

THE FUTURE OF FEED-IN TARIFFS

CLEAN ENERGY SOLUTIONS CENTER WEBINAR

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Outline

Part I: What are FITs?



Part II: Are FITs on the decline?



Part III: FITs & RE Finance



Part IV: The Future



Part I: What are FITs?

What are FITs?

Three key components:

1. Long-term contract (typically 10-25 years)
2. Fixed purchase price
3. Guaranteed grid access

Typically, the purchase prices are based on the estimated risk-adjusted cost of generation from different renewable energy sources

→ This results in different prices for wind, solar, geothermal, etc., in different regions.

What are FITs?

FITs also include a number of related administrative, policy, and regulatory provisions:

- Priority dispatch rules
- Grid codes & interconnection standards
- Inflation indexation
- Annual degression (% per year)
- Caps on project size, total volume
- Etc.



“However brilliant the strategy, you should occasionally look at the results.”

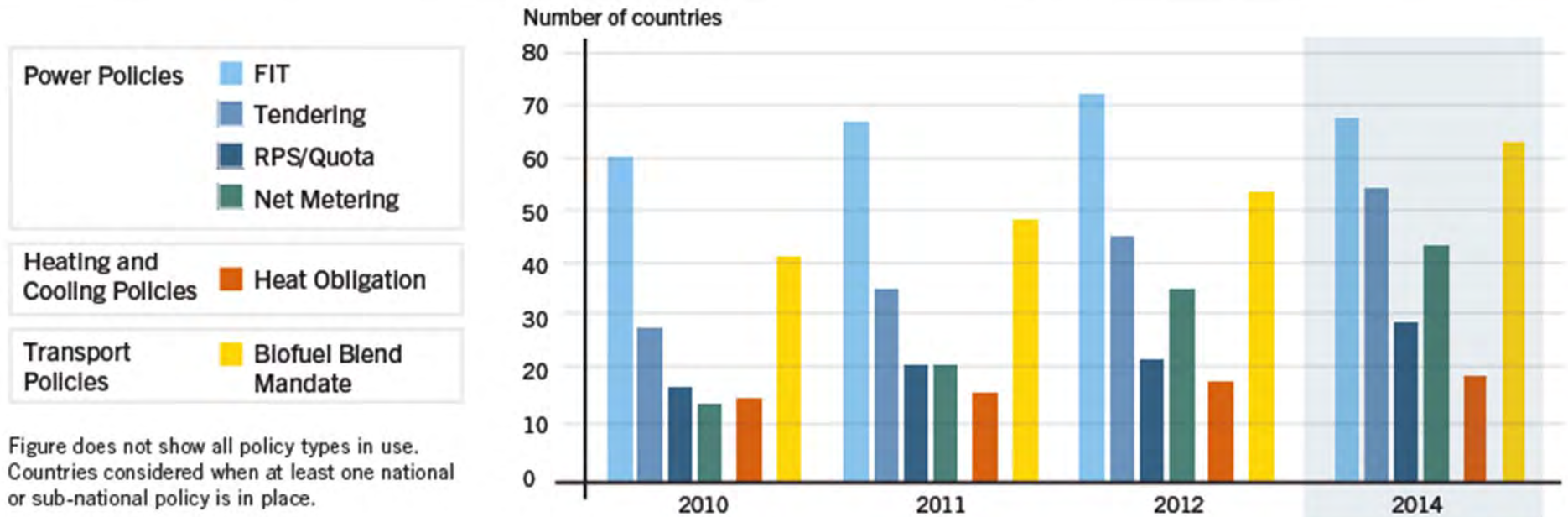
- Sir Winston Churchill



FITs have performed relatively well

- Responsible for approximately 50% of global wind power development and over 75% of global solar PV
- Approximately 75% of global investment in renewable energy
- Markets like Japan and China, which are scaling the most rapidly, are using FITs

Remain the most common RE policy



Source: http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014_full%20report_low%20res.pdf

Why?

