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## Green AI Frontier: Why Tirunelveli & Kanyakumari are Poised for Data Center Dominance

### Executive Summary: Top 10 Reasons to Choose Tirunelveli & Kanyakumari for AI Data Centers

The southern districts of Tirunelveli and Kanyakumari in Tamil Nadu are emerging as a compelling destination for the next wave of AI inferencing data center investments. This region offers a unique blend of abundant green energy, strategic infrastructure, and a supportive policy environment, making it an ideal location for sustainable, high-performance computing.

- 1. Massive Green Energy Potential:** The region is home to India's largest onshore wind farm (1,500 MW) and boasts a state-wide potential of 75 GW.<sup>1</sup>
- 2. Consistent Wind Availability:** Reliable wind is available for approximately 300 days a year, ensuring a continuous source of green power.<sup>5</sup>
- 3. Low Natural Disaster Risk:** The districts are classified with low seismic risk, and other hazards are manageable with modern design.
- 4. Abundant Scalable Land:** Vast tracts of land in planned industrial estates are readily available for large-scale data center expansion.<sup>7</sup>
- 5. Pre-existing Utility Infrastructure:** The region offers ready access to power substations and a perennial water source from the Tamirabarani river.<sup>7</sup>
- 6. Pro-Investment Government Policies:** Tamil Nadu's Data Centre Policy 2021 provides capital subsidies, tax exemptions, and single-window clearance.<sup>8</sup>
- 7. AI Inferencing's Power Focus:** AI inferencing's high power and lower inter-data center bandwidth needs perfectly align with the region's energy strengths.<sup>10</sup>
- 8. Robust Energy Storage Plans:** Identified pumped storage projects with 14,500 MW potential will ensure grid stability for renewable energy.<sup>3</sup>
- 9. Excellent Fiber Connectivity:** Tamil Nadu has the second-highest number of submarine cable landing stations in India, providing high bandwidth.<sup>12</sup>
- 10. Catalyst for a Thriving Tech Ecosystem:** Initiatives like Tiliconveli Tech Park actively foster local talent, create rural jobs (including for women and youth), and support startups and IT companies, building a powerful "Green AI" ecosystem.<sup>13</sup>



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## Unlocking India's AI Future: Why Tirunelveli & Kanyakumari are Primed for Green Data Center Investment

### I. The Dawn of AI Inferencing: A New Infrastructure Imperative

The global digital infrastructure landscape is undergoing a profound transformation, driven by the explosive growth of Artificial Intelligence (AI). This shift is particularly pronounced with the rise of generative AI, which demands a new class of data centers with unprecedented power requirements. Generative AI consumes a staggering 10 to 30 times more energy than traditional task-specific AI, fundamentally reshaping the energy footprint of digital services.<sup>15</sup> This immense appetite for electricity is evident in the fact that training a single large language model can require hundreds of megawatt-hours of electricity.<sup>16</sup> Projections from the Department of Energy (DOE) indicate that U.S. data center electricity usage is expected to increase from 176 trillion-watt hours (TWh) in 2023 to between 325 and 580 TWh by 2028.<sup>15</sup> Globally, the demand for electricity from data centers is forecast to surge by 50% by 2027 and by as much as 165% by 2030, compared to 2023 levels.<sup>15</sup>

A critical distinction must be made between AI *training* and AI *inferencing* when considering infrastructure needs. While AI training involves computationally heavy, iterative processes on massive datasets, AI *inferencing*—the application of a trained model to new, previously unseen data for real-time predictions—is generally less computationally intensive per instance.<sup>10</sup> Inferencing prioritizes low latency and high throughput for real-time processing.<sup>11</sup> Importantly, it does not necessitate the massive, continuous inter-data center bandwidth typically required for large-scale model training.<sup>10</sup> This differentiation is pivotal for strategic site selection. Furthermore, AI data centers generate substantially more heat than traditional operations, necessitating advanced liquid-based cooling solutions, which can account for up to 40% of a data center's total electricity use.<sup>15</sup>

