

Feed-in Tariffs

*Using Feed-in Tariffs to Encourage
Growth of the Renewable Energy
Industry in the US*

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Feed-in-Tariff: Definition

A guaranteed payment for renewable energy fed into the grid.



*Feed-in tariffs are also called Feed Laws, Advanced Renewable Tariffs, Renewable Energy Payments.



Elements of a FIT

- 1) Guaranteed grid connection
 - Anyone who wants to produce renewable power should be able to easily access the grid
- 2) Guaranteed payment
 - Must be at a level to provide rate of return high enough to attract investors
- 3) Long term contract (usually 20-25 years)

Policy Design Options

- 1) Payment Options
- 2) Differentiation by:
 - Type of Technology
 - Size of Project
 - Resource quality
 - Location
- 3) Degression
- 4) Periodic Review

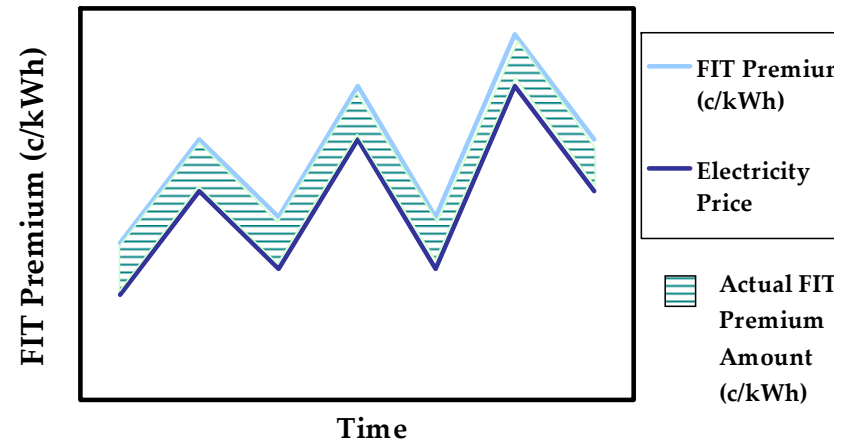
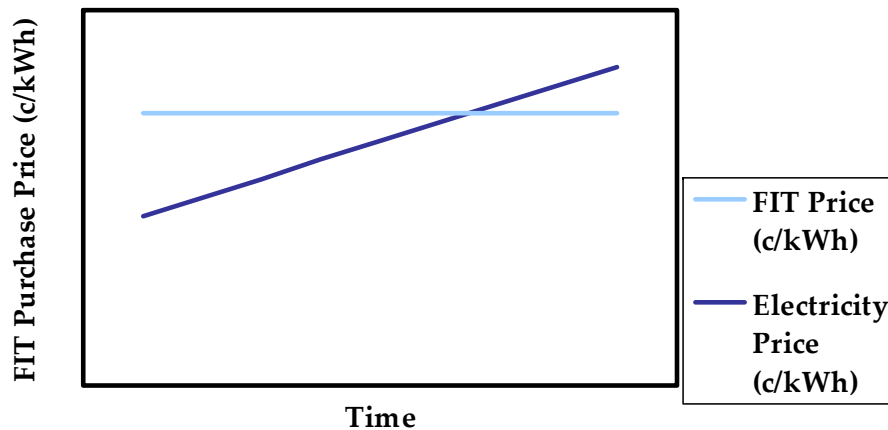


1) Payment Options: Setting the Tariff

- Fixed: Cost of Production + Reasonable rate of return
- Variable: Payment based avoided costs or value of electricity
 - Avoided cost - Price varies based on costs of other sources of energy (PURPA)
 - Value of Electricity - Tariff is a certain amount over the price of energy on the market.

Guaranteed Payment FIT payment choices

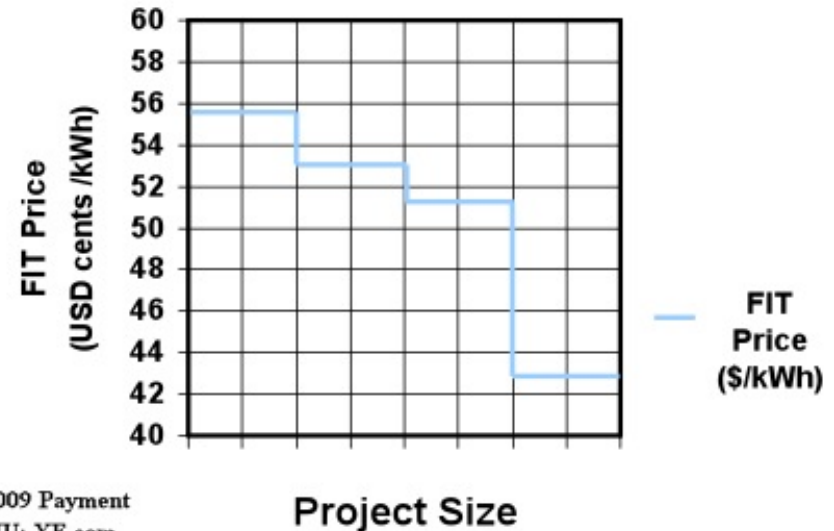
- Fixed price based on cost of production
- Value based payment above market price



2) Differentiations

- Differentiations by:
 - Type of Technology
 - Size of Project
 - Resource quality
 - Location
 - Year of installation

Payment Differentiation by Project Size
Solar PV - Germany 2009



Source: EEG 2009 Payment Provisions, BMU; XE.com
1 Euro=1.29USD (01/29/09)
NREL 2009

Differentiating prices allows for FITs to be adaptable to local conditions and goals

Differentiated Prices

- Differentiation by technology:
 - Price based on cost of production of wind, solar, hydro, geothermal, etc. Allows profits in variety of renewable energy sectors.
- Differentiation by size
 - Higher prices for small projects counteracts additional costs.
- Differentiation by location:
 - Higher prices for rooftop solar, lower prices for projects that use previously undeveloped land.
- Differentiation by resource quality
 - Lower prices in windy sites, higher prices in less windy sites.

