter rooms, and that the electric water heaters installed in the control buildings did not have the required safety plugs to connect them to wall receptacles. As a result, we question KEC's quality control and Tetra Tech's quality assurance and oversight due to the number of deficiencies and punch lists items not identified and still not corrected. USAID officials told us that due to security concerns in the area, they could not visit either substation during construction.

According to USAID officials, DABS withheld 5 percent from each invoice that KEC submitted at specified milestones until DABS received evidence that KEC corrected all defects identified on the invoice in accordance with contract requirements. The officials also told us that KEC had not received full payment because DABS was still reviewing the final $1,002,525.71 invoice.

KEC Did Not Repair or Replace Deficient Gantry Systems Supporting High-voltage Electrical Equipment

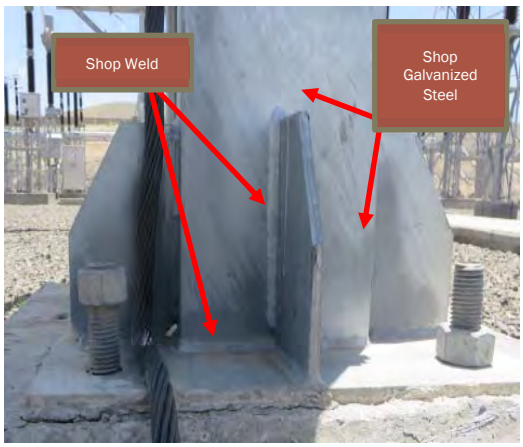
KEC designed and built the gantry systems at the Ghazni and Sayedabad substations. These systems are comprised of various types of foundations, steel columns, steel beams, and fasteners that support the 220-kv equipment at the substations (see photo 1). On November 16, 2016, the legs on one of the gantry towers at the Sayedabad substation failed. KEC conducted an analysis and identified a deficient design throughout the system that affected its structural integrity. KEC proposed a temporary repair that involved welding stiffener plates to the vertical steel beams that connect to the tower's base, which sits on a concrete foundation.[9] Tetra Tech accepted this solution, which was determined to be the easiest and most expeditious way to repair the unsafe gantry systems.

Photo 1 - Gantry Towers, Steel Beams, and Other Elements in the Sayedabad Substation



Source: SIGAR, June 27, 2018

Photo 2 - Proper Weld and Galvanization in the Sayedabad Substation



Source: SIGAR, June 24, 2018

During a June 2018 site visit, we found that while KEC made on-site repairs to the gantrys' steel structures using stiffener plates, the size and quality of the welds used to attach the stiffener plates to the vertical steel towers were inadequate. Photo 2 shows a structural beam at the Sayedabad substation where the steel column and stiffener plate are properly welded to the base plate, which was done in the fabrication shop. The weld is a continuous, smooth line without any gaps or holes, and has the proper amount of galvanization on the steel structure to help prevent corrosion.

[9] Stiffener plates help distribute the forces in the connection zone to prevent the structure from buckling or being crushed.

The contract required all steel structures to be hot-dipped galvanized in the fabrication shop.[10] Photos 3 and 4 show a gantry tower at the Ghazni substation that KEC repaired by adding stiffener plates to the tower base and welding them together. However, we found that the weld was not smooth, contained gaps and holes, was not the required thickness, and was painted silver to look like it was hot-dipped galvanized. We found that the weld size was 3 millimeters thick, 3 millimeters less than the 6 millimeters required in the contract. KEC's poor workmanship in repairing multiple defective gantry towers raises concerns about whether the design deficiency that caused the previous failure was actually corrected. If a tower holding high-voltage electrical equipment collapses, it could damage the substation, electrocute or crush workers, and disrupt the electricity delivered to Afghan citizens and businesses. At the time of our July 2019 follow-up site visit, KEC, Tetra Tech, and DABS had not agreed on a permanent solution to correct the structural deficiencies.

Photo 3 - Gantry Tower Stiffener Plates with Poor Quality Welds and Silver Color Paint

Source: SIGAR, May 28, 2018

Photo 4 - Different Weld Types and Sizes with Varying Stiffener Plate Thicknesses

Source: SIGAR, July 26, 2019

KEC Did Not Install the Required Galvanized Iron Sheet Enclosures with a Water-tight Seal at Either Substation

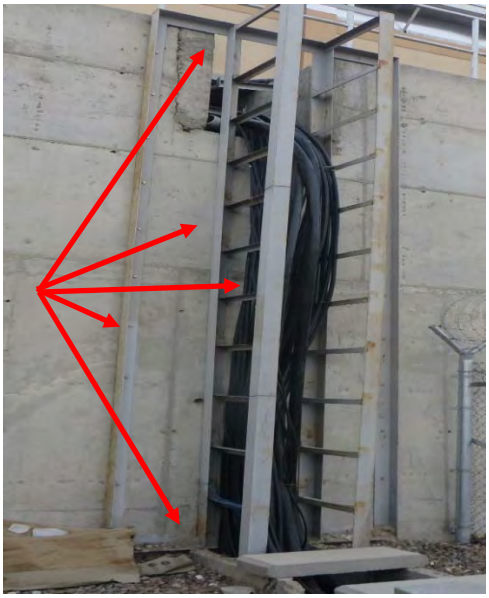
The contract required KEC to install a 16-gauge, galvanized iron sheet metal enclosure with a watertight seal along concrete retaining walls to protect high-voltage electrical cables at the Ghazni and Sayedabad substations.[11] During our June 2018 site visits, we found that KEC did not install the required enclosures with a water-tight seal to shelter cables at either substation. For example, photo 5 shows the exposed cables along the retaining wall for the Ghazni substation's auxiliary transformer that supports the backup generator connection to the substation's switchgear. The red arrows in the photo illustrate where KEC should have installed the enclosure. In December 2018, USAID told us that KEC would correct this deficiency. However, during our July

[10] Per the American Galvanizers Association, "hot-dip galvanizing is the process of coating fabricated steel by immersing it in a bath of molten zinc. There are three fundamental steps in the hot-dip galvanizing process: surface preparation, galvanizing, and inspection." (American Galvanizers Association, "What is Hot-Dip Galvanizing?," *Galvanize It*! AGA Online Seminar, accessed December 9, 2019, http://galvanizeit.org/hot-dip-dalvanized-steel-for-parking-structures/hot-dip-galvanizing.)

[11] Sheet metal thickness is denoted by gauge, which indicates a standard thickness before processing. As the gauge increases, the material's thickness decreases. A galvanized iron sheet is coated with a thin layer of zinc for corrosion resistance.

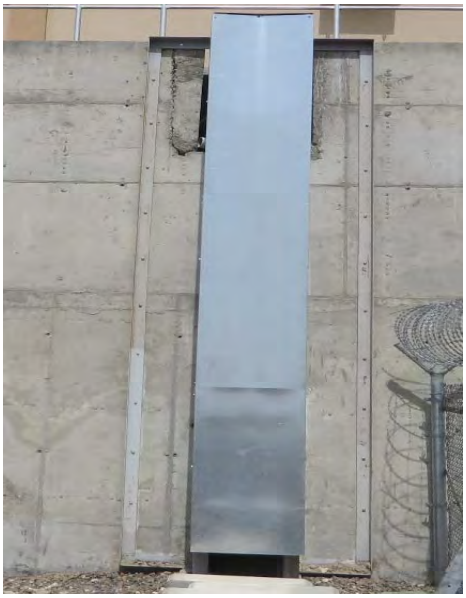
2019 site visit, we found that KEC installed a partial sheet metal enclosure in only one of three locations at the Ghazni substation (see photo 6) and did not install any of the required enclosures at the Sayedabad substation.

