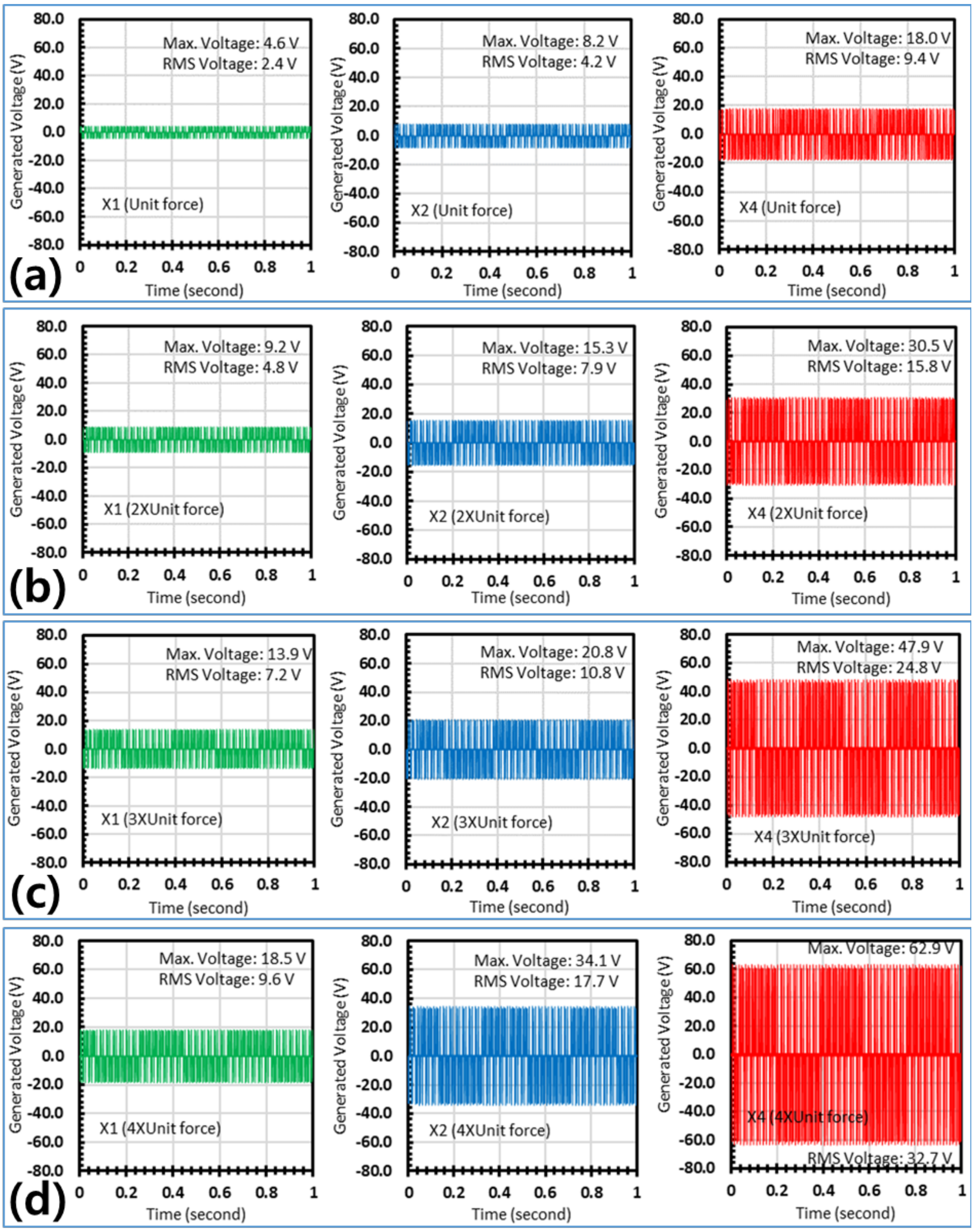


**Figure S1.** Numerical results of output voltage generated from finite element simulations in terms of (**a**) under unit force, (**b**) under 2 times unit force, (**c**) under 3 times unit force, and (**d**) under 4 times unit force.