A Look at Four Key Reasons

1. Provide open access: lower barriers to entry, help democratize the electricity supply

→ RE resources are highly distributed geographically; it therefore makes sense for their financing/ownership to be distributed as well

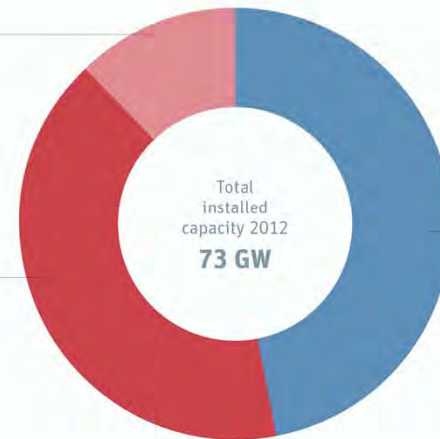
German energy transition is a democratic movement

Ownership of renewables in 2012

Source: AEE, www.unendlich-viel-energie.de

Energy suppliers
12%

Institutional
and strategic investors
41%



Citizens and coops
47%

2. Reduce investment risks:

→ By reducing a host of risks, FITs reduce the cost of capital

And lower cost capital makes RE projects less expensive

3. Provide greater transparency: FITs post open-access prices, to which homeowners, investors, developers, etc. can respond

→ FIT contract terms are public. No back-room deals

4. More efficient to administer: RE projects are typically small in size (e.g. <50MW); this makes negotiating every contract individually time-consuming.

→ More efficient to issue contracts on a 'standard offer' basis

Part II: Are FITs on the decline?

The Case for & Against



The case against centers on four (4) main arguments:

1. FIT payments have been unsustainably high and have often failed to track rapidly changing technology costs (e.g. solar PV).

→ This has resulted in excess profits for investors, and an unsustainable burden on ratepayers.

2. FITs have encouraged costlier technologies (e.g. solar PV), rather than the least-cost option

→ This has increased near-term policy costs and has been economically inefficient. Critics argue that policymakers should always choose the least-cost technology option.

3. FITs have lacked adequate controls on market growth

→ This has fueled boom and bust cycles in markets like Spain, the Czech Republic, and arguably, in Germany. This has driven instability in the market, underscoring FIT policies' political and economic unsustainability

4. FITs are fundamentally incompatible with wholesale electricity spot markets.

→ FITs offer fixed price contracts and a purchase guarantee. This removes the incentive for producers to respond to market dynamics (leading to negative prices)

The case in favor centers on four (4) main arguments:

1. FITs have provided what investors need:

- long-term contracts,
- a cost-based price, and
- non-discriminatory grid access

Deutsche Bank's "TLC":

Transparency, **L**ongevity, **C**ertainty

2. FITs have helped achieve what deregulation or liberalization could not achieve alone:

- introduce a greater diversity of actors into the marketplace
- break up traditional monopolies
- 'democratize' the electricity system

3. FITs have driven the costs of RE technologies down (most notably PV):

- Technology-specific pricing and treatment
- Foster innovation, “dynamic efficiency,” as many different technologies can evolve in parallel

It is argued that a broad mix of renewables will be necessary to achieve higher shares of RE

4. FITs are necessary for renewable energy markets to scale:

→ By providing an open-access environment, FITs help RE investment scale-up in a way that would be impossible under other policies such as volume-restricted tenders, bilateral contracts, net metering, tax incentives, or certificate markets

Part III: FITs and RE Finance

We have spent far too much time looking at renewable energy policy through the lens of economics, rather than through the lens of **finance**.



