SYNTONY RESEARCH · RESEARCH REPORT · MAY 2026

Governance Lag and Emerging Technology Adaptation in Europe

A Cross-Sector Analysis of Institutional Readiness for AI-Enabled Systems

Nathan Heath · Chief Scientist · hello@syntonyresearch.org

syntonyresearch.org

SYNTONY RESEARCH · RESEARCH REPORT · MAY 2026

Governance Lag and Emerging Technology Adaptation in Europe

A Cross-Sector Analysis of Institutional Readiness for AI-Enabled Systems

Nathan Heath · Chief Scientist, Syntony Research ·
hello@syntonyresearch.org

Prepared for policy and research audiences working on AI governance and national security policy · May 2026

Across defence, energy infrastructure, financial services, and public health, Europe faces the same problem: AI-enabled systems are being deployed faster than institutions can govern, procure, evaluate, and adapt to them. We call this governance lag, the gap between the speed of deployment and the pace of oversight. Using the Syntony Research Governance Lag Screen and evidence from 2022 to 2026, the report shows that the main issue is organizational, not just regulatory. The drivers are fragmented decision rights, risk-averse cultures, and the lack of bounded experimentation frameworks. One case study looks at Ukraine's wartime defence innovation ecosystem. The other three cover European smart grid modernization, AI-enabled algorithmic trading, and biosurveillance. The report finds the same structural patterns across all four sectors and sets out an institutional readiness framework for policy audiences, including those working on AI and national security.

The Governance Lag Problem

Defining the Core Concept

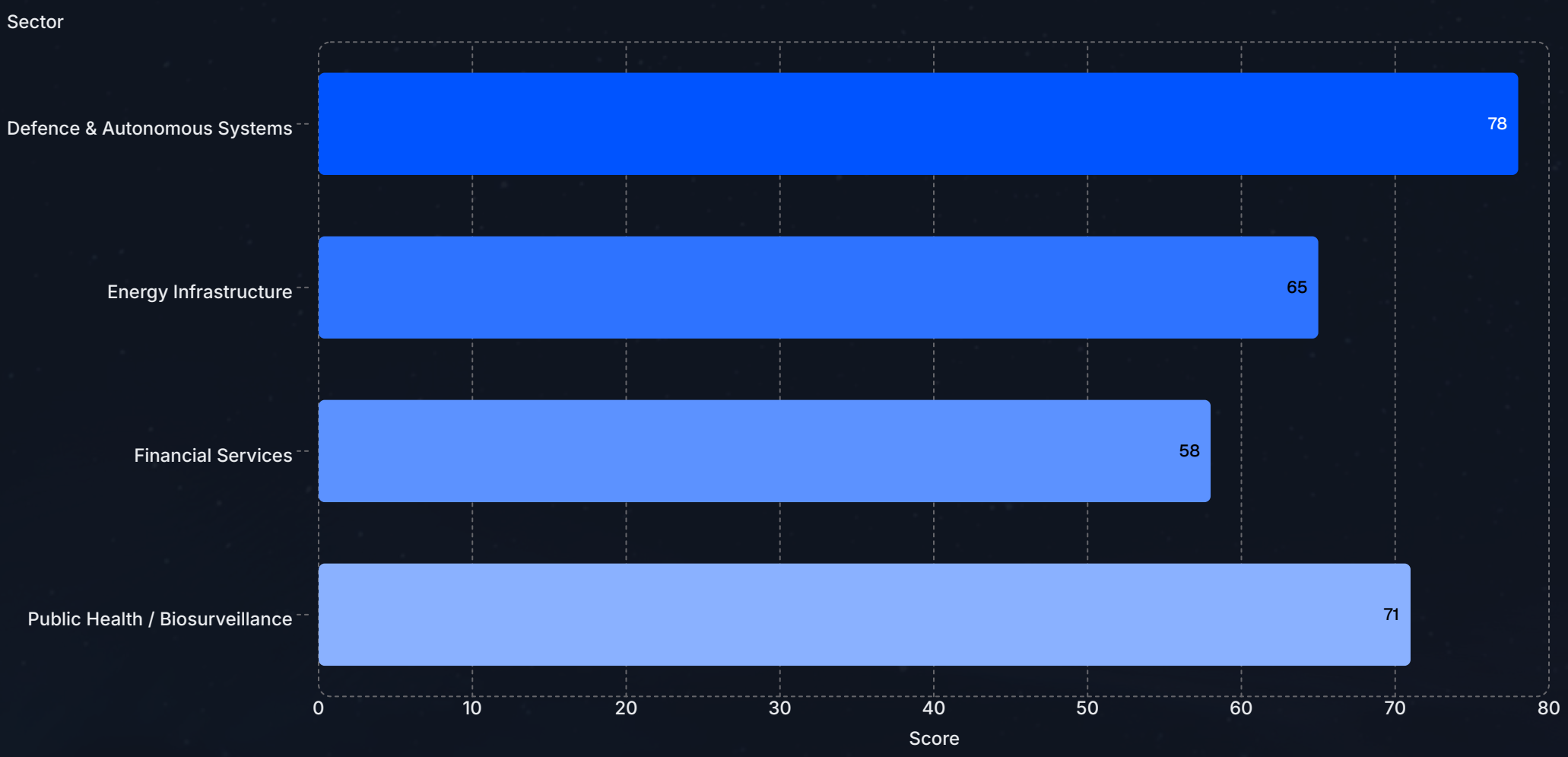
Governance lag is a structural gap. The institutions that oversee, procure, and adapt technology move more slowly than the technology is deployed. It is different from regulatory delay, which is when legislative or rule-making processes fail to keep up with innovation. Governance lag is broader. It covers the full response cycle, from risk identification and evaluation to decision-making, procurement, fielding, and ongoing adaptation. A system can have rules in place and still show severe governance lag if those rules cannot be put into practice at the pace the environment requires (Mügge & Saari, 2025; Helberger, van Dijck, & de Vreese, 2025).

Europe's governance lag problem is not new, but it is now more acute. The Draghi report on European competitiveness, published in September 2024, identified technology underinvestment as the main structural cause of Europe's growing productivity gap with the United States (Draghi, 2024). Only four of the world's top fifty technology companies are European. European firms import more than 80 percent of their digital technology. EU companies also face electricity prices two to three times higher than those in the United States and China, partly because grid modernization has not kept pace with renewable energy deployment. These are not separate failures. They point to the same institutional condition.

The Syntony Research Governance Lag Screen measures this by comparing three variables, the release cadence of a technology or capability, the review cadence of the institution responsible for governing it, and the coverage of recognized governance functions. It draws on the NIST AI Risk Management Framework's four functions of **Govern**, **Map**, **Measure**, and **Manage** (NIST, 2023). When release cadence is much faster than review cadence, and governance function coverage is incomplete, the screen identifies a high-lag condition. It was built for AI deployment contexts, but it applies to any domain where institutional adaptation is the main constraint.

This paper applies that framework across four sectors where Europe's governance lag is measurable and consequential: defence and autonomous systems, energy infrastructure and smart grid modernization, financial services and algorithmic AI, and public health biosurveillance. Each sector shows the same pattern: fast technology deployment, fragmented institutional authority, incomplete governance function coverage, and risk-averse organizational cultures that slow adaptation. The cross-sector comparison is the paper's main analytical contribution.

Figure 1. Syntony Research Governance Lag Screen: composite scores by sector (illustrative, based on author assessment). Higher scores indicate greater lag between deployment velocity and oversight cadence. Framework: NIST AI RMF (2023); Syntony Research (2026).



The Governance Lag Screen

How Syntony Research Operationalizes the Concept

The Governance Lag Screen compares three variables in any AI-enabled technology deployment context: (1) **Release Cadence**, how often new capabilities, model versions, or system updates are deployed; (2) **Review Cadence**, how often the governing institution formally evaluates, audits, or updates its oversight posture; (3) **Governance Function Coverage**, the share of the NIST AI RMF's four functions, Govern, Map, Measure, Manage, that are actually put into practice, not just written down. When release cadence is much faster than review cadence, and coverage is incomplete, especially in Measure and Manage, the screen flags a high-lag condition. The output is a composite score and a diagnosis: how much lag exists, where the bottlenecks are, and which interventions are most likely to narrow the gap (NIST, 2023; Syntony Research, 2026).