Photo 5 - High-Voltage Cable at the Ghazni Substation Without the Galvanized Sheet Metal Enclosure and Water-Tight Seal



Source: SIGAR, June 25, 2018

Photo 6 - Partial Galvanized Sheet Metal Enclosure Installed at the Ghazni Substation



Source: SIGAR, July 26, 2019

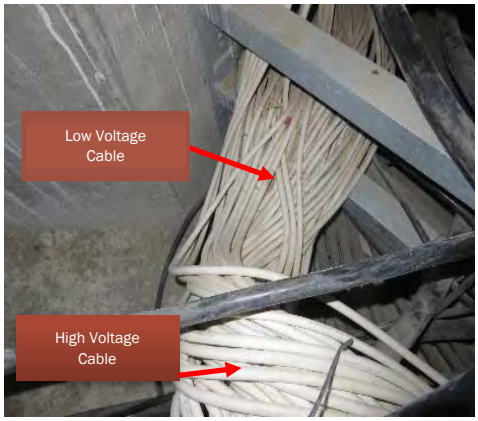
Exposing high-voltage electrical cables to weather conditions will cause the outer insulation material that covers the cables to deteriorate. In addition, without a complete enclosure with a waterproof seal, water will enter the subsurface channel, causing high-voltage cables to run through wet or moist conditions. As a result, the cables could fail, causing short circuits and creating a safety hazard for workers.

KEC Did Not Install the Substations' Cables as the Contract Required

The Ghazni and Sayedabad substations are filled with high- and low-voltage cables that are connected to switch and control gear, and other equipment. The contract's technical specifications required KEC to install identification tags on all of the cables based on a system established in an external connection diagram. However, during our June 2018 and July 2019 site visits, we found that KEC did not install identification tags for any of the substations' cables (see photo 7). The absence of identification tags makes it difficult for operation and maintenance staff to identify cables when repairs or system testing are required, resulting in a safety hazard for those workers.

During our site visits, we also found high-voltage and high-current electrical cables mixed with data cables (see photo 8). The project technical specifications required that different cables must be separated, with each type laid on a separate cable rack. KEC did not install the different cables on separate cable racks as

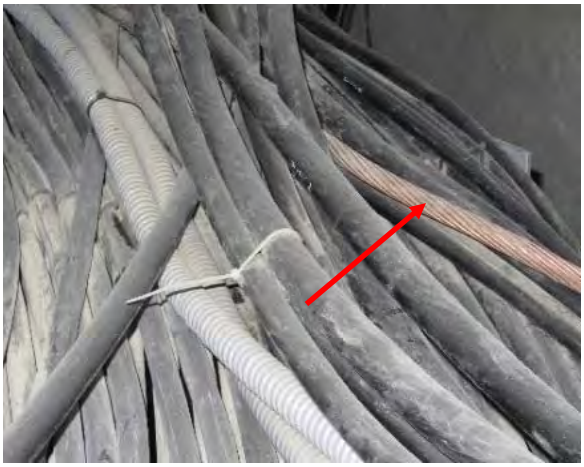
Photo 7 - High- and Low-Voltage Cables Installed Together Without Labels



Source: SIGAR, June 25, 2018

required. High-voltage cables generate an electromagnetic field and should not be located next to unprotected data cables because doing so can interfere with the data signals being transmitted. Further, we found that KEC placed bare copper cables on top of high-voltage cables without grounding the copper cables to the metal brackets, and it did not connect the end of bare copper cables to a grounding rod as required by the contract (see photo 9).

Photo 8 - Unlabeled High- and Low-voltage Cables Mixed with Grounding Cables



Source: SIGAR, June 25, 2018

Photo 9 - Bare Copper Grounding Cable Not Connected to a Grounding Rod

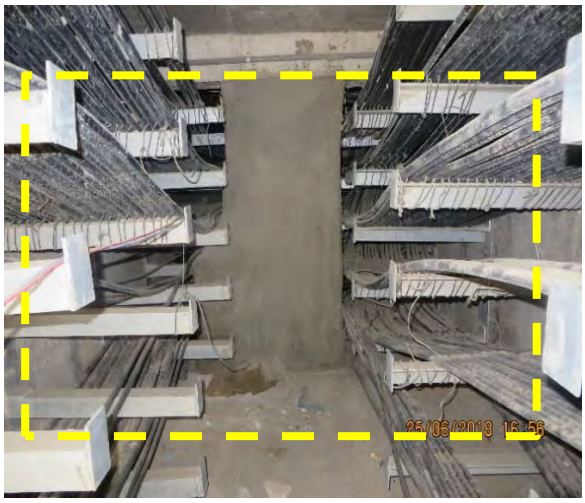
Source: SIGAR, July 25, 2019

KEC Did Not Install Required Entry Ports for High-voltage Electrical Cables at Either Substation

The contract's technical specifications and design drawings required KEC to install 6-inch, high-density polyethylene cable ports for all high-voltage electrical cables and seal the ports with watertight foam. The cable ports allow a limited number of cables to pass through, making it easier and safer to manage, repair, and handle the cables. However, during our 2018 site visits, we found that KEC did not install the required 6-inch diameter cable ports at either substation. Instead, KEC constructed rectangular shelves to hold the cables, with no cable ports or sealant material (see photo 10).

The absence of the required 6 inch diameter ports and watertight seals allows moisture to enter the cable trench containing high-voltage and signal cables. As a result, these high-voltage cables could fail, causing short circuits and creating a safety hazard for substation workers. In December 2018, USAID told us that KEC would correct this deficiency. During our July 2019 follow-up site visit, we found that KEC installed pieces of sheet metal to cover the shelve openings and filled the remaining gaps with expandable foam in an attempt to address the deficiency (see photo 11). However, sheet metal and expandable foam are used for thermal insulation, not for making the watertight seals that the contract required.

Photo 10 - Cables without Ports or Watertight Seals Passing Along Open Rectangular Shelves



Source: SIGAR, June 25, 2018

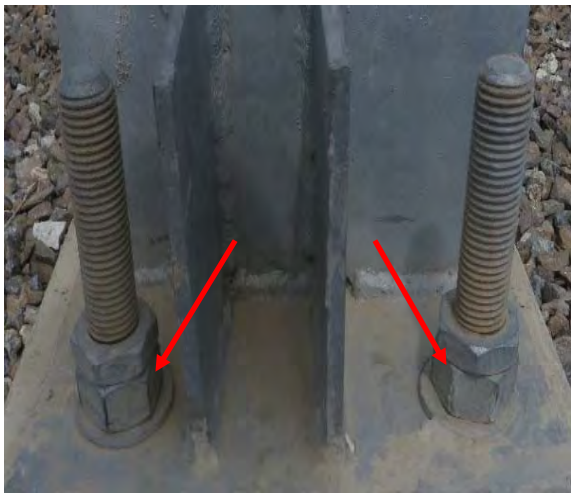
Photo 11 - Sheet Metal Covering Openings and Filled with Expandable Foam

Source: SIGAR, July 26, 2019

KEC Did Not Properly Install and Secure the Washers, Nuts, and Lock Nuts on Some Foundation Base Plates Used to Support Steel Structures

During our June 2018 site visits, we found that KEC had not properly installed and secured some foundation base plates for the steel structures supporting the high-voltage electrical equipment and conductors held up by steel gantry towers at the Ghazni and Sayedabad substations. The contract design drawings required KEC to secure the foundation base plates that support steel structures using standard plain washers, standard hexagonal nuts, and standard hexagonal lock nuts. Photo 12 shows a base plate that KEC properly installed at the Ghazni substation. However, we found that KEC did not properly install all of the required washers, nuts, and lock nuts on other base plates for the gantry tower columns at either substation (see photo 13).

