The Self-Charging Heart

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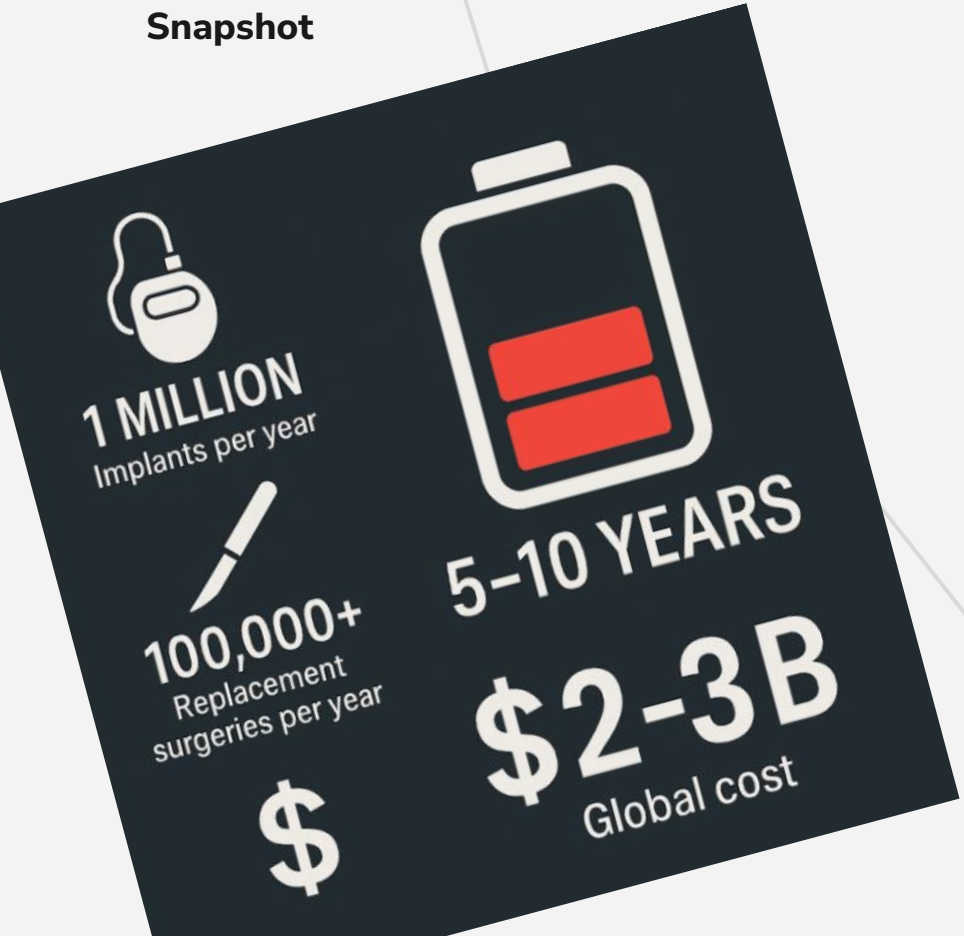
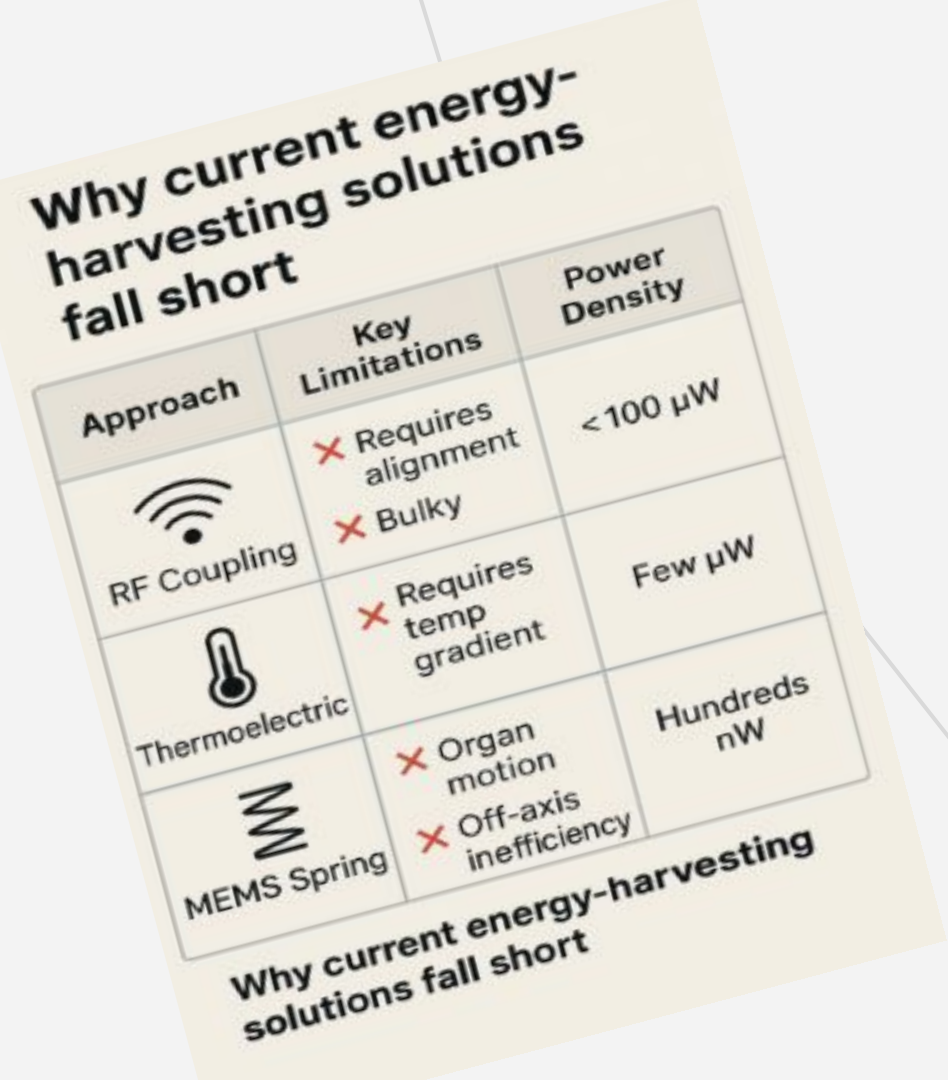
Every 5 minutes a pacemaker patient undergoes surgery...

