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From AI Ambition to AI Capability:

Rethinking Pakistan's AI Policy Through Energy and Compute Constraints

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Executive Summary

Pakistan's National Artificial Intelligence (AI) Policy represents an important step in recognising AI as a future driver of economic growth, governance reform, and technological competitiveness. However, this policy paper argues that the current AI policy is structurally incomplete because it conceptualises AI primarily as a skills- and application-driven digital agenda, while treating energy availability and high-performance compute as external or assumed inputs. In reality, modern AI systems are infrastructure-bound. Without reliable power, affordable compute, and coordinated digital infrastructure, AI ambitions remain aspirational rather than operational.

Using an infrastructure-led diagnostic lens, this paper demonstrates that Pakistan's AI policy will struggle to achieve its stated objectives because it ignores energy and compute as binding constraints. The analysis shows how this omission leads to dependence on foreign platforms, talent and data externalisation, and shallow domestic AI capability. Rather than proposing a wholesale policy rewrite, the paper outlines realistic realignment pathways within Pakistan's existing institutional capacity, focusing on coordination, sequencing, and targeted infrastructure recognition.

1. Introduction: AI as Policy Illusion versus Infrastructure Reality

Artificial intelligence has become a central theme in Pakistan's digital development discourse. Policy documents, public statements, and development programmes emphasise AI education, startups, freelancing, and sectoral applications in health, agriculture, education, and governance. This framing reflects a widespread assumption that AI adoption is primarily a matter of skills, innovation, and software deployment.

However, contemporary AI systems challenge this assumption. Large-scale AI development and deployment depend on uninterrupted electricity, high-performance computing infrastructure, data centres, advanced networking, and cooling systems. Where these conditions are absent, AI initiatives remain limited to pilots, demonstrations, or externally hosted services[1]. In such environments, domestic talent does not translate into domestic capability.

This paper evaluates Pakistan's National AI Policy[2] not on its intent or ambition, but on its feasibility. It argues that Pakistan's AI policy will fail primarily because it ignores energy and compute as binding constraints. By treating AI as a digital overlay rather than an infrastructure-dependent capability, the policy risks reinforcing long-term dependence rather than enabling national AI capacity.

2. What Pakistan's National AI Policy Gets Right

Pakistan's National AI Policy demonstrates several important strengths. It recognises AI as a cross-cutting technology with applications across key development sectors, including healthcare, agriculture, education, public administration, and financial services. The policy

[1] World Economic Forum, "Physical AI" 2025.
https://reports.weforum.org/docs/WEF_Physical_AI_Powering_the_New_Age_of_Industrial_Operations_2025.pdf

[2] Government of Pakistan, "National Artificial Intelligence Policy," Ministry of IT & Telecom, 2023.
https://moitt.gov.pk/SiteImage/Misc/files/National%20AI%20Policy.pdf

emphasises ethical AI, inclusivity, transparency, and responsible use, aligning with international norms and development priorities.

The policy also places strong emphasis on human capital development. Curriculum reform, capacity-building programmes, research collaboration, and support for innovation ecosystems are positioned as central pillars of Pakistan's AI strategy. These elements are necessary components of any AI ecosystem and reflect a genuine commitment to future-oriented skills development[3].

However, these strengths operate largely at the upper layers of the AI value chain. The policy implicitly assumes that foundational infrastructure will either already exist or be provided externally. This assumption becomes problematic when examined against Pakistan's actual energy and compute realities.

3. The Binding Constraint Problem in AI Policy

In policy analysis, binding constraints are factors that fundamentally determine whether objectives can be achieved. In the context of artificial intelligence, energy availability and compute access function as such constraints. Regardless of demand, talent, or applications, AI systems cannot scale without reliable power and affordable high-performance computing[4].

The causal chain is straightforward. Without stable and affordable electricity, data centres cannot operate at scale. Without data centres, domestic access to GPUs and high-performance compute remains unavailable. Without compute, AI research, model training, and deployment migrate to foreign platforms. This migration leads to talent leakage, data externalisation, and dependence on external infrastructure.

Pakistan's AI policy does not explicitly engage with this causal chain. Energy policy, power pricing, grid reliability, and compute infrastructure fall outside its analytical scope. As a result, the policy risks producing AI readiness narratives without delivering AI capability outcomes.

4. Energy as a Structural Constraint in Pakistan

Energy constitutes the foundational layer of any AI ecosystem. Data centres, cloud services, and AI workloads are electricity-intensive and require continuous, predictable power supply. In Pakistan, the power sector faces persistent structural challenges, including high industrial tariffs, grid instability, transmission and distribution losses, and chronic circular debt.

These conditions directly affect the feasibility of AI infrastructure. High electricity costs raise operational expenses for data centres, while grid instability necessitates costly backup systems[5]. As a result, hosting AI infrastructure domestically becomes economically unattractive.

At the same time, Pakistan has witnessed rapid growth in solar photovoltaic adoption, driven by declining global prices and net-metering incentives. Rooftop and commercial solar

[3] ibid

[4] Jensen Huang, NVIDIA Keynote on AI Infrastructure, 2024. https://www.nvidia.com/en-us/events/

[5] NEPRA, "State of Industry Report," 2023. https://nepra.org.pk/publications/State%20of%20Industry%20Reports/State%20of%20Industry%20Report%202023.pdf

installations have expanded across urban areas, reducing daytime grid dependence. However, this expansion is occurring largely in isolation from AI and digital infrastructure planning[6].

