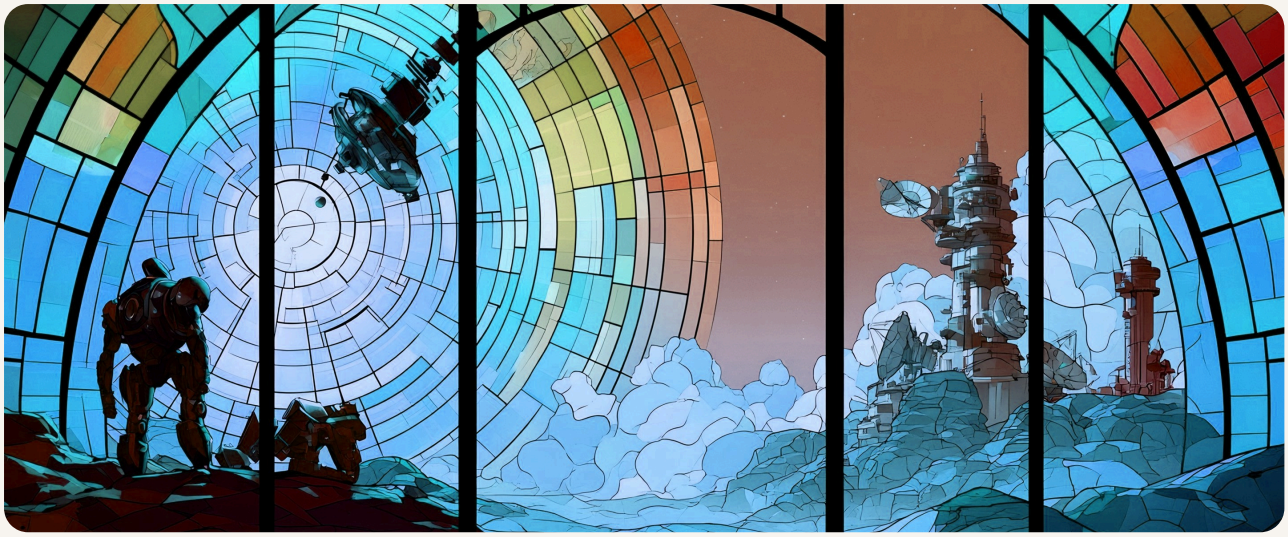


Sector guide · The $500 trillion PPP infrastructure opportunity

Nuclear Energy

WHAT THIS GUIDE IS FOR

Small reactors, central Jordan uranium and the science to use them. This guide sets out nuclear energy in Jordan, its link to the infrastructure singularity, every relevant project in Jordan's PPP pipeline and the ways a partner can take part.

PROJECTS
6 in Jordan's pipeline

FORWARD INVESTMENT
About $835m

PREPARED BY
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JORDAN'S SECTORS

The sectors behind **Jordan's $86 billion**

Jordan is investing in and advancing 23 sectors at once, from solar, water and mining to tourism, health and digital. Together their projects make up the $86 billion PPP and infrastructure opportunity, $46 billion of it anchored in Aqaba. This guide covers one of them, Nuclear Energy, highlighted below.

SECTOR	PROJECTS	FORWARD INVESTMENT
Oil, Gas and Power	18	$15.1bn
Tourism	42	$13.8bn
Urban Development	16	$12.8bn
Green Hydrogen	5	$10.6bn
Transport	24	$8.1bn
Water	18	$6.7bn
Fertilizers and Chemicals	9	$6.5bn
Ports and Logistics	10	$3.6bn
Manufacturing	17	$2.4bn
Storage and Grids	9	$1.4bn
Mining and Minerals	14	$1.2bn
Health	11	$986m
Wastewater and Reuse	13	$946m
Nuclear Energy	**2**	**$835m**
Agriculture and Food	12	$400m
Solar Power	4	$326m
Digital and AI	5	$243m
Circular Economy	12	$189m
Wind Power	3	$186m
Pharmaceuticals	5	$128m
Creative Industries	3	$47m
Defense	1	$10m
Education and Skills	2	$7m
All sectors	**255**	**about $86.3bn**

Forward investment counts each project once, in its home sector, and leaves out projects already delivered. Every sector has its own guide in this collection.

INTRODUCTION

Jordan's **nuclear option**

Jordan holds uranium in its own ground, a working research reactor and a commission that has studied nuclear power for almost two decades. The 2024 Red Book lists 63,019 tonnes of identified conventional uranium resources, with about 98,000 tonnes more in phosphate deposits.

