To obtain equ.(4) we integral equation (9) and used divergence theorem we ~~can~~ can obtained:

$$\int \nabla\cdot(\bar{E}\times\bar{H})\,dV = -\int \frac{1}{2}\frac{\partial}{\partial t}(\bar{E}\cdot\bar{D}+\bar{H}\cdot\bar{B})\,dV - \int \bar{J}\cdot\bar{E}\,dV \quad ---(10)$$

By using ~~Stokes~~ Gauss's theorem: $\int_V \nabla\cdot(\bar{E}\times\bar{H})\,dV = \int_S (\bar{E}\times\bar{H})\cdot n\,d\bar{s}$

Therefore: $\int (\bar{E}\times\bar{H})\cdot n\,d\bar{s} = -\int \frac{1}{2}\frac{\partial}{\partial t}(\bar{E}\cdot\bar{D}+\bar{H}\cdot\bar{B})\,dV - \int \bar{J}\cdot\bar{E}\,dV$

and:

$$---(11)$$

$$-\int_V \bar{J}\cdot\bar{E}\,dV = \int_S (\bar{E}\times\bar{H})\cdot n\,d\bar{s} + \int_V \frac{1}{2}\frac{\partial}{\partial t}(\bar{E}\cdot\bar{D}+\bar{H}\cdot\bar{B})\,dV \quad ---(12)$$

~~equ.(12) is the same equ.(4)~~ ~~---(12)~~

By arranged equ.(12) we can obtain:

$$\boxed{-\int_V \bar{J}\cdot\bar{E}\,dV = \int \frac{1}{2}\frac{\partial}{\partial t}(\bar{E}\cdot\bar{D}+\bar{H}\cdot\bar{B})\,dV + \int_S (\bar{E}\times\bar{H})\cdot n\,d\bar{s}} \quad ---(13)$$

Equ.(13) is the same equ.(4).

The right side of (equ-13) is consist of ~~the test~~ two terms: (1)- rate of change electromagnetic energy stored in volume and surface ~~~~ integrals.

(2)- Power transfored into the electromagnetic field. Through the motion of ~~the~~ free ~~charge~~ charge into volume (V); the right side of equ. (13) is positive).

~~If there are no source of e.m.f in the volume~~

Note: $(\bar{E} \times \bar{H}) \xrightarrow{is}$ Pointing vector $(\vec{S})$