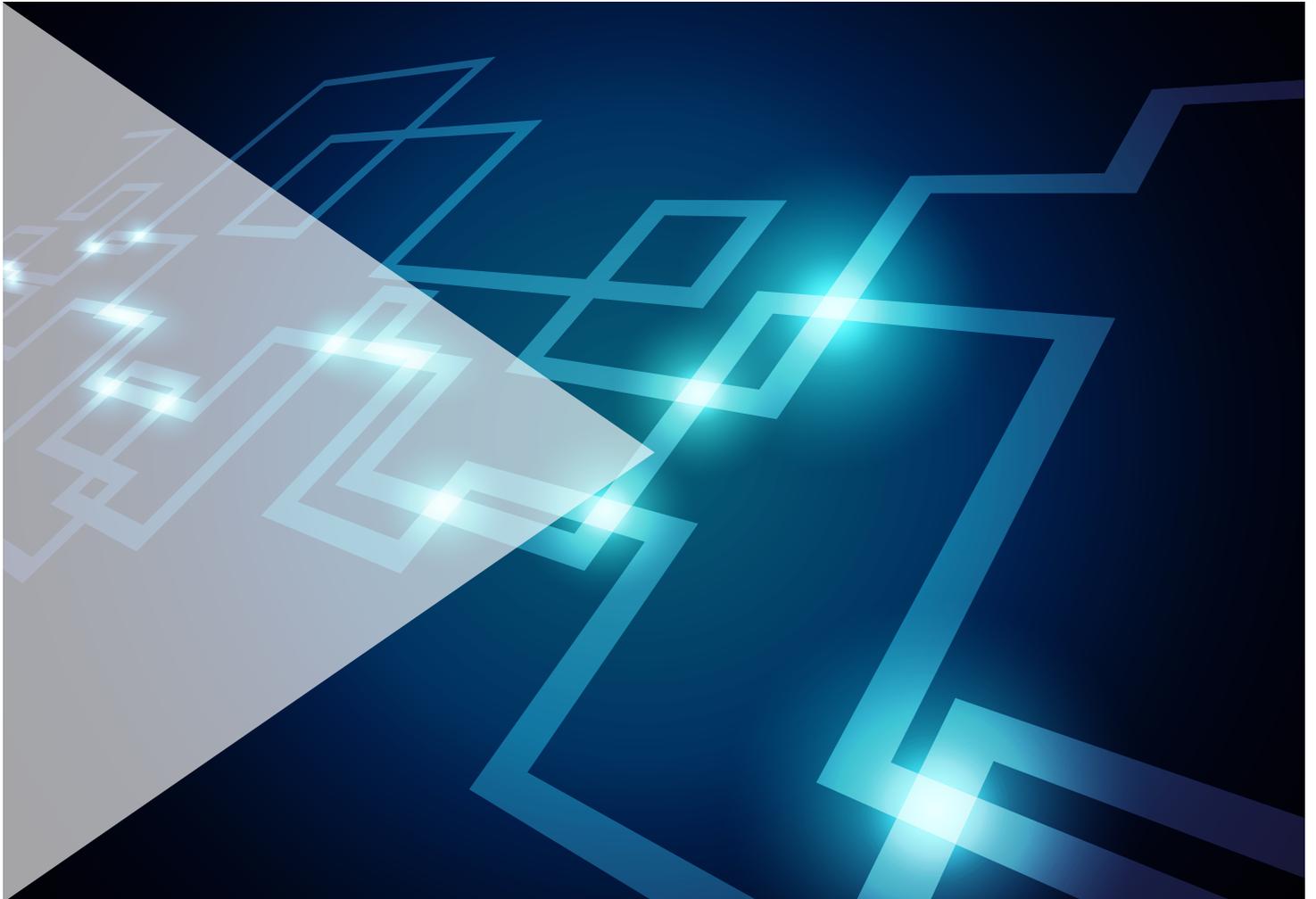


A Monthly Look at Successful Sustainability Initiatives

# Green Light Creating ICT Efficiency for a Cleaner Future

Global Agenda Council on Governance for Sustainability

September 2013



Green Light is published by the World Economic Forum's Global Agenda Council on Governance for Sustainability.

**About Green Light**

Green Light is a new publication highlighting innovative partnerships and concepts for collaboration which offer solutions at scale from the bottom-up to the world's most pressing sustainability challenges.

