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| **Keywords:** | Report; FG-AI4EE |
| **Abstract:** | This document contains the report of the third meeting of Focus Group on Environmental Efficiency for AI and other Emerging Technologies (FG-AI4EE) held virtually on 8 April 2021. |

Please see below.

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# 1 Organization of e-meeting

The third meeting of FG-AI4EE was held on 08 April 2021, online. The meeting was hosted on ITU remote participation platform, MyMeetings, <https://remote.itu.int>.

The meeting was chaired by Mr Paolo Gemma (Huawei Technologies Co., Ltd, China), Co-Chairman of FG-AI4EE, Mr Neil Sahota (Technossus, IBM & University of California, USA), assisted by Ms Charlyne Restivo (TSB, FG-AI4EE Advisor) and Mr Manuel Adrián Soriano (TSB, FG-AI4EE Assistant).

A total of 73 participants from 29 countries attended the Focus Group meeting. The list of participants is available in document [[FG-AI4EE-O-005](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-005.zip)]

The meeting was preceded by a webinar on AI for sustainable transformation in smart cities, mobility & energy, organized on the side-lines of AI for Good Global Summit. The webinar was attended by over 430 participants from 67 countries. The programme and presentations can be accessed [here](https://aiforgood.itu.int/events/ai-for-sustainable-transformation-in-smart-cities-mobility-and-energy/), while the recording is available on [YouTube](https://www.youtube.com/watch?v=K4yZMhrtUAo&ab_channel=AIforGood).

## 1.1 Meeting agenda

The agenda was published in document [[FG-AI4EE-I-050-R1](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-050-R1.docx)]. The agenda was approved as presented.

## 1.2 Meeting documents

Documents considered at this meeting are listed as part of the agenda. All documents are available on the [SharePoint site](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/SitePages/Home.aspx?InitialTabId=Ribbon%2ERead&VisibilityContext=WSSTabPersistence) accessible from the FG-AI4EE [homepage](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx).

# 2 Key meeting results

## 2.1 Key results

The meeting adopted 6 Focus Group deliverables (see 2.2 below).

ITU-T FG-AI4EE subsequently shared the 6 agreed deliverables with its parent group, ITU-T Study Group 5, for consideration at SG5’s virtual meeting on 11-20 May 2021 [[SG5-TD1688](https://www.itu.int/md/meetingdoc.asp?lang=en&parent=T17-SG05-210511-TD-GEN-1688)]

ITU-T FG-AI4EE ran a successful webinar with over 430 participants and plans to capitalize on the energy and interest generated by following up with an invitation to contribute to progressing the FG’s deliverables.

## 2.2 FG-AI4EE’s approved documents

## The documents listed in the table below are the outcome of the third FG-AI4EE meeting.

| **Document** | **Type** | **Number** | **Title** | **Description** |
| --- | --- | --- | --- | --- |
| [FG-AI4EE-O-006](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-006.zip) | Technical Specification | D.WG1-04 | Key performance indicators for small and medium enterprises to assess the achievement of the sustainable development goals | This TS provides a set of 44 easily measurable KPIs, each linked to specific SDGs, for SMEs to evaluate their progress towards becoming more innovative and sustainable. |
| [FG-AI4EE-O-007](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-007.zip) | Technical Report | D.WG1-09 | A method for intuitive human interaction with data model (ML & AI etc.) | This TR provides a method for elegantly connecting complex data, including ML & AI into a system-level solution designed for humans, allowing communication between man and machine, and cultivating mutual enhancement. |
| [FG-AI4EE-O-008](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-008.zip) | Technical Report | D.WG2-03 | Requirements on energy efficiency measurement models and the role of AI and big data | This TR identifies a model to calculate the energy efficiency in the urban space, focusing specifically on the impact of AI and big data on energy efficiency. |
| [FG-AI4EE-O-009](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-009.zip) | Technical Specification | D.WG2-05 | Guidelines on energy efficient blockchain systems | This TS provides an overview of blockchain’s energy demand, identifies a model to calculate its energy efficiency, and details the parameters that can be calibrated to enhance blockchain’s energy efficiency. |
| [FG-AI4EE-O-010](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-010.zip) | Technical Report | D.WG3-02 | Smart energy saving of 5G base station: Based on AI and other emerging technologies to forecast and optimize the management of 5G wireless network energy consumption | This TR identifies how network energy saving technologies, and emerging technologies such as AI, can be leveraged to mitigate 5G base station energy consumption. |
| [FG-AI4EE-O-011](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-011.zip) | Technical Report | D.WG3-07 | Guidelines on the environmental efficiency of machine learning processes in supply chain management | This TR provides guidance on how to improve the environmental efficiency of supply chain management, by using ML, AI and other emerging technologies in the framework of a successful digital transformation business strategy. |

