Energy Saving Checklist
- Preliminary studies in ITU-T SG15
on Access Network Transport -

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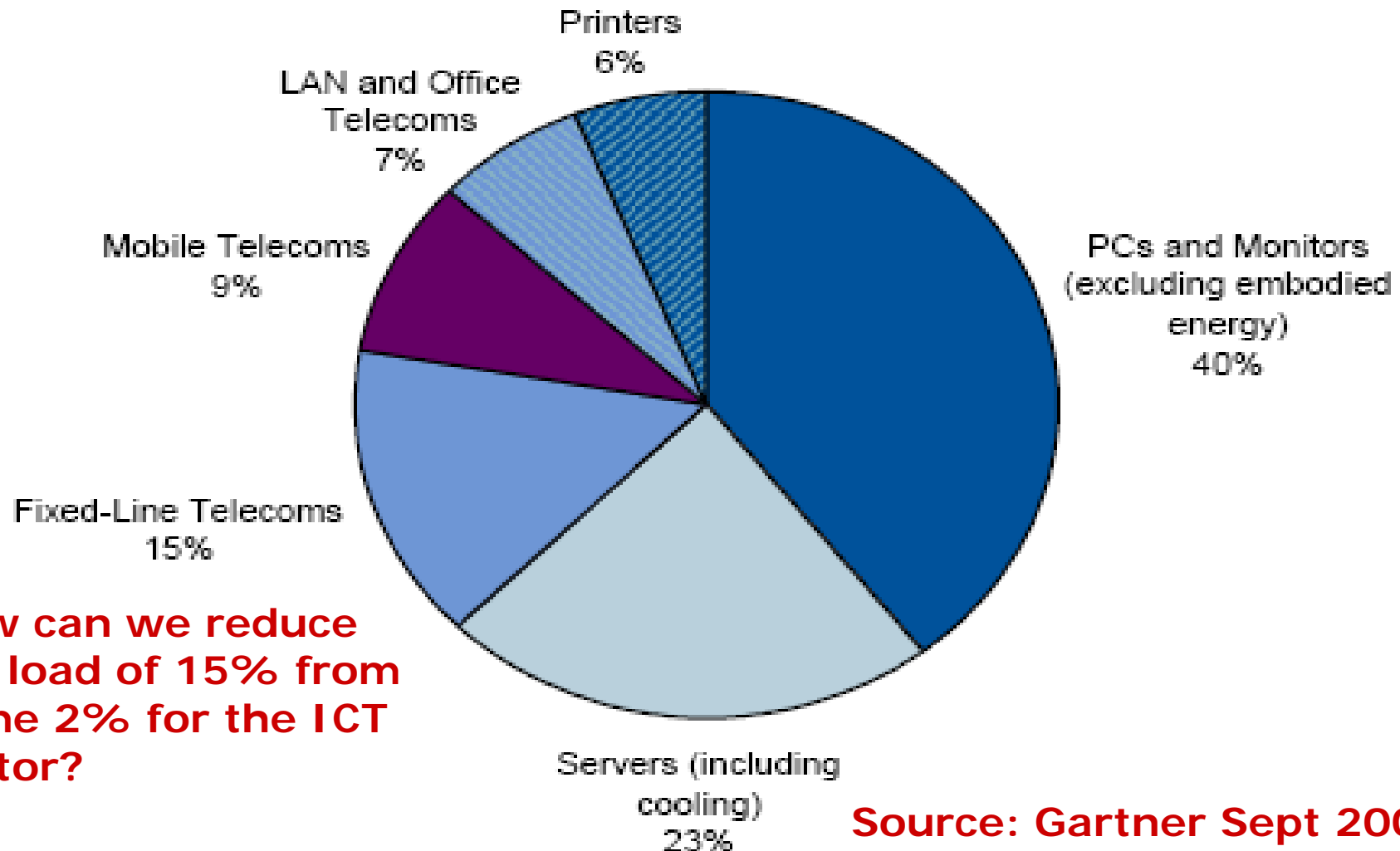**Tim Kelly, Head, ITU-T Standardization Policy Division**
Greg Jones, Counselor, ITU-T SG15

International Symposium: "ICTs and Climate Change"
17-18 June 2008, BT Centre Auditorium, London, UK

What is an Energy Saving Checklist?

