The development of ICT Sector Guidance: rationale, development and outcomes

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ABSTRACT
This paper presents an overview of the GHG Protocol ICT Sector Guidance and a rationale for its development.

Keywords
ICT, Greenhouse Gas measurement, Sector Guidance, GHG Protocol, Greenhouse Gas standards.

1. INTRODUCTION
The initiative to develop the Greenhouse Gas (GHG) Protocol ICT Sector Guidance was set up in response to a growing concern to have a more consistent and detailed approach to measuring the GHG emissions of ICT goods and services. The initiative was formally started in March 2011, with the completed guidance document due to be published in early 2013.

The GHG Protocol ICT Sector Guidance will provide specific guidance for the ICT sector on using the GHG Protocol Product Life Cycle Accounting and Reporting Standard (the *Product Standard)* [6]. The initiative is jointly convened through the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD), the Carbon Trust and the Global e-Sustainability Initiative (GeSI).

2. HISTORY OF THE GHG PROTOCOL AND THE ICT SECTOR GUIDANCE
The GHG Protocol was founded in 1998 by the WRI and WBCSD. In 2001 the GHG Protocol Corporate Standard [4] was published (and revised in 2004); this is now the most widely-used accounting and reporting standard for corporate GHG emissions. In October 2011 the *Product Standard* [6] and *Scope 3 Standard* [5] were published.

The motivation to develop the ICT Sector Guidance came largely from ICT companies that were involved in the development of the *Product and Scope 3 Standards.* These companies were increasingly receiving demands from their customers (both corporate and government) to provide information on the GHG impact of the ICT goods and services that they are purchasing. Companies involved in the development of the Sector Guidance see a clear advantage in understanding the technical details and being in a position to respond to their customer demands and to demonstrate their leadership. The following companies are formal members of the ICT Sector Technical Working Group: Alcatel Lucent, BT, Capgemini, Cisco, Deutsche Telekom, EMC, Ericsson, Fujitsu, HP, Microsoft, NetApp, and Telstra.

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3. MEASURING GHG EMISSIONS FROM ICT GOODS AND SERVICES
There are a number of typical reasons why an ICT company would want to measure the GHG emissions of its products:

- To understand emissions through the life cycle of the product, and where in the life cycle the majority of the emissions occur (e.g. understanding the proportion of embodied to in-use emissions). This can help to direct efforts to reduce emissions of the product such as:
    - Reduction of emissions due to changes in the design of the product
    - Reduction of emissions due to changes in the manufacture of a good, or provision of a service
    - Reduction of emissions in the use stage of a product
    - Reacting to behavioural changes in the use of the product
- Track changes over time, to monitor the impact of product enhancements and new versions of products
- To respond to customer questions on the GHG emissions of the product offering
- Public reporting of the GHG emissions of a product

4. RATIONALE AND FOCUS FOR THE ICT SECTOR GUIDANCE

4.1 The need for ICT specific guidance
The need for ICT Sector Guidance is due to the specific nature of ICT products. ICT equipment is characterised by extensive Bills of Material consisting of hundreds of individual components with long and complex global supply chains often using multiple and alternative sources. This makes it inherently challenging to execute a detailed Life Cycle Assessment (LCA) for typical ICT equipment. The ICT sector is also characterised by a large number of extensive services. These services are generally complex solutions including potentially thousands of items of ICT

equipment and have significant use stages, where understanding the use profile and behavioural aspects of the use of the service are important in assessing the service. The Sector Guidance has specific focus on the assessment of ICT services rather than physical goods.

The ICT Sector Guidance aims to provide a practical approach to the GHG assessment of ICT products, by providing a consistent and pragmatic approach. It is important that the level of precision employed in an assessment matches the goal of the assessment and recognises the context in which the results will be interpreted. Therefore the Sector Guidance presents alternative approaches and estimation techniques, and where appropriate a hierarchy of approaches is provided. The specific approach to be taken by the practitioner will depend on the goal of the assessment, the level of precision that is required, and the data that is available (and the associated cost of collecting further data).

ICT products may also have the potential for avoiding GHG emissions through the 'enabling effect'. (Where the 'enabling effect' is the opportunity that an ICT solution has to avoid GHG emissions in other sectors, which can be attributed back to the ICT solution as the prime cause of that avoidance). The ICT Sector Guidance provides guidance for assessing the 'enabling effect' of ICT.