Tale of Two PV Plants

LCOE of 20MW PV Plant @ 7% WACC = USD 0.107/kWh

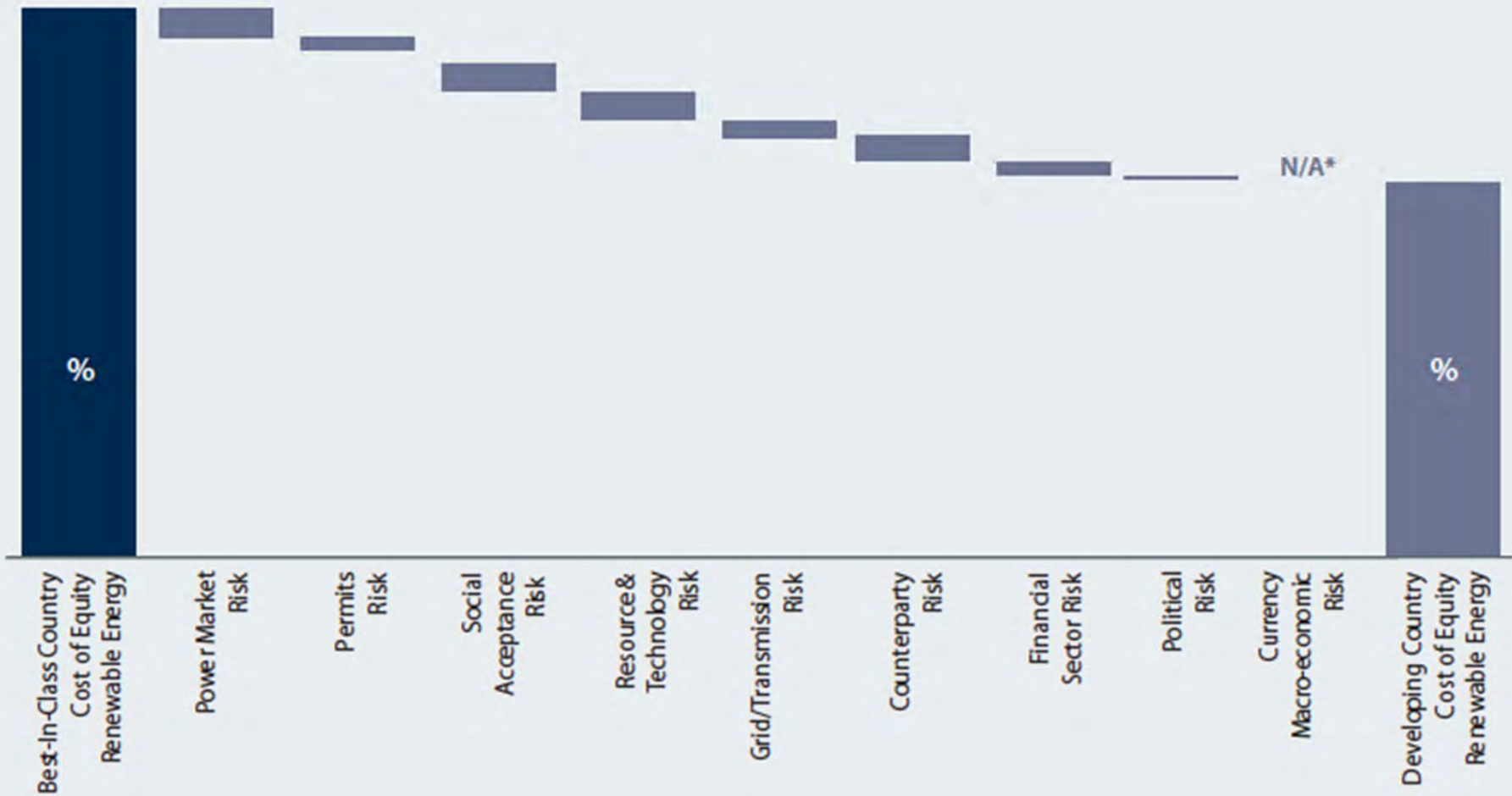
LCOE of 20MW PV Plant @ 14% WACC = USD 0.159/kWh



Risk negatively impacts RE finance in two ways:

1. Increases the cost of both debt and equity (higher WACC)
2. Makes the capital *structure* more equity-heavy (e.g. 65/35 instead of 80/20)

Impact of Risk on the Cost of Equity



Why does this matter?

- Charting our way to a low-carbon future will require abundant, low-cost capital
- FITs have so far been a key part of making this possible



Part IV: The Future of FITs

The Question Remains:

If FITs have been so successful, why is Germany phasing them out?

