How Resonant Link Medical's Advanced Wireless Power Drives Medical Device Company Growth

A business case comparing financial and market implications of advanced wireless charging versus conventional solutions

Executive Summary

Rechargeable devices with advanced, patient-friendly wireless charging offer substantially better return on investment from long-term cost savings, increased patient adoption, and higher revenue potential.

This business case compares the financial and market implications of designing implantable medical devices with Resonant Link Medical's advanced, patient-friendly wireless charging as compared to designs that use conventional wireless charging or non-rechargeable batteries. Key considerations include development costs, reimbursement strategies, total cost of ownership, patient and physician preferences, and market adoption potential. Evidence indicates that rechargeable devices with advanced, patient-friendly wireless charging offer substantially better return on investment from long-term cost savings, increased patient adoption, and higher revenue potential.

As the leader in wireless medical device power, Resonant Link Medical's capabilities accelerate business growth, increase profitability, align with advantageous reimbursement strategies, and boost overall market adoption of new and next generation medical devices.

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Types of Devices and Technologies Compared

Active implantable medical devices traditionally rely on either non-rechargeable (primary cell) or rechargeable power sources. Primary cell devices, such as traditional pacemakers, necessitate surgical interventions to replace depleted batteries, resulting in higher costs, patient risks, and inconvenience. Conversely, rechargeable devices, such as many spinal cord stimulators, cochlear implants, and other types of devices, use wireless power transfer to recharge, avoiding frequent surgeries for battery replacement. For these devices, patients use external chargers to recharge devices inside their bodies. Different types of wireless charging offer different advantages with respect to device capabilities, cost, and patient and clinician preference.

Key Insight: First generation, conventional wireless technology is associated with slow recharge times, requires precise alignment of the charger, which causes frequent patient frustration and non-compliance, has limitations on implant depth, and requires a larger battery, limiting device applications.

Alternatively, Resonant Link Medical's advanced, patient-friendly wireless power technology ensures fast, safe, and reliable recharging without precise alignment constraints, significantly enhancing device usability, patient adherence, and clinician preference.

This business case outlines how advanced, patient-friendly wireless charging not only improves patient experience and clinician preference, but also increases market adoption rates and device profitability compared to primary cell and traditional rechargeable options. While revenue from replacement surgeries offsets some of the disadvantages of non-rechargeable devices, data shows that the market is ready for recharging—in fact, medical device innovation has increasingly favored recharging for a broader range of device types. Keep reading to learn more about the key factors influencing this shift and how Resonant Link Medical is uniquely poised to help medical device companies capitalize on it.

Glossary

Term	Definition
Active implantable medical device	A medical device surgically placed within the body, powered electrically to perform therapeutic functions.
Non-rechargeable (primary cell) active implantable medical device	An implantable device powered by a battery that cannot be recharged and requires replacement after depletion.
Rechargeable active implantable medical device	An implantable medical device that includes a battery capable of repeated recharging without replacement.
Battery replacement surgery	A surgical procedure required to remove and replace depleted batteries in implantable medical devices.
Driveline	An external cable or wire penetrating the skin, connecting an internal medical device to external power or control systems.
Conventional wireless technology	Traditional wireless power systems with limited efficiency, typically requiring precise alignment and short range.
Advanced, patient-friendly wireless technology	Wireless power systems designed for ease of use, offering greater flexibility, comfort, and efficient energy transfer without precise alignment constraints.

Introduction

Medical device companies face significant challenges in ensuring implantable devices are user-friendly, clinically effective, and financially sustainable. Non-rechargeable devices require surgical replacement when batteries run out, are large, and support more limited capabilities than rechargeable counterparts. But they generate revenue from replacement surgeries.

Historically, wireless charging was introduced for medical devices that could not use primary cell batteries, or for which adoption was limited for non-rechargeable devices, but to this day, it has significant limitations—slow charging speeds, strict alignment requirements, limited power range, and still too-large device size negatively impact patient compliance and device performance while limiting implantable applications that can benefit from recharging. Resonant Link Medical's innovative wireless power technology addresses all of these shortcomings, transforming implantable medical devices into powerful growth drivers for medical device companies and enabling clinicians to deliver unconstrained care.

Advantages of Resonant Link Medical's Wireless Charging

Resonant Link Medical is the only company that offers patient-friendly wireless charging—fast, highly efficient, and flexible—across the wide range of active implantable device types.