## 2.3 Liaisons Statements

Four (4) liaison statements (LS) were included in the meeting agenda as follows:

* Incoming
* [[FG-AI4EE-I-LS-015](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-015.docx)] LS/i on invitation to provide inputs to the roadmap of AI activities for natural disaster management [from: FG-AI4NDM]
* [[FG-AI4EE-I-LS-014](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-014.zip)] LS/i on invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information [ITU-T Study Group 13]
* Outgoing
* [[FG-AI4EE-O-LS-003](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-O-LS-003.docx)] LS/o/r on invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information (reply to SG13-LS174) [to ITU-T SG13 and other partners].
* [[FG-AI4EE-O-LS-004](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B5E615FB7-3482-404C-9524-3FEBEB9BAB93%7D&file=FG-AI4EE-O-LS-004.docx&action=default)] LS/o/r on the first meeting of ITU-T FG-AI4EE (reply to Document 6/31-E) [to ITU-R SG 6]. – approved by correspondence by FG-AI4EE Co-Chairmen, and WG3 Co-Chairmen on 12 March 2021

It was agreed to send one reply to FG-AI4NDM identifying the synergies between Disaster Risk Management and AI for Environmental Efficiency, by the requested deadline of 30 June 2021. This LS will be approved by correspondence by the Focus Group Management Team.

*Post meeting note*

The following Liaison Statements were approved by correspondence by the Management Team following FG-AI4EE third meeting.

* [[FG-AI4EE-O-LS-005](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-O-LS-005.zip)] LS on six deliverables of ITU-T FG-AI4EE
* [[FG-AI4EE-O-LS-006](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-O-LS-006.docx)] LS on the progress report of ITU-T Focus Group on Environmental Efficiency for Artificial Intelligence and other Emerging Technologies (FG-AI4EE)

# 3 Summary of discussions

## 3.1 Opening session

### 3.1.1 Welcome remarks and meeting objective

FG-AI4EE Co-Chairman, Mr Paolo Gemma, opened the meeting and provided some welcome remarks.

The main objective of this third meeting was to present six Focus Group’s deliverables for approval.

In his welcome remarks, Mr Gemma indicated that deliverables presented for adoption were the results of Working Group discussions. Mr Gemma commended FG-AI4EE experts’ efforts in drafting, providing inputs and comments to these deliverables. The final versions of these reports were made available on FG-AI4EE SharePoint ahead of this meeting.

### 3.1.2 Agenda

The draft agenda was approved [[FG-AI4EE-I-050-R1](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-050-R1.docx)].

### 3.1.3 IPR call

Mr Gemma explained the ITU Intellectual Property Rights (IPR) policy and read out the IPR call. There were no requests or objections from the floor in response to the IPR call contained in document [[FG-AI4EE-I-051](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-051.docx)].

### 3.1.4 Approval of previous meeting report (December 2020)

The report of the second Focus Group meeting (virtual, 10 December 2020) was approved as contained in document [[](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B111E60E9-0339-4D29-BC3D-157FA2F70ED1%7D&file=AI4EE-O-001.docx&action=default)[FG-AI4EE-O-004](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B8EFA578E-D9D8-49E3-8633-D89AC6F3266A%7D&file=FG-AI4EE-O-004.docx&action=default)].