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# Foreword



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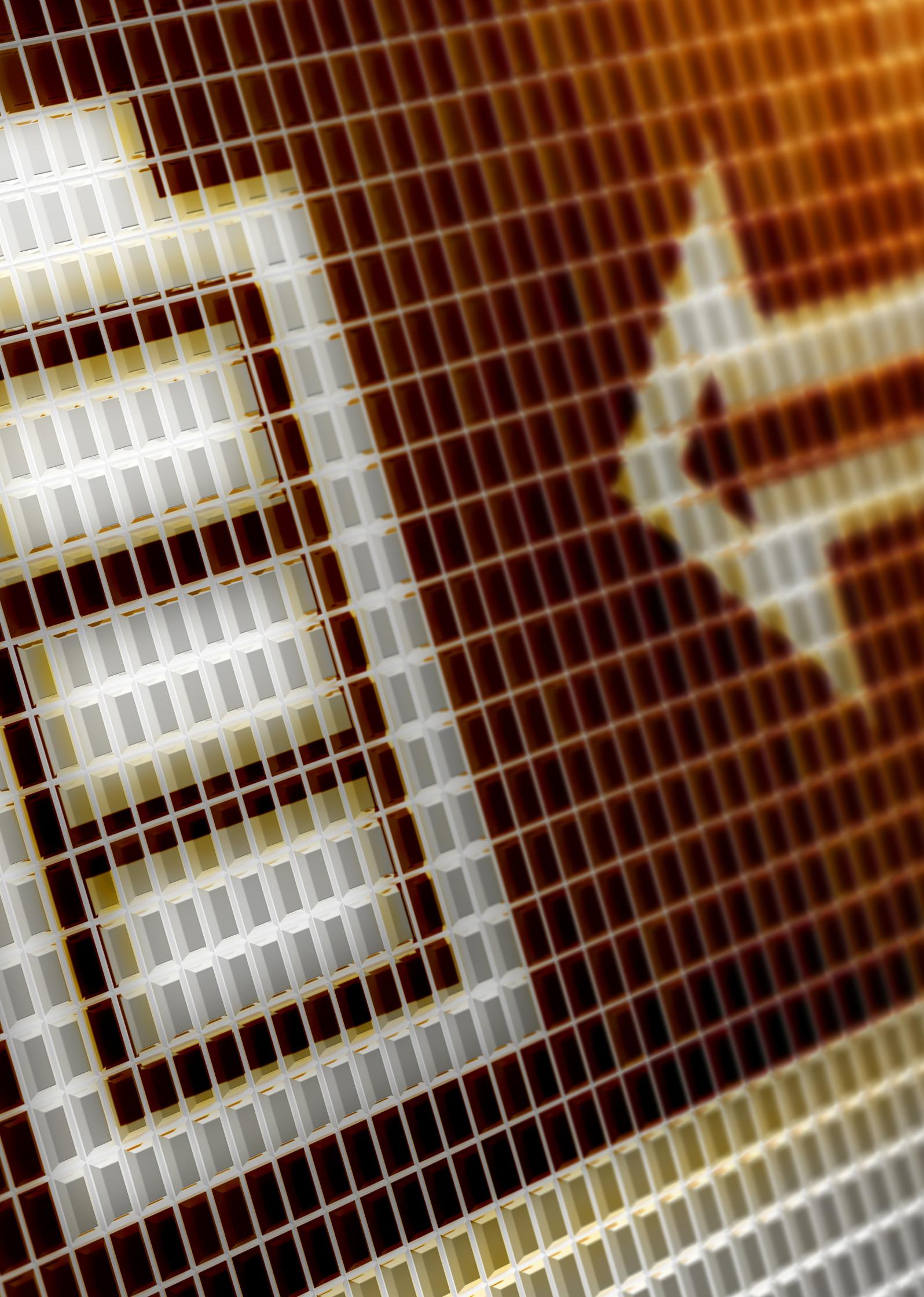
Welcome to the second edition of Green Light, a monthly newsletter from the Global Agenda Council on Governance for Sustainability aimed at highlighting promising environmental initiatives. The Council was established by the World Economic Forum to help identify and promote new ways to serve both people and the planet through sustainable development. We also draw on the ideas of other Global Agenda Councils working on such related issues as food, water, energy, trade, oceans, supply chains and the rule of law.

Worldwide, there is an increasingly urgent need to bring about more prosperity and equality, while preserving a planet imperilled by climate change and a host of other environmental challenges. Our goal is not only to share green ideas, especially those based on collaboration and public-private partnerships, but also to inspire people to replicate and even scale up similar initiatives wherever they are.

