The conventional Casimir effect manifests itself as a quantum-mechanical force between two plates, that arises from the quantization of the electromagnetic field in the enclosed vacuum. In this talk the possibility is discussed of an extra, topological term in the Casimir energy at finite temperatures. This topological Casimir effect emerges due to the nontrivial topological features of the gauge theory: the extra energy is the result of tunnelling transitions between states that are physically the same but topologically distinct. It becomes apparent when examining, for instance, periodic boundary conditions. We explicitly calculate the new term for the simplest example of such a system, consisting of two large plates in the x-y plane, closely separated. Toroidal boundary conditions cause an integer-valued topological flux in the z-direction, giving rise to additional vacuum energy. By dimensional reduction, this system is closely related to two dimensional Maxwell theory on a torus, which is well understood. We find that the topological term is extremely small compared to the conventional Casimir energy, but that the effect could be very sensitive to an external magnetic field. This presentation will be based on a recent preprint (arxiv:1301.1706).