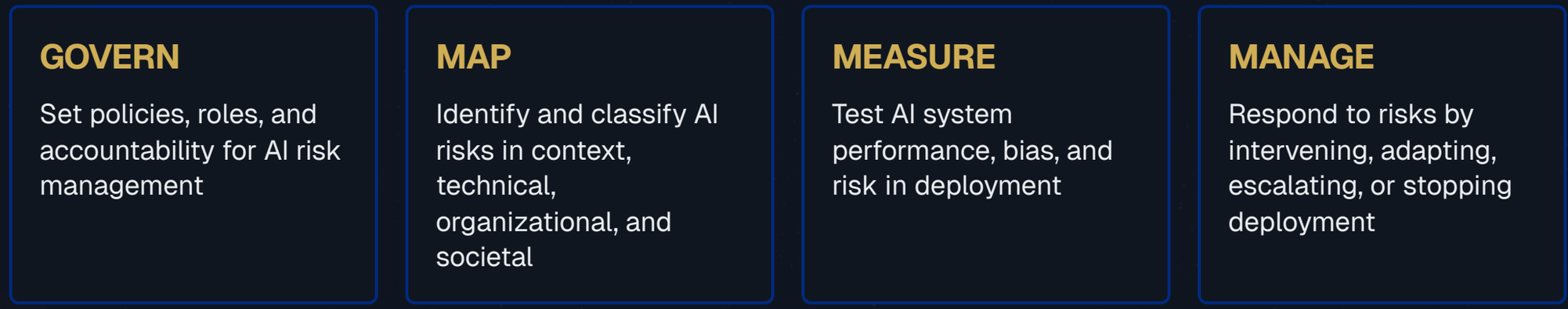


Figure 2. The NIST AI Risk Management Framework's four functions, as applied in the Syntony Research Governance Lag Screen. Source: NIST (2023); Syntony Research (2026).

In the four sectors examined in this paper, Govern and Map are usually in place. Frameworks exist, obligations are documented, and institutional roles are assigned. Measure and Manage are much weaker. Systematic evaluation of deployed AI systems is rare. Active intervention protocols are underdeveloped. The feedback loops needed to update governance in response to operational evidence are mostly missing. This gap between paper and practice is the clearest sign of governance lag.

Europe's Competitiveness Gap

The Structural Context for Governance Lag

Governance lag does not happen in isolation. It sits within a wider pattern of European technological weakness that the Draghi report on European competitiveness, published in September 2024, described clearly. The report found that underinvestment in technology is the main structural reason Europe's productivity gap with the United States keeps widening. In 1996, European and American workers produced at the same rate. By 2024, the average European worker produced only 76 percent as much as the average American worker. Accenture's June 2025 analysis linked that gap to continued underinvestment in technology, especially the failure to scale AI adoption (Draghi, 2024; Accenture, 2025). The gap is not about worker ability. It reflects slower institutional adoption of tools that raise productivity.

The technology concentration data is just as clear. Only four of the world's top fifty technology companies are European. European firms import more than 80 percent of their digital technology. US companies spend 45 to 70 percent more than Western European companies on AI and IT across nearly all sectors (McKinsey Global Institute, 2024). Accenture surveyed 800 large European organizations and found that 56 percent had not yet scaled a transformative AI investment, with an average AI capability score of 46 out of 100. The upside is also large. Accenture estimated that if all large European companies raised their AI capabilities to match leading industries, nearly €200 billion could be added to annual business revenues (Accenture, 2025). Governance lag is not only a security or regulatory problem. It is an economic one.

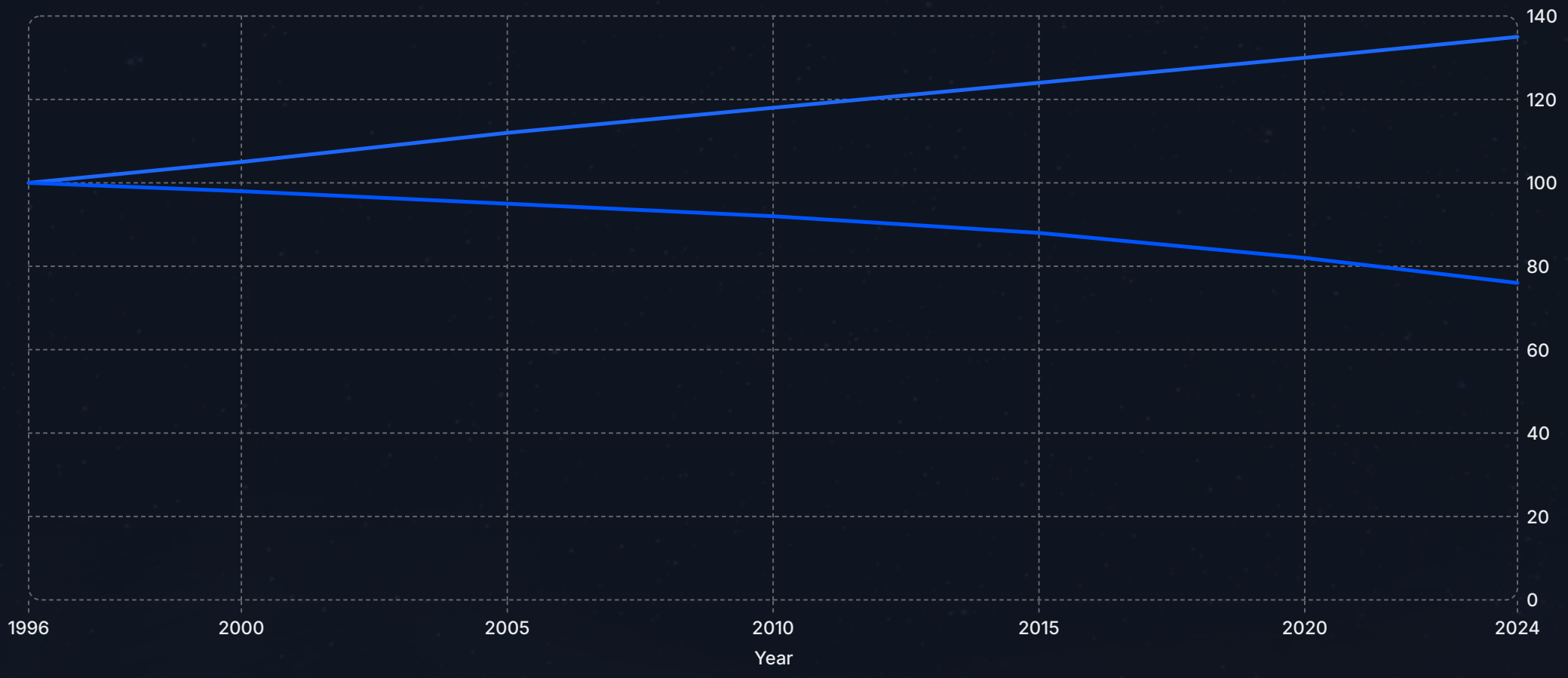


Figure 3. Worker productivity index, Europe vs. United States, 1996–2024 (1996 = 100, illustrative). Sources: Draghi (2024); Accenture (2025).

Case Study 1 — Defence and Autonomous Systems

Ukraine as an Institutional Stress Test

Ukraine's war against Russia has provided the clearest and most compressed test of defence technology adaptation since the Cold War. Its value for analysis is not that the technologies are new, but that the institutional barriers to using them were removed under pressure. Unmanned aerial systems, AI-enabled targeting, and civil-military procurement mechanisms all existed before the war. What changed was the speed of adoption. Governance lag was reduced in practice, and that showed up in battlefield results (Royal United Services Institute, 2024; Lucas, Parakilas, & Honich, 2026).

By mid-2024, Russian forces in and around Ukraine were estimated in the high hundreds of thousands, making this the largest conventional war in Europe since 1945 (Center for Naval Analyses, 2024; International Institute for Strategic Studies, 2024). In that setting, Ukraine shortened iteration cycles for unmanned aerial systems and counter-UAS methods from months to days or weeks. The Brave1 civil-military integration platform, launched in April 2023, linked military demand with more than 500 defence technology companies and sped up prototyping and deployment (TechUkraine, 2023). By 2025, Ukraine reported annual UAS production capacity of 4 to 4.5 million systems, a scale that would have been hard to imagine in any European peacetime procurement system (Ukrainian National Security and Defence Council, 2025).

The main lesson is not that Europe should copy wartime conditions. It is that Ukraine's speed advantage came mostly from organization, not from the technology itself. Three things made that possible: decentralized decision rights that let frontline units test ideas without waiting for approval, direct civil-military feedback loops that brought operational needs back to engineers quickly, and a risk-tolerant culture that allowed limited failure as part of learning (Kennedy, Dee, & Hill, 2025). Each of these points maps directly to a gap in European institutional readiness, as measured by the Governance Lag Screen.

For European NATO members, the implication is straightforward. The Hague commitment of 2025 set a defence spending target of 5 percent of GDP by 2035, and European and Canadian NATO defence expenditure reached $574 billion in 2025, an 84 percent increase from 2021 levels (NATO Secretary General, 2026). But higher spending without institutional change just reproduces the same governance lag at higher cost. The main constraint is not money. It is the organizational structure that turns money into fielded capability.

Phase 1 — 2022

Improvisation: commercial UAS, unit-level modifications, decentralized but uneven.

Phase 2 — 2023

Formalization: Brave1 launch, 500+ companies, purpose-built UAS production.

Phase 3 — 2024–2026

Scale: industrial FPV, loitering munitions, AI targeting via Kropyva and Delta.

Figure 4. Ukraine's institutional transformation in unmanned systems, 2022–2026. Sources: TechUkraine (2023); Royal United Services Institute (2024, 2026); Lucas, Parakilas, & Honich (2026).

