Feed-in Tariffs:
The Art & Science

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What is a Feed-in Tariff (FIT)?

Three Key Elements:
1. Price for electricity sold to the grid
2. A stable, long-term contract
3. Access to the grid

Additional provisions include:
- priority dispatch (EU)
- inflation indexation
- annual degression ($ declines %/yr )
- periodic adjustment
- caps
- technology differentiation
Goldilocks principle:
The price should be “just right”

The challenge is to establish (and maintain) the prices at a level sufficient to foster renewable energy growth
A Tale of Two Countries…

Spain in 2007-08:
- Generous tariffs
- Insufficient oversight
- Lots of land & capital
- Poor policy design

= Explosive solar PV market growth

Germany 2000 – 2010:
- Fine-tuned tariffs
- Balanced oversight
- Proper planning
- Clear procedures

= Stable, predictable market growth
Principle first articulated Germany’s RES Act 2000:

“The compensation rates specified in the RES Act have been determined by means of scientific studies, subject to the proviso that the rates identified should make it possible for an installation – when managed efficiently – to be operated cost-effectively, based on the use of state-of-the-art technology and depending on the renewable energy sources naturally available in a given geographical area.”

- (RES Act 2000; Explanatory Memorandum A)
Principles (con’t)

- All successful FITs are based on the cost of generation plus a reasonable rate of return.

- Rate must be adjusted over time to account for cost reductions: tech change, innovation, economies of scale, etc.

- Granularity of inputs becomes critical: better data will tend to yield better (i.e. more accurate) FITs.
Principles (con’t)

→ Fixed price contracts are key to financing capital intensive infrastructure (e.g. water, rail, toll roads, airports, buildings, etc.)

→ Because RE projects are often small (<100MW), it is inefficient to issue RFPs for every capacity addition.

→ This makes standardization possible, and desirable

→ FITs strike a balance b/w standardization and customization (e.g. tech, size, location differentiation)
Practice
A Look at Design Options

1. Fixed Premium
2. Variable Premium
3. Tariff Degression
4. Spot Gap Model (e.g. NL)
5. Size Differentiation
6. Inflation Adjustment
A Look at Design Options

1. Fixed Premium

Source: NREL 2010
## A Look at Design Options

### 2. Innovative Variable Premium (wind power)

<table>
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<tr>
<th>Spot Market Price (Euro/MWh)</th>
<th>Payment Level (Euro/MWh)</th>
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**Market Price**

- Premium stays constant

**Profit**

**Loss**

Source: Mario Ragwitz, Fraunhofer ISI
A Look at Design Options

-3. Tariff Degression:
Decline (%/yr) in the payment level framework is becoming an increasingly decisive design element

- Designed to track, and encourage, cost reductions
A Look at Design Options

4. Size Differentiation

Source: NREL 2010
A Look at Design Options

5. Size Differentiation (con’t)

Source: NREL 2010
Practice

> 90% of global solar PV developed under FITs

> 50% of global wind developed under FITs

In 16 months alone, Ontario (Canada) attracted over 16,000 MW of new RE capacity
Brief Overview: Lessons from Int’l Experience

- Grid access provisions are critical:
  - Incumbent utilities routinely oppose non-utility generators
  - Clear, **enforceable** rules are essential
  - Need for common technical grid interconnection provisions to ensure security, quality of supply, operational efficiency, and reliability.

- Priority dispatch: avoiding (and compensating) curtailment

**Responsive policy design is key:**
→ markets change, so too should policy
Stability fosters growth

- Transparency, longevity, and certainty (TLC) (Deutsche Bank 2009)
- Investors carefully weigh risk-return characteristics of a market before investing: applies both upstream (manufacturing) & downstream (project development)

→ Create stable conditions for attracting capital to renewable energy sector (FDI and DDI)
Brief Overview: Lessons from Int’l Experience

- Instating maximum delays to undertake basic processes:
  e.g.: grid impact studies, grid connection permission, processing applications, providing FIT contract approval, etc.

- Without rules (and penalties?), incumbents have a strong incentive to delay. Delays stifle development, and investment.

- Transparent rules, and enforceable guidelines, can help increase market certainty, and accelerate RE deployment.
Brief Overview: Recommendations

- Differentiate the frequency of tariff reviews by technology type → e.g. every 6 months for solar, every 4-5 years for hydroelectricity

- METI or other body should collect installed cost and performance data to help future price reviews

- Conditions outlining when the utility can opt not to connect, or not to purchase are essential: exactly when, under what technical, legal, or operational circumstances, utilities can avoid complying

- Tariffs should apply from the date the project connects to the grid, and goes live
Recommendations for Japan

→ Japan needs an comprehensive framework for energy transition: As Germany has shown, FITs can become that framework.

→ Cooperation between different agencies, departments, Ministries, Price Calculation Committee, etc. is critical
Concluding Remarks

- FITs are now present in ~ 80 countries around the world

- Most widely used RE policy

- FITs work – the design is vital to policy success...

  Current framework too modest.
NREL FIT Report:
http://www.nrel.gov/docs/fy10osti/44849.pdf

E3 Analytics:
http://www.e3analytics.ca/
Thank You

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References:


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