Photo 12 - Red Arrows Show Correctly Installed Washers, Nuts, and Lock Nuts in the Sayedabad Substation



Source: SIGAR, July 26, 2019

Photo 13 - Red Arrows Show Missing and Incorrectly Installed Washers, Nuts, and Lock Nuts in the Sayedabad Substation

Source: SIGAR, July 26, 2019

Steel columns supporting high-voltage equipment and gantry towers supporting high-voltage conductors are at risk of failure when washers and nuts are missing or improperly fastened. A failure in the substations' switchyards could damage electrical equipment, cause power outages for Afghan citizens and businesses, and create a safety hazard for anyone near a tower at the time of the failure. In December 2018, Tetra Tech stated KEC would install the required washers, nuts, and lock nuts with proper tightness to the gantry foundations, base plates, and trestle of columns at both substations. However, USAID has not provided any evidence showing KEC made the repairs, and during our July 2019 follow-up site visit, we found that some washers and lock nuts were still missing or not properly installed.

KEC Did Not Obtain Authorization to Connect Different Size Electrical Cables throughout the Substations

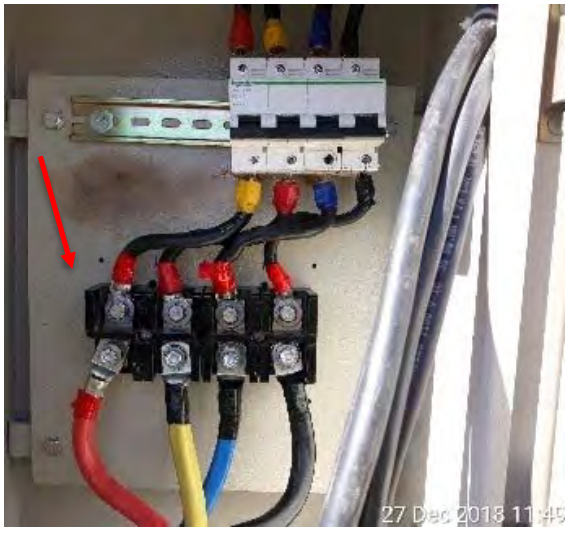
The contract's technical specifications required KEC to install electrical cables throughout the substations that are the same size from end to end. If KEC found that it needed to join different size cables, the contract required it to obtain prior approval from USAID. During our June 2018 site visits, we found different size cables connected and wrapped in tape at both substations. For example, we found 240 square millimeter cables joined with 95 square millimeter cables connected to the transformer's oil filtration control panel at both substations. Photo 14 shows that the red, yellow, blue, and black cables do not extend into the circuit breaker box, but instead were joined together with smaller black cables and covered with electrical tape. We also found that the black spliced cable was burnt at its connection to the circuit breaker box, likely due to the higher value current not being able to pass through the smaller sized spliced cable at the termination point in the box.

Although we requested it, USAID has not provided us with documentation or contract modifications that allowed KEC to join different size cables. Splicing different size cables together prevents higher voltage current from passing through, which could cause wires to burn, creating a fire or short circuit—as occurred with the black cable at Sayedabad substation—and a safety hazard for substation workers. In addition, KEC covered the spliced cables with electrical tape in violation of the National Electrical Code.

Photo 14 - Burnt Wire from Using Different Size Spliced Wires Covered with Electrical

Source: SIGAR, June 1, 2018

Photo 15 - Different Wire Sizes Incorrectly Connected by Bus-Bar and Terminal Blocks



Source: Tetra Tech, December 27, 2018

During our follow-up site visit in July 2019, we found that KEC had installed a bus-bar and terminal block to replace the electrical tape used to join the different size cables.[12] Although KEC changed the connection method, it does not remedy the original issue of splicing different sized cables with different current ratings (see photo 15). USAID told us that the cable size issue has been corrected at Sayedabad substation and that it would be corrected at the Ghazni substation by September 30, 2019. However, as of the date of this report, USAID has not provided us with documentation or photos showing that this deficiency has been corrected.

KEC Did Not Install Mechanical Protection for Conduit Used to Hold Electrical Cables

Photo 16 - Broken Conduit Carrying Electrical Cables at Ghazni Substation

Source: SIGAR, June 28, 2018

The contract's technical specifications required special mechanical protection for the electrical cables placed in conduit at both substations, specifically, something rigid that would not break and would not be separated due to fluctuations in ambient temperature. During our 2018 site visits, we found that KEC installed conduit to protect electrical cables running from the guard tower to the boundary wall. However, the conduit at both substations was broken, and as a result, the cables were exposed to weather conditions (see photo 16 for broken conduit at Ghazni substation). Because these cables were above ground, KEC should have used something rigid, like steel piping or conduit encased in concrete, to protect the cables from the weather and direct impact, such as someone stepping on them. Damaged cables exposed to hot, cold, or wet conditions can lead to a short circuit, electrocution, or failure of substation equipment.

In addition to the damaged conduit, during our follow-up site visit, we found cables extending below ground without any conduit. The switchyard connected to the back-up generator panel board is an example (see photo 17), but not an isolated incident, as we found cables extending underground without conduit at multiple locations in both substations. Cables without conduit are exposed to hot, cold, and wet conditions, and can lead to a short circuit, electrocution, or failure of substation equipment. Tetra Tech did not identify any of these deficiencies in its daily quality assurance reporting.

Photo 17 - Cables Extending Underground without Conduit Protection

Source: SIGAR, July 26, 2019

[12] A bus-bar allows electrical connections to be gathered together for the even distribution of energy.

KEC Did Not Install All Required Grounding Systems in the Substations, and Some Installed Systems Did Not Adhere to the Design Drawings

The contract's technical specifications and design drawings required KEC to construct 20 grounding pits at the Ghazni substation and 22 grounding pits at the Sayedabad substations. Grounding pits are used to protect against unwanted and unexpected electrical currents, such as a lightning strike. During our June 2018 site visits, we found that KEC did not construct all of the grounding pits, and some that it did construct did not adhere to the approved design drawings. At the Sayedabad substation, we found that KEC constructed 19 of the 22 required grounding pits, but 6 of the 19 pits contained loose or non-compliant connections between the grounding cable and grounding bar (see photo 18). At the Ghazni substation, we found that KEC constructed 15 of the 20 required grounding pits, and 5 had grounding cables that were not connected to the grounding bars. In addition, we found that 5 of the constructed grounding pits did not have the required covers, and 2 of the pit boxes had broken concrete walls.

In total, 11 total grounding cables at the two substations were not properly connected to the grounding bars. This could result in equipment malfunction or failure at the substations if a lightning strike or leakage of high-voltage electricity occurs. Further, during our July 2019 follow-up site visit, we found that all 34 grounding pits that were constructed contained corroded metal components (see photo 19). These non-compliant and corroding connections also create a safety hazard for substation workers. In December 2018, Tetra Tech told us that KEC would repair the grounding pits at both substations. However, during our July 2019 follow-up site visit, we found that KEC had not made any repairs to the grounding pits. As of the date of this report, neither USAID nor Tetra Tech has provided us with documentation showing that KEC made the repairs.