Germany:

Leading opinion in Germany appears to be:

- FITs may be a powerful policy tool to reach the first 25% of renewable energy in the mix
- But beyond that, alternative policy mechanisms are required, particularly to avoid negative prices, and encourage greater “market integration” of renewables (see Arguments Against, #4)

Germany:

- However, this view assumes that all technologies should eventually be financed via the spot market

→ Herding Cats

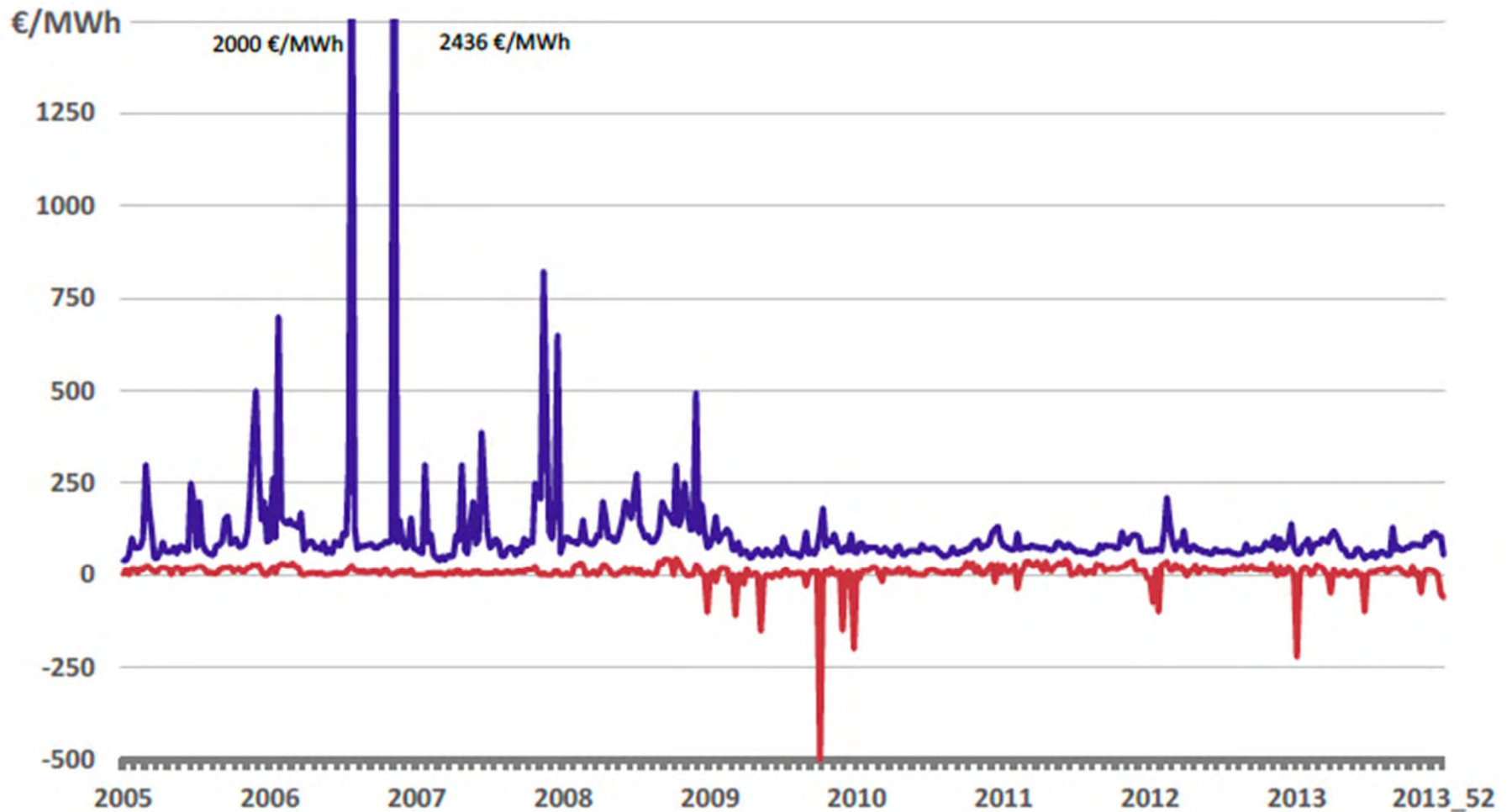


Germany:

→ the truth is that in **Germany today, no technologies are financeable solely via the spot market**

Germany: Day-ahead market

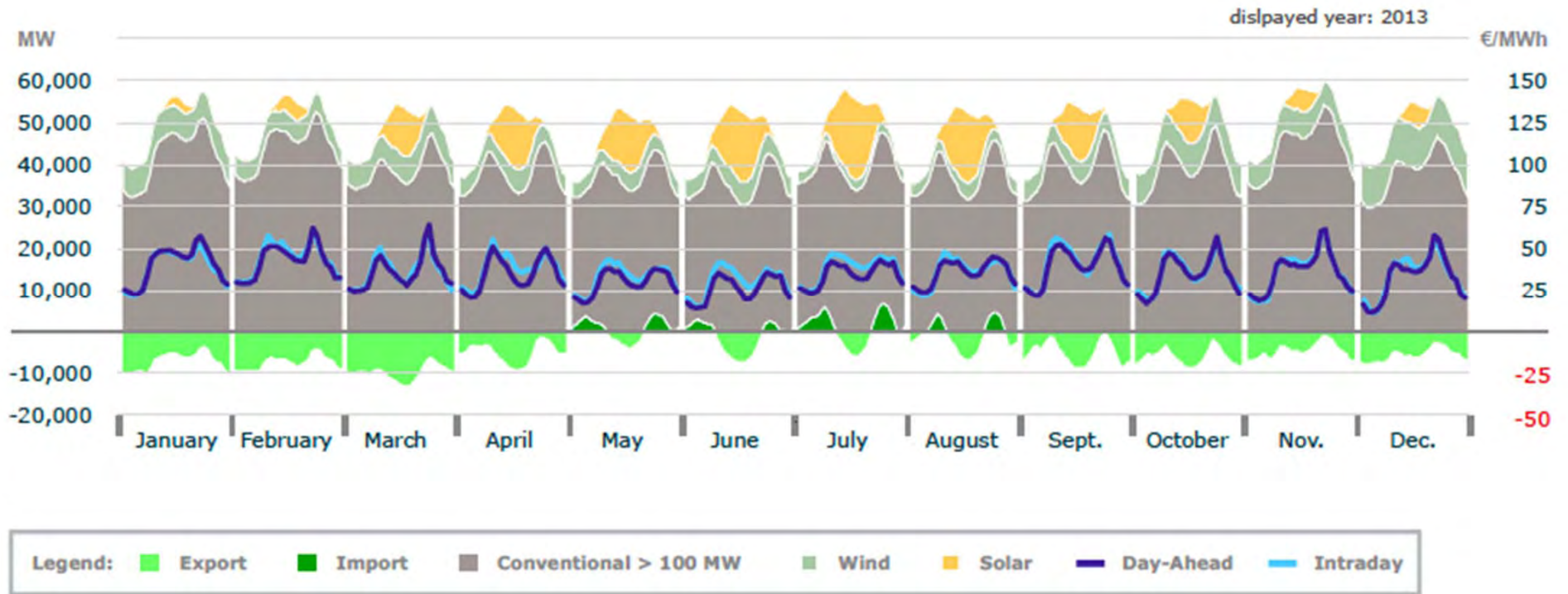
Weekly Day-Ahead maximum and minimum prices, Update: Dec. 2013