The evolving infrastructure demands of AI inferencing point to a strategic decoupling of compute and connectivity requirements. Traditional data center site selection has historically placed a heavy emphasis on proximity to major fiber optic landing points and dense urban areas to minimize latency



and maximize bandwidth. However, the lower inter-data center bandwidth requirements for AI inferencing mean that its core demand shifts to abundant, stable, and cost-effective power, coupled with efficient cooling. This opens up unique opportunities for regions rich in green energy, even if they are not primary international fiber hubs, to become uniquely attractive for AI inferencing data centers. This redefines the optimal geographic strategy for AI data center deployment, allowing areas like Tirunelveli and Kanyakumari, with their exceptional energy resources, to emerge as prime candidates, potentially reducing land and operational costs compared to traditional metro areas.

Concurrently, the astronomical energy consumption of AI data centers is unfolding amidst a global push for sustainability and increasingly stringent environmental, social, and governance (ESG) standards. New data center permits are increasingly requiring carbon-free power sources.<sup>16</sup> Regions that can offer abundant, reliable, and demonstrably green energy sources gain a significant advantage beyond mere cost savings. Locating AI inferencing data centers in a region like Tirunelveli and Kanyakumari, powered predominantly by renewable energy, provides a powerful "green premium." This not only aligns with corporate sustainability mandates and attracts environmentally conscious investors but also preempts future regulatory hurdles, offering long-term operational stability and a strong brand narrative.

**Table 1: AI Inferencing Data Center Requirements vs. Traditional**

Requirement	AI Inferencing Data Centers	Traditional Data Centers
<b>Power Consumption</b>	Exponentially higher (10-30x traditional, hundreds of MWh for training) <sup>15</sup>	Significant, but lower per task <sup>15</sup>
<b>Cooling Needs</b>	Advanced liquid-based solutions, generates extreme heat <sup>15</sup>	Conventional air-cooling often sufficient <sup>15</sup>



<b>Bandwidth Needs</b>	Lower latency, high throughput for real-time processing; less inter-DC bandwidth than training <sup>10</sup>	High bandwidth for diverse applications and data transfer <sup>15</sup>
<b>Hardware Focus</b>	High-performance GPUs, specialized AI accelerators <sup>10</sup>	CPUs, general-purpose servers <sup>15</sup>
<b>Workload Type</b>	Continuous, real-time inference <sup>15</sup>	Varied, cyclical, task-specific <sup>16</sup>

## II. Tamil Nadu's Green Powerhouse: A Wind-Powered Advantage

Tirunelveli and Kanyakumari districts are at the epicenter of India's renewable energy prowess, offering an unparalleled advantage for power-intensive AI data centers. The **Muppandal Wind Farm** in Kanyakumari district stands as India's largest operational onshore wind farm, boasting an impressive installed capacity of **1,500 MW**.<sup>1</sup> This makes it the 4th largest operational onshore wind farm globally, a testament to the region's exceptional wind resources.<sup>1</sup> The area benefits from consistent wind speeds ranging from 3.44 to 18 meters per second (m/s), leading to high capacity factors and annual energy output.<sup>2</sup> Crucially, the region experiences "almost daily winds for close to 300 days a year"<sup>5</sup>, fueled by both southwest and northeast monsoons.<sup>6</sup> The extended wind season typically runs from May to September, providing a reliable and continuous source of clean energy.<sup>3</sup>

Beyond Muppandal, the National Institute of Wind Energy (NIWE) estimates Tamil Nadu's total wind energy potential at a colossal **75 GW**, including 35 GW from offshore sources.<sup>3</sup> The state's current installed wind capacity stands at 10.5 GW<sup>3</sup>, and the Tamil Nadu Green Energy Corporation (TNGEC) has set an ambitious target to generate 25 GW of wind power by 2030.<sup>3</sup> In the last fiscal year, Tamil Nadu added 586 MW to its wind power grid, securing its position as the third-highest contributor in India.<sup>3</sup> Further solidifying its green energy commitment, Tata Power, one of India's largest integrated



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power companies, is investing INR 3,000 crore to establish a 4GW solar cell & 4GW solar module manufacturing plant in Tirunelveli district <sup>18</sup>, diversifying the region's renewable energy ecosystem and fostering a comprehensive clean energy supply chain.