The Defence Procurement Speed Gap

Measuring Governance Lag in Acquisition Systems

The clearest measure of governance lag in defence is procurement time, the gap between an operational need and a fielded capability. Comparative data from 2025 and 2026 show a sharp divide. Brave1 Market, Ukraine's civil-military procurement platform, reported an approximately two-week order-to-delivery cycle for selected modular UAS components after launch. That is a narrow category, but it shows what is possible when institutional friction is reduced (Brave1, 2026). The U.S. Warfighting Acquisition System, introduced by Secretary Hegseth in November 2025, aims for a roughly 50-week cycle for urgent capability categories. That is a major reform effort in the American procurement system (Hegseth, 2025). European traditional procurement, by contrast, still takes about 155 weeks for comparable categories. The EU AGILE proposal is a best-case reform target of around 15 weeks (European Defence Agency, 2024–2025; Retter & Dee, 2024).

These figures are not directly comparable. They refer to different acquisition categories, different institutional settings, and different definitions of "fielding." Their value is not in exact equivalence. It is in what they show about the distance between institutional tempo and operational need. A system that takes three years to field a capability that an adversary can produce in two weeks is not just slower. It works inside a different institutional model. The gap is not mainly about money or technical skill. It is about decision rights, risk tolerance, and how the system is built to adapt.

European defence institutions face this problem in a specific way. Authority is split across national procurement agencies, EU instruments such as EDIRPA and the European Defence Fund, NATO structures, and a growing layer of minilateral sub-alliances, including the Joint Expeditionary Force, NORDEFCO, and the Lublin Triangle. Each layer adds coordination work. Each adds a review cycle. The result is a system where governance function coverage, measured against the NIST AI RMF's Govern, Map, Measure, and Manage functions, exists on paper but moves slowly in practice (European Commission, 2023; Polansky, 2024).

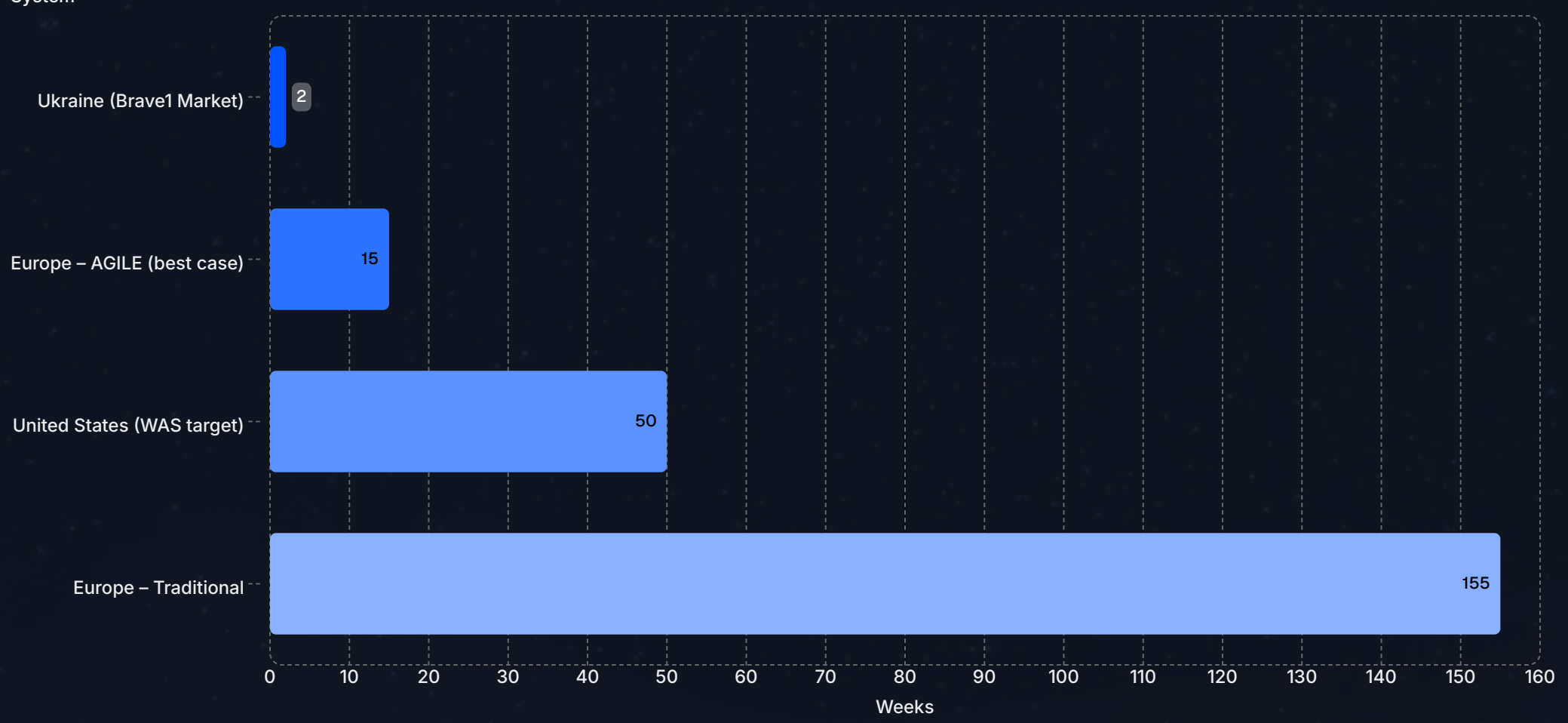


Figure 5. Comparative defence procurement timelines (weeks from order to fielding). Note: figures represent an observed benchmark (Ukraine), a reform target (U.S.), and estimates (Europe). Sources: Brave1 (2026); Hegseth (2025); EU AGILE proposal (2026); RAND Europe.

Defence Governance Lag: The Fragmented Authority Problem

How Overlapping Institutions Slow Adaptation

The structural cause of governance lag in European defence is not a lack of institutions. It is too many institutions, with no clear rule for who leads. A single capability category, such as AI-enabled UAS, can fall under national procurement authority, EU instruments including EDIRPA and the European Defence Fund, NATO capability targets, and the oversight of one or more minilateral groupings such as the Joint Expeditionary Force or NORDEFCO. Each institution has real authority. Each adds a review cycle. Each creates coordination work at the point where it meets the others. The result is a system in which total governance overhead, the sum of review cycles, coordination work, and unclear precedence, is greater than the pace of the technology being governed (European Commission, 2023; Polansky, 2024).

The Governance Lag Screen applied to this structure shows the **Measure** and **Manage** functions as the weakest links. European defence institutions can usually Govern, by setting frameworks and obligations, and Map, by identifying capability gaps and risk categories. They are much weaker at Measuring, which means checking how AI-enabled systems perform in use, and at Managing, which means changing, interrupting, or stopping deployment after evaluation. Without those operational functions, governance frameworks cannot close the loop between deployment and adaptation. The gap between what is written and what is actually done is where governance lag sits.

National Procurement Agencies

Own acquisition authority and decide how capability requirements are translated into contracts and delivery.

EU Instruments (EDIRPA, European Defence Fund)

Provide funding, incentives, and coordination, but add a separate review and compliance layer.

NATO Capability Targets

Set alliance-wide expectations that influence prioritization, readiness, and interoperability requirements.

Minilateral Groupings (JEF, NORDEFCO, Lublin Triangle)

Create additional coordination channels that overlap with national, EU, and NATO authority.

Figure 6. Overlapping institutional authorities over AI-enabled UAS in European defence. Each layer adds review cycles and coordination overhead. Source: Author assessment; European Commission (2023); Polansky (2024).

Case Study 2 — Energy Infrastructure and Smart Grid Modernization

Regulatory Complexity as a Deployment Barrier

Europe's electricity grid is changing faster than at any point in its history. The European Green Deal, REPowerEU, and the growing use of variable renewable energy sources, solar and wind, are making the grid more distributed, harder to manage, and more dependent on real-time data than the system it is replacing. AI-enabled smart grid tools can help with that. They support predictive maintenance, demand response optimization, real-time load balancing, and cybersecurity monitoring. The European Commission's Strategic Roadmap for Digitalisation and AI in Energy, published in December 2025, set a target of a fully AI-enabled EU energy system by 2035 (European Commission, 2025). This section looks at the gap between that goal and current institutional readiness.

Researchers at the University of Southern Denmark's Center for Energy Informatics describe the regulatory environment for AI deployment in European smart grids as a mix of cross-regulatory complexity and sector-specific ambiguity (Jørgensen, Gunasekaran, & Ma, 2025). The EU AI Act, the GDPR, the Network and Information Security Directive, the Electricity Market Directive, and the Data Act all apply to AI systems in grid settings. But they were not designed together. That leaves a compliance environment where one AI-enabled grid management system may fall under four or five overlapping frameworks, each with its own risk definitions, accountability rules, and enforcement timelines.

