Energy Stored in Inductor

Establishing a current in the inductor requires work.
The work done is equal to the potential energy stored in the inductor.

- Current through inductor: I (increasing)

- Voltage induced across inductor: $|\mathcal{E}| = L\dfrac{dI}{dt}$

- Power absorbed by inductor: $P = |\mathcal{E}|I$

- Increment of potential energy: $dU = Pdt = LIdI$

- Potential energy of inductor with current I established:

$$U = L \int_0^I IdI = \frac{1}{2}LI^2$$

Q: where is the potential energy stored?
A: in the magnetic field.