Photo 18 - Improperly Connected Grounding System

Source: SIGAR, June 1, 2018

Photo 19 - Corroded Grounding System Connections

Source: SIGAR, July 25, 2019

KEC Did Not Correct All of the Construction Punch List Items

In December 2018, we provided USAID and Tetra Tech with a list of 34 punch list items that we determined KEC had not corrected at the Ghazni and Sayedabad substations. USAID told us in February 2019 that KEC would address these items before the warranty expired. However, during our July 2019 follow-up site visit, we found that KEC had still not corrected 17 of the 34 punch list items at the substations. After that visit, USAID gave us documentation showing that KEC corrected 6 additional punch list items at the substations. Table 1 lists the 11 remaining punch list items that KEC has not corrected as of the date of this report.

Description	Ghazni Substation	Sayedabad Substation
Excavated area near the control building's storage area has not been filled in with gravel.		X
Five grounding pits are not covered, and two are broken.		X
Chimney hole for the wood stove in the southwest guard tower is not placed correctly.		X
Telephones are not working.	X	X
Concrete storm water channels do not have precast segmental covers.*		X
Circuits in panel boards are not labeled.	X	
Cables for high-density polyethylene pipes are not installed.	X	
Bus post insulators' supporting structure is damaged and not aligned.	X	
Power transformers are leaking oil.	X	
Water heaters are missing the required safety plugs.	X	
Total Uncorrected Items	**6**	**5**

Source: SIGAR site visits and analysis of contract documents.

* Note: Precast segmental covers are small pre-made concrete slab normally placed on top of an open trench to secure trenches and allow easy access, as needed.

THE GHAZNI AND SAYEDABAD SUBSTATIONS ARE BEING USED AND MAINTAINED

During our June 2018 and July 2019 site visits, we found that the Ghazni and Sayedabad substations were operating, and were informed that they operate 24-hours a day, 7-days a week. DABS is responsible for operating and maintaining both substations. Each substation employs a full-time staff of 16 individuals, including a substation manager and maintenance officer. We also found that DABS was maintaining the substations. However, deficiencies we identified, such as a lack of wiring labels, make maintenance more challenging and potentially dangerous.

CONCLUSION

Although KEC completed the Ghazni and Sayedabad substations, eight construction deficiencies exist at both substations that pose safety hazards and could result in the disruption of power transmission. Most significantly, KEC's repairs to its deficiently designed gantry system, part of which failed, exhibited poor workmanship and could result in the system collapsing. In addition, KEC made temporary repairs; no permanent solution has been installed, which further jeopardizes the system. The gantry system's collapse would be catastrophic, damaging the substation and the high-voltage electrical equipment that it holds, disrupting electricity transmission, and causing injures or worse to workers in the area.

The seven remaining construction deficiencies, including KEC's failure to install galvanized iron sheet metal enclosures with watertight seals for high-voltage electrical cables, and not properly installing and securing the washers, nuts, and lock washers for some of the substations' foundation base plates, could lead to similar consequences if they are not corrected. Further, KEC did not correct 11 punch list items, some of which involve

safety hazards, such unlabeled panel board circuits, power transformers leaking oil, and water heaters without safety plugs.

During the warranty period, we advised USAID and Tetra Tech that these construction deficiencies and punch items existed, but KEC has not corrected them. DABS has not yet fully paid KEC for the contract because the final invoice for $1,002,525.71 is still under review. As a result, DABS still has some leverage to force KEC to repair the deficiencies and punch list items caused by poor workmanship.

RECOMMENDATIONS

To protect U.S. investment in the Ghazni and Sayedabad substations, and provide a safe work environment, we recommend that the USAID Mission Director for Afghanistan, in coordination with Tetra Tech, work with DABS and the Afghan Ministry of Finance to direct KEC to take the following actions, and report the results back to SIGAR within 60 days:

1. Correct the eight construction deficiencies at both substations by
    a. installing metal enclosures for the high-voltage electrical cables;
    b. installing identification tags on all electrical cables;
    c. installing cable entry ports for all electrical cables;
    d. properly installing and securing foundation base plates for the steel structures supporting high-voltage equipment;
    e. replacing all the deficiently designed and failing gantry towers that support high-voltage electrical equipment;
    f. installing protective enclosures for wiring running above or below ground;
    g. installing the same size cable when connecting to conductors; and
    h. installing the electrical grounding system according to the contract requirements.
2. Correct the remaining six punch list items at the Ghazni substation and five at the Sayedabad substation by
    a. filling in the excavated area near the control buildings' storage area;
    b. adding covers to the five grounding pits without them, and repairing the two broken grounding pits;
    c. correctly placing the chimney hole for the wood stove in the southwest guard tower;
    d. adding covers to the concrete storm water channels;
    e. making the telephones operational;
    f. labeling the circuits in panel board;
    g. installing cables for the high-density polyethylene pipes;
    h. repairing and aligning the bus post insulators' supporting structure;
    i. repairing the power transformers that are leaking oil; and
    j. adding safety plugs to the water heaters.

To ensure that KEC is not overpaid for work not completed, we recommend that the USAID Mission Director for Afghanistan work with DABS and the Ministry of Finance to:

3. **Withhold the final invoice payment until KEC corrects the construction deficiencies and punch list items, and, if not corrected, return the withheld funds to the U.S. Treasury or use the funds to complete the work with another contractor.**

AGENCY COMMENTS

We provided a draft of this report to USAID for review and comment. USAID, in coordination with Tetra Tech, provided written comments, which are reproduced in appendix II. USAID agreed with our recommendations. USAID stated that KEC corrected all but one deficiency and two punch list items. According to USAID, Tetra Tech has not yet verified that KEC has corrected all of the deficiencies and punch list items, but given favorable weather conditions, Tetra Tech plans to verify them by May 31, 2020.

In its comments, USAID stated that KEC has corrected seven of the eight construction deficiencies we identified in recommendation 1. According to USAID, the uncorrected deficiency involves the improperly running HVAC system at the Ghazni substation. USAID stated that Tetra Tech has only fully verified two of KEC's corrective actions.

USAID also stated that KEC has corrected 8 of the 10 punch list items we identified in recommendation 2. According to USAID, the uncorrected punch list items involve non-operational telephones in each substation's guard tower, and unlabeled cables on the improperly running HVAC system at Ghazni substation. USAID stated that Tetra Tech has only verified one of KEC's corrective actions.

USAID agreed with recommendation 3 and stated that KEC will correct all of the deficiencies and punch list items before the warranty inspection, and Tetra Tech will verify that the corrections had been made and advise USAID accordingly. USAID also stated that it will deduct the amount of any uncorrected deficiencies and punch list items from KEC's 5 percent defect liability invoice.

In its comments, USAID also requested that we revise the body of the report to indicate which deficiencies and punch list items KEC has reportedly corrected, or remove them from the report all together. Although we commend USAID for the actions it took to correct the deficiencies and punch list items we identified and hold the contractor accountable before the warranty expires, we do not think the revisions USAID requested are appropriate. The deficiencies existed at the time of our inspection, and the corrective actions are a result of our recommendations. We will close the recommendations once USAID provides information demonstrating that KEC corrected the deficiencies and punch list items and Tetra Tech verified them, or that USAID imposed a financial penalty for any uncorrected deficiencies or items.