The programme has changed shape. Plans for two large reactors were dropped in 2018 over financing costs, and the Jordan Atomic Energy Commission (JAEC) turned to small modular reactors, signing agreements with several vendors and studying nuclear-powered desalination and water pumping for a country short of water.

Fuel is moving first. The Jordan Uranium Mining Company and Kazakhstan's Kazatomprom signed a Heads of Agreement in August 2025 on the Central Jordan Uranium Project. This guide sets out where the sector stands, the projects in the Jordan PPP project register, and how firm, compact power links Jordan to the singularity.

63,019 tU	Identified conventional uranium resources in Jordan, mainly in central Jordan, per the 2024 Red Book.
98,000 tU	Further unconventional uranium resources in phosphate deposits in the Al Risha and Eshidiyya areas.
400 tU	Upper end of the 300 to 400 tonnes a year uranium mill planned about 80 km south of Amman.
5 MW	Thermal power of the Jordan Research and Training Reactor, commissioned in December 2016.

THE $500 TRILLION REBUILD

A century of infrastructure **reaches the end of its life**

Most of the roads, bridges, power plants, water networks, ports and airports the world runs on were built in the last hundred years, and much of that stock is wearing out at the same time. Rebuilding and running the world's infrastructure will take about $500 trillion over the next fifty years, the largest investment humanity will make in that time.

Public-private partnerships (PPPs) will carry a large share of it, because governments cannot fund, build and run the rebuild alone, and the private sector cannot do it without them. The next generation of infrastructure will carry a software layer specified alongside the concrete. Assets will monitor their own condition, predict their own failures and schedule their own maintenance, and fleets of machines will raise them with very few human hands involved.

	$300T	to build the physical assets: roads, rail, ports, grids, water, cities, schools and hospitals
+	$150T	to operate and maintain them across the life of each concession
+	$50T	for the sensors, compute and robotics that will sit inside them, the share of the rebuild that venture capital can fund
=	**$500T**	**in total to rebuild and run the world's infrastructure over the next fifty years**

When a port knows what the rail line is carrying before it arrives, a water utility prices its pumping energy against the grid in real time, and every contract and drawing sits in one connected record, the built world starts to behave as one system. Joined across borders, the world's roads, grids, ports, water networks, data centers and satellites become one globally connected, superintelligent computer. Nuclear energy could give that computer a firm base, with small reactors running day and night beside data centers, desalination plants and industry, whatever the weather.

THE SINGULARITY

Firm power for **the singularity**

The infrastructure singularity is the point where roads, grids, ports and water networks become one connected, intelligent system, built by robotics, run by artificial intelligence and financed by tokenization. Such a system needs clean power that runs every hour of every day, whatever the weather.

Small modular reactors are factory-built power plants that can sit beside a desalination plant, a data center or an industrial estate and run for years on one fuel load. For Jordan they promise firm, clean power to balance solar and wind, water from the sea pumped inland, and a domestic fuel chain from central Jordan uranium.

The PPP singularity is the point at which it becomes cheaper to build the pilot than to conduct the study. Nuclear is the hardest test of that idea, and digital twins, standard factory designs and regional fleets are bringing it closer: once one design is licensed, every further unit becomes a repeat of a proven pilot.

How nuclear connects to the singularity

Artificial intelligence	Simulates reactor cores, monitors thousands of sensors and supports operators, and speeds up the design and licensing reviews that set the pace of new nuclear.
Robotics	Robots handle inspection, maintenance and fuel in areas people cannot easily reach, and modular factories build reactor parts like aircraft.
Tokenization	A reactor earns power and water revenue for sixty years. Tokenized stakes could spread that long-term ownership across many investors.
Compute	AI data centers need constant clean power. A small reactor beside a data campus gives Jordan firm power for regional compute.
Water	Reactor heat and power can run desalination and pump water uphill to Amman, turning energy into the country's scarcest resource.

JORDAN AND AQABA

An $86 billion pipeline **to start with**

Jordan has more than 250 PPP and infrastructure projects in development, worth about $86 billion, of which $46 billion is anchored in Aqaba, Jordan's only port and its gateway to the Red Sea.

