From Strategy to Execution

Orchestrating semiconductor-enabled value chains to maximize economic and strategic value for Greece

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Executive summary

Greece's draft national strategy makes a credible choice: specialization rather than imitation of countries with established, capital-intensive semiconductor manufacturing. As geopolitical competition and AI-related national security concerns increase the importance of semiconductor supply-chain resilience, Europe must strengthen its ability to design, manufacture, integrate and securely deploy trusted semiconductor technologies and end-to-end solutions across a globally distributed value chain.

Greece is well positioned to contribute to this European objective. It has strengths in design, IP, embedded systems, research, engineering talent, European access, and strategic end-use industries. What Greece lacks is not technical expertise, but the scale of physical semiconductor infrastructure and capital necessary to integrate these capabilities independently. HETiA and the Hellenic Chips Competence Centre (HCCC) have already strengthened the organizational foundation. [1,2]

At the same time, the semiconductor value chain is evolving toward increasingly complex multi-die systems and heterogeneous integration. Advanced packaging, currently concentrated largely in Asia, represents an important emerging opportunity for Europe to develop additional expertise, strengthen supply-chain resilience, and enable new generations of semiconductor-based products and applications. Greece could position itself to contribute to a European competency in heterogeneous integration and advanced packaging by first developing the necessary expertise, partnerships, and virtual integration capabilities.

The proposed next step is not another standalone program or institution. It is an operational competency for ***Semiconductor Value-chain Orchestration***: mobilizing the collective expertise of Greek organizations and international partners to identify real end-user needs, create demand, align incentives, coordinate delivery and generate measurable economic outcomes. This would enhance the strategy's planned National Council, Hellenic Chips Office, HCCC and partner ecosystem.

Semiconductor design, IP, fabrication and packaging form the enabling architecture. AI, embedded systems and cybersecurity extend what that architecture can deliver; Greece's digitalization capabilities can be leveraged to connect workflows across ecosystem partners. A trusted digital thread linking chip identity, manufacturing origin, security credentials and lifecycle intelligence would provide visibility and assurance across the value chain, supporting industrial competitiveness and national-security objectives.

Central recommendation

Within the 2026–2030 implementation roadmap, recognize demand-led value-chain orchestration as a cross-cutting execution competency. Use Greece's collective semiconductor expertise, digitalization capabilities and international partnerships to establish a ***virtual heterogeneous-integration competency***. This would allow participating organizations to design, model, coordinate and validate multi-die solutions using distributed EDA,

IP, foundry, packaging and test resources, before considering domestic investment in capital-intensive physical packaging and integration facilities.

Five mutually reinforcing enablers

1. **Ecosystem orchestration:** Align partner capabilities, and incentives around industrial demand.
2. **Chip design and integration:** Connect EDA, IP, chip design, manufacturing and packaging expertise.
3. **Traceability and cybersecurity:** Link chip identity, provenance, security and lifecycle information.
4. **Global ecosystem partnerships:** Leverage R&D, foundries, pilot lines and global OSAT expertise.
5. **Virtual-to-physical development:** Model multi-die integration, validate customer applications and economics through collaborative pilots, then evaluate physical packaging and test investments.

From Strategy to Economic Impact

The test is not how many organizations are connected but how their collective expertise produces customer demand, viable pilots, design wins, Greek-owned IP, exports, startup growth and sustainable revenue, with more economic value generated per euro of scarce domestic capital.

By combining governance, trusted supply-chain integration and network effects, Greece can help create new industrial demand while developing a differentiated European capability in heterogeneous integration and advanced packaging, progressing from virtual collaboration to physical assets when commercially justified.

1 Start with the strengths of the Greek strategy

The draft strategy already recognizes the semiconductor value chain; the lab-to-fab challenge; Greece's lack of major fabs and mature advanced packaging; and the need for financing, governance and market access. Its own conclusion favors knowledge-intensive activities and selective downstream physical investment subject to economic feasibility. [1, pp. 9, 15–19] HETiA's European engagement, including the Brussels/imec delegation, provides a base for implementation.