As shown in Figure S1, the output voltages of 4.6 $V_{max}$ (2.4 $V_{rms}$), 8.2 $V_{max}$ (4.2 $V_{rms}$), and 18.0 $V_{max}$ (9.4 $V_{rms}$) were generated from the MPEH with the ×1, ×2, and ×4 layer samples, respectively, when the unit force was applied. This result is in line with the experimental measurements displayed in Figure S1a, which shows that the generated voltage is linearly proportional to the thickness of the energy harvester. To study a tendency of the output voltage according to varying AC magnetic field conditions, the other simulations were performed by changing the applied force. As the applied force linearly increased from the unit force to 2, 3, and 4 times the unit force (Figure S1b–d), the generated output voltage also increased in a linear fashion, as shown in Figure S2.

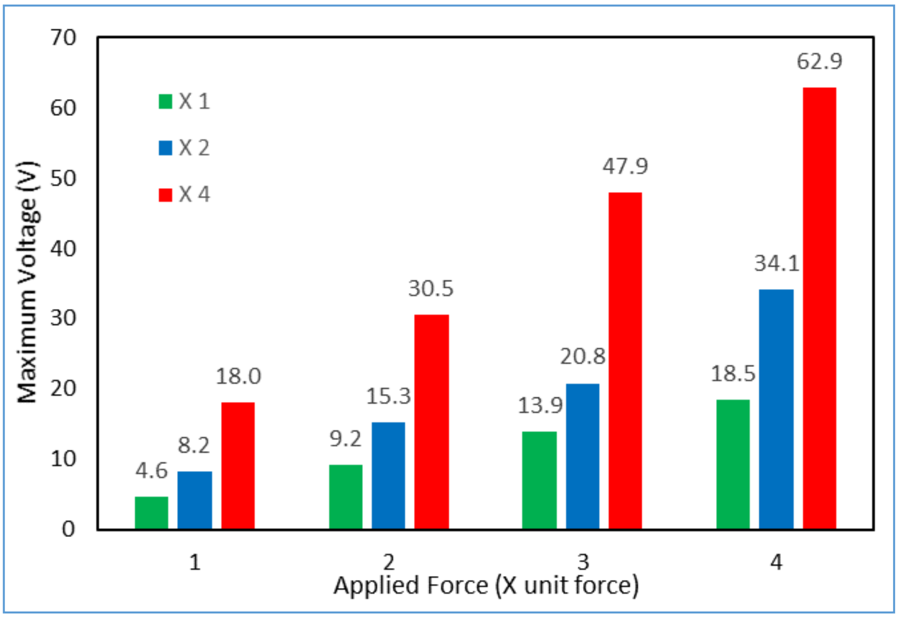


**Figure S2.** Maximum voltage generated from ×1, ×2, and ×4 harvesters under various applied external forces.

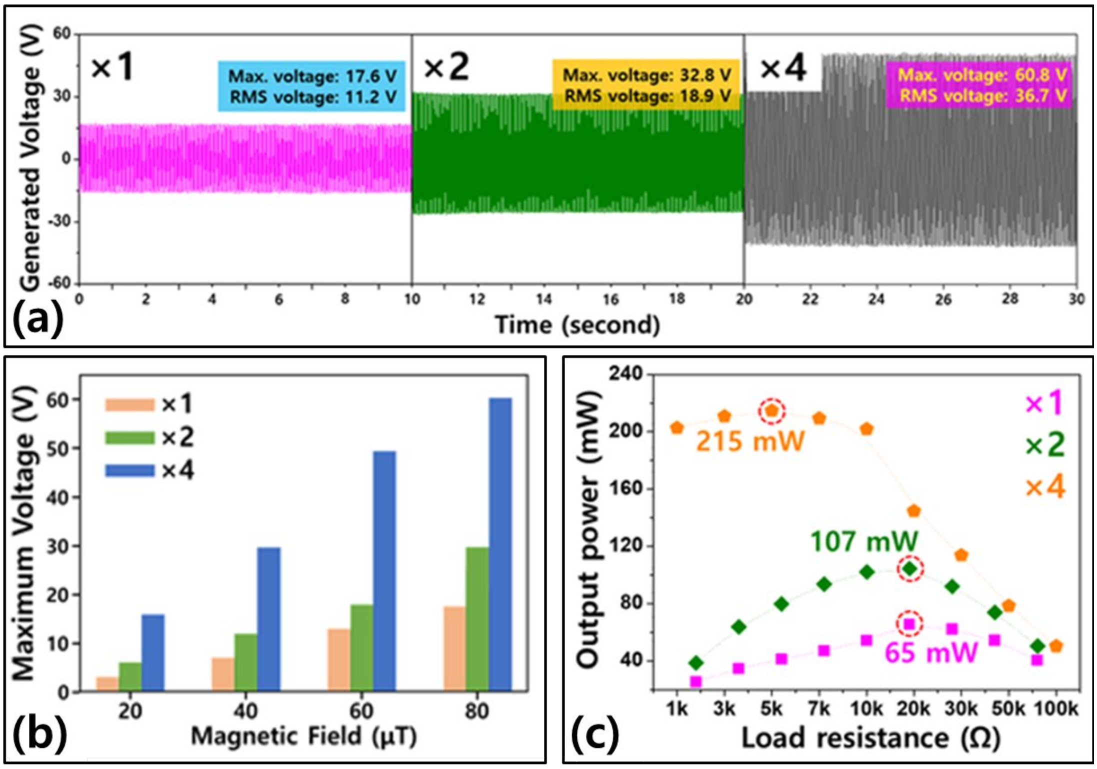


**Figure S3.** (**a**) Output voltage generated from ×1, ×2, and ×4 harvesters under AC magnetic field of 80 μT at 60 Hz for 10 s. (**b**) Maximum voltage generated from ×1, ×2, and ×4 harvesters under various AC magnetic field conditions at 60 Hz. (**c**) Maximum power with resistance changes generated from ×1, ×2, and ×4 harvesters under an AC magnetic field of 80 μT at 60 Hz.

Figure S3a shows the output voltage of the MPEH for various numbers of layers. The ×1, ×2, and ×4 layer samples produced output voltages of 17.6 $V_{max}$ (11.2 $V_{rms}$), 32.8 $V_{max}$ (18.9 $V_{rms}$), and 60.8 $V_{max}$ (36.7 $V_{rms}$) in the 80 μT magnetic field when the same amount of force was applied to the cantilever and it was