## 3.2 Input Contributions

### 3.2.1 Energy consumption of several information technologies (Ziqi Zhou, Tsinghua University, China)

A contribution offering an assessment of the energy consumption of several information and communication technologies (ICTs) such as AI, blockchain, cryptocurrencies, data centers was presented for consideration of the meeting. The written contribution can be found in document [[FG-AI4EE-I-055](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7BD99EA651-09A8-4CC6-A276-B56F12F2BBE2%7D&file=FG-AI4EE-I-055.docx&action=default)] and the presentation given at the meeting in document [FG-AI4EE-I-064].

There were no comments received on the presentation.

### 3.2.2 Other Contributions

A summary of written contributions received since the previous Focus Group meeting in December 2020 was displayed in a slide contained in document [[FG-AI4EE-I-063](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-063.zip)]. These contributions were not presented at this meeting because they have already been integrated in the deliverables and discussed at previous working group meetings. All contributions can be found on [SharePoint](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/SitePages/Home.aspx?InitialTabId=Ribbon%2ERead&VisibilityContext=WSSTabPersistence).

# 4 Working Group 1: Requirements of AI and other emerging technologies to ensure environmental efficiency

Working Group 1 Co-Chair, Mr Joel Alexander Mills (AugmentCity AS, Norway) chaired this session and provided a brief update on the WG1 deliverables.

WG1 is working on a total of 11 deliverables which details can be found online at <https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/WG1deliverables.aspx>.

Two of these deliverables have been completed and were presented at this meeting. Mr Mills extended his thanks and appreciations to all the experts who have contributed to these deliverables.

## 4.1 Presentation of WG1 deliverables for adoption

* [[FG-AI4EE-I-059-R1](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-059-R1.zip)] Technical Specification D.WG1-04 – “List of KPIs for small and medium enterprises to assess the achievement of the sustainable development goals”
* Co-editor, Pierre Major (NTNU, Norway) presented the final version of the Technical Specification which is the outcome of WG1 discussions. The presentation given at the meeting can be found in document [FG-AI4EE-I-066](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-066.zip). A comments log reflecting the comments received during circulation period can be found in folder [[FG-AI4EE-I-059-R1](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-059-R1.zip)]
* For information, it was suggested to refer to <https://smeclimatehub.org> for the carbon reporting of SMEs as this website intends to become a one-stop-shop for SME’s reporting.
* [[FG-AI4EE-I-062](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B5B716A77-A61F-4657-9704-F056DDF6DC7C%7D&file=FG-AI4EE-I-062.docx&action=default)] Technical Report D.WG1-09- “A method for intuitive human interaction with Data model (ML & AI etc)”.
* Co-leader, Pierre Major (NTNU, Norway) presented the final version of the Technical Report which is the outcome of WG1 discussions.
* There were no specific comments on the main body of the document.

## 4.2 Results

Based on the discussion results and resolutions, the meeting agreed by consensus to the following Working Group 1 deliverables:

* [[FG-AI4EE-O-006](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-006.zip)] Technical Specification D.WG1-04 "Key performance indicators for small and medium enterprises to assess the achievement of sustainable development goals"
* [[FG-AI4EE-O-007](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-007.zip)] Technical Report D.WG1-09 "A method for Intuitive Human interaction with data model (ML & AI etc.”

# 5 Working Group 2: assessment and measurement of the environmental efficiency of AI and emerging technologies

Working Group 2 Co-chair, Leonidas Anthopoulos, (University of Thessaly, Greece) chaired this session introduced two deliverables for approval of the meeting.

WG2 is working on a total of 6 deliverables which details can be found online at: <https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/WG2deliverables.aspx>.