Existing National Strategy	Proposed Implementation Extension
EDA, design, IP and embedded systems	Connect capabilities to customer solutions & revenue
Lab-to-fab and EU pilot lines	Establish digital traceability and accountability
HCCC / HETiA coordination	Align partner incentives, funding and execution
Defense and security	Translate application needs into funded pilots
Maritime, industrial, energy and telecom	Develop demand-led industrial solutions
Industrial automation	Connect applications to semiconductor capabilities

The precise strategic gap

Coordination is not absent from the national strategy. The proposed Hellenic Chips Office already has responsibilities for ecosystem mapping, European project pipelines and progress monitoring. The opportunity is to add a repeatable industry-facing operating process, connecting end-user requirements with partner commitments, virtual integration, financing, commercialization and measurable Greek value capture. [1, pp. 48–54]

For OSAT and heterogeneous integration, this process can be developed sequentially:

1. Begin with a specific end application and package-level system requirement.
2. Identify required dies, IP, process nodes, reliability and security needs.
3. Select EDA, foundry, OSAT, test and system partners across locations.
4. Develop a shared virtual package/digital-twin workflow, with clear ownership and data rights.
5. Bind verified die, package and test records to trusted identifiers and signed evidence.
6. Validate technical performance, qualification, logistics and unit economics remotely.
7. Run a small commercial pilot; invest in Greek testing or packaging assets only if demand warrants.

Investment discipline: what should be sequenced, rather than assumed

- Do not make a leading-edge fab a prerequisite for Greek semiconductor value creation.
- Use HCCC, HETiA and existing governance bodies to coordinate a virtual ecosystem.
- Pilot traceability and packaging; validate customer value, data rights and economics.
- Evaluate potential physical investment on advanced packaging when commercially justified.

From Integration to Trusted Supply Chains and Economic Value

The opportunity extends beyond advanced packaging itself. By combining heterogeneous integration with secure chip IDs, verified manufacturing and assembly records, and end-to-end traceability, Greece can help develop trusted chip supply chains that support national security, resilience and commercial competitiveness.

These capabilities can enable new services and recurring revenue streams in provenance verification, security assurance, lifecycle analytics and supply-chain management. Greece can initially develop and validate these capabilities through virtual collaboration with international partners, creating a foundation for selective physical investment as customer demand and economic value are demonstrated.

2 A value-chain model with an execution layer

The strategy's existing diagrams identify the physical chain and the building blocks of a sustainable ecosystem. Figure 1 preserves that chain and shows two additional, connected layers: trusted supply-chain information and coordinated commercial execution. These layers can be modeled virtually before new facilities are built.

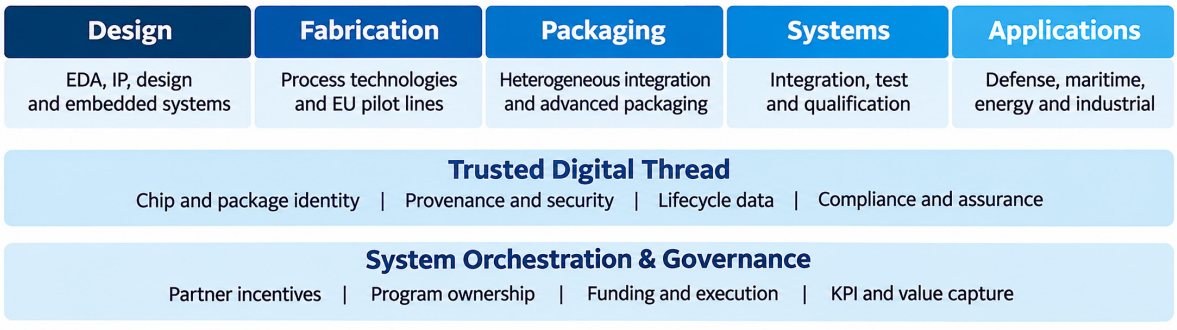


Figure 1. Proposed overlay on the strategy's semiconductor value-chain ecosystem orchestration

Two layers with different jobs

A ***Trusted Digital Thread*** is a common, permissioned record of what happens to a chip and the product built around it. It can link authorized chip and package IDs, design/IP evidence, fabrication/OSAT/test attestations, and later system records. Cryptographic signing and hardware attestation help verify records; ENISA's EUCC work provides relevant cybersecurity-assurance context, but does not itself certify custody or origin. [5] Together, these records can support chip authentication, supply-chain traceability and lifecycle services.