The sheer scale of wind power in this region, with 1,500 MW already operational, a 75 GW potential, and consistent wind availability for approximately 300 days a year, is not merely an environmental attribute; it represents a fundamental economic advantage. The consistent, high-speed wind directly translates to a lower Levelized Cost of Energy (LCOE) for data center operations. Given that power can constitute a substantial portion of data center operational expenditure (OPEX), this offers a significant competitive edge in a power-hungry industry like AI data centers. This transforms the region's natural wind resources into a strategic economic asset, enabling data centers in Tirunelveli and Kanyakumari to achieve significantly lower long-term operational costs, thereby enhancing profitability and making them highly attractive to major AI and data center investors seeking sustainable and cost-efficient solutions.

While the intermittent nature of wind power, despite its abundance, requires robust energy storage solutions, Tamil Nadu has proactively identified potential Pumped Storage Project (PSP) sites in the Western Ghats with a combined capacity of 14,500 MW.<sup>3</sup> These PSPs are vital for storing excess renewable power during low demand and releasing it during peak periods, ensuring grid stability.<sup>3</sup> Historically, the state has faced challenges with its renewable energy policy, including the abrupt withdrawal of annual banking facilities for windmills by Tangedco, which has impacted investor confidence and new project additions.<sup>6</sup> The absence of a clear state policy on wind or solar has also been noted.<sup>6</sup> However, the recent formation of the Tamil Nadu Green Energy Corporation Limited (TNGECL) marks a significant shift. TNGECL is actively seeking an intra-state electricity trading license to act as a power procurement intermediary, aiming to "incentivise the RPD by ensuring early payments before due dates" and streamline green energy project development with a single-window clearance system.<sup>19</sup> This demonstrates a clear governmental pivot towards resolving past policy hurdles and fostering a more investor-friendly environment. This proactive stance signals to discerning investors that the Tamil Nadu government is actively addressing past policy inconsistencies and is committed to ensuring a long-term, stable, and reliable green power supply, thereby mitigating perceived policy risks and enhancing the region's attractiveness for large-scale, long-term data center investments.



**Table 2: Tamil Nadu's Wind Power Profile (Tirunelveli & Kanyakumari Focus)**

Metric	Value	Source(s)
Muppandal Wind Farm Installed Capacity	1,500 MW	1
Global Ranking (Muppandal)	4th largest operational onshore	1
Wind Availability (Tirunelveli/Kanyakumari)	~300 days/year	5
Tamil Nadu Total Wind Energy Potential	75 GW (35 GW offshore)	3
Tamil Nadu Current Installed Wind Capacity	10.5 GW	3
Tamil Nadu 2030 Wind Power Target	25 GW	3
PSP Potential in Western Ghats (TN)	14,500 MW	3



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### III. Strategic Location: Stability and Scalable Foundations

While no region is entirely free from natural hazards, Tirunelveli and Kanyakumari offer a relatively stable environment for critical infrastructure like data centers, particularly when compared to other high-risk zones globally. The region exhibits low seismic risk, with Tirunelveli experiencing a minor 2.3 magnitude earthquake in 2021.<sup>20</sup> India's seismic zoning map classifies Tamil Nadu predominantly in Zone II (low seismic intensity) and Zone III (moderate seismic intensity)<sup>20</sup>, with Tirunelveli and Kanyakumari typically falling within the lower risk Zone II. This provides a significant advantage for long-term infrastructure stability.

Regarding flooding, while coastal Tamil Nadu is generally prone to floods<sup>21</sup> and Tirunelveli has faced flood-like situations due to heavy rainfall<sup>22</sup>, "very high flood risk" is primarily identified in the northern parts of coastal Tamil Nadu, such as the Chennai-Cuddalore stretch.<sup>21</sup> Strategic site selection within Tirunelveli and Kanyakumari, away from immediate flood plains, can effectively mitigate this risk. For cyclones, the Tirunelveli Kattabo area has a "high" cyclone hazard, indicating a greater than 20% chance of damaging winds in 10 years<sup>23</sup>, and Cyclone Ockhi intensified near Kanyakumari.<sup>24</sup> However, modern data center design incorporates robust building codes and advanced mitigation strategies for wind and water ingress<sup>23</sup>, making these risks manageable. Both districts are identified as prone to drought events.<sup>25</sup> This is a consideration for water-intensive cooling systems, but innovations in liquid cooling and water optimization can significantly reduce water consumption.<sup>16</sup> This nuanced perspective provides a more credible and robust argument for investors. Instead of an unrealistic promise of absolute safety, it demonstrates a realistic understanding of the regional environment and how potential risks can be effectively addressed through intelligent design, strategic site selection, and adherence to modern engineering standards, thereby enhancing investor confidence.