$86 billion
of PPP and infrastructure projects in development across Jordan

$46 billion
anchored in Aqaba, inside the Aqaba Special Economic Zone

6
projects in this guide

$835m
forward investment in the sector's own projects

3
of them in or linked to Aqaba

Nuclear is an early part of Jordan's $86 billion. The SMR programme and the Central Jordan Uranium Project are the sector's own projects in the pipeline, and JAEC is studying how small reactors could power the Aqaba-Amman water conveyance, one of the largest projects in Aqaba's $46 billion. Phosphate projects at Eshidiya and Risha also matter, because Jordan's unconventional uranium resources sit in those phosphate deposits.

WHY JORDAN

Why Jordan **for nuclear**

Jordan combines its own uranium, nuclear institutions built over two decades, a trained workforce and an urgent need for firm power and water.

Domestic uranium	Uranium in central Jordan and in phosphate deposits gives the country a possible fuel supply of its own, with a pilot plant producing since 2021.
Institutions	JAEC leads the programme, JUMCO develops uranium and the Energy and Minerals Regulatory Commission licenses and regulates nuclear activities.
Skills	The research reactor and a subcritical assembly at the Jordan University of Science and Technology train Jordanian engineers and scientists.
Water need	Jordan is one of the most water-scarce countries in the world, and nuclear desalination is one of the options JAEC is studying.
Vendor interest	Reactor designers from Europe, Asia and North America have signed agreements with JAEC to study small reactors in Jordan.
The PPP law	PPP Law No. 19 of 2023 sets out how projects are prepared and tendered, and allows private parties to propose projects directly under Article 15.

ARTIFICIAL INTELLIGENCE

AI designs, structures **and runs it**

A PPP takes about seven years from concept to financial close and costs roughly 10% of capex to structure. Almost all of that work is documents and models, which is the work AI does well.

When the cost of intelligence approaches zero, the cost of preparing a project falls with it. Feasibility studies, cost plans, risk matrices, financial models and tender documents can be produced and tested in days, and contracts drafted and stress-tested in hours. Once an asset is running, the same intelligence operates it: a digital twin models the asset in real time, sensors report wear and faults early, and maintenance follows the data.

Jordan arrives late to PPP software, and that is an advantage. With few legacy systems to migrate off, AI-native tools can be built from the ground up.

What it means for nuclear energy

For nuclear energy in Jordan, AI shortens the path from study to licence. Models can compare reactor designs and sites, simulate cores and safety cases, and help JAEC and the regulator review thousands of pages of documents. In operation, AI watches every sensor of a reactor or a uranium mill, flags drift early and supports operators, while the same tools help JUMCO model ore bodies and plan processing.

What can be built

Site screening	Models that rank candidate sites by seismic data, water, grid access and population for a first small reactor.
Licensing assistant	AI that drafts and checks safety documents against regulations, shortening reviews while keeping every standard.
Ore modeling	Machine learning on drill and assay data that maps central Jordan uranium and plans its mining.
Plant monitoring	Systems that track reactor and mill sensors and warn operators of faults early.

ROBOTICS

Robots build it **and keep it running**

Most of the $500 trillion of infrastructure due over the next fifty years will be built by machines, and people will design, train and supervise those machines.

Autonomous software combined with autonomous machines produces autonomous infrastructure. Construction robots, drones and modular factories already raise structures with far fewer people on site, and the machines then stay with the asset to inspect, clean and repair it.

Robotics also changes who can compete. A small company with the right machines can build what once needed a thousand-person contractor, and it can prove its method on a pilot before anyone asks for a track record, which opens PPP work to new companies.

What it means for nuclear energy

Nuclear work takes place where people should spend as little time as possible, which makes robotics essential. Remote handling systems move fuel and isotopes, robots inspect pipes and vessels inside a plant, and drones survey mines and tailings. Small modular reactors are themselves built in factories on automated lines, so the robots that build them also decide how fast and how cheaply they can reach Jordan.

What can be built

Hot cells	Remote manipulators that handle isotopes safely at the research reactor and at future production lines.
Mine automation	Autonomous drills, loaders and drones for uranium mining and heap leaching in central Jordan.
Plant inspection	Robots that inspect welds, pipes and vessels during outages and shorten maintenance.
Module fabrication	Robotic welding and assembly of reactor modules and steel structures, a supply role Jordanian firms could grow into.

TOKENIZATION

Tokenization finances it **and opens its ownership**

A PPP absorbs capital over four years and releases it over thirty. Today's investors expect to enter and exit easily, and tokenization gives them that option.

A concession is a long-dated, contracted, inflation-linked cash flow, the kind of asset a token represents well and an ordinary investor has rarely been able to hold directly. Tokenization lets a small pilot be funded by a few hundred investors, with returns paid automatically from the asset's own revenue.