McKinsey Global Institute estimated in October 2024 that generative AI could account for more than 5 percent of Europe's total electricity consumption by 2030. That creates a feedback loop. The technology used to modernize the grid also adds to the demand pressures that modernization is meant to solve (McKinsey Global Institute, 2024). In that context, AI adoption in European energy utilities is still limited. Accenture's June 2025 survey of 800 large European organizations found that 56 percent had yet to scale a transformative AI investment. Energy and utilities were among the sectors most affected by regulatory uncertainty and data governance barriers (Accenture, 2025).

The main barrier in this sector is not weak technology. AI tools for grid optimization, predictive maintenance, and demand forecasting are already available and have been tested. The main constraint is institutional. Regulation is fragmented. Liability for AI-driven grid decisions is unclear. There are no widely used regulatory sandboxes to let utilities test and validate AI systems before full deployment (Jørgensen & Ma, 2025). The EU's own analysis says the same thing. The ENTEC2 consultation on the Strategic Roadmap, completed in November 2025, named regulatory uncertainty as the main barrier raised by energy sector stakeholders (ENTEC2, 2025).

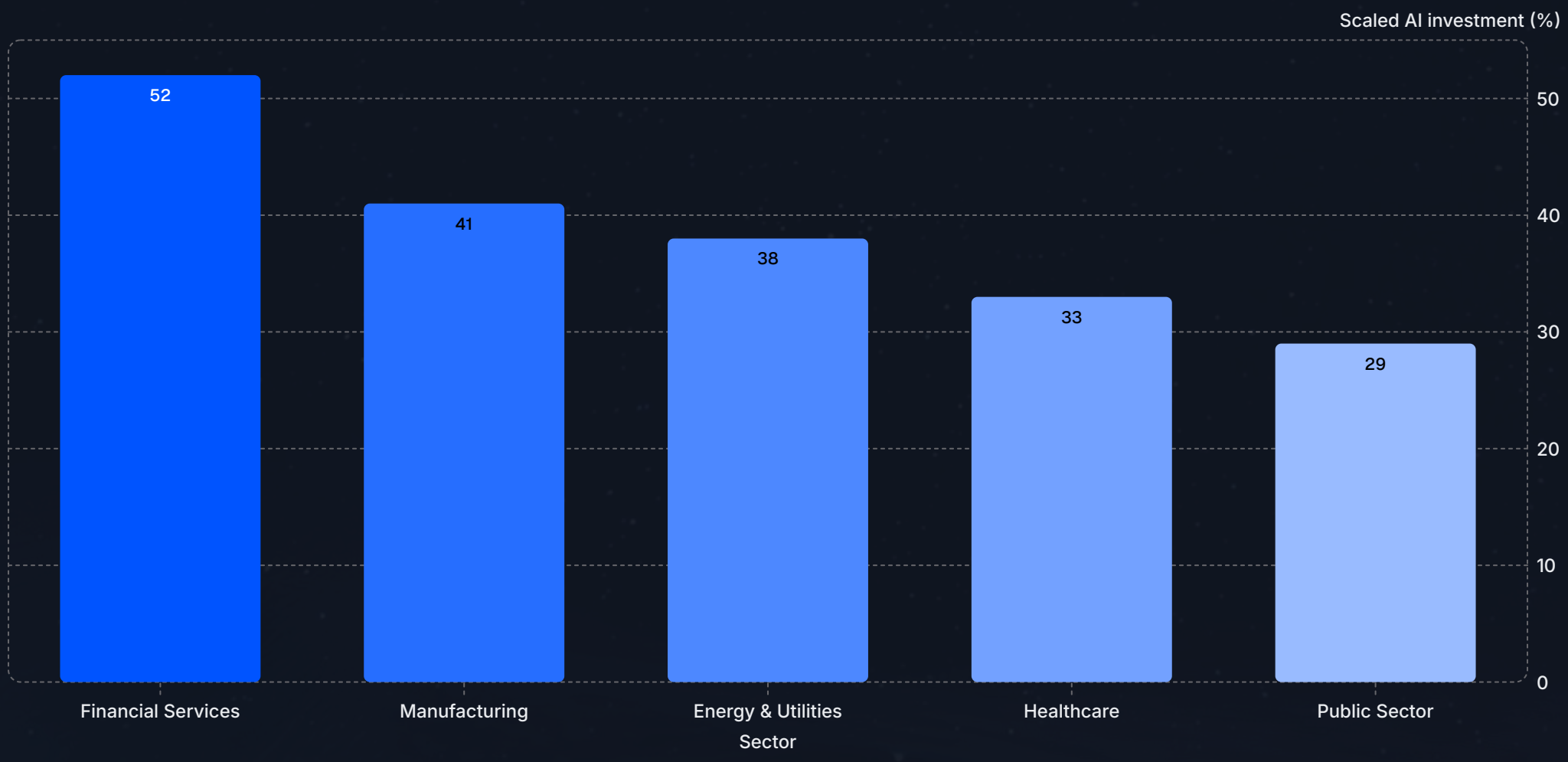


Figure 7. Share of large European organisations that have scaled a major AI investment, by sector (%). Source: Accenture (2025). Note: figures are approximate sector-level estimates derived from aggregate survey data.

Energy: Five Frameworks, One Grid

The Cross-Regulatory Complexity Problem

In Europe in 2026, a single AI-enabled grid management system must comply with five separate regulatory frameworks at the same time: the **EU AI Act** (risk classification, transparency, and human oversight requirements); the **GDPR** (data minimization, purpose limitation, and consent rules for any personal data processed); the **Network and Information Security Directive 2** (cybersecurity risk management and incident reporting); the **Electricity Market Directive** (market participation rules and grid operator duties); and the **Data Act** (data sharing obligations and access rights for connected devices). These frameworks were written by different directorates, at different times, with different risk models and enforcement systems. They were not designed together (Jørgensen, Gunasekaran, & Ma, 2025; Jørgensen & Ma, 2025).

The result is that a utility trying to use AI for real-time demand response optimization faces a compliance setup in which the same data activity may be required by one rule, limited by another, and not covered by a third. The ENTEC2 consultation on the EU's Strategic Roadmap for Digitalisation and AI in Energy, completed in November 2025, found that energy stakeholders saw regulatory uncertainty as the main barrier, ahead of technical immaturity, cost, and workforce skills (ENTEC2, 2025). So the EU target of a fully AI-enabled energy system by 2035 is not mainly a technology problem. It is a governance problem. The frameworks exist. The open question is whether they can be made to work together quickly enough for the energy transition.

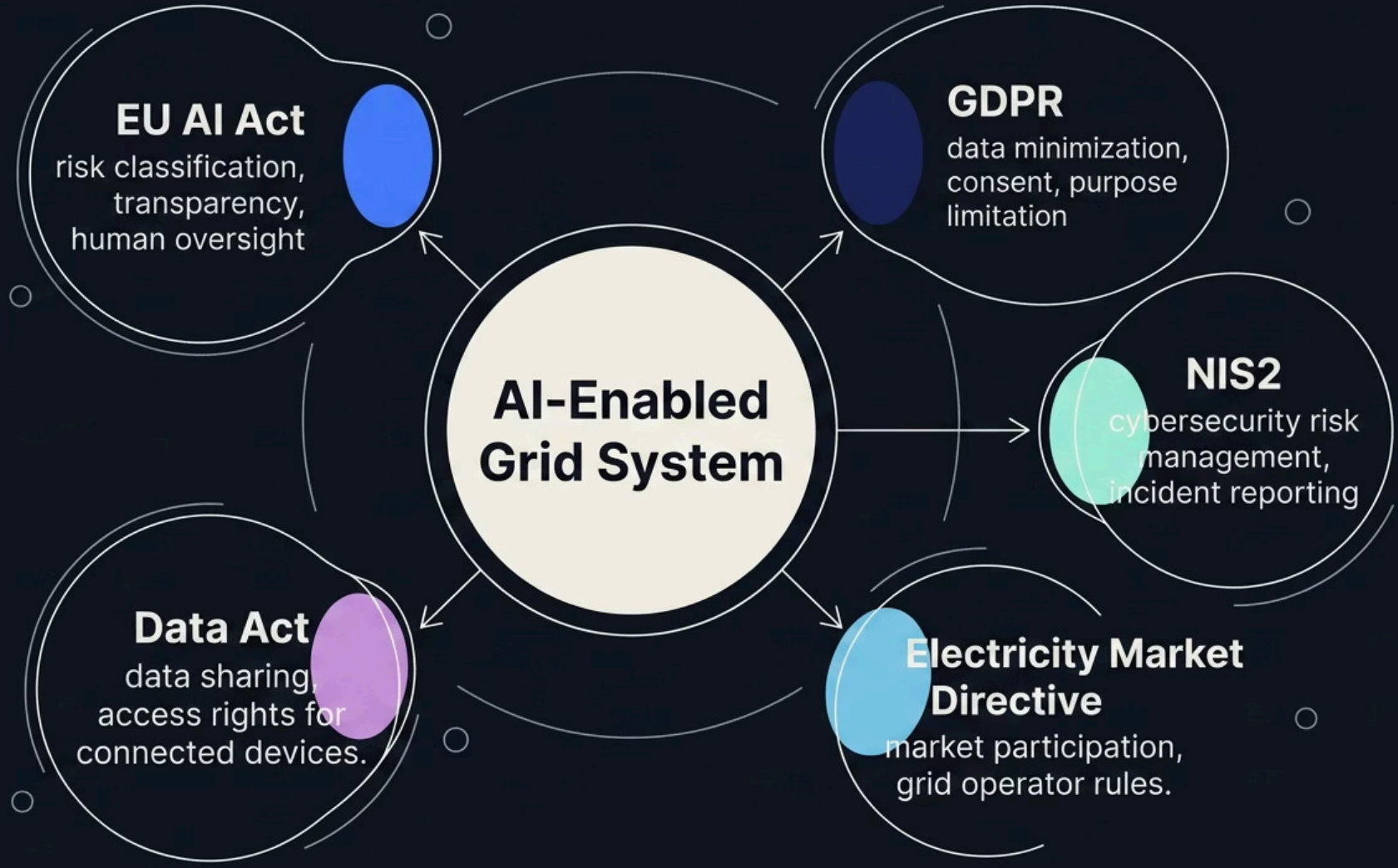


Figure 8. Five regulatory frameworks governing a single AI-enabled grid management system in Europe. Source: Jørgensen, Gunasekaran, & Ma (2025); European Commission (2025).

