

Financial Modeling for Japan's Solar Market: Navigating the Shift from FiT to FiP

Navigating the Shift from Feed-in Tariff (FiT) to Feed-in Premium (FiP)

Content Partner: J. v. G. technology GmbH

Turnkey solar module production lines — since 1997

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Technical Overview: Financial Modeling for Japan's Solar Market (FiT to FiP)



Created as part of the PVKnowHow Knowledge Network



Prepared by J.v.G. Technology GmbH



European specialists in turnkey solar module production lines

Key Project Data

Japan

Market

Japan solar energy market —
third largest solar capacity
globally

FIP

Active Scheme

Feed-in Premium —
introduced April 2022 for
projects ≥ 1 MW

FiT


Previous Model

Feed-in Tariff — fixed-price
procurement since 2012;
now phased out for large
solar

Mediu...

Risk Profile

Market price exposure
replaces guaranteed offtake
revenue

 Market: Japan solar energy market · Scheme: Feed-in Premium (FIP) · Previous model: Feed-in Tariff (FiT) · Revenue model: Market price + premium · Risk profile: Medium to high (market exposure) · Source: PVKnowHow / J.v.G. Technology GmbH

Japan's Policy Shift: From FiT to FIP

1

2012 — FiT Introduced

Fixed tariff launched post-Fukushima to accelerate renewable deployment

Initial rate: ¥40/kWh for large-scale solar

2

2012–2021 — Rapid Expansion

Solar PV capacity grew dramatically; renewables reached ~22% of electricity generation

FiT surcharges increasingly burdened electricity consumers

3

October 2021 — Policy Pivot

6th Strategic Energy Plan approved; transition away from FiT signalled

REA amended to introduce FIP framework

4

April 2022 — FIP Live

FIP launched; FiT no longer available for solar projects ≥ 1 MW

Market integration of large-scale renewables becomes policy objective

FiT vs. FiP: Structural Difference

Feed-in Tariff (FiT) — Fixed Revenue

- Utility purchases all output at a guaranteed fixed price
- Price set by government — no exposure to wholesale market
- Generator revenue is fully predictable over the contract term
- No incentive to optimise generation timing vs. market demand
- Surcharge cost socialised across all electricity consumers

Feed-in Premium (FiP) — Market-Linked Revenue

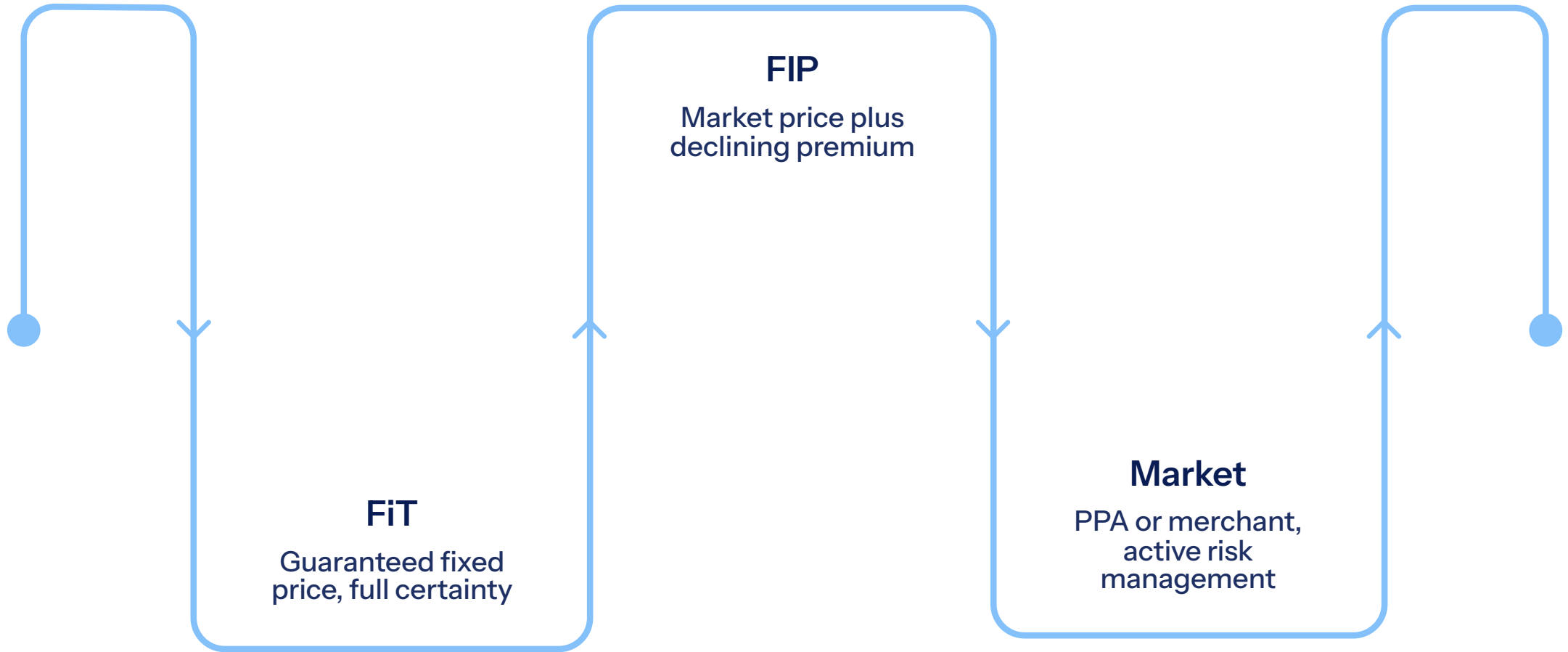
- Generator sells electricity on the wholesale market (JEPX) or via bilateral PPA
- Government pays a variable premium on top of the market price
- Total revenue = market price + FiP premium
- Generator bears market price volatility and imbalance risk
- Incentive to generate during peak demand and optimise dispatch

