(ii) The energy debate: a "permissionless issue", above all

One of the most heated controversies surrounding Blockchain relates to its level of energy consumption. As environmental concerns are at the forefront of the international agenda, some observers note that the greater use of distributed ledger technology could pose a serious challenge to the goal of reducing carbon emissions.

Indeed, the process of validating blocks can, for some blockchains, be computationally intensive and require a high level of energy – which has a direct bearing on the scalability potential of the corresponding blockchain. This is particularly true of Bitcoin transactions. O'Dwyer and Malone (2014) show that in 2014 the Bitcoin blockchain consumed approximately as much electricity as Ireland, i.e. an estimated 3 GW.

These numbers clearly raise questions of sustainability, and even more so in view of the still limited deployment of the technology. While there are good reasons to keep a close eye on the evolution of the energy footprint of blockchain platforms, one cannot generalize based on the numbers mentioned above. Indeed, blockchain platforms are based on different types of algorithms that consume various levels of energy (see Table 2). Bitcoin, for example, is far more energy-intensive than the public blockchain Ethereum – 163 kilowatt-hours (KWh) per transaction versus 49 KWh (Coppock, 2017). In fact, most of the energy debate stems from the high level of consumption of the Bitcoin blockchain. Permissioned blockchains, however, use much lighter consensus mechanisms, which are significantly less energy-intensive. In addition, more energy-efficient algorithms are being developed, such as IOTA or more recently Hashgraph, a new type of distributed ledger that is allegedly 50,000 faster than Bitcoin and that drastically reduces the computational power and level of energy required to validate transactions.

Proponents of Blockchain also note that, moving beyond Bitcoin, blockchain technology can help to increase energy efficiency. The use of smart contracts could allow utility companies to operate their grids more efficiently through a better balance of supply and demand in real time (T'Serclaes, 2017). The deployment of blockchain technology could, on this basis, reshape utility and consumption models and lead to greater energy efficiency.

New technologies and new processes, once developed, are not set in stone. Their characteristics and use evolve over time. The technologies and processes that succeed are those that manage to adjust to meet the constraints of their time and thereby become sustainable. This also holds for blockchain technology: it is only if more energy-efficient algorithms are successfully developed that one can envisage its widespread adoption.