APPENDIX I - SCOPE AND METHODOLOGY

This report provides the results of SIGAR's inspection of the Power Transmission Expansion and Connectivity (PTEC) project's electrical power substations at Ghazni City in Ghazni province and the Sayedabad district in Wardak province. The objectives of this inspection were to determine whether the substations (1) were constructed in accordance with contract requirements and applicable construction standards, and (2) are being used and maintained. Specifically, we

- reviewed contract documents, design submittals, and other relevant project documentation;
- interviewed U.S. and Afghan government officials concerning the substations' construction, use, and maintenance; and
- conducted site visits to the Ghazni and Sayedabad substations on May 27 and 28, June 1, and June 24–28, 2018, and a follow-up site visit on July 26, 2019.

We did not rely on computer-processed data in conducting this inspection. However, we considered the impact of compliance with laws and fraud risk.

In December 2014, SIGAR entered into a cooperative agreement with Afghan civil society partners. Under this agreement, our Afghan partners conduct specific inspections, evaluations, and other analyses. In this regard, Afghan engineers inspected the Ghazni and Sayedabad substations during site visits from May 27, 2018, through June 26, 2018, and a follow-up site visit on July 26, 2019. We developed a standardized engineering evaluation checklist covering items required by the contract and design and specification documents. The checklist required our partners to analyze the contract documents, scope of work, technical specifications, and design drawings.

We compared the information our Afghan civil society partners provided to accepted engineering practices, relevant standards, regulations, laws, and codes for quality and accuracy. In addition, as part of our monitoring and quality control process, we

- met with the Afghan engineers to ensure that the approach and planning for the inspection were consistent with the objectives of our inspection and the terms of our cooperative agreement;
- attended periodic meetings with our partners and conducted our normal entrance and exit conferences with agency officials;
- discussed significant inspection issues with our partners;
- referred any potential fraud or illegal acts to SIGAR's Investigations Directorate, as appropriate;
- monitored our partners' progress in meeting milestones and revised contract delivery dates as needed; and
- conducted oversight of our partners in accordance with SIGAR's policies and procedures to ensure that their work resulted in impartial, credible, and reliable information.

We conducted our inspection work in Kabul and at the Ghazni and Sayedabad substations in Afghanistan from October 2017 through February 2020. This work was conducted in accordance with the *Quality Standards for Inspection and Evaluation*, published by the Council of the Inspectors General on Integrity and Efficiency. Our professional engineers conducted the engineering assessment in accordance with the National Society of Professional Engineers' *Code of Ethics for Engineers*. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our inspection objectives. We conducted this inspection under the authority of Public Law No. 110-181, as amended, and the Inspector General Act of 1978, as amended.

USAID | AFGHANISTAN
FROM THE AMERICAN PEOPLE

MEMORANDUM January 23, 2020

TO: John F. Sopko Special Inspector General for Afghanistan Reconstruction (SIGAR)

FROM: Peter Natiello, Mission Director

SUBJECT: Mission Response to Draft SIGAR Inspection titled: "USAID's Power Transmission Expansion and Connectivity Project in Afghanistan: The Ghazni and Sayedabad Substations are Complete, but Construction Deficiencies Create Safety Hazards and Could Disrupt Electrical Power" (SIGAR 20-XX/I-051)

REF: SIGAR Transmittal email dated December 23, 2019

USAID thanks SIGAR for the opportunity to comment on the draft report titled, "USAID's Power Transmission Expansion and Connectivity Project in Afghanistan: The Ghazni and Sayedabad Substations are Complete, but Construction Deficiencies Create Safety Hazards and Could Disrupt Electrical Power" (SIGAR 20-XX/I-051)

The Ghazni and Sayedabad substations are complete and operational 24 hours a day, seven days a week; and are being maintained by the Da Afghanistan Breshna Sherkat (DABS).

USAID's third party construction management agent, Tetra Tech ESP (Tt ESP) notified the contractor of all the construction deficiencies and punch list items, and the contractor agreed to correct all of them. As detailed in the January 14, 2020 Tt ESP's letter 55 (see Attachment 1) to USAID and its accompanying Appendices B, C, and D, the contractor has corrected all except one deficiency and two punch list items that the contractor is still working on. While Tt ESP has verified the corrections for some deficiencies and punch list

U.S. Agency for International Development
Great Massoud Road
Kabul, Afghanistan

Tel: 202-216-6288 / 0700-108-001
Email: kabulusaidinformation@usaid.gov
http://afghanistan.usaid.gov

items, some are pending their verification. Once the weather becomes suitable for the warranty inspection, Tt ESP will verify and close the remaining deficiencies and punch list items. USAID will deduct the equivalent amount for any open deficiencies and punch list items identified from the warranty inspection from the contractor's five percent defect liability invoice.

USAID provides its response to the three recommendations.

SIGAR Recommendation 1:

Correct the construction deficiencies at both substations by

a. providing metal enclosures for the high-voltage electrical cables
b. installing identification tags on all electrical cables;
c. installing cable entry ports for all electrical cables;
d. properly installing and securing foundation base plates for the steel structures supporting high-voltage equipment;
e. replacing all deficiently designed and failing gantry towers that support high-voltage electrical equipment;
f. providing protective enclosures for wiring running above or below ground;
g. installing the same size cable when connecting to conductors; and
h. installing the electrical grounding system according to the contract requirements.

USAID Response: USAID concurs with the recommendation.

Actions Taken/Planned:

Deficiency item a: At the Ghazni substation, the structures are covered by a Galvanized Iron (GI) sheet (see Appendix B, Ghazni substation, line item 11 of the Tt ESP letter 55). At the Sayedabad substation, the contractor corrected the deficiency but it is pending Tt ESP verification (see Appendix C, Sayedabad substation, line item 9).

USAID requests SIGAR to remove the deficiency at the Ghazni substation and state that "the contractor has corrected the deficiency but it is pending Tt ESP verification at the Sayedabad substation."

Deficiency item b: The contractor has corrected the deficiency. The contractor also discovered that the HVAC system's cables were improperly tagged (see Appendix B, Ghazni substation, line item 4, and Appendix C, Ghazni substation line item 4 and 14 of Tt ESP letter 55). The HVAC system's corrected cables will be verified by Tt ESP.

USAID requests SIGAR to restrict the deficiency to the HVAC system noting that while the contractor has corrected the deficiency, it is pending Tt ESP verification.

Deficiency item c: The contractor installed cable entry ports for all electrical cables but the corrections are pending Tt ESP verification (see Appendix C, Ghazni substation, line item 7 of Tt ESP letter 55).

USAID requests SIGAR to state that "the deficiency has been corrected but the item is pending Tt ESP verification."

Deficiency item d: The contractor corrected the missing nuts and bolts and installed them properly as per the approved drawings and it was verified by Tt ESP (see Appendices B and C, Sayedabad substation Item 8 of the Tt ESP letter 55). The gantry foundation base plates welded portions were cleaned by wire brush and painted with anti-rust paints, but have not been verified by Tt ESP (see Appendix C, Sayedabad substation line item 7 of Tt ESP letter 55).

USAID requests SIGAR to state that the deficiency has been corrected but item number 7 is pending Tt ESP verification.