📌 **Key formula:** $\text{FiP Revenue} = \text{Wholesale Market Price (JEPX)} + \text{Variable Premium}$ · Premium adjusts so that total revenue approximates the reference price — but market risk remains with the generator

Revenue Model Comparison: Investor View

Criterion	FiT Scenario	FIP Scenario
Revenue certainty	High — fixed price for full contract term	Medium — premium is variable; market price fluctuates
Market exposure	None — decoupled from wholesale price	Full — generator sells at JEPX or PPA price
Imbalance risk	Utility absorbs — generator exempt	Generator bears — transitional support (¥1.0/kWh, declining)
Upside potential	None — capped at fixed tariff	Yes — if market price exceeds reference, generator benefits
Financing bankability	High — predictable cash flows	Lower — lenders require additional risk mitigation (e.g. PPA)
Dispatch optimisation	No incentive — fixed price regardless of timing	Strong incentive — revenue maximised at peak demand hours

From Fixed Revenue to Market Exposure



Under FiT, generators operated as price takers with zero market exposure. Under FIP, revenue becomes a function of wholesale market conditions plus a government-set premium. As the premium is calibrated to a reference price, generators absorb the difference when market prices fall — and retain upside when they rise.

Key Risks Under the FIP Scheme

Wholesale Price Volatility

- JEPX spot prices fluctuate significantly intra-day and seasonally
- Revenue uncertainty complicates long-term financial modelling
- Duck curve effect: solar-heavy hours often coincide with low market prices
- Generators must actively manage sell timing to optimise revenue

Curtailement Risk

- Grid operators may instruct curtailment during oversupply conditions
- Under FIP, curtailed output is lost revenue — no compensation mechanism
- Increasing solar penetration in Japan raises curtailment frequency
- Output forecasting accuracy directly affects imbalance costs

Negative Pricing Events

- Excess renewable generation can push wholesale prices to zero or negative
- Under FIP, generators receive market price + premium — but if market price is negative, total revenue is severely compressed
- Growing risk as solar capacity scales in Japan
- Battery storage or demand-side flexibility can partially mitigate this

Imbalance Risk: A New Cost Item

What Is Imbalance Risk?