3) Degression

- Tariff price decreases each year
- Two effects:
 - Encourages investment sooner rather than later
 - Forces green energy sector to innovate
 - If they want to stay in business and keep being profitable, they must find ways to be more efficient, or create more efficient technology.



4) Periodic Review

- Determine if prices are set adequately based on costs of production and adjust prices to avoid windfalls or inadequate incentives.
- Determine if targets are being met
- Should occur every 1-4 years



The Big Questions: How and Why?

How Does it work?

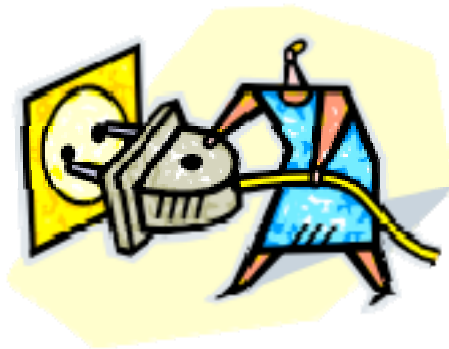
- Allows everyone (homeowners, farmers, cities, non-profits, businesses) to become an energy generator and profit from renewable energy.



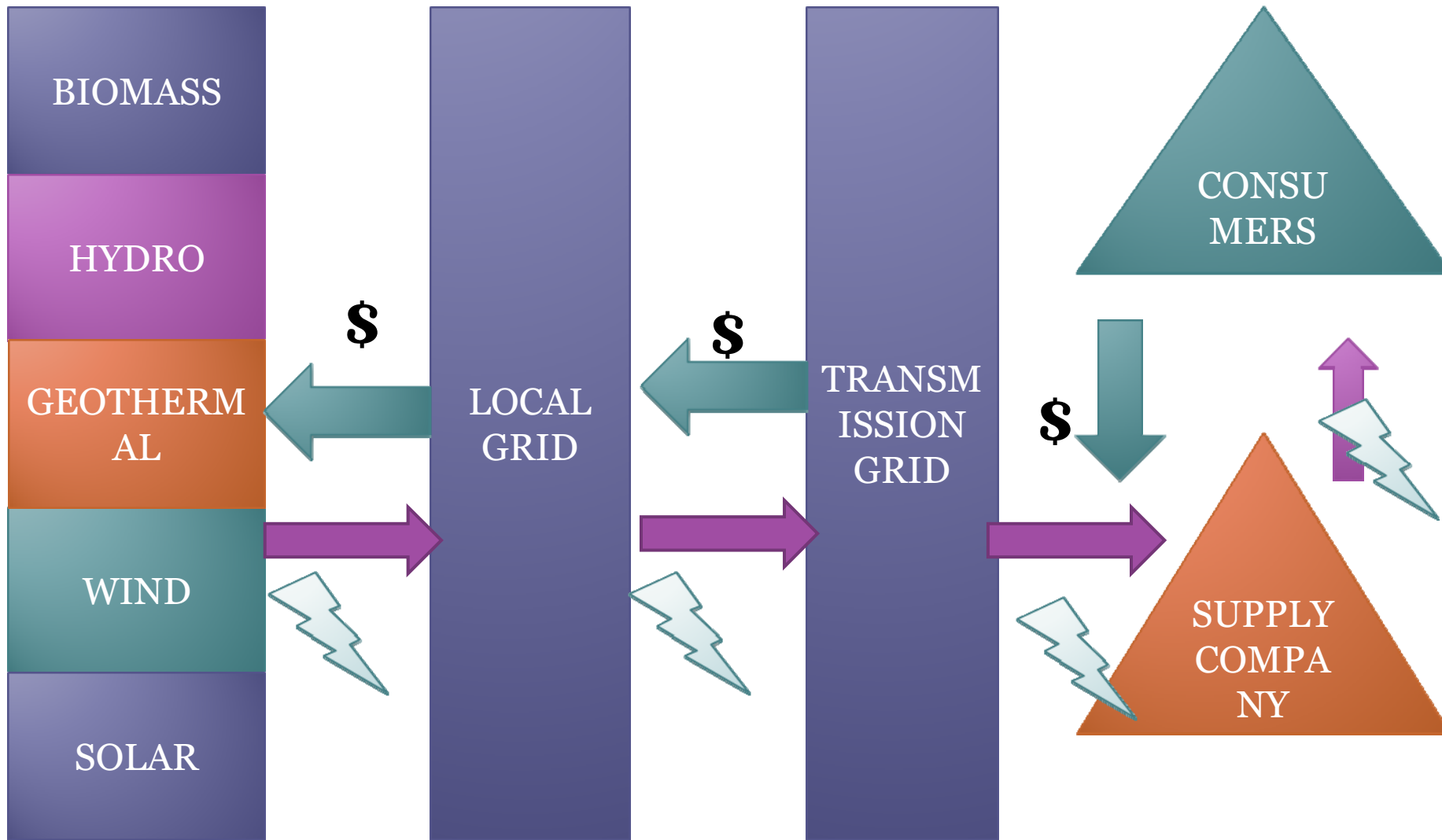
See Jane FIT



Jane gets paid tariff price for what she feeds in to the grid



Jane pays only retail price on the electricity she uses from the grid



Why Do FITs Work?