Ecosystem Orchestration means turning separate firms into a coordinated project team. It starts from an application, identifies who can contribute each capability, agrees governance and IP rules, builds a virtual workflow or digital twin, checks technology and business economics, and advances to physical investment only if the model passes its gates. This is more specific than networking or event coordination. **T**he objective is to create commercially viable solutions through complementary partner capabilities.

Greece can use existing expertise in digitalization and enterprise workflows to make that coordination practical: securely moving approved information between design, fabrication, packaging, testing and systems. Greece's ICT expertise is therefore a complementary enabling capability, not a replacement for semiconductor core competency and specialization. The commercial result may include engineering, software and assurance services and new demand for Greek semiconductor products.

Together, the two layers connect technical evidence with coordinated execution: the digital thread establishes what can be verified, while orchestration determines how partners collaborate to deliver customer value.

3 Five enabling elements — part I

A. An orchestration function within existing institutions

Build on the government's proposed governance architecture, with the Ministry and Council setting priorities, the Chips Office coordinating policy and the national pipeline, HCCC providing technical enablement, and HETiA, Enterprise Greece, end-user sectors and investors contributing industrial and commercial capacity. [1, ch. 5] An optional cross-functional implementation working group could focus on a small portfolio customer-sponsored pilots, with clear accountability and reporting through existing governance bodies.

Minimal operating method working backward from the system and end application:

1. Choose a named industry user and its measurable product need.
2. Translate the system need into chip, IP, packaging, software and security requirements.
3. Recruit the minimum capable Greek and international partner set.
4. Agree decision rights, IP protection, data access, financing and ownership of outcomes.
5. Build the virtual workflow/digital twin and test performance and cost assumptions.
6. Validate through a stage-gated customer pilot; measure demand and Greek value capture.
7. Replicate successful configurations and consider physical capabilities only when justified.

B. Connect semiconductors to Greece's software economy

The national strategy already lists software, simulation, embedded systems and AI/edge among Greek strengths. [1, pp. 15–18] They can supply practical digitalization workflows for semiconductor design-to-system integration including engineering automation, secure data exchange and lifecycle information

management, and become collaborators in industry-specific, end-market-driven projects, not a separate objective that distracts from the chip ecosystem.

Candidate application-led domains include maritime and port systems, energy and grid equipment, defense and dual-use electronics, industrial IoT, medical/health infrastructure, and secure edge AI. Prioritization should depend on a committed user and measurable commercial value, not a broad catalog of sectors.

C. Combine security with authenticated physical provenance

ENISA's cybersecurity work, including EU Common Criteria-based certification (EUCC), provides a relevant assurance framework for hardware, software and integrated circuits. Greece could explore how HCCC and its cybersecurity institutions connect this expertise to product applications, while respecting ENISA's independent EU mandate. [5]

The proposed evidence chain is distinct from any single certificate: a secure identity and hardware-rooted attestation; signed fabrication, packaging and test records; verified association of dies with packages, boards and systems; and appropriate product-level cybersecurity assurance. A cyber certificate alone does not establish country of origin or custody; a logistics record alone does not authenticate silicon.

Together, these capabilities can support trusted semiconductor supply chains, secure system integration and application-specific assurance services.

4 Five enabling elements — part II

D. Partner-based fab, OSAT and advanced-packaging access

Greece can leverage international EDA, IP, foundry and OSAT partners rather than replicate their physical infrastructure. Europe offers substantial R&D and fabrication assets, while advanced packaging and high-volume OSAT remain globally distributed. Collaboration with European and Asian partners can accelerate Greek expertise in systems-level integration.