The region offers substantial land for large-scale data center development, a crucial factor for scalability. While the Gangaikondan SIPCOT Industrial Growth Center is nearing capacity, its IT Special Economic Zone (SEZ) still has 120.59 acres available at a competitive rate of Rs. 15.00 lakhs per acre.<sup>7</sup> Furthermore, new industrial estates are planned at Marukaalkurichi (2,200 acres) and Moolaikkaraipatti (1,060 acres) along the Tirunelveli – Kanniyakumari Highway.<sup>27</sup> An IT Park is also



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slated for development on over 4 acres in Tirunelveli.<sup>27</sup> Tamil Nadu is renowned for "extensive industrial land availability," with all its districts covered under industrial corridor projects like the Chennai – Kanyakumari Industrial Corridor.<sup>28</sup>

The availability of vast, pre-identified land in planned industrial estates and their integration into established industrial corridors is a significant advantage. These are not just empty plots; they come with existing utility easements, planned grid capacity, and water access.<sup>16</sup> This directly contrasts with the extended construction timelines—two to four years, and in some cases as many as six years—for data centers elsewhere due to power constraints and permitting delays.<sup>16</sup> This translates directly to faster deployment and significantly reduced time-to-market for data center operators. The presence of pre-allocated land, pre-approved power infrastructure, and water resources substantially de-risks the development phase, making the region highly attractive for rapid and scalable investments in AI inferencing data centers.

The Gangaikondan IT Park is already equipped with a 133/11 KVA substation and has pre-allocated 12 acres for a larger 230/33 KV substation with 4x50 MVA power transformers, signaling readiness for high-capacity power demands.<sup>7</sup> Water supply is secured from the perennial Tamirabarani river.<sup>7</sup> While Tamil Nadu has faced historical power deficits<sup>30</sup>, the strategic focus on renewable energy integration and the development of large-scale pumped storage projects are designed to enhance overall grid reliability and ensure continuous power supply.<sup>3</sup> In terms of connectivity, Tamil Nadu boasts the second-highest number of submarine cable landing stations in India, hosting over 30% of the nation's subsea cables that connect to 264 global landing stations.<sup>12</sup> Chennai alone offers 14.8 TBPS capacity across 6 submarine cables, with Tuticorin providing an additional 1 TBPS.<sup>12</sup> This extensive Optical Fibre Communication (OFC) network ensures "reliable, large bandwidth" and "lower latency"<sup>12</sup>, crucial for data transmission.



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## IV. Government Vision: Catalyzing Investment with Progressive Policies

Recognizing the critical role of data centers in the digital economy, the Government of Tamil Nadu has implemented a comprehensive Data Centre Policy 2021 designed to attract significant investment.<sup>12</sup> This policy offers tangible financial benefits, including a "capital subsidy for data center developers and cloud providers".<sup>8</sup> Furthermore, it provides "exemption from stamp duty and electricity tax for 5 years"<sup>8</sup>, significantly reducing initial and ongoing operational costs for investors.

To expedite project implementation, the policy has implemented a "single-window clearance system"<sup>8</sup>, directly addressing common bureaucratic delays that often hinder large-scale infrastructure projects. It also offers "exemptions from building norms"<sup>8</sup> to facilitate construction. A core objective of the policy is to "enable power, land & connectivity infrastructure for Data Centres"<sup>12</sup>, ensuring that essential resources are readily available. The policy's explicit promotion of "sustainability through the promotion of green technologies"<sup>12</sup> and active encouragement of renewable energy sources to power data centers<sup>8</sup> aligns seamlessly with global ESG trends and the specific energy demands of AI. This proactive and comprehensive policy environment significantly de-risks investments and accelerates project deployment. It signals a clear, tangible governmental commitment to fostering the data center industry, moving beyond mere aspirational statements to concrete, actionable support, which is paramount for attracting large-scale domestic and international capital.