- **Stability**
 - Predictable revenues allows for financing.
 - Price based on cost of generation, so you are guaranteed a rate of return.
 - About as safe as government bonds, but with better returns
- **Flexibility**
 - Feed-in tariffs can vary from place to place to meet local objectives and accommodate local constraints.
- **Ease**
 - Standardized purchase offer
- **Everyone can participate**
 - Encourages small, medium, and large scale producers

Benefits: too many to count

- **Economic Security**

- **Creates Jobs**

- Installation
 - Manufacturing

- **Increases local ownership**

- **Creates economic growth**

- Directly through investing themselves, or through tapping into the growth of economic activity the incentive creates

- **Environmental and Climate Security**

- **Less GHGs**

- **Promotes technological innovation**

- **Drives economy of scale- costs of RE are lowered over time**

- **National Security**

- **Diversify Energy Supply**

- **More energy independence**





Negatives

Setting FIT payment level is challenging:

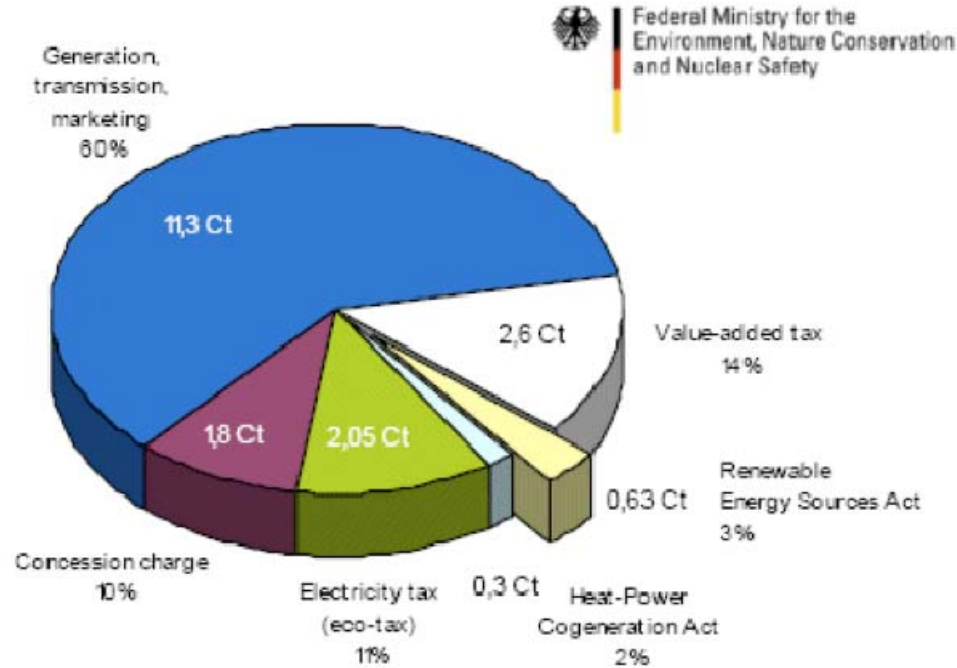
if set too low, little new RE development;

if too high, surplus profits to developers

Cost: supporting emerging technologies leads to small initial increase in electricity rates.

Policy design challenge: Tracking technological improvement and cost reduction accurately over time

Share of Electricity Costs at 18.6 ct/kWh for Private Households in Germany (2006)



Money, money, money.

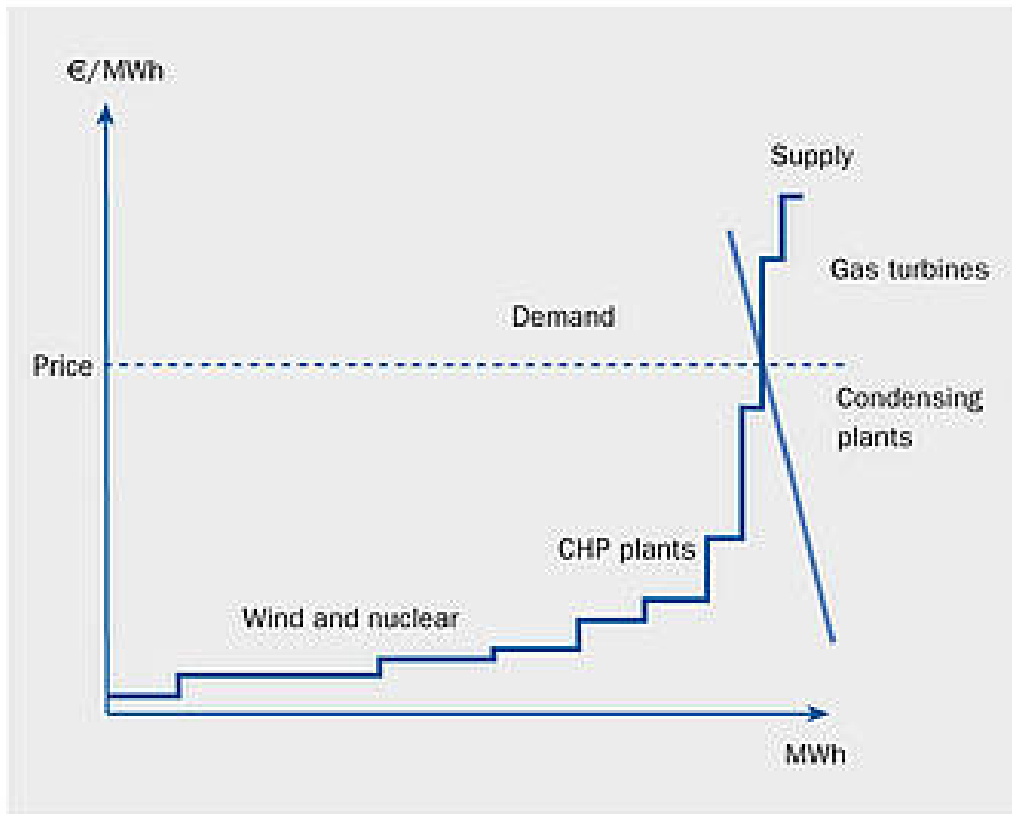
The feed-in compensation paid to producers makes up only 3% of the total power expenses invoiced to private German Households





Why is increase in price ok?