The near-term competency would be ***Virtual Heterogenous Integration***: model multi-die packages from different fabs or technology nodes; validate interconnect, thermal, test, yield, security and traceability requirements; and establish technical and economic feasibility before investing in Greek facilities. Later phases could assess physical provisioning, testing and specialized packaging where justified by customer demand.

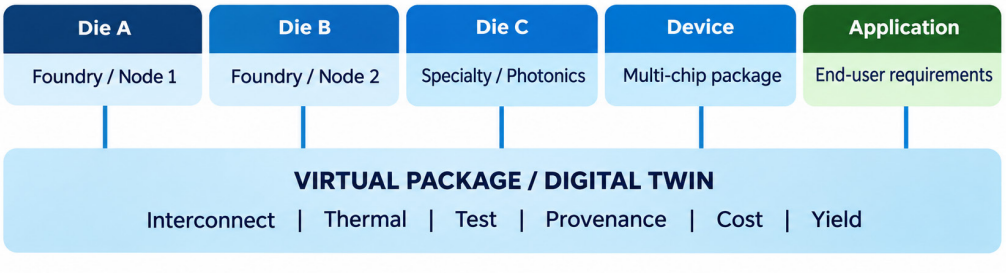


Figure 2. Virtual Multi-die Integration Workflow (Partner-based First)

This virtual integration model depends on clearly defined and complementary responsibilities across the semiconductor value chain. Greece can concentrate on high-value engineering, digital integration, traceability and system-level capabilities while leveraging international partners for capital-intensive manufacturing, packaging and testing. The following table illustrates this division of responsibilities.

Stage / asset	Illustrative Greek role	Required partner contribution
Design & IP	Design, IP integration, chip ID & provenance	EDA tools, IP and secure design flows
Wafer fab	Digital handoff, quality and traceability flows	Wafer fab and authenticated process data
Packaging & test	Virtual multi-die integration and digital twins	OSAT expertise, physical assembly & test
Board / system	Embedded software, security, system assembly	OEM/EMS manufacturing & product spec
Deployment	Lifecycle assurance, analytics, support services	Customer operations and secure field use

E. Demand generation and economic multipliers

End-market demand should drive each pilot, with a sponsoring customer, market need, Greek contribution and viable path to market. Network effects can reduce coordination costs through aligned partner incentives. [3,5]

The value proposition varies by application. Automotive benefits from component authentication, faster qualification and fewer recalls; industrial automation from predictive maintenance and reduced downtime; aerospace and defense from trusted provenance and supply-chain security; and energy and critical infrastructure from resilience and long-term reliability.

Semiconductor traceability links secure chip identities to verified manufacturing, packaging and test records, establishing provenance through deployment. AI can leverage these records to improve engineering, predict failures and optimize performance. Combined with heterogeneous integration, these capabilities enable higher-value products and lifecycle services.

5 Demand-Led Orchestration, Governance and Economic Value

Greece can create economic value by connecting its semiconductor expertise with international technology partners and European industrial demand. The objective is not simply to coordinate organizations, but to develop commercially viable solutions that no single participant could deliver independently. AI-enabled workflows, trusted traceability and virtual integration can help reduce engineering costs, accelerate qualification and create new revenue opportunities.