- **Tool for assessment of existing and new ITU-T Recommendations in the light of climate change (TSAG LS 30)**
  - ITU-T/SG15 Document, TD-288 GEN, provides guidance on energy saving in access networks for Rapporteurs and Editors and proposes a checklist
  - Intended to ensure that drafting Recommendations leads to an economic and energy efficient solution
  - A step towards achieving GHG sustainability in the ICT industry
- **A set of questions relating to energy saving in networks; a first response by SG15 to the TSAG**
  - The Checklist;
    - needs to be distilled down at the Question level to offer "tips and tricks" which will stimulate energy efficient thinking throughout the editing process
    - will provide the trigger to liaise with device groups such as IEC

Estimated Distribution of Global Carbon Dioxide Emissions from ICT

Printers
6%

LAN and Office Telecoms
7%

Mobile Telecoms
9%

Fixed-Line Telecoms
15%

PCs and Monitors (excluding embodied energy)
40%

Servers (including cooling)
23%

How can we reduce the load of 15% from some 2% for the ICT sector?

Source: Gartner Sept 2007*

*Rakesh Kumar and Lars Mieritz, "Conceptualising Green IT and Datacentre Powering and Cooling Issues", Gartner Research paper ID number G00150322, 7 Sept 2007.
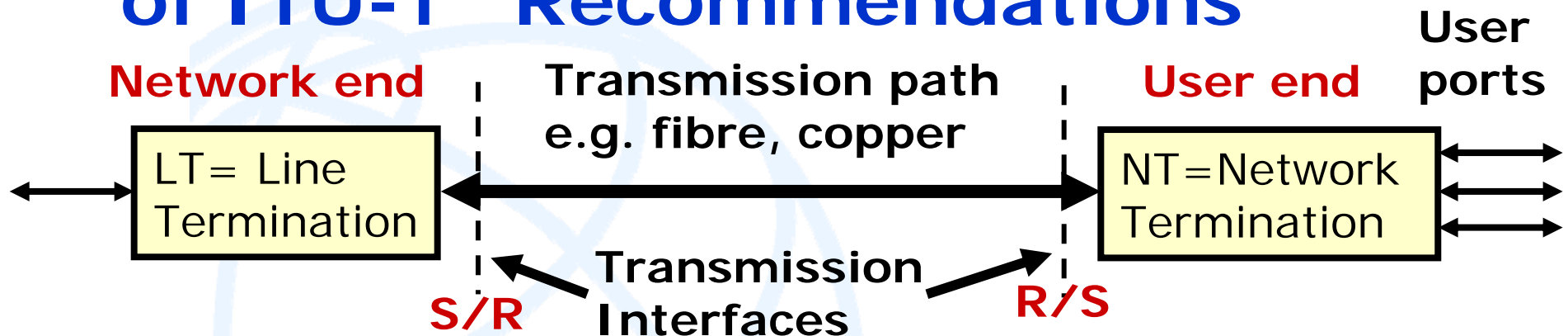
3

What are the Benefits of Energy Saving in Telecommunications?

- **Reduces the cost of energy**
  - for operators (LTs; Line Terminals) or end-users (NTs; Network Terminals and End devices)
- **Reduces the carbon footprint (global warming)**
  - where electricity is sourced from fossil fuel
- **Reduces the size and cost of backup battery/generator**
  - to support lifeline services during power outage
- **Low power makes new technology solutions feasible**
  - such as line-powered remote nodes with fibre/copper (xDSL) hybrid solution to provide up to 100Mbit/s to the home

Scope of SG15 for Energy Saving

- **SG15 has a mandate to provide the standards for the transport network infrastructure**
  - to lead the studies on Broadband Access Network Technologies and Optical Transport Network & Technologies in ITU-T

- **Broadband Access Technologies: Serve mass populations over the final drop**
  - potential for large energy savings in end devices (e.g. 10W*1 billion NTs = 10GW = 20 medium sized PSs)
  - higher speed access systems will become a dominant network infrastructure

- **Transport Technologies: Carry aggregated traffic, sharing devices across whole populations**
  - energy savings are possible but energy saving per customer is smaller