- Unlike big power plant constructions – the costs of which are also passed on to the consumer- everyone has the opportunity to profit.



Source: Risø DTU

Costs continued

Merit-Order Effect

In the long term, the reduced-risk FIT delivers a lower price compared with renewable energy certificates.

FITs around the world

History and Success Stories

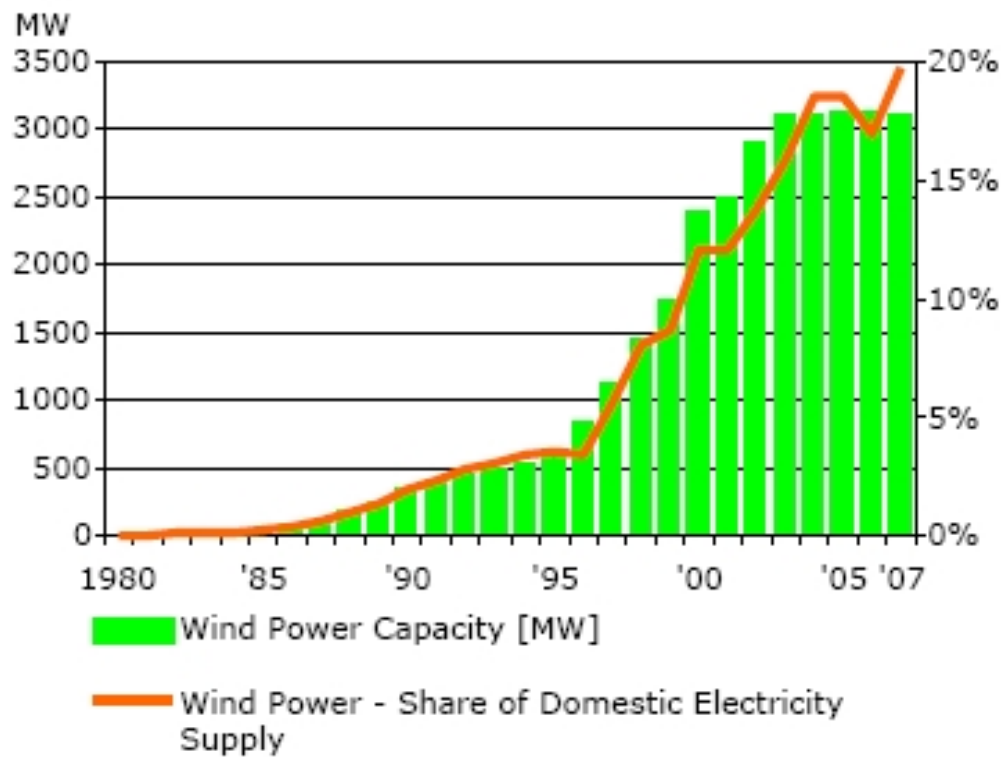


History of FIT policy

- Oil embargo
- Denmark
- Spain