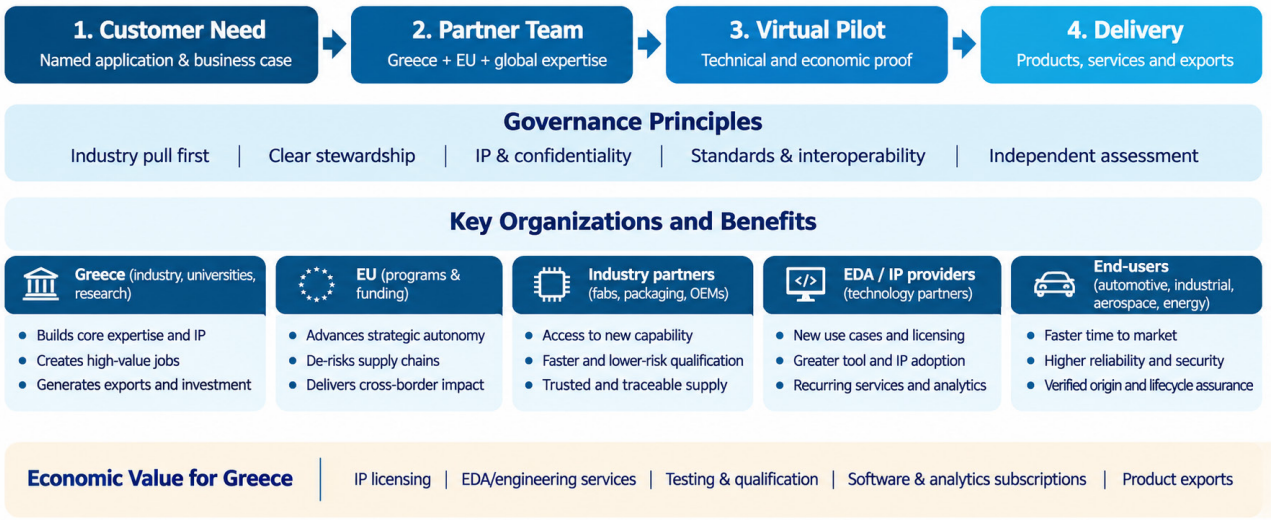


Figure 3. Ecosystem orchestration linking customer requirements, complementary partners and pilots.

Governance principles for the first pilot portfolio

Effective orchestration requires clear governance that protects each participant's interests and fosters collaboration, while aligning the ecosystem around measurable customer outcomes.

- **Industry demand:** Named customer sponsor, application requirements and business case.
- **Accountability:** Defined ownership, partner responsibilities, milestones and investment gates.
- **IP and data protection:** Authorized information sharing, confidentiality and ownership rights.
- **Interoperability:** Established NIST, SEMI, JEDEC and applicable European standards.
- **Independent validation:** Technical feasibility, customer adoption and economic value capture.

From Ecosystem Collaboration to Economic Value

Existing Greek institutions can facilitate this model without creating another organization. Each participant contributes distinct capabilities and benefits from its contribution to a shared commercial outcome.

Participating Organizations	Potential Benefits
HCCC / HETiA	Coordinated pilots, industry participation and EU partnerships
National Council / Chips Office	Investment oversight, accountability and measurable outcomes
Greek companies and research institutions	IP licensing, engineering contracts, startups and exports
EDA, IP, foundry and OSAT partners	New customers, qualified solutions and service revenues
Industrial OEMs and end users	Trusted products, faster qualification and reduced risks

Commercial models can combine IP licensing, engineering and integration fees, testing and qualification services, software subscriptions, lifecycle analytics and revenue-sharing arrangements. Trusted chip identities and verified lifecycle records enable traceability-based services, while clear governance defines partner responsibilities, data rights and the mechanisms for sharing economic value.

The objective is to capture more economic value from a globally distributed semiconductor value chain without requiring Greece to own every capital-intensive manufacturing asset. Success should be measured through customer adoption, commercial revenue, Greek-owned IP, exports, investment leverage and economic value retained in Greece.

6 Implementation path aligned with 2026–2030

The government’s implementation timetable provides a suitable backbone. The proposed evolution begins with Greece’s collective engineering, software and security expertise; then assembles an international virtual chain for multi-die packaging and trust services; proves that model with end users and partners; and advances to selective physical facilities only when economics demonstrate a viable opportunity. [1, pp. 53–54]

Each phase should build on the results of the preceding one. Initial efforts would connect Greek expertise with end-user requirements and international partners, followed by virtual integration and traceability pilots that demonstrate technical feasibility and commercial value. Progression to the next phase should depend on measurable results, partner commitments and customer demand, not simply the passage of time.