Tamil Nadu's inherent strength in "manufacturing of electronics and electrical equipment such as server systems"<sup>12</sup> provides a complementary industrial ecosystem, potentially streamlining supply chains for data center components. The state's commitment to renewable energy extends beyond data centers, as evidenced by schemes like the Chief Minister's Solar Rooftop Capital Incentive Scheme, which offers capital subsidies for solar installations.<sup>32</sup> The formation of the Tamil Nadu Green Energy Corporation Limited (TNGECL) and its efforts to streamline green energy projects and act as a power procurement intermediary<sup>19</sup> directly support the data center policy's sustainability goals by ensuring a robust supply of green power.

The policy's explicit emphasis on green technologies and renewable energy access for data centers perfectly aligns with the immense power demands of AI data centers and the global imperative for sustainable operations.<sup>16</sup> The state's broader efforts to streamline green energy projects through



entities like TNGECL create a direct and reliable pipeline of clean power for data centers. This fosters a powerful symbiotic relationship: the burgeoning data center industry provides a massive, consistent demand for renewable energy, thereby incentivizing further investment in green power generation. In turn, abundant green energy attracts more data centers. This positions Tamil Nadu as a pioneering leader in "Green AI," attracting companies committed to their ESG goals and potentially carving out a unique competitive niche in the global data center market.

**Table 3: Key Incentives from Tamil Nadu's Data Center Policy**

Incentive Type	Specific Benefit	Source(s)
<b>Financial</b>	Capital subsidy for developers/cloud providers	8
	Exemption from stamp duty for 5 years	8
	Exemption from electricity tax for 5 years	8
<b>Land &amp; Infrastructure</b>	Allocation of land at concessional rates (often in designated parks)	12
	Enable power & connectivity infrastructure	12
<b>Regulatory</b>	Single-window clearance system	8



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	Exemptions from building norms	8
<b>Sustainability</b>	Encouragement of renewable energy sources	12
	Promotion of green construction techniques	9

## V. Forging a Powerful AI Ecosystem: Who Stands to Gain?

Data centers are far more than just technological hubs; they are powerful economic engines.<sup>34</sup> India's data center capacity is projected to surge from 1.3 GW in 2024 to 5 GW by 2030, attracting an estimated \$20-22 billion in capital expenditure during this period.<sup>35</sup> The Indian data center market is currently valued at around \$10 billion, growing at a Compound Annual Growth Rate (CAGR) of 25%.<sup>35</sup> Over \$10 billion in data center transactions have already been announced by major players, indicating strong investor interest.<sup>35</sup>

The economic impact of data centers extends far beyond direct capital expenditure. These facilities generate a wide array of employment opportunities, including temporary roles during construction (e.g., electricians, construction workers) and permanent, highly skilled positions in IT, network engineering, security, facility management, HVAC, and administration. A single hyperscale data center can create thousands of direct and indirect jobs.<sup>34</sup> State policies actively support workforce development programs and local hiring initiatives, ensuring a pipeline of skilled workers and addressing regional employment goals.<sup>9</sup> This indicates a holistic transformation of the regional economy, not just a single-sector boom, presenting a powerful and compelling narrative for both government policymakers and local communities. It positions data center investment as a fundamental catalyst for broad-based economic development, leading to improved living standards, a modern and skilled workforce, and enhanced overall regional competitiveness, aligning with broader state development goals.