SG15 Broadband Access Scope of ITU-T "Recommendations"

User ports

Network end | **Transmission path** e.g. fibre, copper | **User end**

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LT= Line Termination  <——>  NT=Network Termination
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S/R ——— Transmission Interfaces ——— R/S

- **Focus is on transmission interfaces in ITU-T Recs.**
  - Describing "the signals passing through" for interoperability between vendors
  - But the "black boxes" at the ends consume most of the energy
- **Liaison is needed with other bodies about devices**
  - International standards bodies such as International Electrotechnical Commission (IEC) and IEEE
  - Regional policymakers such as European Commission "Code of Conduct for Broadband Equipment" (EU/CoC)

6

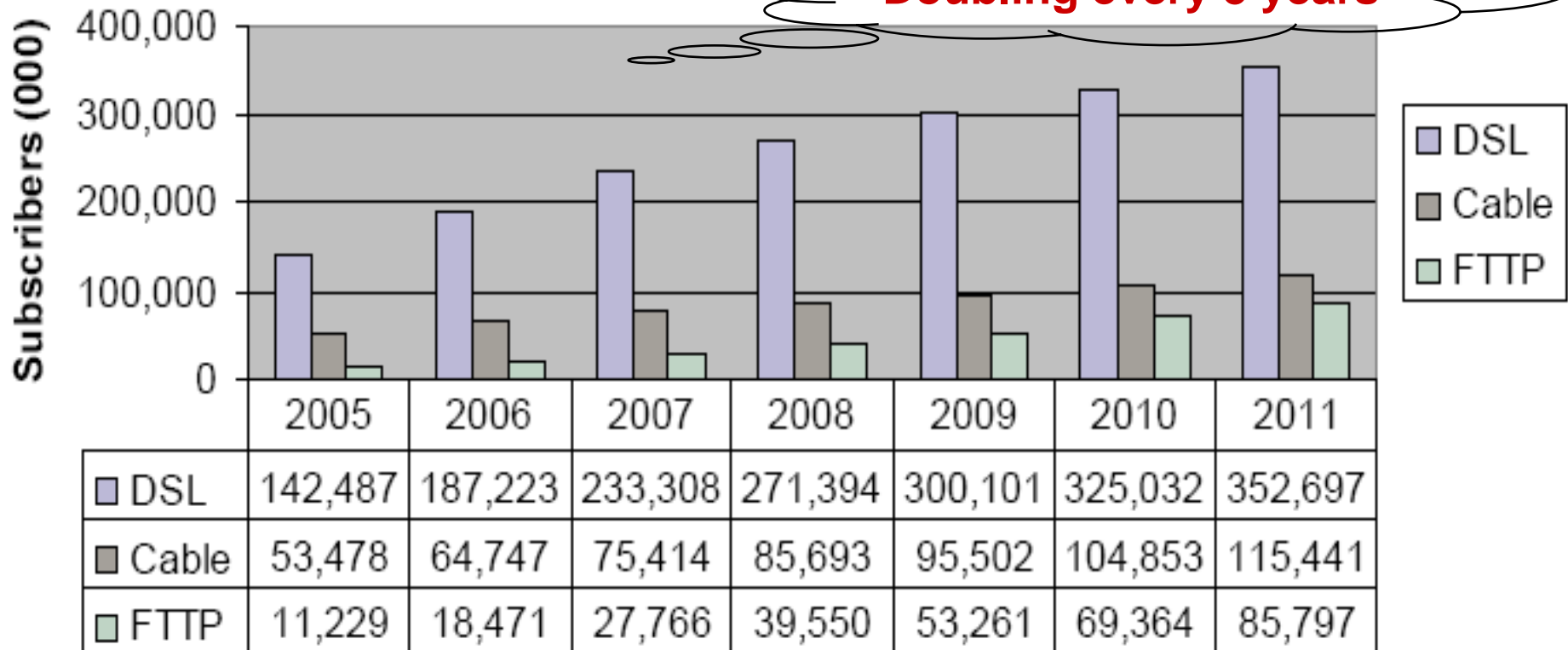# What is the power consumption of SG15 Broadband Access Technologies?