Case Study 3 — Financial Services and Algorithmic AI

When Technological Neutrality Becomes Normative Silence

European financial markets were among the first in Europe to adopt AI-enabled systems at scale. In algorithmic trading, AI systems place orders at speeds and volumes no human trader can match. These systems now make up a substantial share of European equity market activity. MiFID II, the main rulebook for these systems, was built on technological neutrality. It regulates the trading function, not the technology used to carry it out. A February 2026 analysis in ERA Forum argues that this makes the framework "**functionally enabling**" but "**normatively silent in the face of the distinctive and evolving risks introduced by financial AI**" (ERA Forum, 2026).

The lag in financial governance has a clear shape. MiFID II was designed for a world where the main risks of algorithmic trading were speed and market manipulation. It was not designed for AI systems that show emergent behavior, make decisions their developers cannot fully explain, or interact in ways that create systemic market risk. The EU AI Act, which entered into force in 2024, classifies some AI systems in financial services as high-risk, but its provisions are being delayed. In November 2025, the European Commission's Digital Omnibus on AI proposed moving the compliance deadline for high-risk AI systems from August 2026 to December 2027 (Politico, 2025). Trilogue talks on that delay broke down in April 2026, which left companies facing a compliance cliff (IAPP, 2026).

In February 2026, the European Securities and Markets Authority issued a supervisory briefing on algorithmic trading. It said AI use in trading had moved ahead of supervisory frameworks and that national competent authorities were applying the rules in very different ways (ESMA, 2026). The briefing is non-binding. It is a way to align supervisors, not a way to enforce compliance. That is typical of governance lag in financial services. Regulators respond to a known risk with guidance, not with an operational control, and they do it after the technology is already widely deployed.

The deeper problem is structural. MiFID II, the AI Act, and the Markets in Crypto-Assets Regulation (MiCA), which became fully applicable in December 2024 but still lacks complete Level 2 and Level 3 implementing measures, create a compliance setting with overlapping duties, unclear precedence rules, and enforcement timelines that do not match the speed of technology deployment (Hogan Lovells, 2025; Azzutti, 2024). Digital Europe, the Brussels-based technology lobby, estimated that up to €31 billion in compliance costs were at stake in the AI Act simplification debate alone (ResultSense, 2026). In this sector, the cost of governance lag is not only strategic. It is also direct financial cost.

1

2018 — MiFID II

Algorithmic trading rules come into force. Technological neutrality baked in.

2

2024 — EU AI Act

AI Act enters EU rulebooks. MiCA becomes fully applicable in December.

3

2025 — ESMA & Digital Omnibus

ESMA supervisory briefing issued. Digital Omnibus proposes 16-month delay to high-risk provisions.

4

2026 — Compliance Cliff

Trilogue talks collapse in April. Provisional delay agreed May 2026. August deadline remains uncertain.

Figure 9. EU financial services AI regulatory timeline, 2018–2026. Sources: ESMA (2026); IAPP (2026); Hogan Lovells (2025); The Register (2026).

Financial Services: The Compliance Cost of Governance Lag

When Regulatory Uncertainty Becomes a Balance Sheet Item

The EU AI Act's high-risk compliance provisions were due to take effect on 2 August 2026. In November 2025, the European Commission's Digital Omnibus on AI proposed pushing that date to December 2027, a 16-month extension backed by steady industry pressure. Trilogue talks on the delay broke down in the early hours of 29 April 2026, after 12 hours of negotiations. The European Parliament and the Council of the EU could not agree on whether industrial AI systems built into regulated products, such as machinery, medical devices, and toys, should follow the AI Act or sector-specific rules (IAPP, 2026; Politico, 2025). Dutch MEP Kim van Sparrentak told Reuters that "**Big Tech is probably popping champagne.** While European companies that care about safety and did their homework now face regulatory chaos." A provisional agreement on a 16-month delay was reached in May 2026, but the uncertainty had already disrupted compliance planning (The Register, 2026).

The financial cost of this uncertainty is real. Digital Europe, the Brussels-based technology lobby representing companies including ASML, Airbus, Ericsson, Nokia, SAP, Siemens, and Mistral AI, estimated that up to €31 billion in compliance costs were at stake in the AI Act simplification debate (ResultSense, 2026). For financial services firms, the picture is further complicated by the incomplete rollout of MiCA, the Markets in Crypto-Assets Regulation. MiCA became fully applicable in December 2024, but its Level 2 and Level 3 implementing measures are still unfinished (Hogan Lovells, 2025). The pattern is the same each time: rules are adopted, implementation slips, and firms are left with a system that is not fully in force and not clearly replaced. The burden falls hardest on firms that spent early on compliance in good faith.

€31B	16 months	€200B
Compliance Costs	**Delay to AI Act**	**Revenue Boost**
At stake in AI Act simplification debate (Digital Europe / ResultSense, 2026)	Applied to high-risk provisions (The Register, 2026)	Potential annual increase if European firms close AI capability gap (Accenture, 2025)

Figure 10. Key financial indicators of governance lag in European AI regulation. Sources: ResultSense (2026); The Register (2026); Accenture (2025).

Case Study 4 — Public Health and Biosurveillance

Biological AI and the Regulatory Blind Spot

The COVID-19 pandemic made the governance lag in European public health surveillance hard to miss. In its December 2025 mid-term revision, the European Centre for Disease Prevention and Control's surveillance framework for 2021 to 2027 said several key milestones had been dropped or delayed, including an EU-wide sentinel hospital system and routine use of spatial epidemiology for cross-border outbreak detection (ECDC, 2025). The revision said timelines were updated "to reflect delays and changes in the sequence of activities", which is another way of describing governance lag.

AI-enabled biosurveillance tools can process electronic health records, genomic sequencing data, and open-source epidemic intelligence at scale, and they have been shown in research settings. The main barriers to deployment are institutional. A 2024 qualitative study of epidemic intelligence practitioners in five European countries and at the ECDC found that practitioners wanted to review surveillance strategy together, handle growing data volumes, and get methodological support for cross-sector analysis. But the institutions involved were split across national agencies, EU bodies, and the WHO European Region (BMC Public Health, 2024). The WHO's April 2026 assessment of AI readiness in EU health systems found large differences across member states in national AI strategies, data governance frameworks, and workforce preparedness (WHO Europe, 2026).

The sharpest gap in this sector concerns **biological AI models**, AI systems trained mainly on biological data and able to predict viral evolution, design novel proteins, or suggest pathogen modifications. A November 2025 analysis in TechPolicy Press identified a clear regulatory blind spot: the EU AI Act's general-purpose AI provisions, which took effect in August 2025, cover large language models, but explicitly exclude biological AI models, even though they may pose much greater biosecurity risks (Hopkins, 2025). The EU AI Office's implementation guidance, published with the GPAI provisions, does not deal with this gap.

The pattern is the same as in the other three sectors. A technology, in this case AI-enabled biosurveillance and biological AI, is moving faster than the institutions meant to govern it. The rules in place were built for a different risk profile. The governance functions needed for this new risk, including systematic mapping of biological AI capabilities, measurement of misuse potential, and protocols for high-risk deployments, are missing or incomplete. The result is a sector where governance lag is not just inefficient, but a safety issue.

Cross-Sector Governance Gap Analysis

Sector	Primary Technology	Governance Gap Type	Key Institutional Barrier	NIST RMF Functions Missing
Defence & Autonomous Systems	AI-enabled UAS; autonomous targeting	Procurement speed; fragmented authority	Multi-layer acquisition bureaucracy	Measure, Manage
Energy Infrastructure	Smart grid AI; demand response	Cross-regulatory complexity	Overlapping frameworks (AI Act, GDPR, NIS2, Data Act)	Map, Manage
Financial Services	Algorithmic trading AI; crypto-asset systems	Normative silence; compliance cliff	MiFID II technological neutrality; AI Act delay	Govern, Measure
Public Health / Biosurveillance	Epidemic intelligence AI; biological AI models	Regulatory blind spot; fragmented national capacity	Exclusion of biological AI from GPAI scope	Govern, Map, Measure

Table 1. Cross-sector governance gap analysis. Sources: Author assessment; NIST AI RMF (2023); ESMA (2026); Jørgensen et al. (2025); Hopkins (2025); ECDC (2025).