- Germany

Denmark: the rise and fall of Feed-in tariffs

Wind Power Capacity and Share of Domestic Electricity Supply



Spain

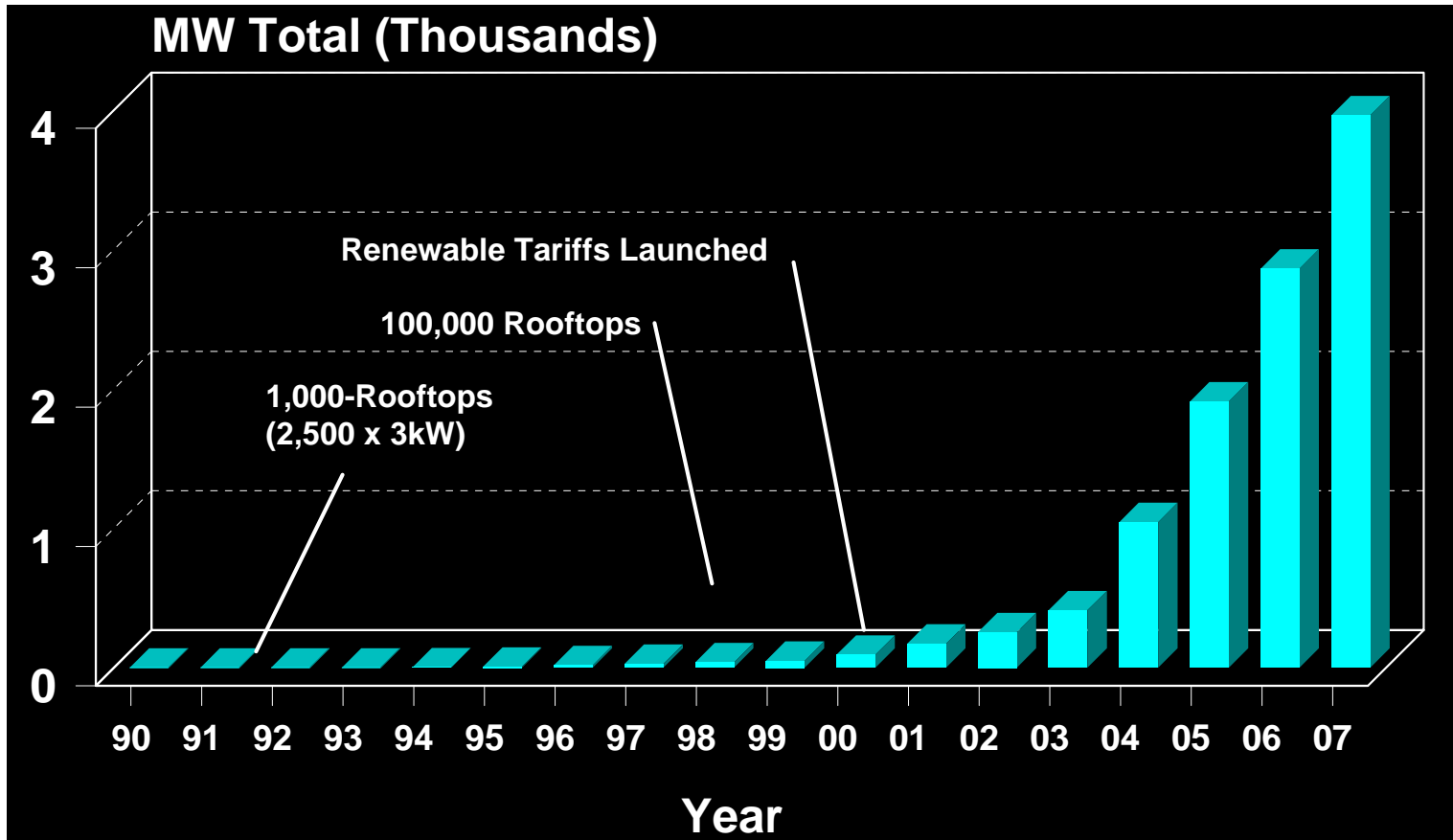


Germany's Feed-in Tariff

A picture of perfection

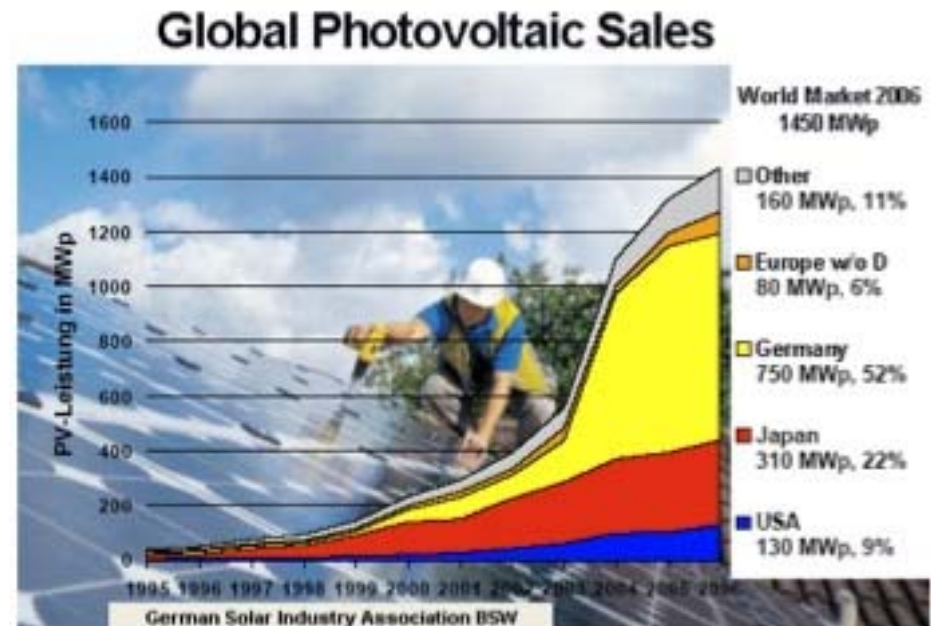


Growth of Renewables in Germany



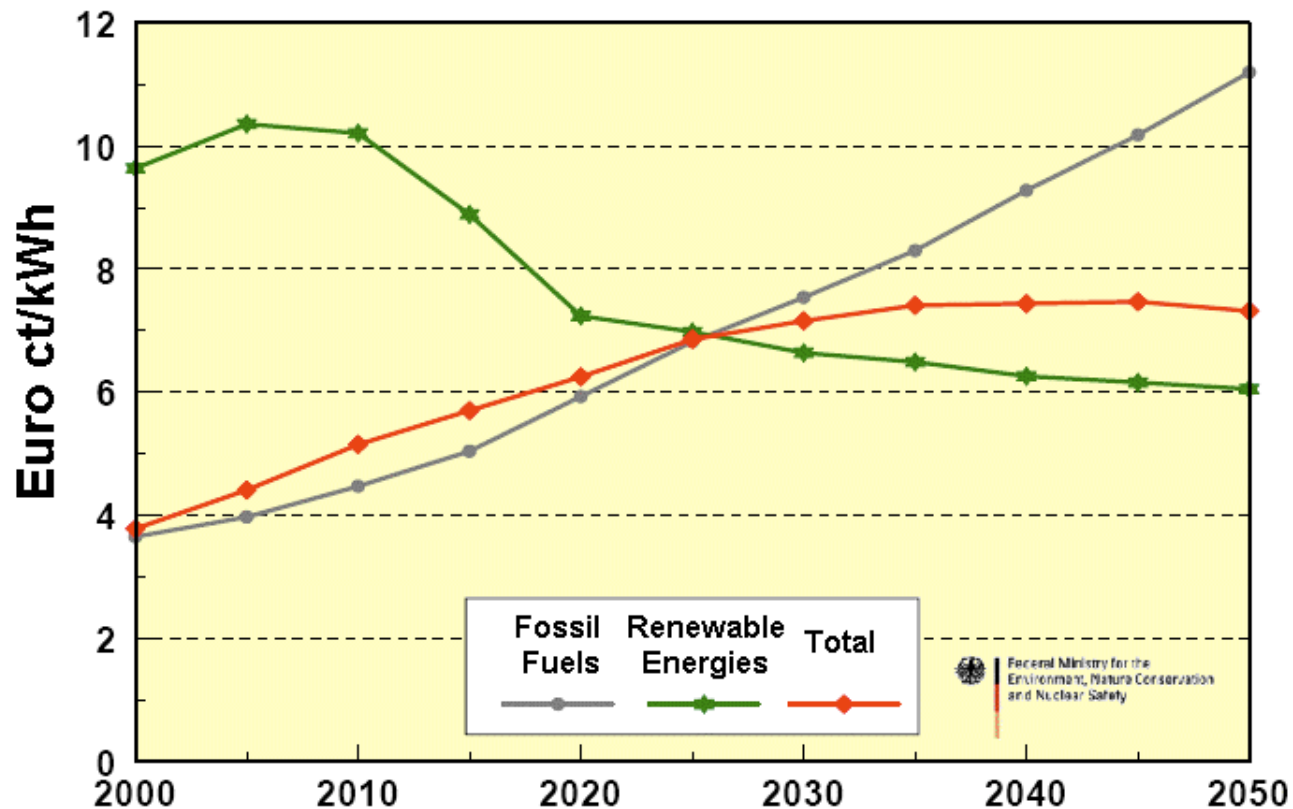
Result of Germany's Feed-in Tariff

- Jobs created:
- Renewables: 15% of Energy Supply
- Cost of German EEG per household: 1.5 Euro