The rails already exist in the region. ADGM regulates tokenized securities, the Dubai Land Department records tokenized title deeds, and Jordan adopted a national Blockchain Technology Policy in December 2024. Tokenized concession revenues are still rare, so the first tokenized PPP in Jordan is open to whoever builds it.

What it means for nuclear energy

A small reactor would earn power and water revenue for decades, the kind of long, steady income tokenization handles well. Tokenized stakes could let Jordanian and regional investors share in a future plant alongside export credit and development finance. Tokens can also trace uranium and isotopes from mine or reactor to user, giving buyers and regulators a verified record of every shipment.

What can be built

Reactor stakes	Tokenized minority stakes in a future small reactor, paid from its power and water sales.
Uranium traceability	A ledger that tracks yellowcake from the central Jordan mill to its buyers and supports safeguards reporting.
Isotope supply	Tokenized records that trace medical isotopes from production to hospital and settle orders automatically.
Offtake notes	Tokenized notes backed by uranium offtake contracts that fund the mill before production starts.

SMALL PPPS IN PARALLEL

A thousand small PPPs **teach more than one large one**

The World Bank counted 315 private infrastructure projects reaching financial close across all low- and middle-income countries in 2024, only a few per country. No country can learn quickly at that pace, and each lesson arrives years after the technology behind it has moved on.

Each of those projects is too large, too slow and too expensive to try anything new on, and every approval, guarantee and stakeholder on a $1 billion project pulls it toward the way things were done before. Small projects are where a new idea can afford to be wrong, because the downside is small, the learning cycle is fast and the bureaucracy is thin.

Run them in parallel

Software has already moved from building one idea at a time to building ten at once, and infrastructure can follow. Many small projects, each delivered through its own PPP and each testing a slightly different legal structure, financing model, construction method and operating approach, produce performance data quickly. The models that work are copied, the weak ones are retired early and policy improves with every round.

$10M

spent preparing a single $100 million PPP, enough to build 100 pilots at $100,000 each

780

small PPPs a year in Jordan at $100,000 each, from 1% of the budgets of its 40 contracting authorities, about $78 million

The PPP singularity

The PPP singularity is the point at which it becomes cheaper to build the pilot than to conduct the study. A pilot settles the argument with evidence. Governments that work this way become portfolio managers of experimentation: they set the objectives and the guardrails, standardize contracts that can adapt, and publish every pilot, every cost and every failure on one public website.

PPP RESEARCH LABS

Pilots need **somewhere to live**

PPP innovation needs the public and private sectors working together, so each lab is built the way a PPP is built: the public sector spearheads it and the private sector designs, finances, builds and operates it.

One lab per sector	Each sector gets a PPP research lab inside the ministry or authority that runs it.
A one-line brief	Run ten small PPP projects a year at up to $100,000 each, testing new technologies, PPP frameworks, construction methods and financing structures.
A PPP itself	The ministry tenders the lab, and private companies bid to design, finance, build and operate it with their own capital, effort and technology.
Funding	About $1 million a year per lab, found by moving 1% of an authority's budget away from inefficient spending.
Open results	Every result is published as it happens, including the failures, and the lessons go straight into the large PPPs already running.

What it means for nuclear energy

Nuclear projects are large, but the research around them can start small. A nuclear research lab could run three pilots of about $100,000 each: AI tools that screen sites and draft licensing documents for a small reactor, a robotic and drone survey of a central Jordan uranium area, and a test rig for recovering uranium from phosphoric acid at Eshidiya. Small PPPs below about US$14.1 million can then carry proven ideas forward.

UNSOLICITED PROPOSALS

Jordanian law accepts **unsolicited PPP proposals**

Any private company can take its own PPP idea to government. Article 15 of PPP Law No. 19 of 2023 lets a proposer submit a direct proposal to the Ministry of Investment or a public authority, and PPP Regulation No. 9 of 2024 sets out how it is assessed. This is the Swiss Challenge approach: the proposer brings the idea, the market competes on it and the proposer keeps the right to match the best offer.

Conditions	The proposal offers an innovative solution for a public service, is prepared on the proposer's own initiative, gives value for money, fits government programs and covers the government's obligations from project revenues.
Contents	The scope, the proposer and its experience, a pre-feasibility study with the innovation behind it, the fiscal implications and any support sought, and the cost of preparing the study.
Review	A public authority or municipality that receives a proposal refers it to the Ministry of Investment, which has 60 days to take it up for study or return it, and can charge a study fee of at least $7,050.
Tender	If the project goes to tender, the proposer can match the best offer, and if another bidder wins, the winner repays the proposer's direct study costs.
Small projects	Projects with a capital cost below $14.1 million are small-scale PPPs, and similar ones can be bundled into one feasibility report and one tender.