What Fast Movers Do Differently

Institutional Features of Low-Lag Systems

This report mainly looks at where governance lag exists and what causes it. But the case studies also point to a positive pattern: some institutions have cut lag, and certain organizational features helped them do it. Ukraine's Brave1 platform is the clearest example, but it is not the only one. The Nordic countries consistently rank among Europe's highest AI adopters, with Denmark and Finland leading in both enterprise AI deployment and regulatory readiness (World Economic Forum, 2025). The U.S. Warfighting Acquisition System is a deliberate effort to cut governance lag in defence procurement through institutional redesign rather than more resources. The EU's sandbox provisions, if put into practice, could do the same in energy and health. The common thread is not the removal of oversight. It is the redesign of oversight so it can work on a faster schedule.

Three institutional features set low-lag systems apart from high-lag ones. First, decision rights are clear and limited: specific actors have defined authority to approve, change, or stop deployment within set limits, without needing full consensus across the hierarchy. Second, feedback loops are short and tied to operations: findings from deployed systems feed back into governance decisions within weeks, not years. Third, failure is allowed within limits: institutions create protected spaces, such as sandboxes, experimentation corridors, and pilot programs, where bounded failure counts as learning rather than a compliance breach. These are not cultural traits. They are design choices. Existing institutions can adopt them without overhauling the whole regulatory system.

Feature	High-Lag System	Low-Lag System
Decision rights	Distributed across multiple institutions; consensus required	Named and bounded; specific actor has clear authority
Review cadence	Annual or multi-year cycles; tied to legislative timelines	Continuous or quarterly; tied to deployment events
Failure tolerance	Failure triggers investigation and delay	Bounded failure triggers learning and adaptation
Feedback loops	Evaluation findings take years to reach governance decisions	Evaluation findings reach governance decisions within weeks
Experimentation	Requires full qualification before deployment	Sandboxes and pilots permitted with defined risk boundaries

Table 2. Institutional features of high-lag vs. low-lag governance systems. Source: Author assessment; NIST AI RMF (2023); Syntony Research (2026).

Cross-Sector Pattern Analysis

Four Sectors, One Structural Problem

The four case studies in this paper, defence and autonomous systems, energy infrastructure, financial services, and public health biosurveillance, are different on the surface. They use different technologies, follow different rules, involve different institutions, and carry different risks. But when they are viewed through the Governance Lag Screen, they show the same structural pattern. In every sector, AI deployment has moved faster than the institutions meant to govern it. In every sector, the main problem is organizational, not technical. And in every sector, the governance gap is growing.

Three structural features appear in all four cases. The first is fragmented authority. In defence, procurement authority is split across national agencies, EU instruments, NATO structures, and minilateral groupings. In energy, AI governance duties are spread across the AI Act, GDPR, NIS2, the Electricity Market Directive, and the Data Act. In financial services, MiFID II, the AI Act, and MiCA create overlapping, and sometimes conflicting, compliance duties. In public health, surveillance authority is split across national agencies, the ECDC, the WHO European Region, and the EU AI Office. This fragmentation adds coordination work, slows decisions, and leaves accountability gaps between institutions.

The second recurring feature is incomplete coverage of governance functions. When the NIST AI RMF's four functions, Govern, Map, Measure, and Manage, are applied to each sector, none of the sectors shows full coverage. The missing functions are usually the operational ones, Measure, which means systematic evaluation of AI performance and risk in use, and Manage, which means active intervention, adaptation, and escalation. Across all four sectors, governance frameworks are stronger at the front end, where rules are set and obligations are mapped, than at the back end, where deployed systems are monitored, evaluated, and adjusted (NIST, 2023).

The third feature is a risk-averse organizational culture. This is the hardest to measure, but it may matter the most. In each sector, the response to uncertainty about AI systems has been to delay deployment, issue non-binding guidance, or wait for technical standards that do not yet exist. The EU AI Act's high-risk compliance deadline was delayed not because the technology was unready, but because institutions were not ready to enforce it. The ECDC dropped surveillance milestones not because the tools were unavailable, but because the organizational capacity to implement them was lacking. Ukraine's defence innovation advantage was not mainly technological. It was cultural, a willingness to allow bounded failure as a way to learn, which European institutions have not yet matched.

56%

Not scaled

of large European organisations have not scaled a major AI investment (Accenture, 2025)

4 of 50

Top tech firms

top global tech companies are European (Draghi, 2024)

16 months

Delay applied

to EU AI Act high-risk provisions (The Register, 2026)

Figure 11. Selected indicators of Europe's governance lag across sectors. Sources: Accenture (2025); Draghi (2024); The Register (2026).

The NIST AI RMF Coverage Gap

Where European Institutions Are Strong — and Where They Are Not

The NIST AI Risk Management Framework is a useful way to compare governance coverage across the four sectors examined in this report. Its four functions, **Govern**, **Map**, **Measure**, and **Manage**, describe a full cycle of AI risk management, from setting accountability to acting on identified risks. Applied to European institutions in each sector, the pattern is the same: coverage is strongest in **Govern** and **Map**, and weakest in **Measure** and **Manage**. This is not surprising. **Govern** and **Map** are mainly legislative and policy functions. They produce documents, frameworks, and obligations. **Measure** and **Manage** are operational. They need technical infrastructure, organizational capacity, and authority to act on findings. European institutions are better at writing rules than enforcing them in real time (NIST, 2023).

The practical result is that governance frameworks in all four sectors are front-loaded. They set out what should happen, but they lack the operational infrastructure to check whether it does. In defence, there is no systematic evaluation of AI-enabled UAS performance in deployment across European forces. In energy, there is no shared framework for testing AI grid management systems against failure scenarios before deployment. In financial services, ESMA's February 2026 supervisory briefing said practices had diverged sharply across national competent authorities, which is a clear sign of weak **Measure** coverage. In public health, the ECDC's own mid-term revision acknowledged dropped milestones and delayed timelines. The **Measure** and **Manage** gap is not just theoretical, it is documented in the institutions' own assessments.