- **Power consumption of a modem pair per line (approximate without user ports)**
  - ADSL 3 W (1.5W NT plus 1.5W LT)*
  - VDSL 6.75 W (4W NT plus 2.75WLT) *
  - PON 3 W (2W NT including a 1/32 share of OLT@1W)
- **User Ports typically add up to a further 5 W and include**
  - Router/Firewall, 4 Ethernet, Wifi, and VOIP ports
  - Not standardised in ITU-T, liaise with e.g. IEEE
- **Currently these are 'always-on' technologies**
  - Stand-by modes, power-down modes and sleep modes

*http://re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative_broadband%20communication.htm

Broadband Subscriber Forecast

DSL and FTTP are major products of ITU-T SG15

Global broadband subscribers forecast

Doubling every 5 years

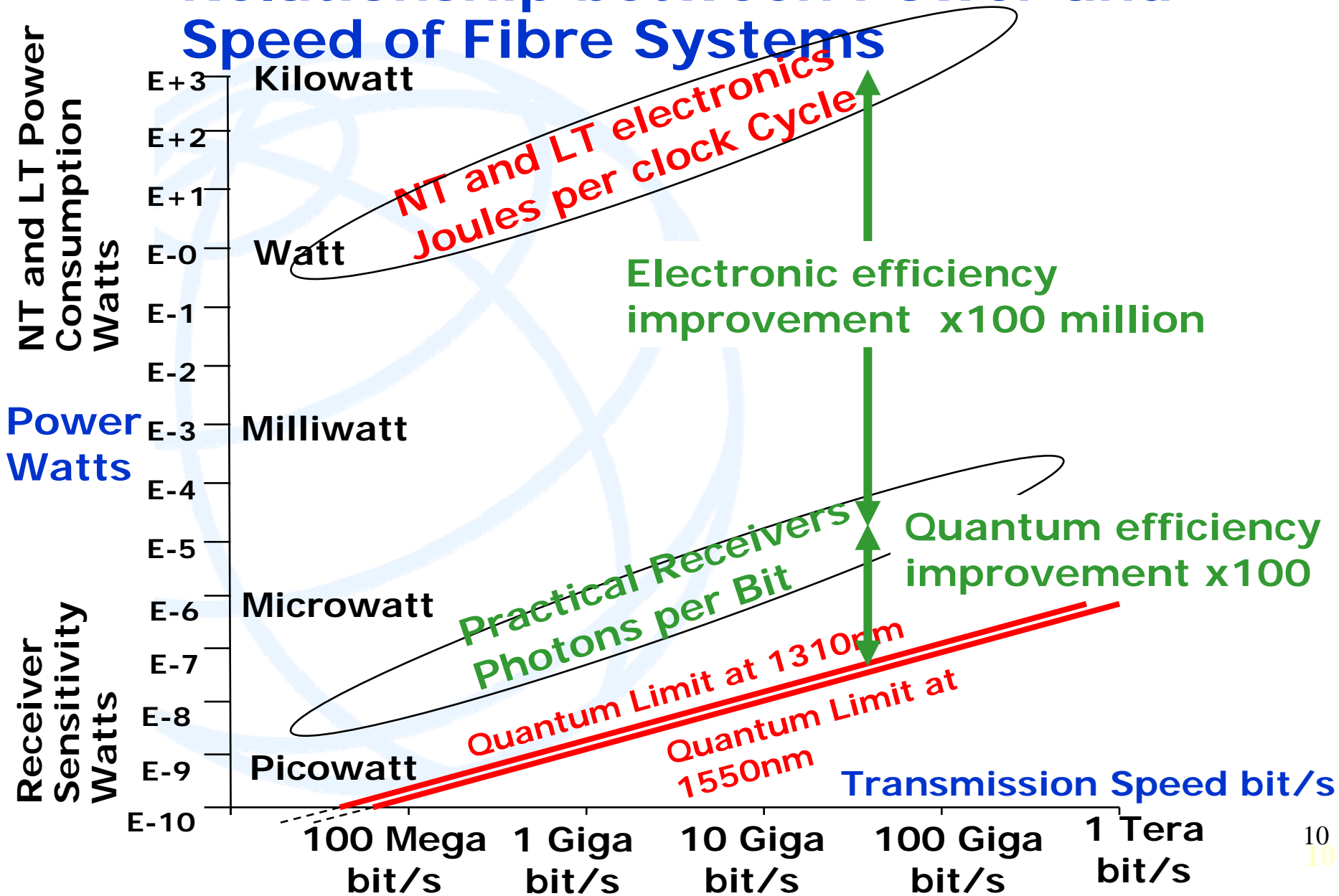|	2005	2006	2007	2008	2009	2010	2011
DSL	142,487	187,223	233,308	271,394	300,101	325,032	352,697
Cable	53,478	64,747	75,414	85,693	95,502	104,853	115,441
FTTP	11,229	18,471	27,766	39,550	53,261	69,364	85,797

