

# Generalizing the McClelland Bounds for Total $\pi$ -Electron Energy

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In 1971 McClelland obtained lower and upper bounds for the total  $\pi$ -electron energy. We now formulate the generalized version of these bounds, applicable to the energy-like expression  $E_X = \sum_{i=1}^n |x_i - \bar{x}|$ , where  $x_1, x_2, \dots, x_n$  are any real numbers, and  $\bar{x}$  is their arithmetic mean. In particular, if  $x_1, x_2, \dots, x_n$  are the eigenvalues of the adjacency, Laplacian, or distance matrix of some graph  $G$ , then  $E_X$  is the graph energy, Laplacian energy, or distance energy, respectively, of  $G$ .

*Key words:* Total  $\pi$ -Electron Energy; Energy of Graph; Laplacian Energy of Graph;  
Bounds for Energy.