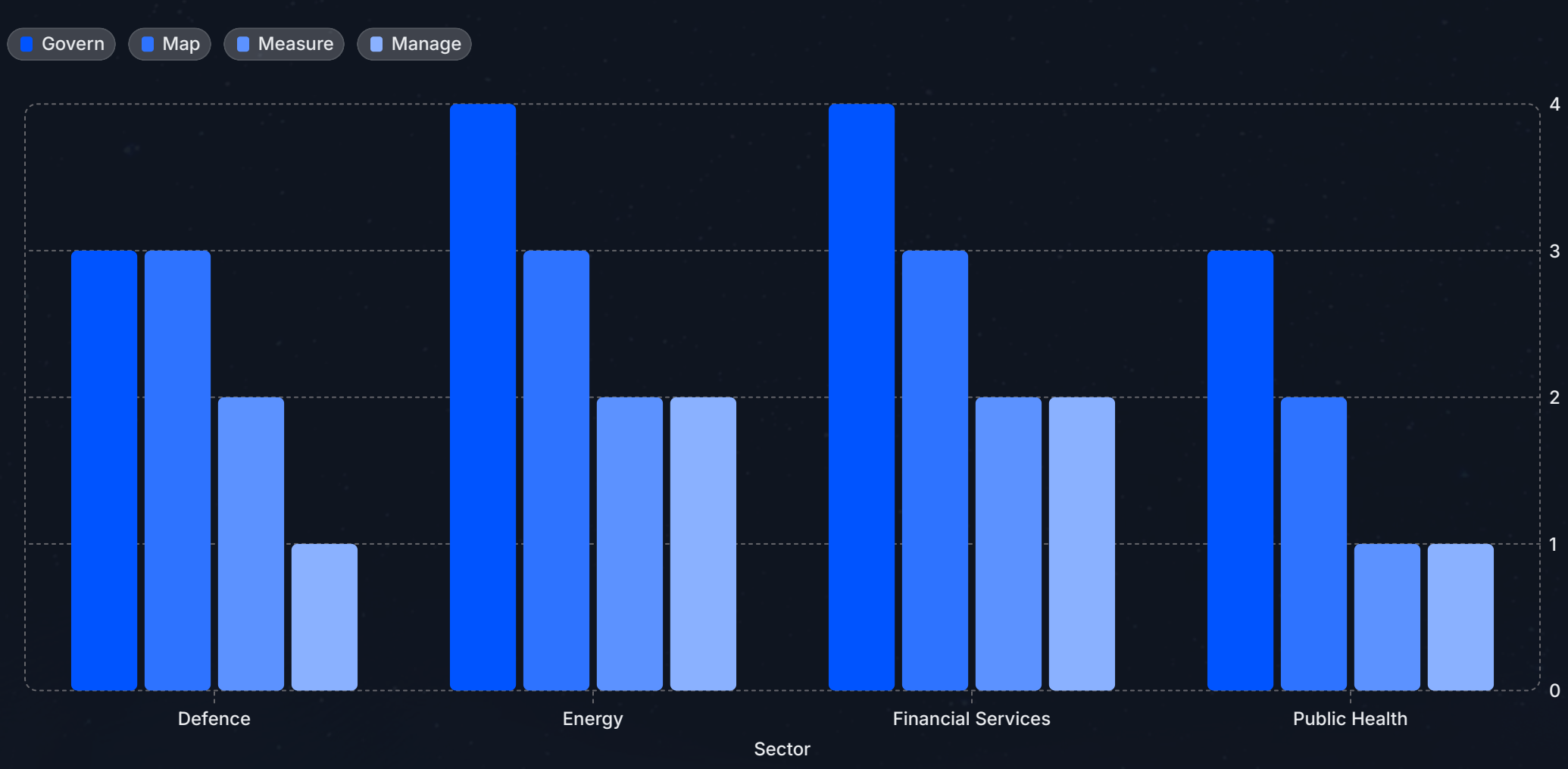


Figure 12. NIST AI RMF governance function coverage by sector (1 = absent/minimal, 5 = fully operationalized). Illustrative author assessment. Source: NIST (2023); Syntony Research (2026).

Implications for Policy and Institutional Readiness

From Governance Lag to Governance Velocity

The cross-sector analysis in this report points to a shared set of institutional fixes. These are not sector-specific regulatory recommendations. Those belong to sector experts and regulators. They are design principles for organizations where governance lag is the main barrier to adapting AI-enabled technology. This framework draws on the Syntony Research Governance Lag Screen, the NIST AI Risk Management Framework, and the cross-sector evidence in the previous sections.

The first principle is named decision rights. Governance lag is worst at the boundaries between institutions, where no single actor has clear authority to decide and coordination costs pile up. The fix is not to centralize everything, but to name who decides. For each type of AI-enabled technology deployment, specify which actor can approve, modify, or stop deployment, and at what threshold. In defence, this means clarifying the relationship between national procurement agencies, EU instruments, and NATO structures for specific capability categories. In energy, it means resolving precedence between the AI Act, NIS2, and the Electricity Market Directive for AI systems operating in grid contexts. In financial services, it means specifying which provisions of MiFID II and the AI Act apply first to algorithmic trading systems covered by both frameworks (NIST, 2023; Syntony Research, 2026).

The second principle is bounded experimentation. Risk-averse organizations do not change because they are told to be more open to change. They change when they have places where limited failure is allowed and learning is built in. Regulatory sandboxes, already proposed in the EU AI Act and the energy sector Strategic Roadmap, are the right tool. But they need clear entry criteria, defined risk limits, and feedback loops that carry what is learned back into governance decisions. Ukraine's Brave1 platform is, in practice, a bounded experimentation environment for defence procurement. It allows rapid iteration within a defined institutional frame. The point is not to copy Brave1, but to see what conditions made it work (Kennedy, Dee, & Hill, 2025; ENTEC2, 2025).

The third principle is operational governance coverage. The NIST AI RMF's Measure and Manage functions, systematic evaluation of deployed AI systems and active intervention protocols, are still the weakest parts of European institutional frameworks. Closing that gap requires investment in evaluation infrastructure: technical capacity to test AI systems in deployment, organizational capacity to act on the results, and decision records that show how and why governance decisions were made, challenged, and updated as conditions change. This is the core of what Syntony Research calls an evidence register: a structured artifact that separates observation from inference, assigns severity and confidence levels to findings, and sets the conditions for updating the governance posture (Syntony Research, 2026).

For people working on AI and national security policy, the cross-sector view has a direct implication. Governance lag in defence is not an isolated problem. It is one example of a wider pattern that affects European institutional capacity across sectors. A state that cannot govern AI-enabled grid management, algorithmic trading, or biosurveillance at speed is unlikely to govern AI-enabled autonomous systems at speed either. The readiness problem is systemic, and the remedies, named decision rights, bounded experimentation, and operational governance coverage, can be used across sectors.

Named Decision Rights

Specify which actor has authority to approve, modify, or halt AI deployment at each threshold. Resolve precedence conflicts between overlapping frameworks.

Bounded Experimentation

Create institutional spaces where failure is permitted and learning is systematized. Operationalize regulatory sandboxes with clear entry criteria and feedback mechanisms.

Operational Governance Coverage

Invest in evaluation infrastructure. Build evidence registers. Close the gap between the Govern/Map functions and the Measure/Manage functions.

Figure 13. Three-principle institutional readiness framework. Source: Syntony Research (2026); NIST AI RMF (2023).

The Evidence Register

Syntony Research's Core Governance Artifact

The evidence register is the main working document in Syntony Research's governance method. It separates observation from inference, assigns severity and confidence levels to findings, sets reproduction constraints, and records when the governance posture should change. It is built for decision-making, not for abstract reporting. That distinction matters. In most of the sectors covered in this report, governance documents are written to show compliance, not to support action. An evidence register is meant to do the opposite. It makes the current state of knowledge about a deployed AI system clear to the people who need to act on it, at the speed they need to act (Syntony Research, 2026).

Applied to governance lag, the evidence register closes the Measure and Manage gap directly. It gives teams the tools to evaluate deployed AI systems in a systematic way. That means the technical ability to test, the organizational ability to record findings, and the decision record that lets governance postures be reviewed, challenged, and updated as conditions change. In defence, an evidence register for an AI-enabled targeting system would record observed performance, flag deviations from expected behavior, assign confidence levels to findings, and define the point at which the system should be halted or changed. In energy, it would record the performance of an AI grid management system against reliability and safety criteria, with escalation triggers tied to specific failure modes. This is not a compliance document. It is a decision support tool.

Field	Description	Example
Observation	What was directly observed or measured	"Model output deviated from expected range in 3.2% of test cases"
Inference	What the observation implies	"Possible distribution shift in input data since last evaluation"
Severity	How serious the finding is	High / Medium / Low
Confidence	How certain the finding is	High (reproduced) / Medium (single instance) / Low (inferred)
Reproduction constraints	Conditions under which the finding can be reproduced	"Reproducible under load conditions above 85% grid capacity"
Governance trigger	What action the finding requires	"Escalate to named decision authority; halt deployment if severity confirmed"
Update condition	When the posture should be revised	"Re-evaluate within 30 days or after next major model update"

Table 3. Syntony Research Evidence Register: artifact structure. Source: Syntony Research (2026).

Conclusion

Governance Velocity as a Strategic Imperative

This report argues that governance lag, the gap between the speed of technology deployment and the pace of institutional oversight, is the main constraint on Europe's ability to adapt to AI-enabled systems across sectors. The four case studies are not separate failures. They reflect the same institutional conditions: fragmented decision rights, incomplete coverage of governance functions, and risk-averse cultures that treat uncertainty as a reason to wait instead of manage it.

The value of the cross-sector frame is that it makes the pattern visible. A policymaker looking only at defence procurement reform, AI Act implementation, or smart grid regulation will see a sector-specific problem and look for a sector-specific fix. The cross-sector view shows that the same three institutional features appear in every case, and that the responses, named decision rights, bounded experimentation, and operational governance coverage, can be used in different sectors. This is not an argument for harmonizing regulation across sectors. The risks are too different for that. It is an argument for organizational design principles that can work within each sector's existing institutional structure.

For people working on AI and national security policy, the implication is straightforward. Europe's ability to govern AI-enabled autonomous systems at the speed deterrence requires cannot be separated from its ability to govern AI-enabled grid management, algorithmic trading, or biosurveillance at the speed those fields require. Institutional readiness is not specific to one sector. A state that has built the organizational capacity to govern AI quickly in one domain has built capabilities that can carry over to others, including evaluation infrastructure, decision record practices, and bounded experimentation frameworks. A state that has not built those capabilities anywhere is unlikely to build them first in the most demanding domain.

The Syntony Research Governance Lag Screen is one tool for making that assessment. Applied to the four sectors examined here, it places defence and autonomous systems at the highest-lag end, followed by public health biosurveillance, energy infrastructure, and financial services. But the main value of the screen is not the ranking. It is the diagnosis. By breaking governance lag into release cadence, review cadence, and governance function coverage, it shows where the binding constraints are and which interventions are most likely to close the gap. That diagnostic value is what this report offers to the policy community, and what Syntony Research brings to work with institutions facing these problems.

> **Governance lag** is not mainly a regulatory problem. It is an organizational one. The institutions that close it fastest will not be the ones with the most rules. They will be the ones with the clearest decision rights, the most systematic evaluation practices, and the most room for bounded failure as a way to learn.