Subscribers (000)

Year

Source: Lynn Hutcheson - Ovum

www.Ovum.com

# What are the energy consumption trends?

- **Broadband market likely to double in next 5 years**

- **If the energy consumed per line is halved in this timescale?**
  - **this would maintain emissions at the current level**

- **A challenge is to reduce the energy consumption by more than half every 5 years**
  - **to reduce the energy consumption**

Relationship between Power and Speed of Fibre Systems

NT and LT Power Consumption Watts

Power Watts

Receiver Sensitivity Watts

E+3 — Kilowatt
E+2
E+1
E-0 — Watt
E-1
E-2
E-3 — Milliwatt
E-4
E-5
E-6 — Microwatt
E-7
E-8
E-9 — Picowatt
E-10

NT and LT electronics Joules per clock Cycle

Electronic efficiency improvement x100 million

Quantum efficiency improvement x100

Practical Receivers Photons per Bit

Quantum Limit at 1310nm

Quantum Limit at 1550nm

Transmission Speed bit/s

100 Mega bit/s   1 Giga bit/s   10 Giga bit/s   100 Giga bit/s   1 Tera bit/s

10

Relationship between Transmission-rate and Power consumption over time

Can we save the power while increasing the speed?
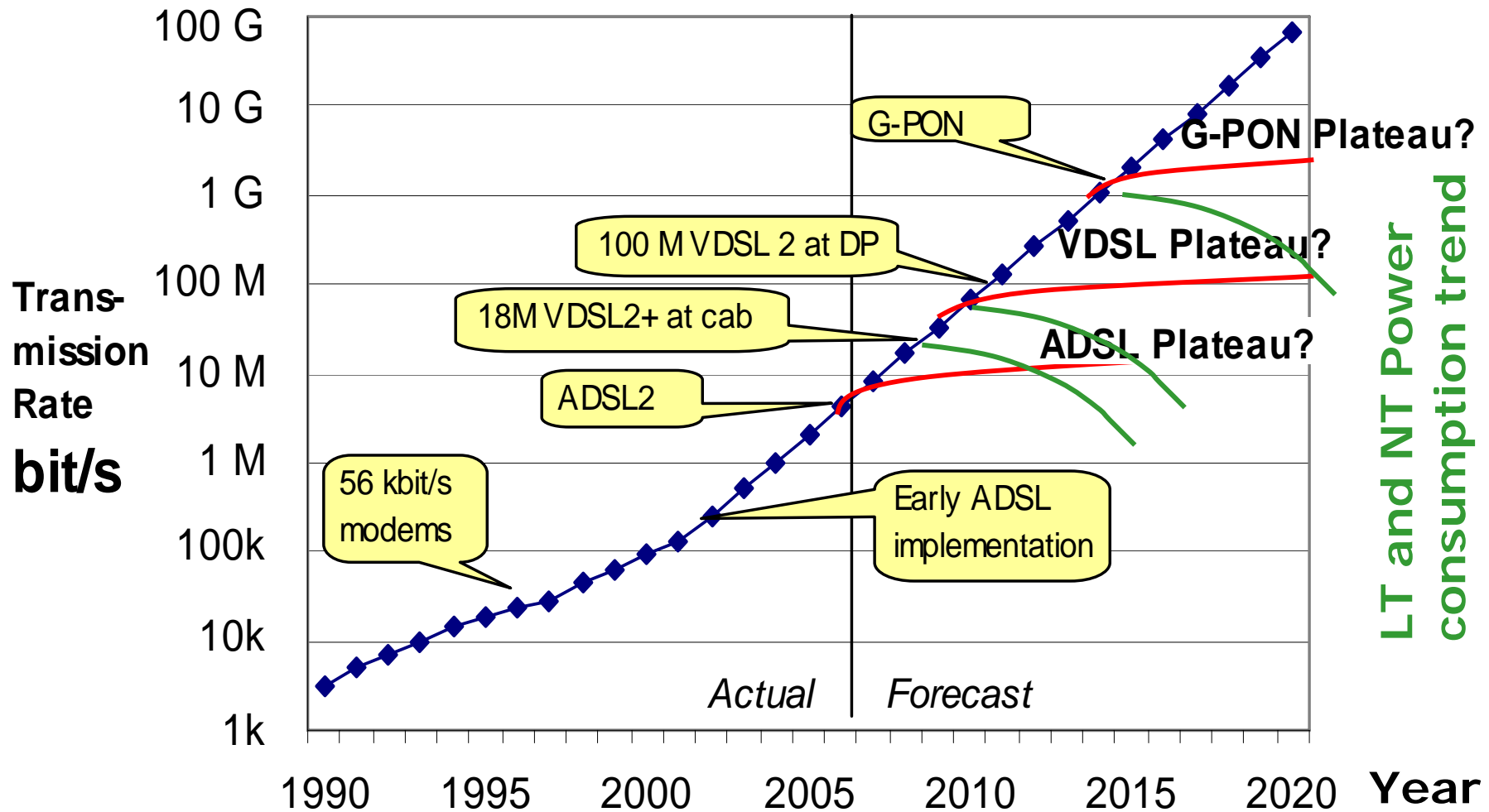
Energy Saving Checklist; Example Questions- 1. General