What it means for nuclear energy

A company can bring a nuclear-related project to government under Article 15 of PPP Law No. 19 of 2023. Ideas include recovering uranium as a by-product of phosphoric acid production, an isotope distribution network for hospitals, site and grid studies for a small reactor beside a desalination plant, and training and research services built around the research reactor. The proposer keeps the right to match the best offer if the project goes to tender.

FLAGSHIP PROJECTS

Flagship **projects**

PIPELINE · SITE TO BE DECIDED

Small Modular Reactor (SMR) Nuclear Programme

JAEC's plan for small modular reactors to produce power and desalinated water, replacing the large-reactor plan. Vendor feasibility studies are under way, and an IAEA expert review found Jordan's reports a good basis for a feasibility study. Candidate sites include the Aqaba and Amra corridor.

PIPELINE · CENTRAL JORDAN

Central Jordan Uranium Project (CJUP)

JUMCO's pilot plant has operated since 2021, and a mill of 300 to 400 tonnes of uranium a year is planned. JUMCO and Kazatomprom signed a Heads of Agreement in August 2025, with a joint venture planned if the pilot results are positive.

STUDIES · AQABA TO AMMAN

Nuclear Desalination and Water Pumping Studies

JAEC is studying how small reactors could power seawater desalination and pump water inland, including their fit with the national water conveyance from Aqaba to Amman.

DELIVERED · RAMTHA

Jordan Research and Training Reactor

A 5 MW research reactor at the Jordan University of Science and Technology, built by a KAERI-led consortium and commissioned in December 2016. It trains nuclear specialists and supplies iodine-131 to hospitals across Jordan.

DELIVERED · ALLAN

SESAME Synchrotron

The region's synchrotron light source, an international research center hosted by Jordan. In 2019 it became the first large accelerator complex fully powered by renewable energy, from a 6.48 MW solar plant.

PROJECTS IN JORDAN'S PIPELINE

Nuclear projects **in the pipeline**

PROJECT	LOCATION	STAGE	VALUE
Small Modular Reactor (SMR) Nuclear Programme	To be decided	Pipeline	$800m*
Central Jordan Uranium Project (CJUP)	Central Jordan	Pipeline	$35m*
Aqaba-Amman Water Desalination & Conveyance Project (AAWDCP)	Aqaba to Amman	Awarded	$5.8bn
JIFCO Fertilizer Expansion	JIFCO fertilizer complex at Eshidi	Tendering	$1bn
Arab Potash × JPMC Integrated Fertilizer Complex	Eshidiya	Pipeline	$1bn
Phosphate Exploration (Block A3)	Mafraq	Open opportunity	$40m*

The table lists nuclear power and uranium projects. Research facilities such as the research reactor and SESAME are described in the text. Values in US dollars. * Estimated where no figure has been published. Rows in grey sit in another sector and connect to this one. Source: the Jordan PPP project register, updated daily from Invest Jordan, ministries and published announcements.

NEW INDUSTRIES

New industries **built on the atom**

A nuclear programme opens industries Jordan does not yet have at scale. Each can begin with research and pilots and grow into a regional business.

01 **Uranium yellowcake**

Mining and milling central Jordan uranium into yellowcake for export and, in time, for the country's own reactors.

02 **Uranium from phosphate**

Recovering uranium as a by-product of phosphoric acid and fertilizer production, adding value to Jordan's phosphate industry.

03 **Medical isotopes**

Producing isotopes for diagnosis and cancer treatment for hospitals in Jordan and across the region.

04 **Nuclear desalination**

Water from the sea made with reactor power and heat, supplying cities and industry far inland.

05 **Reactor supply chain**

Jordanian firms making modules, steel structures and components for small reactors built in factories.

06 **Nuclear and accelerator science**

Materials testing, imaging and analysis services for industry, building on the research reactor and SESAME.

OPPORTUNITIES

Where partners **come in**

Reactor vendors, miners, investors and service companies can take part through studies, joint ventures and partnerships with JAEC and JUMCO.