In this second edition of Green Light, we look at GreenTouch, an exciting initiative that aims to transform communication, data networks and the Internet, and radically reduce the carbon footprint of ICT devices, platforms and networks.

We hope you enjoy Green Light and that you will find it a source of inspiration for your work.

*James Bacchus*



# The GreenTouch Vision

Communications traffic is growing at an exponential rate as more consumers use smartphones, tablets and PCs to connect to the Internet. A growing number of other devices and machines are also connected, including TVs, refrigerators, cars and thermostats – the so-called Internet of Things. Moreover, legions of new users are joining networks in emerging economies, with information and communications technology (ICT) increasingly being used in a range of industries to create efficiencies.

The scale of this growth has created a problem for communication networks as they demand an ever-increasing amount of energy to support rapidly rising traffic. The root of the problem is that the increase in traffic is much higher than the rate at which networks are becoming more energy efficient. This is because the design of today's networks is calibrated to optimize capacity and speed, but not energy efficiency. As a result, they are hugely energy inefficient. This creates a growing network energy gap, which is not sustainable.

The effect of this inefficiency on the environment is significant. If the Internet was a country, it would be the fifth biggest energy consumer in the world, ahead of Russia and just a little less than Japan. ICT's carbon emissions account for 2% of carbon emissions globally, putting its carbon footprint on a par with the global aviation industry, or the equivalent of 50 million cars.

Solving the growing network energy gap, therefore, requires inventing new technologies, algorithms and architectures, or finding smarter ways of using existing technologies to reduce energy consumption in communication networks.

But no single entity, no company, however large, can tackle the

challenge of hugely increasing energy efficiency in communication networks on its own. The problem is simply too complex and involves too many players. What is needed is a new innovation model, one that incorporates all stakeholders within the ICT landscape.

Increasing energy efficiency means lowering the cost of traffic per user. This in turn reduces operational expenditure and, of course, the less power used means a lower carbon footprint. Using less power more efficiently also means that renewable energy sources begin to become viable. Environmental ambitions alone are not sufficient to achieve all this; it also requires an economic and technical approach. This is the GreenTouch way.

# What is GreenTouch?

GreenTouch is a collaborative research consortium of leading ICT industry, academic and non-governmental research experts who share a common and ambitious goal. The consortium has set itself an ambitious five-year mission to deliver the architecture and technologies needed to increase the energy efficiency of communication networks by a factor of 1,000 by 2015 compared to 2010 levels.

GreenTouch was founded in 2010 by several stakeholders in the ICT industry based on the finding of a study produced by Bell Labs showing that there was an enormous opportunity to improve energy efficiency in current communication networks. The consortium currently has over 50 members across the ICT sector, comprising telecom equipment vendors, service providers, component suppliers and academia. It brings together more than 300 participants.



# Road Map to the Future

In May 2013, GreenTouch unveiled the findings of a major research project, which concluded that it would be possible to reduce the energy consumption of data and communication networks by 90% by 2020. The study, the first of its kind, employed advanced modelling to map the communications landscape of the future and to reach its dramatic forecast. These potential energy efficiencies are possible despite the dramatic growth likely in communications traffic over the next decade.

In its announcement, GreenTouch detailed a series of new technologies for mobile, fixed residential and core transmission networks that create a dramatic reduction in energy consumption. GreenTouch has many more projects underway that will further improve the energy numbers.

Energy efficiency is defined as the ratio of the useful traffic carried by a network and the total energy required to support that traffic over a year. The research examined technologies in use in 2010 and detailed the energy efficiencies possible by 2020 if new technologies are introduced. Among the research's conclusions were:

- Mobile networks are likely to be the biggest gainers from energy efficiencies because these networks are currently the most energy inefficient and the fastest growing measured by the data they handle. Researchers believe that an improvement in energy efficiencies of 1,000 times could be achieved by enhancing existing technologies and introducing new technologies in these networks.
- Fixed-line residential access networks connecting end users to the core network also have the potential to see energy efficiency improvements of 500.

- Core transmission networks interconnecting fixed-line and mobile access networks can also achieve energy efficiencies, but these are likely to be far less dramatic as these networks are already relatively efficient. The research shows a 100-fold improvement for core networks.

The study was conducted as part of GreenTouch's [Green Meter analysis](#).