## 5.1 Presentation of WG2 deliverables for approval

* [[FG-AI4EE-I-061](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B88F6B0B8-92D7-4670-ABC9-44677B51EB30%7D&file=FG-AI4EE-I-061.docx&action=default)] Technical Report D.WG2-03 – “Requirements on energy efficiency measurement models and the role of AI and big data”.
* Editor, Leonidas Anthopoulos (University of Thessaly, Greece) presented the final version of the Technical Report which is the outcome of WG2 discussions.
* There were no specific comments on the main body of the document.
* [[FG-AI4EE-I-057](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7BDDE74C55-D128-4F9D-A5B6-9A605CDEAF9E%7D&file=FG-AI4EE-I-057.docx&action=default)] Technical Specification D.WG2-05 – “Guidelines on energy efficient blockchain systems”
* Co-editor, Ioannis Nikolaou (Fuelics, Greece) presented the final version of the Technical Specification which is also the outcome of WG2 discussions held over the past months. The presentation is available in document [[FG-AI4EE-I-067](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-067.zip)].
* There were no specific comments on the presentation nor the main body of the document.

## 5.2 Results

Based on the discussion results and resolutions, the meeting agreed by consensus to the following Working Group 2 deliverables:

* [[FG-AI4EE-O-008](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-008.zip)] Technical Report D.WG2-03 "Requirements on energy efficiency measurement models and the role of AI and big data"
* [[FG-AI4EE-O-009](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-009.zip)] Technical Specification D.WG2-05 "Guidelines on Energy Efficient Blockchain Systems"

# 6 Working Group 3: implementation guidelines of AI and emerging technologies for environmental efficiency

Working Group 3 Co-Chair, Ms Shi Ying (China Telecom, China), chaired this session introduced two deliverables for approval of the meeting.

Working Group 3 is working on a set of 7 deliverables which details found online at <https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/WG3deliverables.aspx>.

## 6.1 Presentation of WG3 deliverables for approval

[[FG-AI4EE-I-058](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B51B925FE-FB00-4BA0-9188-3B3B1D9CD8BA%7D&file=FG-AI4EE-I-058.docx&action=default)] Technical Report D.WG3-02 – “Smart Energy Saving of 5G Base Station: Based on AI and other emerging technologies to forecast and optimize the management of 5G wireless network energy consumption”

* Co-editor, Shi Ying (China Telecom, China) presented the final version of the Technical Report which is the result of WG3 discussions.
* There were no specific comments on the main body of the document.

[[FG-AI4EE-I-060](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B47A91A1B-9110-4380-A47C-F33C03FD1503%7D&file=FG-AI4EE-I-060.docx&action=default)] Technical Report D.WG3-07 – “Guidelines on the Environmental Efficiency of Machine Learning Processes in Supply Chain Management”

* Editor, Claudio Bianco (Telecom Italia S.p.A., Italy) presented the final version of the Technical Report which is the outcome of WG3 discussions.
* There was requested to correct the acronym ‘URLLC’ in the document. It was requested that the deliverable be updated accordingly before being shared with the parent group.

**6.2 Presentation of WG3 contribution for comments**

* At the request of the Editor of deliverable D.WG3-01 (in progress), a contribution on “Emerging Technologies - Domains, Applications and the Environmental Impact” from Vimal Wakhlu, (ITU APT Foundation of India) was presented at the meeting with the objectives to receive inputs and invite experts to join the work on this deliverable. It was noted that this contribution had already been presented at previous WG3 e-meetings.
* The contribution can be found in document [[FG-AI4EE-I-052](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-052.docx)] and experts were invited to provide comments on this proposed table contained in the contribution.
* Experts were invited to join WG3 e-meeting of 11 May 2021 to discuss deliverable D.WG3-01 further.

## 6.3 Results

Based on the discussion results and resolutions, the meeting agreed by consensus to the following Working Group 3 deliverables:

* [[FG-AI4EE-O-010](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-010.zip)] Technical Report D.WG3-02 "Smart Energy Saving of 5G Base Station: Based on AI and other emerging technologies to forecast and optimize the management of 5G wireless network energy consumption"
* [[FG-AI4EE-O-011](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-011.zip)] Technical Report D.WG3-07 "Guidelines on the Environmental Efficiency of Machine Learning Processes in Supply Chain Management".