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

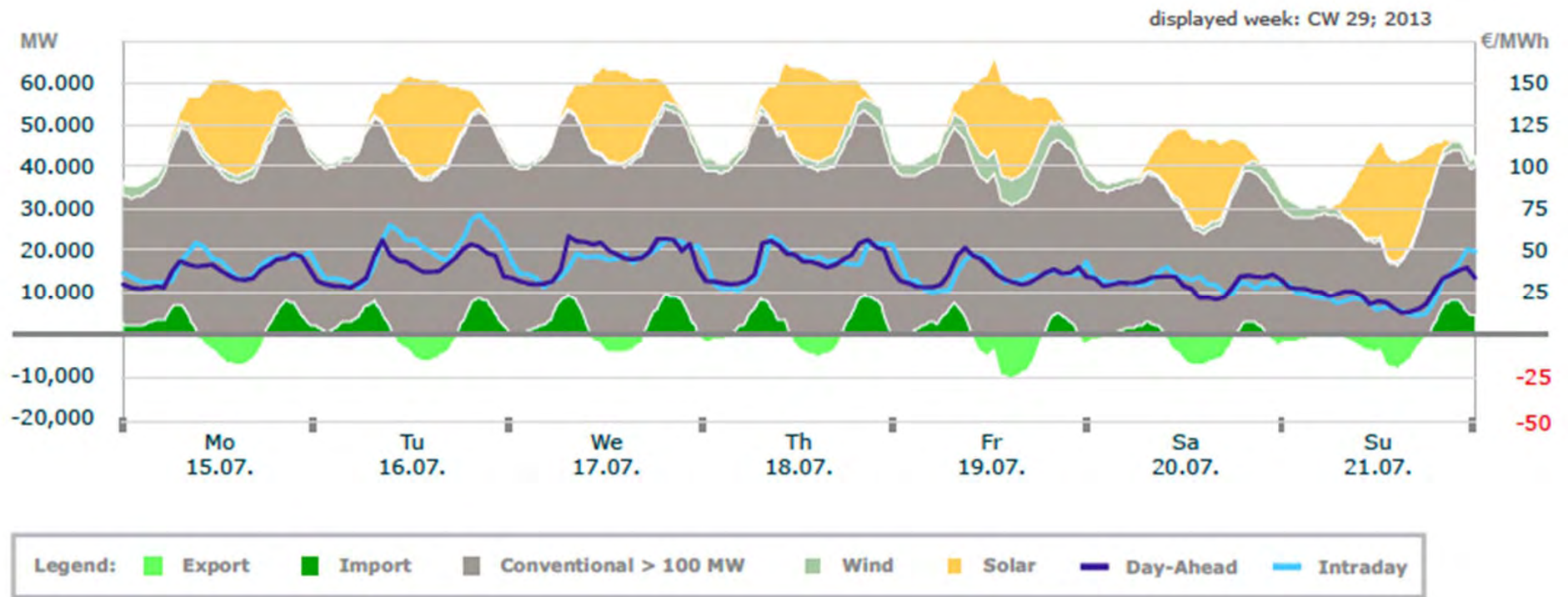
Source: <http://www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-prices-and-production-data-2013.pdf>

Germany: Power Mix and Spot Prices (2013)



Source: <http://www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-prices-and-production-data-2013.pdf>

German Power Mix: Mid-July 2013



Source: <http://www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-prices-and-production-data-2013.pdf>

Germany:

- Q1:2014 market prices averaged €33/MWh
- €9/MWh lower than Q1:2013
- Projected to remain low for the foreseeable future
- E.ON posted a 12% decline in earnings in 2014
- RWE posted a 15.5% decline, and its first loss in the company's 60-year history (of €2.8Bn)