“We are extremely proud of the progress we have made in our first three years,” said Thierry Van Landegem, Chairman of GreenTouch. “Yet there is still much more we can do to improve efficiencies and effectively reinvent technologies in the name of environmental stewardship.”

Continued research within the frame of the GreenTouch consortium will further improve energy efficiencies in communication networks. Several research projects are currently active, looking at other novel architectures and technologies. Moreover, members can further propose new projects that build the path to the ambitious goal.



# A Winning Formula for Open Innovation 2.0

The collaborative model created by GreenTouch is one that could be applied to other major global societal challenges, such as climate change, according to GreenTouch Chairman Thierry Van Landegem.

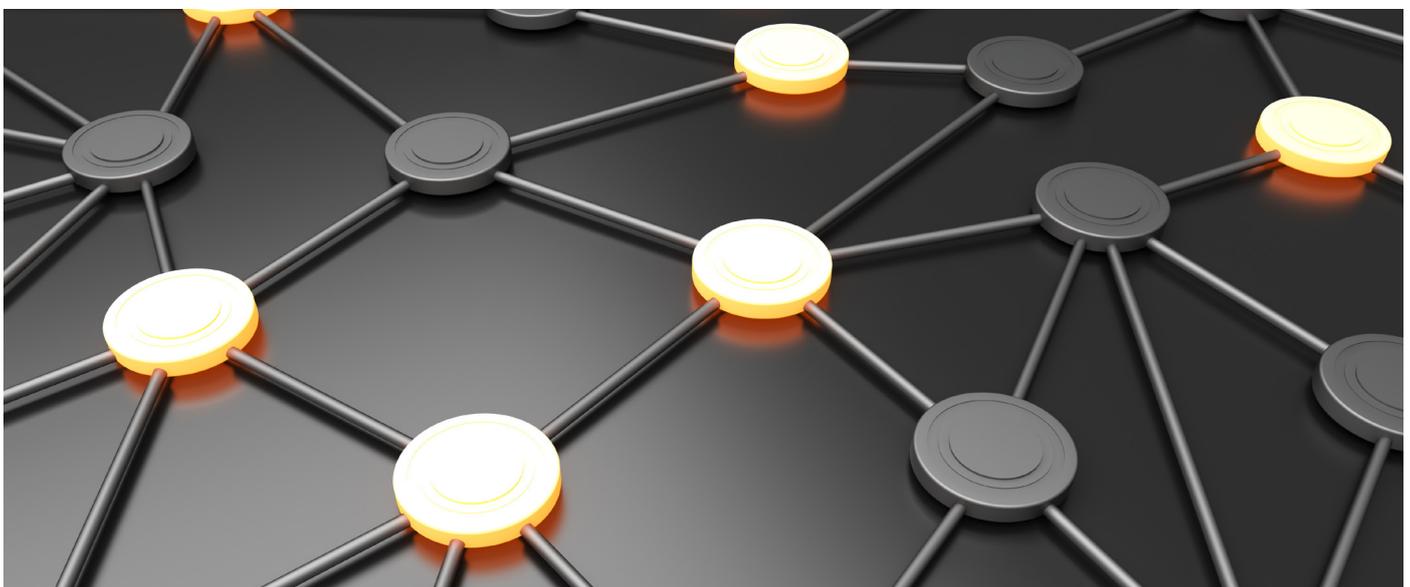
“This is a model that we have shown to work. I believe it is a recipe for the future – major challenges can be tackled in the same way and I would say climate change is one example. We have the innovations to prove that this model works.”

A number of essential features make the collaborative model successful:

- It is important to appreciate that open innovation reaches beyond any individual company; it is about a whole industry. Involving all stakeholders in the value chain is a prerequisite to ensure that all dimensions – technical, social, consumer and policy – of the project are examined. This demands a multidisciplinary approach.

- A big and ambitious goal creates a realizable target for all stakeholders to strive for; a goal that even makes competitors work together. A challenge of this type is not a purely theoretical framework; it is something that can bring about tangible results.
- Truly grand challenges are simply too big and too capital intensive to be borne by the private sector alone. Public-private partnerships are also needed because public authorities have an important role to play in supporting projects and complementing investment by industry. In this context, understanding what public funding is available and what sources are appropriate at the various stages of progress towards reaching the bold goal is vital because funding organizations will have their own agendas, such as research, trials, pilots and procurement.