Deficiency item e: There are no failing gantry towers at the Sayedabad or Ghazni substations. The deficiency was corrected based on the re-analysis and modification of the towers. The modification included installing additional braces and changing some of the gantry structures' legs from a single to a star type angle brace for improved performance. The gantry foundations were also modified and strengthened by casting an additional 40 centimeters of reinforced concrete which formed a jacket around the existing foundation. The modifications were approved by Tt ESP and DABS. Regarding the extra holes in the gantry members, the contractor is working to provide a design analysis to ensure the gantry structures are safe and meet the minimum required specification. The contractor has mitigated the problem of the extra holes by filling the holes with nuts and bolts.

USAID requests SIGAR to remove this deficiency from the deficiency list.

Deficiency item f: Protective enclosures for cabling, which run above the ground, were provided according to the contract requirement and approved drawings. For Ghazni substation, the structures are covered by a GI sheet (see Appendix B, Ghazni substation, line item 3, and 11 of Tt ESP letter 55).

For the Sayedabad substation, the contractor has corrected the deficiency by installing GI sheets for the cable trench to protect the cables from sunlight but this corrective action is pending Tt ESP verification (see Appendix C, Sayedabad substation, line item 9 of Tt ESP letter 55).

USAID requests SIGAR to remove the deficiency with respect to Ghazni substation and to state that the deficiency at the Sayedabad substation has been corrected but is pending Tt ESP verification.

Deficiency item g: The contractor has corrected the deficiency at the Sayedabad substation and the same has been verified by Tt ESP (see Appendix B, Sayedabad substation, line item 9 of Tt ESP letter 55).

As per Appendix C, Ghazni substation, line item 11 and 13 of Tt ESP letter 55, the contractor installed cables according to the approved drawings and the cables are connected using busbar arrangements as per standard procedure.

USAID requests SIGAR to remove the deficiency with respect to Sayedabad substation and to state that the deficiency at the Ghazni substation has been corrected but is pending Tt ESP verification.

Deficiency item h: For the pits, ground, and connection hand-hole access pits that were constructed per site requirements, the design changes were reflected in the as-built drawings and approved by Tt ESP and DABS. Further, site tests of the grounding systems at both substations provided satisfactory results. The contractor has corrected the deficiency item 3 which has also been verified by Tt ESP (see Appendix B, Sayedabad substation, line item 3). The contractor has also corrected line items 10 and 11 but the same have not been verified by Tt ESP (see Appendix C, Sayedabad substation, line items 10 and 11).

USAID requests SIGAR to remove the deficiency item 3 of Appendix B and state that the contractor has corrected deficiency items 10 and 11 of Appendix C but the items are pending Tt ESP verification.

The target closure date for Recommendation 1 is May 31, 2020. It is anticipated that the weather will be suitable to complete the final inspection.

SIGAR Recommendation 2:

Correct the remaining six punch list items at the Ghazni substation and five items at the Sayedabad substation by

a. *filling in the excavated area near the control buildings' storage area;*
b. *adding covers for the five grounding pits without them and repairing the two broken grounding pits;*
c. *correctly placing the chimney hole for the southwest guard tower's wood stove;*
d. *adding covers to the concrete storm water channels;*
e. *making the telephones operational;*
f. *labeling panel board circuits;*
g. *installing cables for the high-density polyethylene pipes;*
h. *repairing and aligning the bus post insulators' supporting structure;*
i. *repairing the power transformers that are leaking oil; and*
j. *adding safety plugs to the water heaters.*

USAID Response: USAID concurs with the recommendation.

Actions Taken/Planned:
Punch list item a: A manhole was constructed in the deep excavated area close to the control building's storage area and the contractor backfilled the deep excavated location (see Appendix C, Sayedabad substation line item 2 of Tt ESP letter 55).

USAID requests SIGAR to state that "the contractor corrected this punch list item. This punch list item will be verified by Tt ESP when the weather is suitable for inspection."

Punch list item b: For the ground and connection hand-hole access pits that were constructed per site requirements, the design changes were reflected in the as-built drawings and approved by Tt ESP and DABS. Site tests of the grounding systems at both substations provided satisfactory results. Tt ESP has verified punch list item 3 (see Appendix B, Sayedabad substation, line item 3 of Tt ESP letter 55). Line items 10 and 11 have been corrected by the contractor but are pending Tt ESP verification (see Appendix C, Sayedabad substation, line items 10 and 11 of Tt ESP letter 55).

USAID requests SIGAR to remove deficiency item 3 of Appendix B and state that the contractor has corrected deficiency items 10 and 11 of Appendix C but these line items are pending Tt ESP verification.

Punch list item c: The guard tower chimney holes are installed properly, and DABS installed a wooden stove in the guard tower.

USAID requests SIGAR to state that "the contractor has corrected punch list item c but the item is pending Tt ESP verification" (see Appendix C, Sayedabad substation line item 4 of Tt ESP letter 55).

Punch list item d: Tt ESP verified that concrete covers for the stormwater channel were added by the contractor according to the approved drawings (DTS 632 Rev B). The front side of the building drain was covered with precast cover slabs (see Appendix B, Ghazni substation line item 2 of Tt ESP letter 55). The contractor installed covers at the Sayedabad substation as per the approved drawings but Tt ESP has not verified the corrections (see Appendix C, Sayedabad substation line item 6 of Tt ESP letter 55).

USAID requests SIGAR to remove punch list item d for Ghazni substation and state that the contractor has corrected the punch list item at Sayedabad substation. The item is pending Tt ESP verification.

Punch list item e: Tt ESP verified that all intercom telephones were operational except at guard towers 1, 2, and 3 at Sayedabad substation (see Appendix B, Sayedabad, line item 5 of Tt ESP letter 55). At the Ghazni substation, all intercom telephones were operational except guard towers 1 and 3, and some damage that was observed along the CAT6 cables (see Appendix B, Ghazni substation, line item 1 of Tt ESP letter 55).

As per Appendix C, Ghazni substation, item 1 and Sayedabad substation item 5, all telephones are operational at both substations. The corrections done by the contractor at guard towers 1, 2, and 3 at Sayedabad substation and guard towers 1 and 3 and the damage along CAT6 cables at Ghazni substation are pending Tt ESP verification.

USAID requests SIGAR to restrict the punch list item to guard towers 1, 2, and 3 at Sayedabad substation, and guard towers 1 and 3, and some damage that was observed along the CAT6 cables at the Ghazni substation; adding that "while the contractor has corrected these punch list items, Tt ESP has not verified the corrections."

Punch list item f: Tt ESP verified that the contractor installed all cable tags at the start and end, except for the HVAC system where the cables do not have

tags and do not run properly (see Appendix B, Ghazni substation, line item 4 of Tt ESP letter 55). According to Appendix C, Ghazni substation, item 4 and 14 of Tt ESP letter 55, the contractor has corrected the punch list item but the item is pending Tt ESP verification.

USAID requests SIGAR to state that all cable tags are labeled and verified by Tt ESP, except the HVAC system that is pending Tt ESP verification.

Punch list item g: At one place of the cable trench, a high density polyethylene pipe was missing and it was replaced with galvanized sheets with weatherproof form to fill the gaps. The replaced galvanized sheets have not been verified by Tt ESP.

USAID requests SIGAR to restrict the punch list item to the one place of the cable trench, and to state that "the punch list item has been corrected but is pending Tt ESP verification" (see Appendix C, Ghazni substation, line item 7 of Tt ESP letter 55).