- **Does this ITU-T Recommendation foresee the development of devices or networks that will require the consumption of electric power?**
  - ➤ YES / NO
- **Will the implementation of this ITU-T Recommendation change the power requirements of existing devices or networks?**
  - ➤ YES / NO
- **If YES, please assign an approximate score to the significance of this Recommendation for climate change,**
  - ➤ based on the following assumptions concerning power consumption and market potential (see next Figure)

12

Categorisation of power consumption and market potential for ITU-T Recommendations

	Power consumption per device / network				
Market-Million Users in 10 years	Below 0.1 Watt	Up to 1 Watt	Up to 10 Watts	Up to 100 Watts	1 kWatt Plus
0-1M	A	A	B	B	C
1-10M	A	B	B	C	C
10-100M	B	B	C	C	D
100M-1B	B	C	C	D	D
1B+	C	C	D	D	E

Energy Saving Cheklist; Example Questions- 2. Mitigation

- **Does the ITU-T Recommendation consider/enable lower power/energy consumption of the technology or network (e.g. NGN, ADSL2+), for instance by enabling multiple power modes?**
  - YES / NO

- **If so, how well does the ITU-T Recommendation perform the action of reducing energy consumption?**
  - For example, is power saving mandatory or optional?

SG15's Questions- The Challenge

- **All Questions in SG15 for the next study period are now updated to include climate change issues (e.g. energy saving, reducing greenhouse gases, etc).**

- **Each new Recommendation should identify**
  - **its impact on climate change**
  - **how it contributes towards measurable reduction in emission of greenhouse gases**

15

Summary

- **The checklist (TD-288-GEN) is at a first draft stage for WP1/SG15**
  - ➤ A General Technical Document with useful metrics and tools
  - ➤ Is it workable yet for old and new Recommendations?
  - ➤ See Annex 1 (old) and Annex 2 (new) respectively
  - ➤ What improvements can be made at the Question level?

- **Can other Study Groups use it as a model?**

- **Can ITU work with other bodies to agree worldwide targets and check compliance?**
  - ➤ IEC, IEEE, DSL-Forum ?
  - ➤ ETSI, ATIS, APT ?

Thank You

For additional information, see
www.itu.int/ITU-T/climatechange

and

http://www.itu.int/ITU-T
/studygroups/com15/index.asp