## 7 Incoming and Outgoing Liaison statements

## 7.1 Incoming Liaison statements

Four (4) liaison statements were included in the meeting agenda as follows:

* [[FG-AI4EE-I-LS-015](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-015.docx)] LS/i on invitation to provide inputs to the roadmap of AI activities for natural disaster management [from: FG-AI4NDM]
* It was agreed to send one reply to FG-AI4NDM identifying the possible synergies between Disaster Risk Management and AI for Environmental Efficiency, by the requested deadline of 30 June 2021.
* This LS will be approved by correspondence by the Focus Group Management Team ad interim of the next FG meeting.
* [[FG-AI4EE-I-LS-014](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-014.zip)] LS/i on invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information [ITU-T Study Group 13]
* This incoming LS shares an update on the AI roadmap, which now includes the list of FG-AI4EE deliverables, and invites FG-AI4EE and other groups to keep providing updates as appropriate.
* It was agreed to consider a reply to this LS, as necessary, to be sent out by the requested deadline of 12 November 2021.

## 7.2 Outgoing Liaison statements

* [[FG-AI4EE-O-LS-003](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-O-LS-003.docx)] LS/o/r on invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information (reply to SG13-LS174) [to ITU-T SG13 and other partners].
* This outgoing LS, approved by correspondence by FG-AI4EE Co-Chairmen on 29 January 2021, informs ITU-T SG13 of the work being carried in FG-AI4EE for the update of the AI Roadmap.
* [[FG-AI4EE-O-LS-004](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B5E615FB7-3482-404C-9524-3FEBEB9BAB93%7D&file=FG-AI4EE-O-LS-004.docx&action=default)] LS/o/r on the first meeting of ITU-T FG-AI4EE (reply to Document 6/31-E) [to ITU-R SG 6]. – approved by correspondence by FG-AI4EE Co-Chairmen, and WG3 Co-Chairmen on 12 March 2021
* This outgoing LS invites interaction and further collaboration with ITU-R Study Group 6.
* Chairman ITU-R WP 6C, Andy Quested, advised that the LS was under consideration of ITU-T SG6 and that a reply was in the pipelines.

# 8 Future Meetings

## 8.1 Virtual workshop

* A virtual workshop co-hosted with WG1 Co-Chair, Joel Alexander Mills (Offshore Simulator Centre, Norway) is scheduled to take place on 2 June 2021. The event will showcase examples where emerging technology, such AI, ML and AR, can be used to reduce the negative impact of climate change in cities. This workshop is complementary to deliverable D.WG1-10 in progress.

## 8.2 Forth FG-AI4EE meeting

* The next Focus Group meeting will take place virtually during the last week of September 2021. Once the dates are confirmed, the meeting information will be communicated through the mailing-list.
* The objectives of the forth Focus Group meeting will be to approve the second round of deliverables that are completed with a view to share them with parent group, ITU-T Study Group 5 for consideration at their virtual meeting in November-December 2021 (dates TBC).

## 8.3 Possible participation at COP 26

* It was suggested that FG-AI4EE takes part in the 26th United Nations Climate Change conference (COP26) scheduled to be held in Glasgow, UK, from 1 to 12 November 2021.
* FG-AI4EE Co-Chairmen together with ITU will investigate the modalities of such participation.

# 9 Closing & acknowledgements

FG-AI4EE Co-Chairman, Mr Neil Sahota, provided some closing remarks and congratulated the group on the outcomes of this meeting which led to the approval of six Focus Group deliverables. Mr Sahota also referred to the successful webinar held the day before which gathered many viewers and lively discussions.

Mr Sahota warmly thanked all participants for their active participation, contributions and commitment to advance the work of the Focus Group.

FG-AI4EE Co-Chairmen both extended their appreciations to FG-AI4EE Vice-Chairmen, Working Group Co-Chairmen, editors, contributors, and to Ms Charlyne Restivo, Advisor (TSB) and Mr Manuel Adrián Soriano (FG-AI4EE Secretariat) for their assistance.

FG-AI4EE Co-Chairmen encouraged participants to pursue their collaboration by sending their contributions to ITU Secretariat ([tsbfgai4ee@itu.int](mailto:tsbfgai4ee@itu.int)) to advance the work on the remaining 18 FG-AI4EE deliverables.

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