Punch list item h: Tt ESP verified that the bended member was repaired, and extra member support installed. The foundation was also repaired with approved grout. See Appendix B Ghazni substation line item 8 of Tt ESP letter 55 that shows the verified corrections.

USAID requests SIGAR to remove punch list item h.

Punch list item i: The leakages were corrected and no leakages were found at the transformers (see Appendix C, Ghazni substation, line item 9 of Tt ESP letter 55). However, Tt ESP has not verified the corrections.

USAID requests SIGAR to state that "the punch list item has been corrected but the item is pending Tt ESP verification."

Punch list item j: Water heaters for the kitchen and bathroom 3-pin sockets were installed but they are pending Tt ESP verification (see Appendix C, Ghazni substation line item 10 of Tt ESP letter 55).

USAID requests SIGAR to state that "the punch list item has been corrected but it is pending Tt ESP verification."

The target closure date for Recommendation 2 is May 31, 2020. It is

anticipated that the weather will be suitable to complete the final inspection.

SIGAR Recommendation 3:
Withhold the final invoice payment until KEC corrects the construction deficiencies and punch list items, and, if not corrected, return the withheld funds to the U.S. Treasury or use the funds to complete the work with another contractor.

USAID Response: USAID concurs with the recommendation.

Actions Taken/Planned:
The contractor has agreed to correct all the remaining deficiencies before the warranty inspection. Tetra Tech ESP will verify the corrections and advise USAID and DABS accordingly and USAID will deduct the amount for the open deficiencies from the contractor's five percent defect liability invoice.

The target closure date is May 31, 2020.

Comments on the Draft SIGAR Inspection titled: "USAID's Power Transmission Expansion and Connectivity Project in Afghanistan: The Ghazni and Sayedabad Substations are Complete, but Construction Deficiencies Create Safety Hazards and Could Disrupt Electrical Power" (SIGAR 20-XX/I-051)

1. **What SIGAR Found, Page ii, Par. 1, bullet 1:**
SIGAR Statement: Adequately repair the deficiently designed gantry towers supporting high-voltage equipment.
SIGAR Statement, Page 2, Par. 1 bullet 1: make adequate repairs to the deficiently designed gantry towers that support high-voltage electrical equipment.
SIGAR Statement, Page 4, Par. 1: KEC's poor workmanship in repairing multiple defective gantry towers raises concerns about whether the design deficiency that caused the previous failure was actually corrected.
SIGAR Statement, Page 12, Par. 1: KEC's repairs were a temporary solution, and no permanent solution has been installed, which further jeopardizes the system.

   USAID Comment 1: The deficiency has been corrected based on the approved gantry structure re-analysis and modification of the towers. Additional braces were installed and some of the gantry structures' legs were modified from a single to star type angle brace for improved performance and to support applicable loads. The gantry foundations were also modified and strengthened by casting an additional 40 centimeters (cm) of reinforced concrete which formed a jacket around the existing foundation.

   Regarding the extra holes in the gantry members, the contractor is working on a design analysis to ensure the gantry structures are safe and meet the minimum required specification. The contractor has mitigated the problem of the extra holes by filling the holes with nuts and bolts which is a standard practice according to the American Institute of Steel Construction (AISC) code's recommendations. See Appendix C, Sayedabad substation line item 7 and 8 of Tt ESP letter 55 that shows that the contractor has corrected this deficiency. Tt ESP will carry out an inspection to verify the correction.

   USAID requests SIGAR to state that the deficiency has been corrected but it is pending Tt ESP verification, or to remove the deficiency.

2. **What SIGAR found, Page ii, Par. 1, bullet 2:**
SIGAR Statement: Install galvanized iron sheet enclosures for high voltage electrical cables at either substation.
SIGAR Statement, Page 2, Par. 1 bullet 2: Install galvanized iron sheet enclosures for high voltage electrical cables at either substations.
SIGAR Headline, Page 4: KEC Did Not Install the Required Galvanized Iron Sheet Enclosures with a Water-tight Seal at Either substation
SIGAR Statement, Page 4, Last Par.: During our July 2019 site visit, we found that KEC installed a partial sheet metal enclosure in only one of three locations at the Ghazni substation (see photo 6) and did not install any of the required enclosures at the Sayedabad substation.
SIGAR Statement, Page 12, Par. 2: KEC's failure to install galvanized iron sheet metal enclosures with watertight seals for high-voltage electrical cables.

USAID Comment 2: At Ghazni substation, the structures are covered by a Galvanized Sheet (GI) and the deficiency has been corrected and verified by Tt ESP (see Appendix B, Ghazni substation, line item 11 of Tt Esp letter 55).

The contractor has corrected the deficiency at the Sayedabad substation but it is pending Tt ESP verification (see Appendix C, Sayedabad substation, line item 9 of Tt ESP letter 55).

USAID requests SIGAR to remove the deficiency with respect to the Ghazni substation and to state that the deficiency at Sayedabad substation was corrected but is pending verification by Tt ESP.

3. **What SIGAR found, Page ii, Par. 1, bullet 3:**
SIGAR Statement: Install the substations' cables per the contract requirements.
SIGAR Headline, Page 5: KEC Did Not Install the Substations' Cables as the Contract Required.
SIGAR Statement, Page 5, Par. 3: However, during our June 2018 and July 2019 site visits, we found that KEC did not install identification tags for any of the substations' cables.

USAID Comment 3: Tt ESP has checked all cable tags installed by KEC at the start and end points. For the HVAC system, Tt ESP observed that the

cables do not have tags and do not run properly (see Appendix B, Ghazni substation, line item 4 of Tt ESP Letter 55). The contractor has corrected the HVAC cable tagging at Ghazni substation but is pending Tt ESP verification (see Appendix C, Ghazni substation, line item 4 and 14 of Tt ESP letter 55).

USAID requests SIGAR to state that "all cable tags have been installed at the start and end points and has been verified by Tt ESP except for the HVAC system, which the contractor has corrected but is pending Tt ESP verification."

4. **What SIGAR found, Page ii, Par. 1, Bullet 4:**
SIGAR Statement: Install cable entry ports for the high-voltage electrical cables.
SIGAR Statement, Page 2, Par. 4, Bullet 4: Install cable entry ports for the high-voltage electrical cables.
SIGAR Heading, Page 6: KEC Did Not Install Required Entry Ports for High-voltage Electrical Cables at Either Substation.
SIGAR Statement, Page 6, Par. 3: However, during our 2018 site visits, we found that KEC did not install the required 6-inch diameter cable ports at either substation. Instead, KEC constructed rectangular shelves, with no cable ports or sealant material, to hold the cables.
SIGAR Statement, Page 6, Par. 3: During our July 2019 follow-up site visit, we found that KEC installed pieces of sheet metal to cover the shelve openings and filled the remaining gaps with expandable foam in an attempt to address the deficiency (see photo 11). However, sheet metal and expandable foam are used for thermal insulation, not for making the watertight seals that the contract required.

USAID Comment 4:
The contractor installed cable entry ports for all electrical cables but the corrections are pending Tt ESP verification (see Appendix C, Ghazni substation, line item 7 of Tt ESP letter 55). Tt ESP will verify this correction once the weather becomes suitable for the inspection.

USAID requests SIGAR to rephrase the deficiency stating that it has been corrected but pending Tt ESP verification.