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The demand for data centers stimulates significant investment in commercial real estate, often revitalizing underutilized industrial zones into high-tech hubs.<sup>34</sup> This development also drives crucial upgrades in local infrastructure, including roads, power grids, and fiber networks, benefiting entire communities by increasing property values and improving overall service reliability.<sup>34</sup> Data centers support a vast supply chain, including manufacturers of servers, cooling systems, and electrical components. Additionally, local businesses such as restaurants, hotels, and logistics providers benefit from the influx of workers and business travelers associated with data center operations.<sup>34</sup> Furthermore, data centers contribute significantly to local and state economies through tax revenue, further bolstering regional development.<sup>34</sup>

Several key stakeholders are poised to harness this opportunity in Tirunelveli and Kanyakumari:

- **Data Center Operators:** Major global and national players are already recognizing Tamil Nadu's potential. STT Global Data Centers (STT GDC), one of India's leading operators, is investing \$229 million to expand its capacity in Tamil Nadu, aiming to add up to 80 MW of critical load in multiple phases over the next 5-7 years.<sup>36</sup> The state already hosts facilities from other prominent operators like NTT, Yotta, and CtrlS.<sup>36</sup> India's overall data center market is one of the fastest-growing in Asia, with over \$23 billion in planned investments.<sup>37</sup>
- **Renewable Energy Companies & Wind Mill Developers:** Given the immense wind potential and the escalating demand for green energy from data centers, companies like Tata Power, which is investing INR 3,000 crore in a 4GW solar manufacturing plant in Tirunelveli, and the Tamil Nadu Green Energy Corporation (TNGECL) are direct beneficiaries.<sup>18</sup> The identified need for 14,500 MW of pumped storage projects also creates substantial opportunities for energy storage solution providers.<sup>3</sup>
- **AI Companies:** As the primary consumers of AI inferencing capabilities, AI innovators will be drawn to a region offering stable, cost-effective, and environmentally sustainable compute infrastructure. The development of a robust ecosystem will further incentivize them to establish or expand their operations in the southern districts of Tamil Nadu.
- **Local Businesses & Workforce:** The significant influx of investment and the resulting job creation will dramatically boost local economies. Furthermore, the focus on workforce development programs will foster a skilled local talent pool, creating a virtuous cycle of growth and prosperity.<sup>9</sup>

By combining abundant renewable energy, strategic land availability, pro-investment government policies, and the specific power-intensive yet bandwidth-flexible needs of AI inferencing, Tirunelveli



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and Kanyakumari are uniquely positioned to foster a specialized "Green AI Corridor." This is more than just a cluster of data centers; it represents an integrated ecosystem where green energy generation, sustainable data center operations, and cutting-edge AI innovation mutually reinforce each other. This vision creates a distinct and powerful brand identity for the region on the global stage, attracting specialized talent, further targeted investment, and potentially driving research and development in green AI technologies. It positions Tamil Nadu as a forward-thinking leader in sustainable AI infrastructure, offering a model for future digital economic development.

## VI. Conclusion: Seizing the Green AI Opportunity

The southern districts of Tirunelveli and Kanyakumari present an unparalleled confluence of strategic advantages for attracting AI inferencing data centers. This region offers abundant, consistent green energy from wind, with the Muppandal Wind Farm alone providing 1,500 MW of operational capacity and the state boasting a total wind energy potential of 75 GW. This is complemented by vast and readily available land within planned industrial corridors, a relatively stable natural environment with manageable risks through modern design and site selection, and a highly supportive, forward-looking government policy framework. The Tamil Nadu Data Centre Policy 2021, with its capital subsidies, tax exemptions, and single-window clearance system, actively de-risks and accelerates investments.

This unique alignment positions Tamil Nadu to capture a significant share of the rapidly expanding global AI inferencing market. The distinction between AI training and inferencing, particularly the latter's lower bandwidth requirements, allows these energy-rich districts to emerge as prime locations, offering a cost-effective and sustainable alternative to traditional data center hubs. The potential for a powerful economic multiplier effect, including extensive job creation, real estate development, infrastructure upgrades, and a boost to local supply chains, underscores the transformative impact these investments can have.

It is imperative for the Tamil Nadu government, private investors, and technology companies to act decisively and collaboratively to capitalize on this strategic window of opportunity. By attracting billions in investment, Tirunelveli and Kanyakumari can establish a powerful, sustainable AI



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ecosystem, driving not only unprecedented economic growth for South Tamil Nadu but also cementing the state's leadership at the forefront of the global AI revolution.

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