The solution to current implantable medical device challenges is patient-friendly wireless charging with a larger charge range — that is, wireless charging that enables capable implantable devices, works for all body types, and ensures patients can actually use and see the benefits of their devices. Resonant Link Medical is the only company that offers this type of wireless charging—fast, highly efficient, and flexible—across the wide range of active implantable device types.

Key Capabilities

Rapid Charging: The best wireless charging is so fast and seamless that it doesn't require people to change their lifestyles. Resonant Link Medical's wireless charging, featuring inductive coupling and integrated capacitance for fast, high-efficiency power transfer, enables charging in minutes, not hours—eliminating the need for overnight or extended charging sessions.

Reliable, Uninterrupted Power Over a Large Range: For truly patient-friendly wireless charging, power transfer must be seamless and reliable as patients go through their day, something Resonant Link Medical uniquely offers. Adaptive power tuning and a wide alignment tolerance mean that users can charge without disruptions, even as they move around, ensuring not only fast, but safe and consistent power for implants. No longer do patients need to sit or lie still for hours to recharge implants, a significant source of frustration and non-compliance today.

More Capable Implants: Patient-friendly wireless charging enhances, not restricts, device capabilities. Resonant Link Medical's wireless power technology enables compact, high-power-density systems and when coupled with its advanced telemetry and data transfer allows for miniaturized, high-performing devices that improve patient comfort and compliance, and enable advanced diagnostic and therapeutic capabilities.

Higher Efficiency and Safety: Increased power transfer efficiency minimizes heat generation and energy loss, enhancing device safety and longevity. This means rechargeable implants can be located in higher sensitivity areas of the body, can be more powerful, and can last longer.

Scalability Across Active Implantables: Patient-friendly wireless charging enables scalable devices that can be upgraded without surgical intervention, and gives medical device companies one universal power platform for their device portfolio that clinicians and patients can use across applications. This streamlines device development and commercialization, simplifies clinician and patient education, and meets clinician and patient needs for device compatibility.

By addressing the shortcomings of traditional implantable power, both primary cell and conventional wireless, Resonant Link Medical's technology ensures that the benefits of rechargeable implantable medical devices are fully realized, thereby supporting greater market adoption.

Why Clinicians and Patients Prefer Rechargeable Devices

70.3%

of patients switching from non-rechargeable to rechargeable preferred the rechargeable option

87.3%

of DBS patients with rechargeable devices reported satisfaction with their devices

Studies indicate that many patients and clinicians prefer rechargeable implantable medical devices despite the need for regular recharging, valuing the long-term benefits over the convenience of non-rechargeable, "set-it-and-forget-it" devices. For example, in a study involving patients with deep brain stimulation (DBS) devices, 87.3% of those with rechargeable implantable pulse generators reported satisfaction with their devices. Notably, among patients who transitioned from non-rechargeable to rechargeable devices, 70.3% expressed a preference for the rechargeable option.

Reasons for Patient Preference

More Comfortable and Less Visible Devices: Rechargeable devices often have a smaller profile, which patients prefer for several reasons such as being able to hide device use when desired and reducing pain at the implant site, which a sacral neuromodulation study showed affected 5x more people for non-rechargeable implants vs. rechargeable.

Device Longevity and Avoidance of Replacement Surgeries: For life-sustaining devices like pacemakers and ICDs, a study showed the "vast majority of patients prefer a larger device to reduce the number of potential replacement operations...This preference crosses the spectrum of those with a previously implanted device, those undergoing initial implants, those returning for routine follow-up, and patients of various ages, gender, and habitus."

Rechargeable devices have longer lifespans, reducing the need for surgical replacements and enabling smaller devices, so patients don't have to choose. In this study, the benefit of longer lasting devices and fewer battery replacements was paramount for patients, more so even than device size.

Economic Considerations: While the initial cost of rechargeable devices may be higher due to higher rechargeable battery costs, the reduced need for both battery replacements and follow-up office visits can lead to cost savings over time, influencing patient choice.

While non-rechargeable devices offer the convenience of minimal maintenance between replacement surgeries, many patients prefer rechargeable implantable medical devices due to their longer lifespan, reduced need for surgical replacements, and overall device performance. Additionally, many rechargeable devices can be adjusted remotely if needed, eliminating the need for follow-up visits, which is another key aspect of device maintenance. This capability also exists to a lesser extent with non-rechargeable devices as depending on the device's power needs, capabilities like remote monitoring and therapy personalization can be limited by the amount of power and energy available.