About Syntony Research

AI Safety, Governance, and Geopolitical Forecasting

Syntony Research is an AI safety and strategy practice based in Research Triangle, NC. The firm works with technical, policy, and executive teams to test systems, map exposure, set controls, and brief leadership. We do this without hiding uncertainty. All engagements are under NDA. The firm's work covers AI evaluation and red teaming, governance architecture, geopolitical and emerging-technology forecasting, and technical writing for decision settings. The name Syntony Research comes from syntonic telegraphy. In 1897, physicist Oliver Lodge patented the idea that meaningful signal emerges from noise when transmitter and receiver are tuned in resonance. The firm applies that same idea to AI. Technical systems, governance institutions, and decision structures need to be aligned for consequential AI decisions to be made well.

Test the System

Adversarial evaluation, misuse-path discovery, and evaluation methodology for models, tools, and workflows.

Govern the Decision

Control maps, escalation triggers, accountability pathways, and decision records that survive scrutiny.

Forecast the Outside World

Emerging-technology scenarios for AI, compute, chips, cyber, defence, standards, and regulation.

Make the Evidence Usable

Technical reports, executive memos, policy briefs, and launch-ready public explanations.

hello@syntonyresearch.org · syntonyresearch.org

References

Accenture. (2025, June 25). *Europe's AI reckoning: Reinventing industries for a new era.* https://www.accenture.com/gr-en/insights/data-ai/europes-ai-reckoning

Azzutti, A. (2024, August 27). AI governance in algorithmic trading: Some regulatory insights from the EU AI Act. *Banking and Finance Law Review, 41*(1). https://www.ippapublicpolicy.org/file/paper/683ee14cdec81.pdf

BMC Public Health. (2024). Epidemic intelligence in Europe: A user needs perspective to foster innovation in digital health surveillance. *BMC Public Health, 24,* 973. https://doi.org/10.1186/s12889-024-18466-1

Brave1. (2026). *Brave1 Market: Platform overview and procurement benchmarks.* Ukrainian Ministry of Digital Transformation.

Carnegie Endowment for International Peace. (2025, May 20). *The EU's AI power play: Between deregulation and innovation.* https://carnegieendowment.org/europe/research/2025/05/the-eus-ai-power-play-between-deregulation-and-innovation

Center for Naval Analyses. (2024). *Russian military mobilization during the Ukraine War: Evolution, methods, and net impact.* https://www.cna.org/reports/2024/10/russian-military-mobilization-during-the-ukraine-war

Draghi, M. (2024, September). *The future of European competitiveness.* European Commission. https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_sl

ECDC. (2025, December). *Long-term surveillance framework, 2021–2027: Mid-term revision.* European Centre for Disease Prevention and Control. https://www.ecdc.europa.eu/sites/default/files/documents/Long-term-surveillance-framework-2021-2027_Review-2025.pdf

ENTEC2. (2025, November). *Digitalisation and AI in the energy sector: Analysis of the open public consultation results for the Strategic Roadmap.* European Commission, DG ENER.

ERA Forum. (2026). AI governance after MiFID II: Beyond (mere) technological neutrality? *ERA Forum.* https://doi.org/10.1007/s12027-026-00871-1

ESMA. (2026, February 26). *Supervisory briefing on algorithmic trading in the EU.* European Securities and Markets Authority. https://www.esma.europa.eu/press-news/esma-news/esma-issues-supervisory-briefing-algorithmic-trading

European Commission. (2023). *EDIRPA: Procuring together defence capabilities.* https://defence-industry-space.ec.europa.eu/eu-defence-industry/edirpa-procuring-together-defence-capabilities_en

European Commission. (2025, December). *Strategic Roadmap for digitalisation and AI in energy.* DG ENER.

European Defence Agency. (2024–2025). *Defence Data 2024–2025.* https://eda.europa.eu/publications-and-data/defence-data/

Hegseth, P. (2025, November 7). *Memorandum: Transforming the Defense Acquisition System into the Warfighting Acquisition System.* U.S. Department of War.

Helberger, N., van Dijck, J., & de Vreese, C. H. (2025, October 27). Europe wrote the AI rulebook. Can it deliver on its ambitions? *TechPolicy Press.* https://techpolicy.press/europe-wrote-the-ai-rulebook-can-it-deliver-on-its-ambitions

Hogan Lovells. (2025, February 20). *The EU's Markets in Crypto-Assets MiCA Regulation — a status update.* https://www.hoganlovells.com/en/publications/the-eus-markets-in-crypto-assets-mica-regulation-a-status-update

Hopkins, M. (2025, November 3). Biological AI is slipping through Europe's AI law — for now. *TechPolicy Press.* https://techpolicy.press/biological-ai-is-slipping-through-europes-ai-law-for-now

IAPP. (2026, April 29). EU AI Act reform talks stall as key compliance deadline looms. *International Association of Privacy Professionals.* https://iapp.org/news/a/eu-ai-act-reform-talks-stall-as-key-compliance-deadline-looms

International Institute for Strategic Studies. (2024). *The Military Balance 2024.* Routledge/IISS.

Jørgensen, B. N., Gunasekaran, S. S., & Ma, Z. G. (2025). Impact of EU laws on AI adoption in smart grids: A review of regulatory barriers, technological challenges, and stakeholder benefits. *Energies, 18*(12), 3002. https://doi.org/10.3390/en18123002

Jørgensen, B. N., & Ma, Z. G. (2025). Digital twin of the European electricity grid: A review of regulatory barriers, technological challenges, and economic opportunities. *Applied Sciences, 15*(12), 6475. https://doi.org/10.3390/app15126475

Kennedy, J., Dee, S., & Hill, D. (2025). *Tooling up together: How Europe and Ukraine can improve defence industrial collaboration.* RAND Corporation, RR-A3833-4. https://www.rand.org/pubs/research_reports/RRA3833-4.html

Lucas, R., Parakilas, J., & Honich, A. (2026, January 30). *Bridging innovation: Defence-civilian synergies for a resilient European future.* RAND Europe. https://www.rand.org/pubs/research_reports/RR4328-1.html

McKinsey Global Institute. (2024, October). *Time to place our bets: Europe's AI opportunity.* https://www.mckinsey.com/capabilities/quantumblack/our-insights/time-to-place-our-bets-europes-ai-opportunity

Mügge, D., & Saari, L. (2025, February 25). The EU AI policy pivot: Adaptation or capitulation? *TechPolicy Press.* https://techpolicy.press/the-eu-ai-policy-pivot-adaptation-or-capitulation

NATO Secretary General. (2026, March 26). *Annual Report 2025: Significant increase in defence investment from Europe and Canada.* NATO.

NIST. (2023). *Artificial Intelligence Risk Management Framework (AI RMF 1.0).* National Institute of Standards and Technology. https://doi.org/10.6028/NIST.AI.100-1

Polansky, S. (2024). *Integrated Deterrence Reachback Study.* National Security Innovations. https://www.nsiteam.com/sma-publications/integrated-deterrence-reachback-study

Politico. (2025, December 1). 'Pure regulatory chaos': Move to help Europe win artificial intelligence race misfires. https://www.politico.eu/article/eu-ai-race-tech-legal-mess-build-legislators/

Retter, L., & Dee, S. (2024, March 20). *Pace through integration? UK Defence attempts procurement reform, again.* RAND Europe. https://www.rand.org/pubs/commentary/2024/03/pace-through-integration-uk-defence-attempts-procurement.html

ResultSense. (2026, April 30). EU AI Act trilogue stalls — August deadline back in play. https://www.resultsense.com/news/2026-04-30-eu-ai-act-omnibus-trilogue-stalls/

Royal United Services Institute. (2024). *Winning the industrial war: Comparing Russia, Europe and Ukraine, 2022–24.* Occasional Paper 194. RUSI.

Royal United Services Institute. (2026). *Ukraine's brigade level commercial approach.* RUSI. https://www.rusi.org/explore-our-research/publications/external-publications/ukraines-brigade-level-commercial-approach

Syntony Research. (2026). *Governance lag screen: Framework documentation.* https://www.syntonyresearch.org

TechUkraine. (2023, April 27). *BRAVE1 – Ukrainian Defence Tech Cluster launch.* https://techukraine.org/2023/04/27/brave1-ukrainian-defence-tech-cluster-launch/

The Register. (2026, May 7). EU hits snooze on AI Act rules after industry backlash. https://www.theregister.com/ai-and-ml/2026/05/07/eu-hits-snooze-on-ai-act-rules-after-industry-backlash/5234530

Ukrainian National Security and Defence Council. (2025). *UAS production capacity report 2025.* Kyiv.

U.S. Department of War. (2026, January 23). *2026 National Defense Strategy.* https://media.defense.gov/2026/Jan/23/2003864773/-1/-1/0/2026-NATIONAL-DEFENSE-STRATEGY.PDF

WHO Europe. (2026, April). *Artificial intelligence is reshaping health systems: State of readiness across the European Union.* World Health Organization Regional Office for Europe. https://www.who.int/europe/publications/i/item/WHO-EURO-2026-12707-52481-81471

World Economic Forum. (2025, September). What does AI need to thrive in Europe? https://www.weforum.org/stories/2025/09/europe-ai-adoption-lag/

syntonyresearch.org