just to change a battery

Problem Snapshot



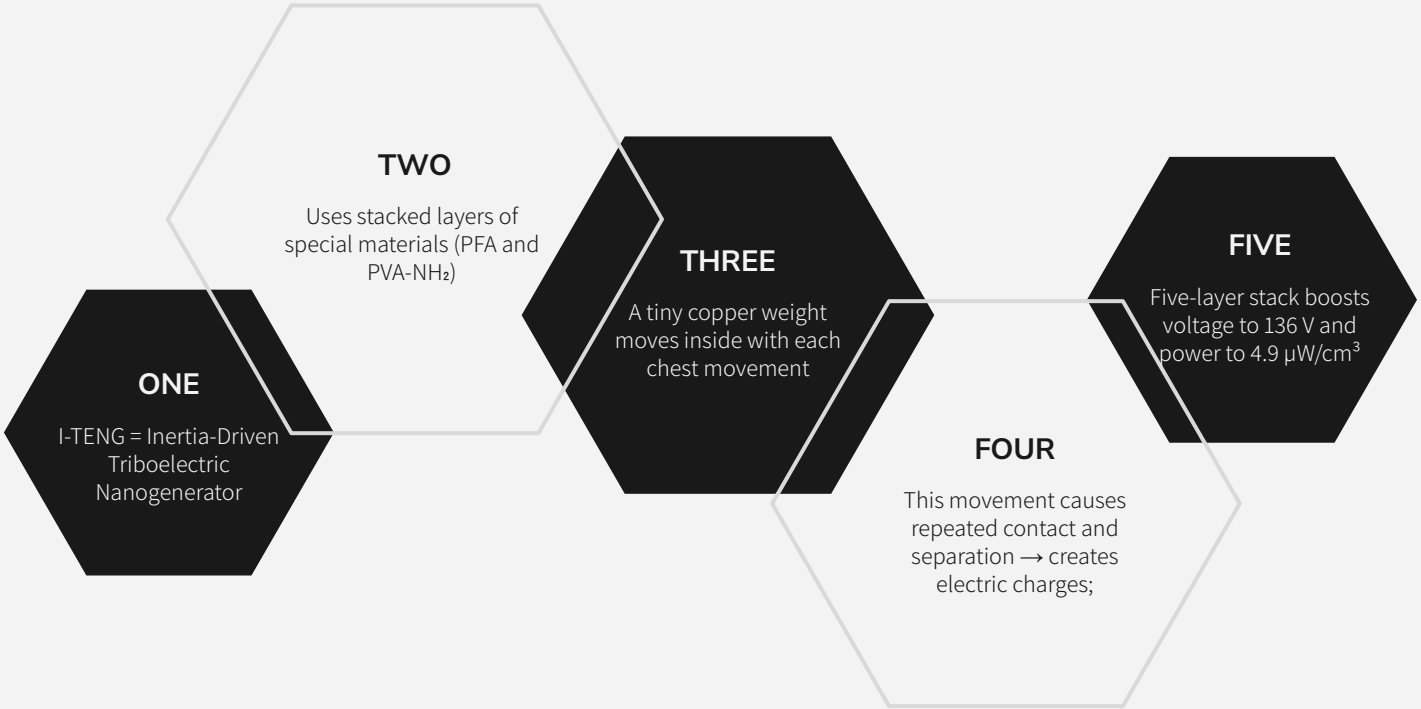
- 1 million new pacemaker implants every year worldwide
- Battery life only 5 – 10 years ⇒ frequent generator replacements
- 100 000 replacement surgeries annually—each adds infection & lead-failure risk
- Average replacement bill ≈ $20 000; global burden tops $2 – 3 billion
- Extra operations mean anxiety, hospital stays, and lost quality of life.



