Extracellular electron transfer has in one decade emerged from an environmental phenomenon to an industrial process driver. On the one hand, electron transfer towards anodes leads to production of power or chemicals such as hydrogen, caustic soda and hydrogen peroxide. On the other hand, electron transfer from cathode enables bioremediation and bioproduction. While the microbiology of extracellular electron transfer is increasingly understood, bringing the processes to practice requires a number of considerations that are both operational and technical. In this manuscript we investigate the key operational aspects related to electricity driven bioproduction, including biofilm development, reactor and electrode design, substrate fluxes, surface chemistry, hydrodynamics and electrochemistry, and finally end product removal/toxicity. Each of these aspects will be critical for the full exploitation of the intriguing physiological feat extracellular electron transfer is today.