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## REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

### APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

**RAI No.:** 348-8279  
**SRP Section:** 07.09 - Data Communication Systems  
**Application Section:**  
**Date of RAI Issue:** 12/24/2015

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### **Question No. 07.09-11**

Describe the measures used to prevent data going from non-safety systems to safety-related systems.

10 CFR 50.55a(h) requires compliance to IEEE Std 603-1991. IEEE Std 603-1991, Clause 5.6.1, states, in part, "Redundant portions of a safety system provided for a safety function shall be independent of and physically separated from each other to the degree necessary to retain the capability to accomplish the safety function during and following any design basis event requiring that safety function," and Clause 5.6.3, states, in part, "The safety system design shall be such that credible failures in and consequential actions by other systems, as documented in 4.8 of the design basis, shall not prevent the safety systems from meeting the requirements of this standard." Digital I&C Interim Staff Guidance (DI&C-ISG)-04 provides guidance for meeting the communications independence requirements of IEEE Std. 603-1991, Clause 5.6.

Section 4.1.1.4 of Technical Report APR1400-Z-J-NR-14001-P states "The QIAS-P also transmits the sensor signals and their calculated variables to the IPS and QIAS-N through the MTP and ITP, respectively. In the case of the IPS, this data communication is a uni-directional protocol from the MTP. In the case of the ITP, the SDL data communication is used to transmit data to the QIAS-N." The first paragraph of section 4.2.3.4 of the same report also discusses the MTP, its capabilities, displays, interfaces, and data transmission details.

Section 4.3.1.5 of the same report states "This MTP interface is a unidirectional point-to-point Ethernet datalink from the MTP to the DCN-I gateway." In addition, Figure 4-22 of the technical report shows that the MTP to IPS link is a one way fiber optic cable. Section C.4.2 of the report contains the following, "...(no receiving connection)..."

Describe the uni-directional interface between MTP and IPS and clarify what is meant by "no receiving connection," since a typical Ethernet connector has 4 pairs of wires. It is not clear to staff if a standard Ethernet cable is used or a modified cable/connectors with TX pairs/pins on the non-safety end removed and RX pairs/pins on the safety end removed.

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## **Response – (Rev. 1)**

The uni-directional media converter is used for one-way data transmission across a single fiber optic cable from the maintenance and test panel (MTP) to the distributed control system (DCS) gateway server in the information processing system (IPS). Standard duplex fiber connectors are utilized with their full-duplex function disabled. This uni-directional media converter provides the Fast Ethernet RJ-45 ports, which are switch-selectable to allow a choice of forced full duplex or auto-negotiated twist-pair connections with other network devices. Even if full-duplex links are established at the unshielded twist pair (UTP) interface, they never actually transport full-duplex traffic. The transmit (Tx) port of the transceiver converter is connected to the receive (Rx) port of the receiver converter using a single fiber strand; the RJ-45 port of each converter is then connected and configured with its associated host for secure, one-way data transmission.

The MTP processor has a full-duplex link to the RJ-45 port in the transceiver converter. The transceiver converter receives data from the MTP processor and forwards one-way data, and provides a fiber optic path with transported and forwarded one-way data to the receiver converter. This receiver converter forwards one-way data to the DCS gateway server.

The reference plant, Shin-Kori 3&4, uses CFT-206XD and CFT-206XDR of Canary Communication for the receiver converter and transceiver converter to implement uni-directional communication from the MTP to the DCS gateway server.

The following changes will be made to APR1400-Z-J-NR-14001-P, Rev.0 Safety I&C System, Section 4.3.1.5, "Maintenance and Test Panel" to describe the uni-directional interface between the MTP and the IPS:

The MTP provides the isolated interface to the non-safety DCN-I network via the gateway. This MTP interface is a unidirectional point-to-point Ethernet datalink from the MTP to the DCS gateway server. The uni-directional media converter is used for one-way data transmission across a single fiber optic cable from the MTP to the DCS gateway server in the IPS. Standard duplex fiber connectors are utilized with their full-duplex function disabled. This uni-directional media converter provides the Fast Ethernet RJ-45 ports which are switch-selectable to allow a choice of forced full duplex or auto-negotiated twist-pair connections with other network devices. [The transmit \(Tx\) port of the transceiver converter is connected to the receive \(Rx\) port of the receiver converter using a single fiber strand; the RJ-45 port of each converter is then connected and configured with its associated host for secure, one-way data transmission.](#) The MTP processor has a full-duplex link to the RJ-45 port in the transceiver converter. The transceiver converter receives data from the MTP processor and forwards one-way data, and provides a fiber optic path with transported and forwarded one-way data to the receiver converter. This receiver converter forwards one-way data to the DCS gateway server.

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### **Impact on DCD**

There is no impact on the DCD.

**Impact on PRA**

There is no impact on the PRA.

**Impact on Technical Specifications**

There is no impact on the Technical Specifications.

**Impact on Technical/Topical/Environmental Reports**

APR1400-Z-J-NR-14001-P/NP, Rev.0, "Safety I&C System", Section 4.3.1.5 will be revised as indicated in the attachment associated with this response.

- LPD margin
- CPCS calculated values
- CPCS trouble
- Processor failure
- CPCS in test

#### 4.3.1.4 Operator Module Function

The OM, which is shared with the PPS and ESF-CCS, is provided to monitor certain inputs and calculated results and status for operator. The OM has a dedicated area of display for alarm conditions. In the OM, the specific activities such as monitoring of values or changing addressable constants are performed.

#### 4.3.1.5 Maintenance and Test Panel

The MTP provides the capability to modify the CPCS addressable constants, and displays information such as system parameters, various system status, and test results. The MTP also provides an interface to initiate and support testing. It is located in the MTC and is shared with other safety systems within the division. ~~The MTP provides the isolated interface to the non-safety DCN-I via a gateway. This MTP interface is a unidirectional point-to-point Ethernet datalink from the MTP to the DCN-I gateway.~~

Manual switches and/or touch panels are used to enable the CPCS control functions such as addressable constant changes, test initiation, etc.

#### 4.3.1.6 Interface and Test Processor

The ITP is located in the same cabinet as the MTP, separate from the CPC and CEA calculator (CEAC) cabinet. Data are shared with other safety systems in the same division using the SDN (e.g. the ITP communicates with the CPCS via the SDN). The ITP also provides the interfaces between the CPCS and QIAS-N by transmitting safety-related data to the QIAS-N via the SDL.

The MTP provides the isolated interface to the non-safety DCN-I network via the gateway. This MTP interface is a unidirectional point-to-point Ethernet datalink from the MTP to the DCS gateway server. The uni-directional media converter is used for one-way data transmission across a single fiber optic cable from the MTP to the DCS gateway server in the IPS. Standard duplex fiber connectors are utilized with their full-duplex function disabled. This uni-directional media converter provides the Fast Ethernet RJ-45 ports which are switch-selectable to allow a choice of forced full duplex or auto-negotiated twist-pair connections with other network devices. The MTP processor has a full-duplex link to the RJ-45 port in the transceiver converter. The transceiver converter receives data from the MTP processor and forwards one-way data, and provides a fiber optic path with transported and forwarded one-way data to the receiver converter. This receiver converter forwards one-way data to the DCS gateway server.

The transmit (Tx) port of the transceiver converter is connected to the receive (Rx) port of the receiver converter using a single fiber strand; the RJ-45 port of each converter is then connected and configured with its associated host for secure, one-way data transmission.