# Chapter 69
# Improving the Energy Efficiency of Telephone Exchanges (Switching Centers)

**Keith Dickerson**
*Climate Associates, UK*

**David Faulkner**
*Climate Associates, UK*

**Paul Kingston**
*K8T Computational Modelling and Consultancy Services, UK*

## ABSTRACT

*This chapter discusses the environmental assessment of telecommunications switching centers (telephone exchanges), based on the experience gained by Climate Associates Limited (CAL) and K8T on contracts in the UK and Ireland over the last few years. CAL has been asked to assess the energy efficiency of telephone exchanges and make recommendation on how their energy efficiency could be improved. Although we are not able to disclose details that may be commercially in confidence, this chapter draws out some general principles on the energy efficiency of telecommunications switching centers, taking into account the electricity demand of the equipment, the energy performance of the buildings housing it, the air conditioning needed to cool it, and the electrical systems used to power it, with a focus on how this could be improved. Reference is made to assessment standards such as ITU-T L.1310 Energy efficiency measurement and metrics for telecommunication network and ITU-T L.1300 Best Practices for Green Data Centers. Dr. Keith Dickerson and Dr. David Faulkner have both been active in the development of standards for environmental assessment in the European Telecommunications Standards Institute (ETSI) and the International Telecommunications Union (ITU) over the past 10 years and hold leadership positions in these bodies. Dr. Paul Kingston has an excellent track record in the modeling and assessment of power consumption to optimize design of the built environment. Acknowledgement is given to BT for permission to publish the results of this study. The results are based primarily on the study of a single telephone exchange and may not be valid for all exchanges of this type in the UK.*

DOI: 10.4018/978-1-4666-9619-8.ch069

## INTRODUCTION

Telecommunications operators need to assess the environmental impact of their telecommunications switching centers (or telephone exchanges) in order to report and ultimately reduce their overall energy consumption. The electricity consumption of these switching centers can have a significant impact on a country's overall energy consumption as telephone operators with Significant Market Power (SMP) typically consume around 1% of the total electricity generated. Therefore, any steps that operators can take to reduce the energy consumption of their telecommunications switching centers could have a significant impact on reducing a country's overall energy demand.

However, assessment can be difficult because many telephone exchanges contain equipment which is up to 30 years old and consumes a relatively large amount of power compared with more modern equipment. Relatively large amounts of investment are needed to replace this equipment with more modern, lower consumption equipment and this is difficult to justify on purely commercial grounds. Telephone exchanges must also have a very high reliability/resilience ('5 9s') as they form the backbone of the nation's telecommunications infrastructure and may carry highly secure and sensitive traffic as well as normal telephony and broadband services.

The objectives of this chapter are to show how these telephone exchanges can be assessed for energy efficiency and to make recommendations on the measures that can be taken to reduce the overall energy consumption of an operator's telecommunications infrastructure. Based on our analyses and through a study of the scientific literature, including best practice case studies and relevant standards, opportunities have been identified to make significant cost, energy and carbon savings in the telecommunications network.

## BACKGROUND

Telephone exchanges and their associated network infrastructure are a large (and steady) consumer of power in developed nations. At the same time, data centers, starting from a low base, are growing rapidly in size and number and are consuming ever more significant amounts of power, so that these are indirectly becoming major sources of GHG emissions in their own right. Therefore, the environmental impact of telecommunications equipment and data centers should be assessed and this should be carried out using standardized techniques which can then be used to compare GHG emissions from equipment performing similar functions in different countries and regions.

In the UK, BT as an organization consumes around 0.8% of all electricity generated, with almost three-quarters of its electricity consumed by the network (BT Group plc, 2014b). Therefore, any steps that BT take to reduce the energy consumption of their telecommunications switching and data centers could make a significant contribution to reducing the UK's overall energy demand. This would help to meet carbon reduction targets such as those specified in the UK Climate Change Act 2008 (Parliament of the United Kingdom, 2008) to reduce GHG emissions by at least 26% compared to a 1990 baseline by 2020, and the EU target for GHG emissions to be 20% below 1990 emissions by 2020.

Sustainability is high on the list of BT's priorities and the company has championed reductions in energy consumption for many years and continues to do so as part of its sustainability strategy (BT Group plc, 2014a). This has proved very successful and, as a result, the company topped the Telecommunications section of the Dow Jones Sustainability Index for seven years running. BT in common with many operators globally are replacing obsolescent Time Division Multiplex (TDM) equipment with more energy efficient IP-based equipment, and are also implementing low power modes for their DSL services. However, at