Key Insight: The preference for rechargeable devices is even stronger when patient-friendly recharging technology is used, because of people's ability to seamlessly integrate recharging into their daily life, as opposed to scheduling their lives around recharging needs.

We'll dive more into the reasons patient-friendly wireless charging is preferred over conventional wireless technology later in this business case. In summary, patient preference for recharging has been demonstrated across clinical areas and device types, and is growing due to patients' desire for more comfortable and discreet devices, longer-lasting devices, fewer replacement surgeries, and lower overall costs. Clinicians, likewise, prefer rechargeable implants for similar reasons.

Reasons for Clinician Preference

Across various medical fields, clinicians are increasingly valuing the benefits of rechargeable implantable devices, such as reduced surgical interventions, improved patient satisfaction, better patient outcomes, and long-term cost-effectiveness. While the need for regular recharging is a consideration, the overall advantages make rechargeable devices a preferred choice in many clinical scenarios.

Enhanced Patient Satisfaction: Patients often report higher satisfaction with rechargeable devices due to fewer surgeries, cosmetic advantages of smaller implants, less pain from their device, and the autonomy provided by self-managed recharging routines.

Improved Patient Outcomes: Studies indicate that rechargeable implantable medical devices can deliver more effective treatment outcomes compared to non-rechargeable counterparts in certain applications. For example, research on rechargeable SCS devices suggests improved long-term treatment effectiveness compared to non-rechargeable systems through reductions in pain diagnoses, hospitalizations, physician visits, and pain medication usage over

time. A study of DBS for Parkinson's disease reported that 87.7% of patients with rechargeable implantable pulse generators were satisfied with the stimulation effects.

Cost-Effectiveness: Over time, rechargeable devices can be more economical by reducing the cumulative costs of multiple surgeries, hospital stays, and follow-up doctor's office visits. While some reimbursement models favor these repeated surgeries and follow-up visits, clinicians' preferences have increasingly shifted toward rechargeable devices that don't require as much intervention. For example, a study analyzing sacral neuromodulation devices found that over a 15-year period, rechargeable systems were associated with a cost savings of $27,121 per patient compared to non-rechargeable systems. With the growth of value-based care reimbursement, the shift to recommending rechargeable devices is likely only going to continue.

Reduced Surgical Interventions: Rechargeable devices typically have longer battery life, decreasing the need for replacement surgeries and associated risks. Battery replacement surgeries, though generally considered minor, carry risks such as infection and wound healing issues that clinicians seek to avoid. A study on deep brain stimulation (DBS) highlighted that multiple implantable pulse generator (IPG) replacements over a patient's treatment course can increase health risks, including elevated post-implantation infection rates and wound healing problems. This has led more clinicians to favor rechargeable options.

$27,121

cost savings per patient over 15 years with rechargeable systems vs. non-rechargeable

Clinicians increasingly prefer rechargeable implantable devices, recognizing their long-term benefits despite the need for recharging. This preference is evident in various specialties, including neuromodulation therapies like spinal cord stimulation (SCS) and deep brain stimulation (DBS). Even in areas like cardiology where rechargeable options are less common, there is a growing interest in recharging to minimize the risks and costs associated with battery replacement surgeries, and to increase device longevity. Clinicians recognize that longer-lasting devices can improve patient outcomes, reduce the burden on healthcare systems, and are what patients want.

Business Impacts of Advanced Wireless Charging

$36,300

average sales price for rechargeable SCS devices vs. $18,700 for non-rechargeable

16.4%

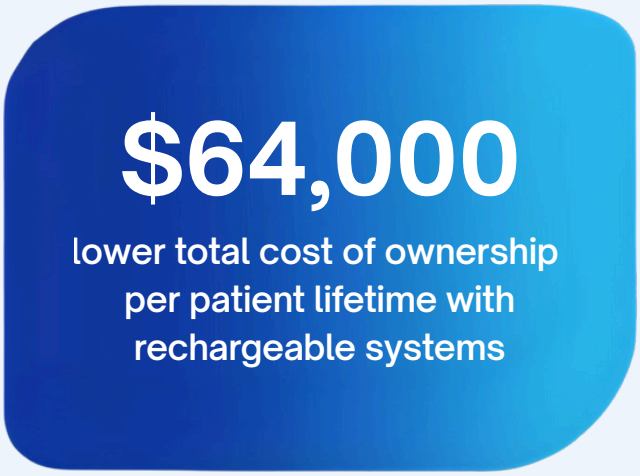
market share captured by Nevro's rechargeable SCS system in less than a decade

Higher Average Sales Price: Rechargeable implantable medical devices often have a significantly higher average sales price when compared to their non-rechargeable counterparts. For example, the average sales price for rechargeable SCS devices is approximately $36,300, whereas non-rechargeable devices average $18,700.