5. **What SIGAR found, Page ii, Par. 1, bullet 5:**
SIGAR Statement: Properly install and secure the washers, nuts, and lock nuts on some of the foundation base plates for the steel structures supporting high-voltage equipment.
SIGAR Statement, Page 2, Par. 4, Bullet 5: Properly install and secure the washers, nuts, and lock nuts on some of the foundation base plates for the steel structures supporting high-voltage equipment.
SIGAR Heading Page 7: KEC Did Not Properly Install and Secure the Washers, Nuts, and Lock Nuts on Some Foundation Base Plates Used to Support Steel Structures.
SIGAR Statement, Page 7, Par. 1: However, we found that KEC did not properly install all of the required washers, nuts, and lock nuts on other base plates for the gantry tower columns at either substation.
SIGAR Statement, Page 12, Par. 2: The seven remaining construction deficiencies, including ...and not properly installing and securing the washers, nuts, and lock nuts for some of the substations' foundation base plates, could lead to disastrous consequences if they are not corrected…"

USAID Comment 5: All missing nuts and bolts for the switchyard tower foundation were installed as per the approved drawings and verified by Tt ESP (see Appendix B, Sayedabad substation, line item 8 of Tt ESP letter 55).

The gantry foundation base plates welded portions were cleaned by wire mesh and painted with anti-rust paint, and gantry tower missing bolts were installed but are pending Tt ESP verification (see Appendix C, line items 7 and 8 of Tt ESP letter 55).

USAID requests SIGAR to remove the deficiency related to Appendix B, item 8 and to state that "the contractor has corrected the deficiency related to Appendix C, item 7 and 8 but the items are pending Tt ESP verification.

6. **What SIGAR found, Page ii, Par. 1, bullet 6:**
SIGAR Statement: Use the same size cable when connecting to conductors, but instead used different size cables without authorization and spliced them with tape.
SIGAR Statement, Page 2, Par. 4, Bullet 6: Use the same size cable when connecting to conductors, but instead used different size cables without authorization and spliced them with tape.
SIGAR Headline, Page 8: KEC Did Not Obtain Authorization to Connect Different Size Electrical Cables throughout the Substations.

SIGAR Statement, Page 8, Par 2: KEC Did Not Obtain Authorization to Connect Different Size Electrical Cables throughout the Substations.

USAID Comment 6: Tt ESP verified that the observed deficiency for the transformer oil filtration box was rectified at both substations. The diameter of the power cable is per the approved cable schedule and sizing calculation submittal (DTS 412 RevB). The interior wiring of the oil filtration box was as per the manufacturer's design. The contractor rectified the deficiency with a junction cable. See Appendix B, Sayedabad substation, line item 9 of Tt ESP letter 55 and Appendix C, Ghazni substation line item 11and 13 of Tt ESP letter 55.

USAID requests that SIGAR remove these deficiencies with respect to both substations.

7. **What SIGAR found, Page ii, Par. 1, bullet 7:**
SIGAR Statement: Provide mechanical protection for conduits used to hold electrical cables.
SIGAR Statement, Page 2, Par. 4, Bullet 7: Provide mechanical protection for conduits used to hold electrical cables.
SIGAR Statement Page 9, Par. 2: KEC Did Not Install Mechanical Protection for Conduit Used to Hold Electrical Cables.

SIGAR Photo 17, Page 9: Cables extending underground without conduit protection.

USAID Comment 7: The contractor has corrected these deficiencies but the items are pending Tt ESP verification (see Appendix C, line item 12 of the Tt ESP letter 55).

USAID requests SIGAR to state that the contractor has corrected the deficiencies but the items are pending Tt ESP verification.

8. **What SIGAR found, Page ii, Par. 1, bullet 8:**
SIGAR Statement: KEC did not install the electrical grounding system according to the contract requirements.
SIGAR Statement, Page 2, Par. 4, Bullet 8: Install the electrical grounding system according to contract requirements.
SIGAR Heading, Page 10: KEC Did Not Install All Required Grounding Systems in the Substations, and Some Installed Systems Did Not Adhere to the Design Drawings.
SIGAR Statement, Page 10, Par. 3: In total, 11 grounding cables at the two substations were not properly connected to the grounding bars.

USAID Comment 8:
The grounding cables were connected to the grounding strips. All grounding pits have protective covers and damaged pits were repaired. Two panels inside the control room building were connected to the substation earth mat system. The substation earth pits were checked and loose connections and missed bolts replaced. See Appendix C, Sayedabad substation, line items 3, 10, and 11 of Tt ESP letter 55.

USAID requests SIGAR to state that these deficiencies were corrected but are pending Tt ESP verification.

9. **SIGAR Statement, Page 3, Par. 2:** According to USAID officials, DABS withheld 5 percent from each invoice that KEC submitted at specified milestones until DABS received evidence that KEC corrected all defects

identified on the invoice in accordance with contract requirements. The officials also told us that KEC had not received full payment because DABS was still reviewing the final $1,002,525.71 invoice.
SIGAR Statement, Page 12, Par. 3: During the warranty period, we advised USAID and Tetra Tech that these construction deficiencies and punch items existed, but KEC has not corrected them.

USAID Comment 9: After the word "invoice" in the statement on page three above, USAID requests SIGAR to insert the sentence: "The last five percent defect liability invoice against the warranty period will be evaluated and paid after correction of all outstanding deficiencies."

10. **SIGAR Statement Page 11, Par. 1:** KEC Did Not Correct All of the Construction Punch List Items.

    USAID Comment 10: USAID requests SIGAR to add the statement "the contractor has corrected most of the punch lists items. While some have been verified by Tt ESP, some are still pending verification. During the warranty inspection, Tt ESP will verify the correction of all punch list items and recommend deducting the equivalent amount from the defect liability invoice for any open punch list items."

11. **SIGAR Statement Page 12, Par. 2:** The seven remaining construction deficiencies...could lead to disastrous consequences if they are not corrected, further, KEC has not correct[ed] all the punch list items, some of which involve safety hazards…"

    USAID Comment 11: USAID requests SIGAR to add the paragraph below just before heading "RECOMMENDATIONS" on page 12: "The contractor closed most of the mentioned deficiencies and corrected most of the punch list items at both substations. Tt ESP will verify the corrections made by the contractor during the warranty inspection. The equivalent amount of uncorrected deficiencies and open punch list items will be deducted from the defect liability invoice."

cc: Markham Isom, Acting Controller, USAID/Afghanistan
U.S. Embassy/Kabul
OAPA Audit

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Blake Chrystal, Office of Infrastructure Director, USAID/Afghanistan

APPENDIX III - ACKNOWLEDGMENTS

Steven Haughton, Senior Inspection Manager

Arthur Granger, Senior Inspector-in-Charge

Ahmad Javed Khairandish, Civil Engineer

Abdul Rahim Rashidi, Program Analyst

Yogin Rawal, Professional Engineer

Shahanshah Shirzay, Civil Engineer

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- Phone Afghanistan: +93 (0) 700-10-7300
- Phone DSN Afghanistan: 318-237-3912 ext. 7303
- Phone International: +1-866-329-8893
- Phone DSN International: 312-664-0378
- U.S. fax: +1-703-601-4065

Public Affairs

Public Affairs Officer

- Phone: 703-545-5974
- Email: sigar.pentagon.ccr.mbx.public-affairs@mail.mil
- Mail: SIGAR Public Affairs
  2530 Crystal Drive
  Arlington, VA 22202