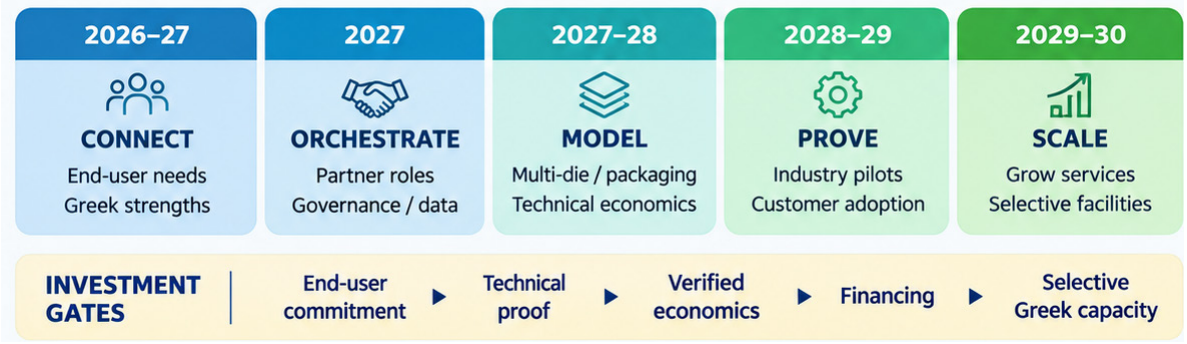


Figure 4. Validate virtually before investing physically: a proposed 2026–2030 implementation path

The following table translates this progression into specific deliverables and decision gates for the 2026–2030 implementation period.

Window	Proposed additive deliverable	Decision gate
2026–27	Prioritized application map; partner/incentive matrix; 2–3 scoped candidate pilots	End-user need, Greek value potential and accountable owner
2027–28	One or two cross-border digital-thread and/or virtual OSAT workflows	Verified technical feasibility and adoption economics
2028–29	Repeatable partner agreements, software services and startup participation	Paying customers, investment interest and defensible IP
2029–30	Consider testing, secure provisioning or specialized packaging assets	Independent commercial/technical investment case

The 2028 mid-term review should examine real customer demand, completed pilots, partner participation, revenue potential, Greek IP and verified value capture. Investment in physical facilities is a decision informed by the virtual model—not an automatic end-of-roadmap requirement.

7 Economic outcomes and measurement

The opportunity is measurable, but EU-wide budgets must not be confused with Greek allocations. European Commission, Chips JU and ESIA sources provide a useful scale for market opportunity and potential Greek participation. The priority is to convert access to European programs and industrial partnerships into funded projects, commercial demand and measurable Greek economic value. For context, ESIA/WSTS reported $791.7 billion in global semiconductor sales and $54.5 billion in sales to the European region in 2025; these are regional sales, not the revenues of Europe-headquartered chip companies. [3]

EU Program Scale — The European Chips Act has mobilized more than €80 billion in announced or planned semiconductor investments, according to the Commission; the Chips for Europe initiative has over €3 billion in EU funding, matched by participating states. These are Europe-wide measures, not Greece-specific available funds. [2]

Current Funding Pathways — Chips JU reported 16 calls in July 2026 with more than €300 million in indicative EU funding; many of those deadlines have passed. A separate pair of AI-chip/compute calls carries a combined indicative EU budget of €80 million, with an extended deadline of 1 December 2026. [4]

New Design Platform — The Commission announced on 4 November 2026 a €525 million European investment package associated with the European Chip Design Platform and new chip-design companies. The platform is operated by an imec-led consortium; its leadership does not establish that imec receives the entire package or that Greece has a predetermined allocation. [6]

Greek Starting Point — HETiA reports €3.63 million of approved public funding for the HCCC national component. The near-term task is to link such enabling capacity to fundable, customer-backed Greek projects, with national co-funding and eligibility confirmed case by case. [7]