Thus the purpose of this ICT Sector Guidance is to address the inherent nature of ICT products and particularly the following points:

- Multiple components for ICT equipment
- Complex and long supply chains for ICT equipment
- Complex nature of ICT services
- ICT services are often bespoke and tailored to meet specific customer requirements
- ICT services typically share resources, which need to be allocated
- Significant in-use stage of ICT products (emissions occurring when a product is used by a customer)
- Uncertainty surrounding measurement of use stage
- Potential enabling effect of ICT products

4.2 Current 'State of the Art'

The ICT industry is very conscious of the impact of ICT in terms of GHG emissions. A number of ICT companies are performing LCAs and GHG assessments on their products and related research is being carried out by the ICT industry and academia. However, the current state of this work is still in development and has limitations. It is far from routine for ICT companies to automatically carry out GHG assessments on all their products. Generally, data collection systems cannot readily provide the data needed to carry out an assessment. Reliable and consistent sources of secondary emission factors for ICT components are not easily available. Reliable data on the actual use of ICT products is difficult to determine. Therefore, currently, GHG assessments are typically carried out as individual projects, rather than being a routine business activity. As the work of measuring GHG emissions continues, more comprehensive datasets will be developed allowing more wide spread practice of GHG assessments of products.

4.3 Evolving technology

A further significant issue for the ICT sector is the rapidly changing and evolving nature of the technology. This potentially has a number of effects, for example: development of new products; technology being used in new and unexpected ways; new technologies driving different user and social behaviours; development of more energy efficient ICT equipment changing underlying assumptions between in-use and embodied emissions; development of equipment with built-in measurement capabilities (e.g. device energy consumption, network traffic monitoring and reporting, power saving mode monitoring and reporting).

5. WIDER ISSUES FOR ICT

There is a growing interest in ICT with respect to GHG emissions, this is both because of the significant emissions associated with the manufacture and use of ICT products, and also because of the opportunity for ICT products to reduce emissions elsewhere (the so called 'enabling effect'). In 2008, the SMART 2020 report [3] catalysed the debate about the GHG impact of ICT, estimating that ICT is responsible for 2% of global GHG emissions, and also that ICT has the potential to reduce emissions equivalent to five times its own emissions through the 'enabling effect'.

The following are some of the issues and questions being raised in relation to ICT on both the positive and negative 'carbon account':

- Rapid growth of ICT (e.g. driven by use of social networking, smart phones, mobile data usage, internet usage, internet TV, music and video streaming)
- Exponential growth in the usage of data centres
- Increasing energy efficiency of computing and telecommunications
- Social changes driven by ICT
- Opportunities to reduce business related travel through Tele-working, Tele-commuting and Remote Collaboration.
- Opportunities to indirectly reduce emissions through the use of various smart technologies
- Rapid changes in technology and promises of new technology development leading to new unknown opportunities and challenges
- Considering when is the best time to replace ICT equipment, taking account of the improvements in energy efficiency of new equipment vs. the embodied emissions
- As ICT equipment becomes more energy efficient the embodied emissions of the equipment become proportionately more significant compared to the use stage emissions.

6. SCOPE AND COVERAGE OF THE ICT SECTOR GUIDANCE

6.1 Structure of the ICT Sector Guidance document

The document is organised into specific chapters that provide guidance on the measurement of a specific ICT product (or group of products). There is a focus on ICT services rather than physical goods. The guidance document does not provide exhaustive cover of all ICT products; the approach taken has been

to prioritise those which have a significant impact in terms of GHG emissions.

6.2 Key drivers for each chapter

The choice of chapters to include in the guidance was based on those ICT services which are widely adopted and/or may have a significant impact in terms of GHG emissions. The following summarises the key drivers behind each chapter:

6.2.1 Telecommunications Network Services (TNS)

Telecommunication networks provide the fundamental support to all modern communications and due to the rapid growth in use of the internet, data transfers, mobile communications etc. this is leading to significant increases in associated GHG emissions. At the same time, advances in technologies are leading to more energy efficient networks. The aim of the TNS chapter is to provide guidance, methodologies and options to enable practitioners to assess the GHG emissions associated with a TNS. This helps to identify the relative size and scale of emission sources within different life cycle stages. Understanding this enables telecoms providers to communicate and collaborate with suppliers and customers on ways to reduce GHG emissions.

6.2.2 Desktop Managed Services (DMS)

DMS is the provision of computing facilities, usually in a corporate environment. It is very broad in scope, encompassing the equipment on customer premises (e.g. desktops, laptops, printers), the data centre, the LAN and WAN, and the supporting human services (e.g. break-fix support, help desk). Desktop Managed Services account for a major part of the ICT sector outsourcing market and a major portion of overall ICT carbon emissions. Customers of DMS are increasingly demanding accurate and transparent information on the GHG emissions of the DMS provided to them, for reporting purposes and for identification of areas for potential emissions reduction.