Accelerated Market Adoption: Clinicians and patients prefer rechargeable implantable devices that reduce surgical interventions, improve patient outcomes, and can be easily used and integrated into their daily lives. These advantages have been shown to drive rapid market share growth. For example, Nevro's rechargeable SCS system captured 16.4% of the $6 billion spinal cord stimulator market in less than a decade, driven by the

superior capabilities afforded by its recharging. Now, ten years later, new devices are demonstrating a leap forward in what's possible–new devices such as those powered by Resonant Link Medical's wireless power.

Increased Device Profitability: Rechargeable systems offer a much lower total cost of ownership (up to $64,000 per patient lifetime) by minimizing replacement surgeries, patient support, and clinical follow-ups. This is a 43% reduction in costs compared to non-rechargeable systems and when paired with higher initial sales prices, means rechargeable devices command higher margins than non-rechargeable devices.



Better Utilization of Hospital Resources to Increase Profits: Rechargeable devices can significantly decrease the number of surgeries required for battery replacements, leading to potential savings of $14,275 per patient. While these surgeries also generate revenue for hospitals, medical device manufacturers and hospitals often experience lower revenue from sales of replacement devices, so hospitals can be incentivized to perform fewer replacement surgeries in favor of procedures that generate higher revenue. Additionally, fewer instances of surgical complications from fewer overall surgeries leads to reduced unplanned healthcare expenses, like hospital readmissions or emergency care, which typically aren't significant revenue generators.

Remote Management and Reduced Clinical Support: Rechargeable implantable devices can reduce patient maintenance and healthcare interactions, creating opportunities to allocate resources to new patients, because devices can be easily recharged in outpatient or home settings and clinicians can get access to more system

data remotely. This reduces the need for frequent clinical visits to monitor battery health and device performance. In contrast, depending on their capabilities, non-rechargeable devices can require more frequent check-ups and clinical monitoring to validate device effectiveness, fine-tune treatment parameters, and accurately predict end-of-life battery depletion, ensuring patient safety and device reliability. Thus, rechargeable technology can simplify device management, reduce patient burden, and decrease routine medical care, which typically commands less revenue and incurs higher costs when compared to other sources of revenue, such as new patient visits.

Advantageous Reimbursement Strategies: With the healthcare industry increasingly adopting value-based care models, rechargeable devices align well with hospital cost-containment goals and improved patient outcomes, leading to higher reimbursement incentives. Additionally, fewer replacement surgeries and hospitalizations lower readmission penalties and boost financial performance under value-based reimbursement programs.

New Devices and Treatments: Resonant Link Medical's advanced, patient-friendly wireless charging drives business growth by making new devices possible that wouldn't be otherwise, due to the limitations of primary cell batteries and conventional wireless technology, such as their larger size and limited power delivery.

Greater Return on R&D Investment: See the below section for how wireless charging, especially patient-friendly wireless charging, can increase return on investment for medical device research and development.

Development Cost and Commercialization Advantages

Key Insight: Resonant Link Medical combines unmatched wireless power expertise, proprietary in-situ modeling, and a proven technology platform to bring new device designs from the screen to the lab in one design iteration, delivering working hardware in months, not years.

Beyond affecting the sales price, profitability, and potential adoption of implantable devices, the choice between primary cell and rechargeable implantable medical devices, and between conventional recharging and advanced wireless capabilities, significantly impacts device development costs, timelines, and clinical trial success. Rechargeable devices typically incur higher development costs than non-rechargeable devices, largely due to the higher costs of rechargeable batteries; however, they have a higher return on investment given their greater average sales price, faster adoption, and overall revenue contribution from increased market share and new revenue streams. Additionally, time to market for rechargeable devices can be similar to non-rechargeable medical devices due to the availability of wireless charging platforms that accelerate development.

For the greatest return on investment, Resonant Link Medical's advanced, patient-friendly wireless charging offers lower or comparable overall development costs as compared to traditional wireless charging, and significantly higher revenue potential. That's because Resonant Link Medical combines unmatched wireless power expertise, proprietary in-situ modeling, and a proven technology platform to bring new device designs from the screen to the lab in one design iteration, delivering working hardware in months, not years, and supporting its medical device partner's regulatory and compliance submissions for a smooth market entry. This leads to financially advantageous partnerships where medical device companies can reduce development costs, accelerate market entry, and drive significantly higher growth rates and revenue for new and next generation devices.