Dimension	Illustrative measurable indicator	Interpretation
Commercial demand	Industry-sponsored pilots, design wins, customer commitments	Real market pull rather than project counts alone
Greek IP / companies	Greek-owned IP, licensing, startup/spin-off product launches	Value created and retained domestically
Financial leverage	External committed capital ÷ Greek public capital	Capital mobilization; not itself an economic return
Greek value capture	Domestic commercial revenue, exports and skilled jobs per euro invested	Sustainable national economic contribution
Operational execution	Time from lab concept to validated prototype; pilot conversion rate	Whether orchestration removes friction
Trust / digital integration	Coverage and verification of signed supply-chain events, audit results	Evidence quality rather than simply database size

Priority consultation recommendations

1. Explicitly recognize cross-value-chain orchestration and trusted digital integration as a horizontal competency under the five existing priorities.
2. Include Greece's software, enterprise platforms and cybersecurity organizations in the national capability map, alongside IC design, IP and research.
3. Create a small set of demand-led, multi-party pilot opportunities, with European fabrication/OSAT partners, supported by transparent IP, data and incentive rules.
4. Assess a staged virtual-to-physical advanced packaging and test proposition, including identity binding and system-level provenance, against real end-user requirements.
5. Include commercial demand, domestic value capture and leverage-adjusted capital productivity in annual reporting and the 2028 review.

The policy test should be explicit: improve the conversion of European access and Greek expertise into funded pilots, market demand, Greek-owned IP, export revenues, and private capital participation. Report committed EU funding, competitive call budgets and Greek-awarded amounts separately; evaluate domestic economic value independently from gross external funding.

8 Closing perspective and basis for discussion

The national strategy's strength is its realism: Greece should specialize rather than attempt to recreate every capital-intensive segment. The next opportunity is to orchestrate an application-led, digitally connected and

commercially accountable ecosystem that combines Greek semiconductor know-how with software, cybersecurity and international manufacturing expertise.

The ESIA Chips Act 2.0 position reinforces the importance of industry-led demand creation. For Greece, effective governance and network effects can transform distributed expertise into trusted supply-chain solutions, commercial demand and sustainable economic value, while establishing the foundation for future heterogeneous-integration and advanced-packaging capabilities.

I offer these recommendations as a constructive contribution to Greece's 2026–2030 national strategy, and would welcome a dialogue on opportunities to contribute international industrial and ecosystem experience through the appropriate advisory and implementation mechanisms.

Selected public sources and links

[1] Hellenic Ministry of Development, National Semiconductor and Microelectronics Strategy 2026–2030, October 2026 draft; pp. 9–19, 20–35, 48–54, 60–62. [Greek strategy]

[2] European Commission, European Chips Act — investment, pilot lines, competence centres and policy objectives. [Chips Act]

[3] ESIA/WSTS, Global chip sales 2025, release 6 February 2026; and ESIA, Chips Act 2.0 position, 14 September 2026. [ESIA data]

[3a] ESIA, Chips Act 2.0: Supporting Demand Creation, Empowering Industry, Securing an Ambitious Budget, 14 September 2026. [ESIA paper]

[4] Chips JU, 2026 calls and AI chips/compute opportunities; all EU budgets indicative, subject to conditions. [Chips JU calls]

[5] ENISA, EUCC Common Criteria cybersecurity scheme and integrated circuits guidance. [ENISA EUCC]

[6] European Commission, €525 million European Chip Design Platform announcement, 4 November 2026. [Design platform]

[7] HETiA, HCCC national component funding approval of €3.63 million, December 2025. [HCCC funding]

Author context: international experience and perspective

Athanassios (Tom) Katsioulas is Greek-born and a dual U.S.–EU citizen, with decades of executive leadership in the global semiconductor and electronic-design ecosystem. He served as a member of the U.S. Department of Commerce Internet of Things Advisory Board, appointed in 2022, contributing expertise on trusted IoT and semiconductor supply chains, security and international industry collaboration.

His work has included cross-company ecosystem orchestration across EDA, semiconductor IP, manufacturing and system applications, as well as U.S.–EU collaboration on cross-border chip supply chain traceability and technological resilience for AI data centers and applications. This combination of Greek roots, U.S. public-service experience and international industrial practice informs the recommendations offered here.