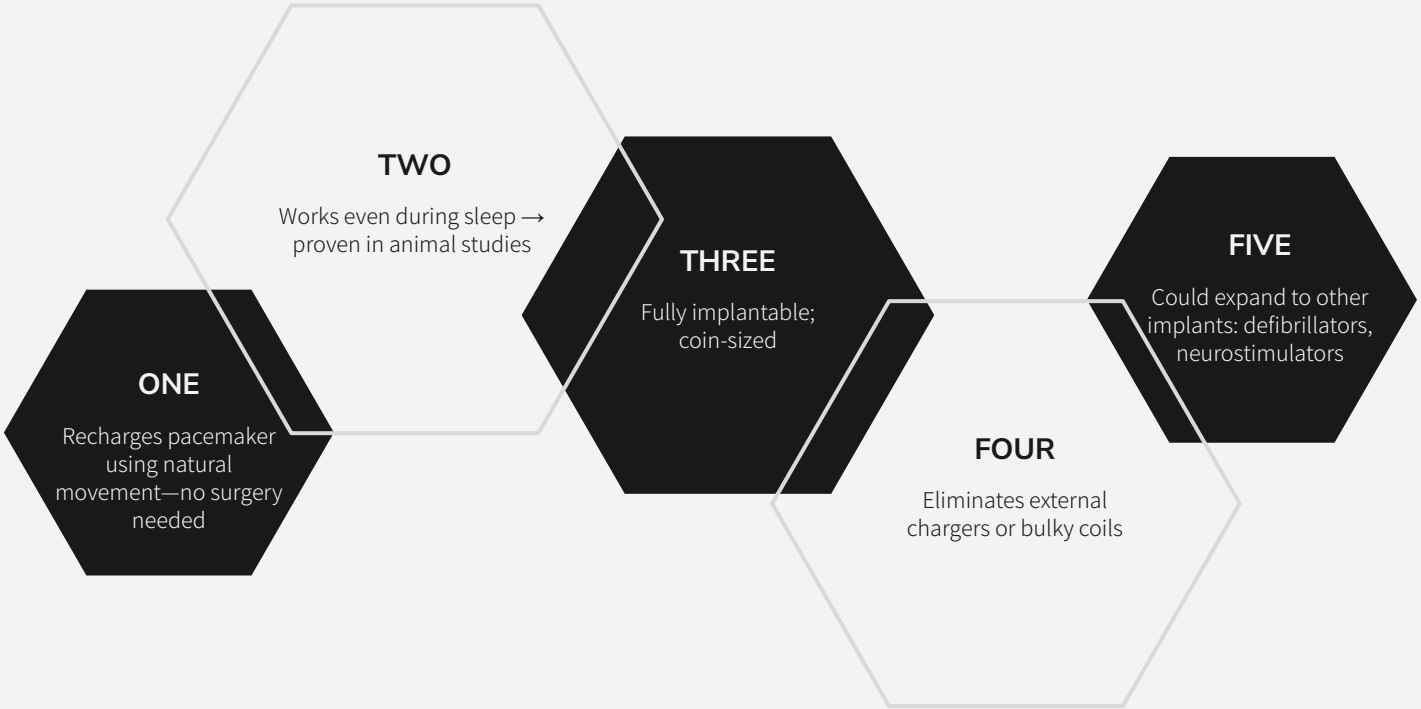
Existing Problem Solutions

- RF / inductive coupling: needs precise coil alignment, bulky chargers; < 100 μW output.
- Thermoelectric harvesters: rely on core-skin gradient → only a few μW.
- Spring-suspended MEMS generators: hundreds nW, off-axis losses, degrade in Ti can.
- None satisfy > 10 μW, compact size, and alignment-free implantation.

The Self-Charging Heart – How the Technology Works



The Self-Charging Heart – Why It Matters



How Do We Bring I-TENG to Patients?

Challenges to Adoption

Limited power in low-activity patients

Biocompatibility & long-term safety

Regulatory complexity (e.g. 510(k))

Manufacturing & quality control

Patient variability

CONCLUSION

- I-TENG enables battery-free cardiac pacing
  - Converts natural body motion into usable electrical power
- Reduces surgical risk and improves patient quality of life
- Proven effective in animal studies
  - Recharged pacemaker and responded to heart rate changes
- Next Steps:
  - Miniaturization & material optimization
  - Long-term safety and biocompatibility testing in humans
  - Regulatory submission and first-in-human trials