- Under FiT: generators were exempt from imbalance costs — utilities absorbed deviations
- Under FIP: generators must submit generation forecasts to OCCTO
- Any deviation between forecast and actual output incurs imbalance charges
- Accurate forecasting is now a direct financial requirement, not optional
- Transitional support: ¥1.0/kWh for FY2022 — to be gradually reduced

Mitigation Options

- Co-located battery energy storage (BESS) — smooths output and reduces deviations
- Advanced generation forecasting systems
- Aggregator partnerships — pool risk across multiple sites
- Under FIP, business plans may be amended to add BESS without changing the base premium price — a deliberate policy incentive

PPAs as a Risk Mitigation Tool

Role of PPAs Under FIP

- FIP allows generators to sell output via bilateral corporate PPAs — not only on JEPX
- A PPA provides a fixed or floor price that reduces wholesale market volatility exposure
- Particularly critical for project financing — lenders require revenue certainty
- Corporate demand for green electricity (RE100, ESG commitments) drives PPA market growth

Physical vs. Virtual PPAs

- **Physical PPA:** Generator delivers electricity directly to a corporate offtaker via the grid
- **Virtual PPA (VPPA):** Financial contract — generator sells on JEPX, offtaker receives non-fossil certificates
- VPPAs growing in Japan; separate electricity delivery from green credential transfer
- Both structures reduce revenue risk while maintaining FIP premium eligibility

PPA Structuring Considerations

- PPA strike price vs. reference FIP price — basis risk must be modelled
- Contract duration must align with project debt tenor
- Creditworthiness of offtaker is a key lender requirement
- An experienced European turnkey provider integrates PPA structuring awareness into full project financial models


Financial Modeling: FiT vs. FiP — Scenario Logic

FiT Scenario (Historical Reference)

- Revenue stream: fixed tariff × annual generation (kWh)
- P50 / P90 scenarios vary only on yield, not price
- Debt sizing based on stable, predictable DSCR
- Equity IRR relatively compressed — low risk, low upside
- No merchant tail exposure — bankable on fixed-price basis
- Sensitivity: primarily generation risk (irradiance, degradation)

FiP Scenario (Current Framework)

- Revenue stream: (market price + premium) × generation — both variables
- P50 / P90 scenarios must model price distributions, not yield alone
- Lenders require PPA or floor price to underwrite project debt
- Equity IRR potentially higher — but distribution is wider (higher variance)
- Merchant tail risk in post-premium period must be explicitly modelled
- Sensitivity: generation risk + wholesale price risk + curtailment risk + imbalance cost

 **Critical modelling note:** FiP financial models require multi-variable Monte Carlo or scenario analysis — a single-point revenue assumption is no longer sufficient for bankable project finance under FiP.

Strategic Considerations for Project Developers

1

Scheme Selection

For solar ≥ 1 MW: FIP only (via auction). Understand premium calculation methodology and reference price determination before committing to project economics

2

Revenue Structuring

Combine FIP premium with a corporate PPA to create a bankable floor price. BESS integration further reduces imbalance cost and improves dispatch economics

3

Risk Allocation

Assign price risk, curtailment risk, and imbalance risk explicitly in project documents. Ensure EPC and O&M contracts reflect FIP operational requirements

- ❑ A proven turnkey manufacturing concept integrates scheme-aware project planning — covering technical, financial, and regulatory requirements — reducing execution risk for developers entering Japan's solar market under FIP conditions.

Key Takeaways

1 FiT provided certainty; FIP introduces managed market exposure

The shift is structural — generators must now actively participate in electricity markets

2 Three core risks: price volatility, curtailment, negative pricing


All three must be explicitly modelled and mitigated in project finance structures

3 PPAs are the primary bankability tool under FIP

Physical or virtual — a PPA provides the revenue floor that project debt requires

4 FIP financial models require multi-variable analysis

Single-point revenue assumptions are no longer adequate — price distributions matter

 Source: PVKnowHow / J.v.G. Technology GmbH · Market: Japan · Scheme: FIP (April 2022-) · Content basis: Composite scenarios based on real market figures



About the Content Partner

J. v. G. technology GmbH – The DESERT Company

Founded in 1997 in Bavaria, Germany. Family-owned engineering company specializing in turnkey solar module production lines.

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