The absence of coordination between the Ministry of Energy, NEPRA, and the Ministry of IT & Telecom means that renewable energy growth is not strategically aligned with emerging AI infrastructure needs. Solar generation, without integrated storage, grid support, or data-centre-specific planning, remains an underutilised opportunity rather than a strategic enabler.

5. Compute and Data Infrastructure Absence

High-performance compute, particularly GPUs and AI accelerators, represents the core productive asset of modern AI systems. Access to compute determines who can train models, conduct experiments, and deploy AI at scale.

Pakistan lacks a national strategy for compute access. There are no shared GPU clusters for universities, no public-sector high-performance computing facilities dedicated to AI research, and no coordinated approach to lowering the cost of compute for startups. As a result, Pakistani researchers and firms rely heavily on foreign cloud providers.

This dependence has multiple consequences. Costs remain high, data sovereignty is limited, and value creation increasingly occurs outside national borders. Talent trained domestically contributes to foreign platforms[7], reinforcing Pakistan's position as an AI consumer rather than a producer.

6. Institutional Fragmentation and Coordination Failure

Another structural weakness lies in institutional fragmentation. AI policy leadership resides primarily within the Ministry of IT & Telecom, while energy planning is governed by the Ministry of Energy and economic coordination by the Planning Commission. Higher education and research fall under the Higher Education Commission, with limited integration across mandates.

Without a formal coordination mechanism, AI infrastructure remains nobody's explicit responsibility. Energy policy does not account for AI demand, and AI policy does not account for energy constraints. This fragmentation results in implementation gaps despite policy intent and rhetorical alignment.

7. Strategic Consequences of the Current Trajectory

If current trends persist, Pakistan faces several strategic risks. AI adoption will remain limited to low-compute applications. Domestic talent will continue to generate value primarily for foreign platforms. Public-sector AI initiatives will remain pilot-level and unsustainable. Energy constraints will increasingly bind digital growth.

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[6] Alternative & Renewable Energy Policy 2019, Government of Pakistan. https://www.ppib.gov.pk/policies/ARE_Policy_2019_-_Gazette_Notified.pdf

[7] World Bank, "Pakistan Digital Economy Diagnostic," 2022. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099030524162525956

In such a trajectory, Pakistan risks becoming structurally locked into an AI consumer role, with limited leverage in regional or global AI value chains.

8. Realistic Policy Realignment Pathways

Rather than rewriting the AI policy, Pakistan can pursue incremental realignment within existing institutional capacity. Key steps include formal coordination between the Ministry of IT & Telecom, Ministry of Energy, and Planning Commission on AI infrastructure needs. Data centres and AI compute should be recognised as strategic infrastructure within national planning frameworks.

Renewable energy incentives can be aligned with digital infrastructure requirements through hybrid solar-grid models, targeted tariffs, and support for storage solutions. Shared public compute facilities for universities and government research can be developed gradually, reducing dependence on foreign platforms. These measures emphasize coordination and sequencing rather than large-scale fiscal expansion.

9. Conclusion: From AI Aspirations to AI Capability

Artificial intelligence capability does not emerge at the application layer alone. It compounds from the bottom up, beginning with energy and infrastructure. Pakistan's AI ambitions will remain aspirational unless policy explicitly accounts for energy and compute as binding constraints.

Aligning AI policy with infrastructure reality is not an optional enhancement but a prerequisite for sustainable national capability. Without this alignment, Pakistan risks reinforcing dependence rather than achieving technological autonomy.

10. Summarized Recommendations

Policy Gap Identified	Recommended Action	Lead Institutions	Time Horizon	Expected Policy Outcome
AI treated as a digital or skills-led agenda	Formally classify AI compute facilities and data centres as strategic national infrastructure within federal planning and development frameworks	Planning Commission; Ministry of IT & Telecom	Short-term	Enables coordinated treatment of AI infrastructure across energy, telecom, and investment policies
Lack of coordination between AI and energy planning	Establish a cross-ministerial AI infrastructure coordination mechanism focused on energy demand,	Ministry of IT & Telecom; Ministry of Energy; Planning	Short-term	Reduces policy fragmentation and aligns AI ambitions with infrastructure feasibility

Policy Gap Identified	Recommended Action	Lead Institutions	Time Horizon	Expected Policy Outcome
	compute access, and infrastructure sequencing	Commission; HEC		
High energy costs and unreliable supply for data centres	Align renewable energy incentives with AI infrastructure through hybrid solar–grid models, storage support, and predictable tariffs	Ministry of Energy; NEPRA; Provincial Energy Departments	Medium-term	Improves cost competitiveness and reliability of domestic AI and data infrastructure
Absence of domestic high-performance compute	Develop shared public GPU and HPC facilities for universities and government research, starting with phased pilot clusters	HEC; Ministry of IT & Telecom; Public-sector universities	Medium-term	Reduces dependence on foreign cloud platforms and strengthens domestic AI research capacity
AI talent trained without access to compute	Integrate guaranteed compute access into AI research grants, doctoral programmes, and startup support schemes	HEC; Ministry of IT & Telecom	Medium-term	Translates human capital investment into domestic AI capability and value creation
Uniform AI rollout despite infrastructure constraints	Sequence AI policy implementation based on infrastructure readiness, prioritising high compute use cases where energy and compute are assured	Planning Commission; Line Ministries	Ongoing	Improves sustainability of AI initiatives and reduces pilot-level project failures

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