Cost and Time to Market Comparison

Developing rechargeable devices introduces unique considerations including the level of expertise needed for the desired capabilities, timeline to commercialization, and market adoption. The following comparison examines three development strategies for rechargeable implantable medical devices, outlining their costs, capabilities, and commercial outcomes.

Option 1: Fully In-House Development

Description: Developing the rechargeable device entirely within the company's internal capabilities and resources.

Pros	Cons
Internal control of the development process	Limited wireless power expertise
Potentially lower development expenses	Longer development timeline and multiple iterations expected

Option 2: Contract Manufacturer Development

Description: Outsourcing device design and development to a specialized contract manufacturer, with wireless power system development capabilities. This model assumes an average all-in cost of $1.25M, with a post-launch fee of $25/device.

Pros	Cons
Leveraging external resources frees up in-house resources for other projects	Higher initial costs
Can reduce development timeline when compared to fully in-house, when the contract manufacturer has proven expertise delivering the desired capabilities	Multiple design iterations needed to meet specifications
	Less control over proprietary technology
	Incentivized to get you to production to earn manufacturing revenue vs. delivering on device needs the first time, especially when additional technological complexity is involved

Option 3: In-House Device Development with Resonant Link Medical Handling Wireless Power System Design and Integration

Description: Keeping device development in-house and outsourcing wireless power system design, development, and integration to Resonant Link Medical. Assumes an average upfront cost of $750K, an average post-launch fee of $75/device, and double the year-over-year market growth due to superior device performance and usability, and a higher average sales price.

Pros	Cons
Highest wireless charging expertise and performance	Less control over proprietary technology
Significantly shorter time to market leading to earlier returns on investment	Higher per-device fees post-commercialization
Reproducible performance from models to hardware in only design iteration, every time	
Lower upfront development costs than non-specialized wireless charging companies and contract manufacturers	
Enhanced device capabilities that allow you to command a higher ASP, serve a larger patient population, and strengthen your competitive advantage	
Free up in-house resources for other projects	
Use of IP grants you access to future technology platform improvements	

Comparison Summary

The below table provides a detailed comparison of these development strategies, assuming a starting volume of 500 units sold in year one.

Partnering with Resonant Link Medical accelerates device innovation, commercialization, and adoption, enabling smaller, smarter implants that clinicians want and patients prefer.

Development Strategy	Device Capabilities/ Expertise	Est. Cost for Development	Design Iterations	Avg. Time to Market	Annual Growth	Sales Price	Addl. Per Device Fee	Total 5-Year Revenue	ROI (Revenue/ Cost)
In-House	Moderate (Limited in-house wireless expertise)	$3,000,000	3-4	6-7 years	15%	$30,000	-	$101,135,719	4x
Contract Manufacturer	High (Specialize in several areas of device development; only traditional wireless charging expertise)	$4,250,000 ($1.25M for wireless power)	3-4	5 years	15%	$30,000	$25/device	$101,135,719	4x
In-House with Resonant Link Medical	Highest (Deep expertise in advanced, patient-friendly wireless charging)	$3,750,000 ($750K for wireless power)	1	4 years	30%	$35,000	$75/device or one-time NRE	$158,254,250	5x

Conclusion

By integrating advanced, patient-friendly wireless charging into implantable devices, medical device companies achieve superior market positioning, higher average selling prices, faster commercialization timelines, and significantly greater long-term revenue potential—key for sustained business growth.

Patient-friendly wireless charging technology significantly accelerates business growth for implantable medical devices by improving patient experience, clinical outcomes, and market differentiation. Devices equipped with intuitive, easy-to-use wireless power reduce patient burden, increase compliance, and support rapid adoption. Additionally, rechargeable systems that leverage advanced wireless charging technology extend device longevity, reduce surgical interventions, and decrease healthcare resource utilization, making them highly attractive under value-based reimbursement models.

These improvements translate into higher patient satisfaction, increased adoption rates, and greater clinician preference—critical drivers for accelerated market growth and increased sales. Thus, Resonant Link Medical's patient-friendly wireless charging technology directly impacts medical device companies' financial performance through increased profitability, accelerated market adoption, advantageous reimbursement scenarios, and optimal development economics.

To learn more about the advantages of advanced, patient-friendly wireless power for your medical device, please contact Resonant Link Medical at info@rlmedical.com.