- Collaboration requires clear rules about intellectual property rights. A robust framework that protects intellectual property rights is an important ingredient for success. New intellectual property created by membership is shared royalty free for the purposes of research within the consortium. This is the case whether the intellectual property is arrived at jointly or through sole projects. Sharing the IP for research purposes serves as an accelerator for innovation. If a product is later created as a result of this intellectual property, a licence fee is payable.
- Focus does not stop when inventing new technologies. These often require a change in current standardization or even new standards. New technologies also provide new perspectives towards current regulations and policy frameworks. GreenTouch is actively pursuing standardization and policy work through its membership to make sure that novel architectures and technologies can find their way into communication networks.



# Innovation in Action

GreenTouch research is built around three major groups: wired core and access networks; mobile networks; and services, policies and standards.

The consortium is two-thirds of the way through its five-year programme to develop technologies to support the growth of the ICT industry in an economically and environmentally sustainable way. More than 16 projects are underway.

GreenTouch provides the platform for innovative researchers, engineers and technology experts from around the world to work together and accelerate their efforts from creation to standardization. Through collaboration, these experts make far faster progress in increasing the energy efficiency of ICT networks than any could make individually.

Among its many findings, the consortium has unveiled two major technological breakthroughs:

## Large Scale Antenna System (LSAS)

The wireless medium offers the greatest potential for dramatic improvements in energy efficiency simply because it is currently so inefficient. Mobile phone towers are designed to enable them to cope with traffic at the busiest times. Because of this, they continually transmit signals in all directions over large areas in order to send a signal to any device in that area, whether this is a phone, laptop or tablet. And they transmit whether a device is present or not.

GreenTouch has shown that the network can be redesigned and made much more energy efficient if large, power-hungry wireless towers are replaced by much smaller antennas – hundreds, even thousands – working together. These transmit concentrated beams of information selectively to many users at once. The greater the

number of antenna elements deployed, the higher the concentration of the beams and, therefore, the lower the power that any antenna needs to send a given amount of information. Importantly, along with the large reduction in radiated power, signal strength and quality of service are maintained. This system reduces the power consumed dramatically and is likely to be especially effective in cities.

Director of Melbourne University's Centre for Energy Efficient Telecommunications and member of the GreenTouch Executive Board, Professor Rod Tucker, believes the switch to multiple antennae systems will happen in the next 5-10 years, driven not only by the need to cut energy use, but also to meet demand for ever-faster download speeds.

## Bit-Interleaved Passive Optical Network Technology (Bi-PON)

Bi-PON technology is targeted at creating big energy savings in the transmission of data via fibre to the home (FTTH). Not only does the Bi-PON reduce power consumption over current levels by a factor of 30, it also improves performance. Currently, some 99% of data sent in packets through fibre connections into homes is unneeded and dropped. Bi-PON simplifies the electronic circuitry and drops this irrelevant data much earlier in the process. As the irrelevant data is no longer transmitted, power is saved.

The result is energy savings for each consumer, who can expect to use less than 100 milliwatts of energy compared to several watts currently. This represents a sizeable energy saving per home. But more importantly, FTTH is expected to almost double over the next five years, reaching 142 million subscribers worldwide by 2016, according to ABI Research. When the energy savings produced by Bi-PON are multiplied by

those 142 million homes, the result is the equivalent reduction in carbon footprint of taking 500,000 cars off the road, or approximately all the cars in San Francisco.

# Fast Facts

- The ICT industry currently accounts for 2% of global carbon emissions. This figure is forecast to at least double in the next decade.
- If it were a country, the Internet would be the fifth biggest energy consumer, ahead of Russia and just behind Japan.
- GreenTouch's goal is to deliver by 2015 architectures, specifications and solutions, and demonstrate key technologies to increase network energy efficiency by a factor of 1,000 compared to 2010; this would mean networks around the world could be run for three years using the same energy they now consume in a single day.
- GreenTouch members come from across the ICT industry and represent leading research organizations, universities, equipment manufacturers, suppliers and network operators.
- Greentouch comprises over 50 members and 300-plus participants, with numbers continuing to grow. A member list is available at: [www.greentouch.org](http://www.greentouch.org)



# How to Get Involved



GreenTouch is open to all sectors of the ICT industry and academia. Members are service providers, software and infrastructure vendors, as well as academic and research institutions. They collaborate in applying established science to pioneer the new technologies on which energy-efficient and sustainable networks of the future will depend. The energy savings will also ultimately reduce greenhouse gas emissions.

For more information on GreenTouch activities, visit [www.greentouch.org](http://www.greentouch.org).



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