- 97 million tonnes of CO₂ emissions avoided in 2006 from use of renewables
- Breathing Cleaner Air and Slowing Global Warming: Priceless



FITs are accelerating cost convergence with conventional generation

New Installation Power Generation Costs
Baseline 2020 - Oil: 75 \$₂₀₀₀/bbl, CO₂: 20 €/t





Local Architect Rolf Disch's home

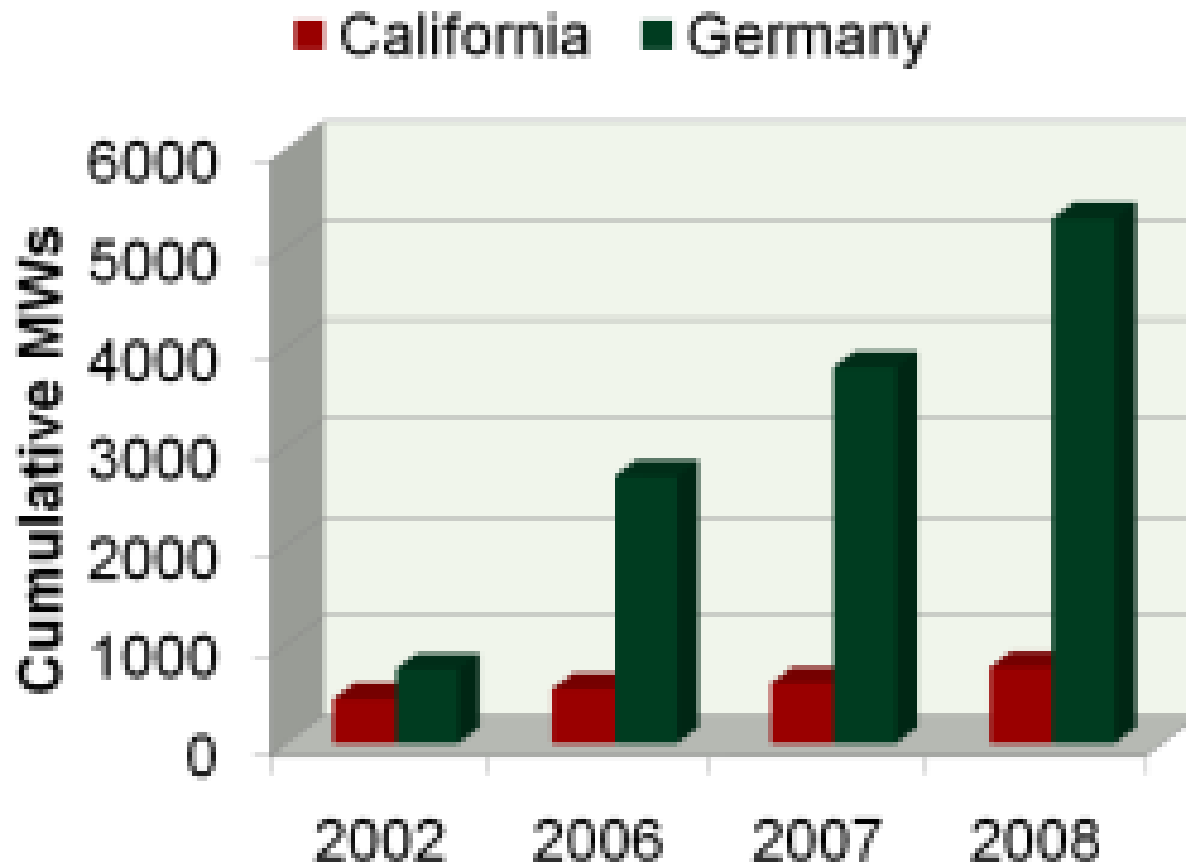
Creates five times more electricity than it uses