made of the same material. Because the three cantilevers receive energy under the same mechanical conditions, the output voltage and current were different, but the output energy generated was the same. In detail, $p$ is a power that can be expressed as $p = \mathrm{i} \times \mathrm{V}$, and the high voltage sample should have a lower generating current ($i$). The following Equation (2) shows the relationship between the generated current and the characteristics of the cantilever [26].

$$i = N \times d_{31} \times \frac{dF}{dt} \quad (2)$$

where t is the time. In Equation (2), it can be seen that the generated current is linearly proportional to the number of layers, the piezoelectric constant of the material, and the mechanical vibration conditions. It is thought that the piezoelectric constant of the material can be increased with further study of the new composition and that the mechanical vibration condition can also be determined by the vibration source. The multilayer approach is believed to be very effective in increasing the generation current [26,27]. The generated voltage increased rapidly as the number of layers of the harvester increased: this value increased in proportion to the strength of the applied magnetic field (see Figure S3b). The output power of the ×4 harvester was calculated under various load resistances (1 kΩ–100 kΩ). The output power of the ×1 harvester was 65 mWmax at a load resistance of 20 kΩ; the value for the ×2 harvester was 107 $mW_{max}$ at a load resistance of 20 kΩ and the value for the ×4 harvester was 215 $mW_{max}$ (99 $mW_{rms}$) at a load resistance of 5 kΩ, with the matching resistance changing according to the different internal impedances (see Figure S3c).