Feasibility and design	Support JAEC's vendor feasibility studies, site studies and grid integration work as Jordan moves towards choosing a small reactor design.
Uranium development	Join the Central Jordan Uranium Project as a contractor, equipment supplier or offtaker as the joint venture moves towards a bankable feasibility study.
Direct proposals	Propose energy and water projects under Article 15 of PPP Law No. 19 of 2023, such as nuclear-ready desalination studies.
Isotopes and science	Partner on isotope production, research services and training with the research reactor and Jordanian universities.
Industrial supply	Build fabrication and services capacity in development zones and the Aqaba Special Economic Zone, with Investment Environment Law incentives.
Investment and ownership	Finance future reactors through export credit agencies, development banks, sovereign funds and tokenized stakes.

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THE HORIZON

From research **to firm power**

A possible path for the sector, from today's projects to a country where small reactors supply firm power and water.

2026	JUMCO prepares the technical studies for a bankable uranium feasibility study; JAEC continues small reactor studies with vendors.
2030	A small reactor design and site are chosen; the uranium joint venture builds towards commercial production.
2035	Central Jordan produces yellowcake; licensing and early works start on the first small reactor.
2040	The first small reactors supply firm power and desalinated water, balancing a grid run mostly on sun and wind.
2050	Factory-built reactors, robots and AI run a fleet that powers Jordan's water, compute and industry around the clock.

Jordan has the uranium, the institutions and the need. The projects in this guide are the first steps towards firm, clean power that can run the country's water and intelligence through every hour of the day.

JORDAN PPP GUIDES

Launch a PPP program **of your own**

Jordan PPP publishes 96 free guides, one for each kind of organization in Jordan, each showing how that organization can launch a PPP program of its own, with AI, robotics and tokenization, small PPPs, research labs and direct proposals under Article 15. These guides are closest to nuclear energy.

Nuclear Energy Organizations	Nuclear energy organizations plan assets that serve generations. www.JordanPPP.com/guides/nuclear
Energy Developers	Energy developers power every other PPP. www.JordanPPP.com/guides/energy
Research Centers and Laboratories	Research centers turn new ideas into evidence a contract can rely on. www.JordanPPP.com/guides/research-centers
Universities	Universities supply the people every PPP depends on. www.JordanPPP.com/guides/universities

Every guide can be read and downloaded at www.JordanPPP.com/guides, with the summary of all guides at www.JordanPPP.com/summary. The site also explains small PPPs, unsolicited proposals, AI, robotics and tokenization in PPPs.

ABOUT

Jordan PPP

Accelerate Jordan
Accelerate the infrastructure singularity
Accelerate the Jordan PPP singularity

AMMAN, JORDAN WWW.JORDANPPP.COM

Jordan PPP helps every kind of organization in Jordan launch a public-private partnership (PPP) program of its own. It publishes 96 guides, one for each kind of organization, and this sector guide brings the same ideas to nuclear energy.

Its vision is the infrastructure singularity, when roads, grids, ports and water networks become one globally connected, superintelligent computer, built by robotics, run by artificial intelligence and financed by tokenization. Rebuilding and running the world's infrastructure will take about $500 trillion over the next fifty years.

Its method starts small: a PPP program for every organization, small PPPs run in parallel, a research lab in each sector and direct proposals under Article 15 of PPP Law No. 19 of 2023, starting with Jordan's $86 billion and Aqaba's $46 billion of projects.

JORDAN PPP

What Jordan PPP offers

The guides

One for every organization

96 guides, each with the case, the program and six first steps.

www.JordanPPP.com/guides →

The summary

All guides in one document

Every guide, its organization and its ask, in one place.

www.JordanPPP.com/summary →

Futureproofing

AI, robotics, tokenization

What the three technologies change for every organization.

www.JordanPPP.com/futureproofing →

The opportunity

$500 trillion

The $500 trillion PPP infrastructure opportunity, from the crisis to the exchanges.

www.JordanPPP.com/opportunity →

SOURCES

Sources **and further reading**

01 World Nuclear Association: Nuclear Power in Jordan

02 World Nuclear News: Kazatomprom, JUMCO sign agreement on Jordan mining project

03 World Nuclear News: IAEA assesses Jordanian plans for SMR deployment

04 World Nuclear News: Jordan research reactor complete

05 Jordan Times: Central region holds estimated 41,000 tonnes of yellowcake, JAEC

06 Lightsources.org: SESAME fully powered by renewable energy

07 Jordan Atomic Energy Commission

08 Invest Jordan: investment opportunities

09 Jordan PPP guides



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