Feed-in tariffs in the US

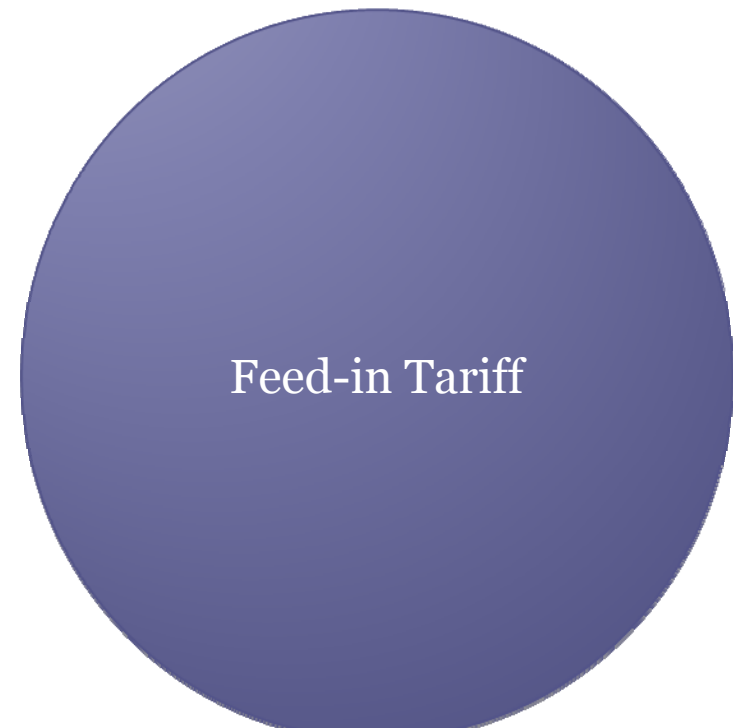
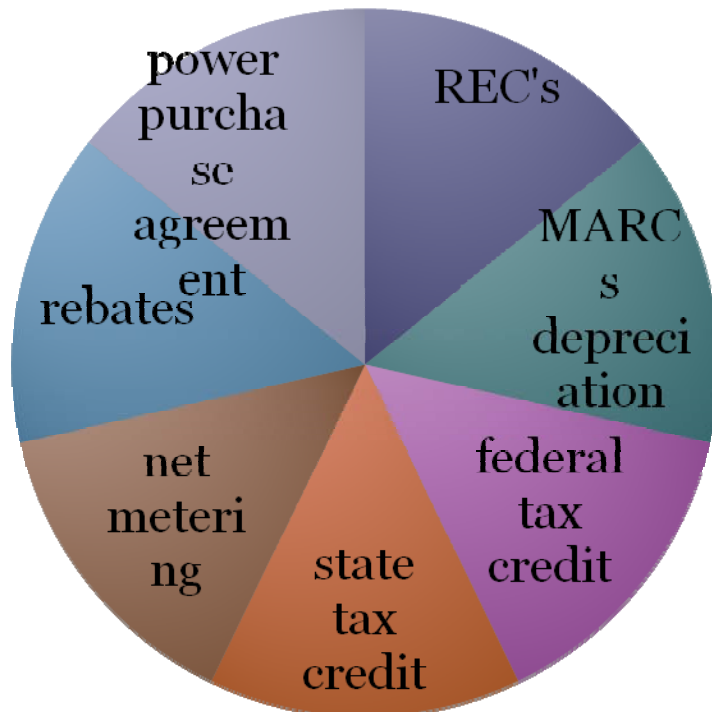
“If the incentives are right, there’s no reason there couldn’t be solar panels on every Walgreens and Sam’s Club across the country.”

Renewable Energy Generation in the US Lags Way Behind Germany



Current US Policies

- 1) Patchwork of state subsidies and federal tax breaks
 - One source of revenue makes financing European RE Projects Simpler

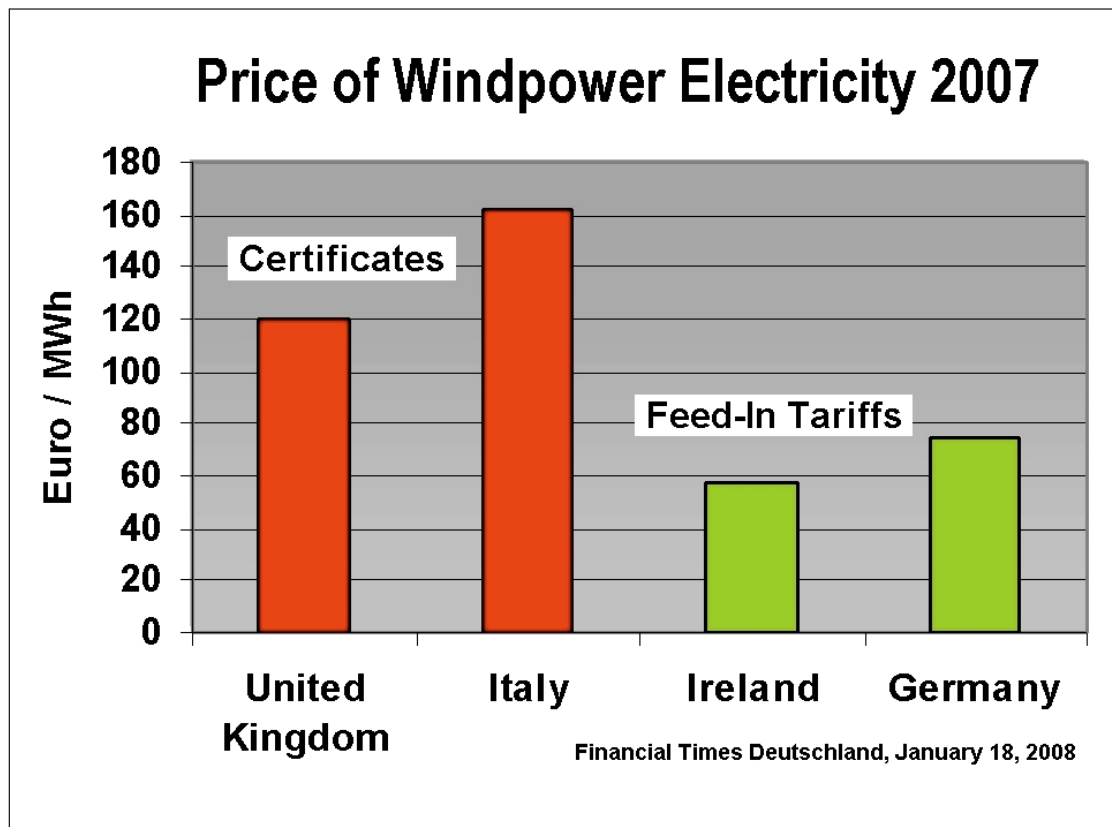


2) Renewable Portfolio Standards

FIT vs. RPS= Frienemies?