6.2.3 Cloud and Data Centre Services

Cloud computing, which is a model for efficiently providing ICT services from a shared pool of remote computing resources (i.e. hardware, data centres, networks, and software applications), can potentially reduce GHG emissions associated with ICT services. This chapter allows cloud and data centre service providers and customers to benchmark and report the GHG emissions from cloud and data centre services in a consistent manner and make informed choices to reduce greenhouse gas emissions.

6.2.4 Hardware

ICT Hardware is a fundamental component of any ICT system or service. The hardware chapter provides guidance on the GHG assessment of ICT hardware. The methodologies described in the chapter cover different calculation methods and provide guidance on different estimation techniques. The chapter also references other standards that cover the GHG assessment of ICT hardware.

6.2.5 Software

Software controls more than 90% of the energy used by ICT hardware. The design of software for energy efficiency can reduce the GHG emissions of ICT services. This chapter provides software developers and architects guidance to benchmark and report the GHG emissions from software use in a consistent manner and make informed choices to reduce greenhouse gas emissions. The chapter is in two parts: Part A provides guidance on the full life cycle assessment of software; Part B relates specifically to the energy use of software, and covers the three categories of software: Operating Systems (OS), Applications and Virtualisation.

6.2.6 Transport Avoidance

The application of ICT for remote collaboration and remote working (such as teleconferencing and telecommuting) can reduce, in absolute terms, GHG emissions by avoiding business travel and employee commuting. The Transport Avoidance chapter provides guidance and methodologies for the calculation and reporting of the avoided emissions due to the use of the ICT product.

7. OTHER RELATED STANDARDS

There are a number of other related standards for the measurement of the greenhouse gases of products. Some of these are described here, categorised as generic standards and ICT specific standards.

7.1 Generic product life cycle standards

The ICT Sector Guidance provides additional guidance for ICT products to the GHG Protocol *Product Standard*. The *Product Standard* follows a life cycle approach to the GHG assessment of products and builds on the framework and requirements established in the ISO LCA standards: 14040:2006, Life Cycle Assessment: Principles and Framework [8] and 14044:2006, Life Cycle Assessment: Requirements and Guidelines [9]. ISO 14040 and ISO 14044 are considered the base standards for LCA, which other standards are built on.

Two other generic standards for the life cycle assessment of GHG emissions are the PAS 2050 [1] and the ISO 14067 [10]. These generic standards are applicable to any kind of products, but do not give specific guidance for ICT products.

The PAS 2050 is a Publicly Available Specification (PAS) for the assessment of life cycle greenhouse gas emissions of goods and services. It was first published in October 2008 by the British Standards Institution (BSI), in partnership with the UK Department of Environment Food and Rural Affairs (DEFRA) and the Carbon Trust. A revised edition (PAS 2050:2011) was released in October 2011.

The ISO standard 14067 "Carbon footprint of products -- Requirements and guidelines for quantification and communication" is under development at the time of writing, and is expected to be published in 2014.

The relationship between the ICT Sector Guidance and these generic product standards is shown in Figure 1.

Figure 1: Relationship of the ICT Sector Guidance to generic product standards

7.2 Other ICT specific standards

In addition to the generic standards mentioned above, and the ICT Sector Guidance, there are three ICT specific standards relating to the life cycle assessment of products. These are also all based on the ISO 14040 and 14044 standards.

ETSI – TS 103 199 "Life Cycle Assessment (LCA) of ICT equipment, networks and services: General methodology and common requirements". (Published October 2011) [2].

ITU-T L.1410 "Methodology for environmental impacts assessment of information and communication technologies (ICT) goods, networks and services". (Consented September 2011, published March 2012) [11]..

IEC TR 62725 "Quantification methodology of greenhouse gas emissions for electrical and electronic products and systems". (In development, planned to be published 2013) [7].

8. CONCLUSION

The GHG Protocol ICT Sector Guidance is being developed through a collaboration of ICT companies, academics, consultants, advocates, NGOs and other stakeholders, to meet a growing demand for clearer guidance in measuring the greenhouse gas emissions of ICT products. The development process is highly consultative and has successfully brought together a wide range of stakeholders from across the world. Draft versions have been published for public comment, with the completed guidance document due to be published in early 2013.

9. REFERENCES

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