- RPS
 - Favors large-scale projects, and cheapest technologies (wind), in cheapest areas (rural)
 - A lot of energy is waste in transporting
 - Benefits the large companies that fund and invest, but not the local communities in which they are located
- FIT
 - Allows all Res to profit, no matter the size or cost
 - Distributed energy means less transmission needed
 - Benefits local communities economically, and everyone that breathes physically
- FITs are better than RPSs, but they can work together. FITs can be used to meet RPS goals

FITs deliver lower prices compared to RPS



3) Net Metering



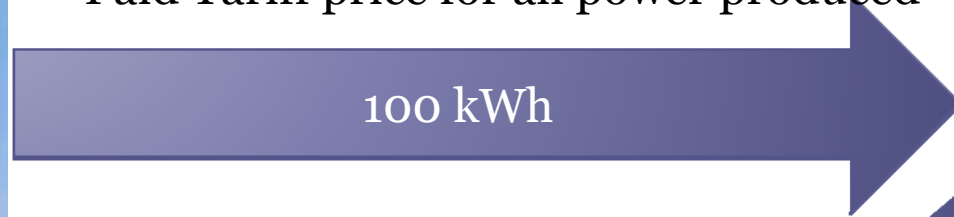
Homeowner uses power to offset domestic use and gets paid at wholesale rate for excess power

Feed-in Tariff

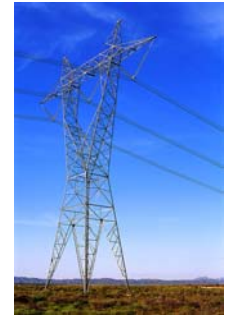


100 kWh

Paid Tariff price for all power produced



60 kWh

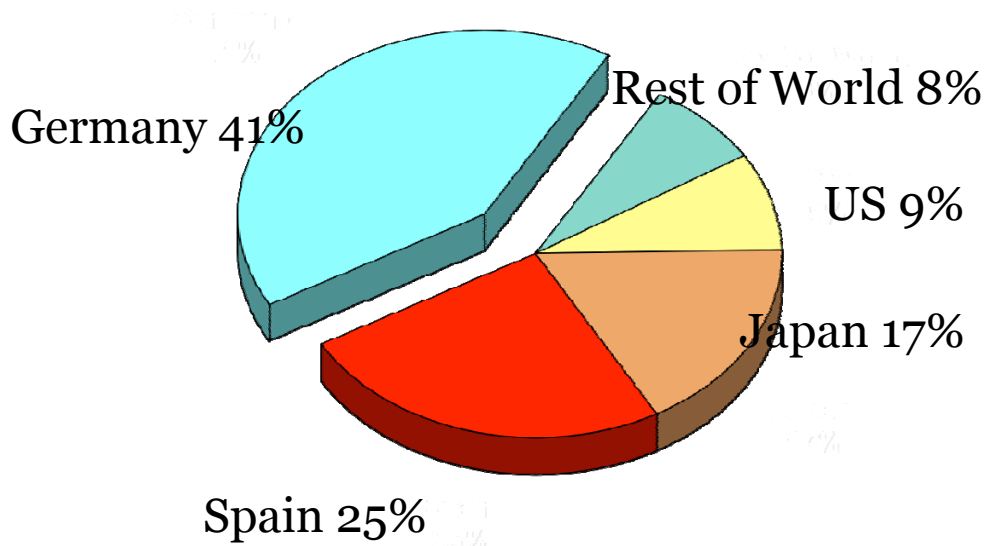


+40kWh

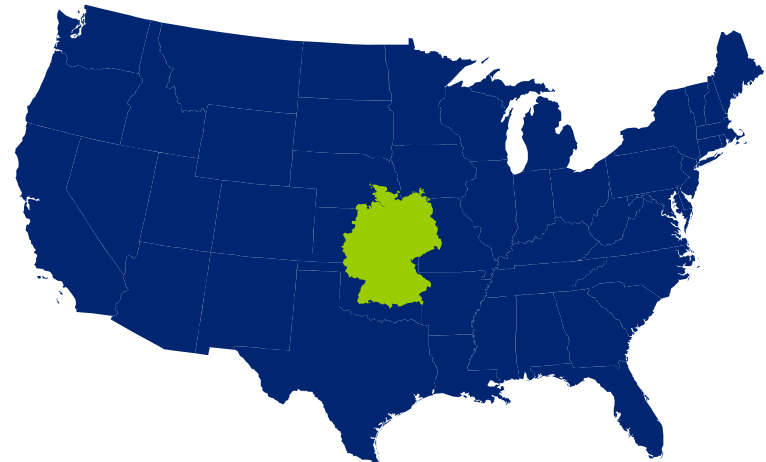
Homeowner sells all their power to the grid for a premium price, but buys all their power from the grid at retail rates

US vs. Germany

World Solar Capacity 2008



- Size of Germany vs. US





Current US Policies are Not Working

What the US is lacking:

- Guaranteed grid connection
- Stability
 - Current policies expire creating a boom-bust cycle.
- Simplicity
- Enough incentive to encourage investment



Key Differences Between US and EU

- 1. FITs in the US have not been based on cost of production
- 2. US FITs have contained various caps like on project or program size
- 3. US FITs have not fully differentiated tariffs based on technology

Gainesville, Florida - There is hope!



Conclusion

- We already know FITs work!
 - FITs have created rapid growth in renewable energy generation in Europe
 - Create more jobs, deliver more renewable energy, and all at a lower cost than other market incentives.
- Feed-in tariffs do not involve government spending, but only the political will to implement them