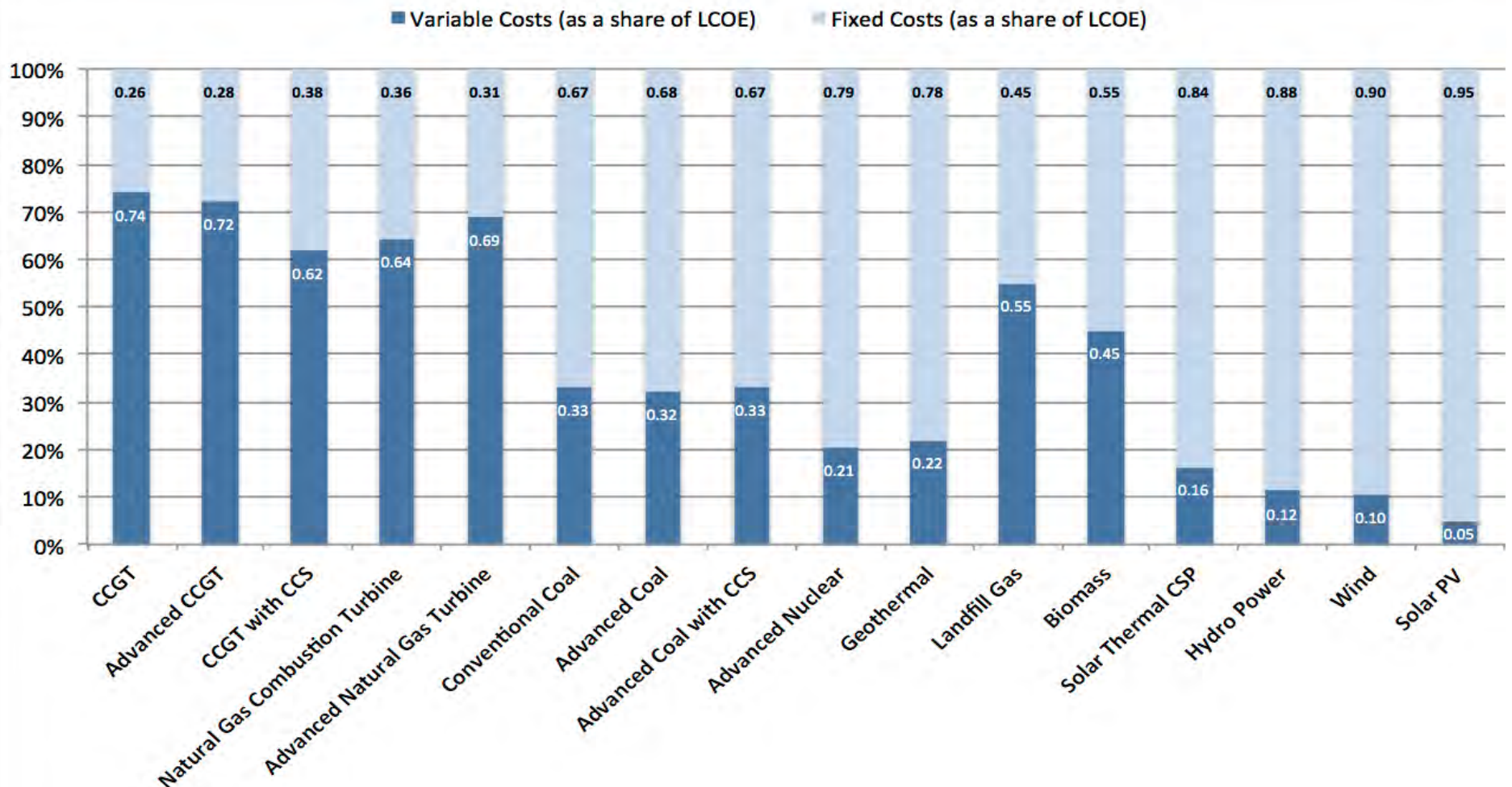
The Deeper Challenge

Energy-only spot markets are powerful tools for *allocating* supply:

→ However, they are an insufficient basis on which to *finance* that supply

Reconciling these two realities is one of the key challenges ahead

RE Technologies are capital intensive



Long-term contracts are necessary to finance capital intensive assets at reasonable discount rates

So long as RE technologies remain capital intensive, they will be best financed using some form of long-term contract.

The policy debate then becomes about how these contracts are *allocated*.



What about integration challenges?

Can be partially if not entirely overcome by:

- increasing the flexibility of demand (i.e. demand response and load management)
- improving forecasting
- increasing the integration between the electricity, transport, and H/C sectors
- storage
- encouraging self-consumption
- increasing the size of balancing areas

Conclusion

The electricity system of the future will need a massive volume of decentralized finance

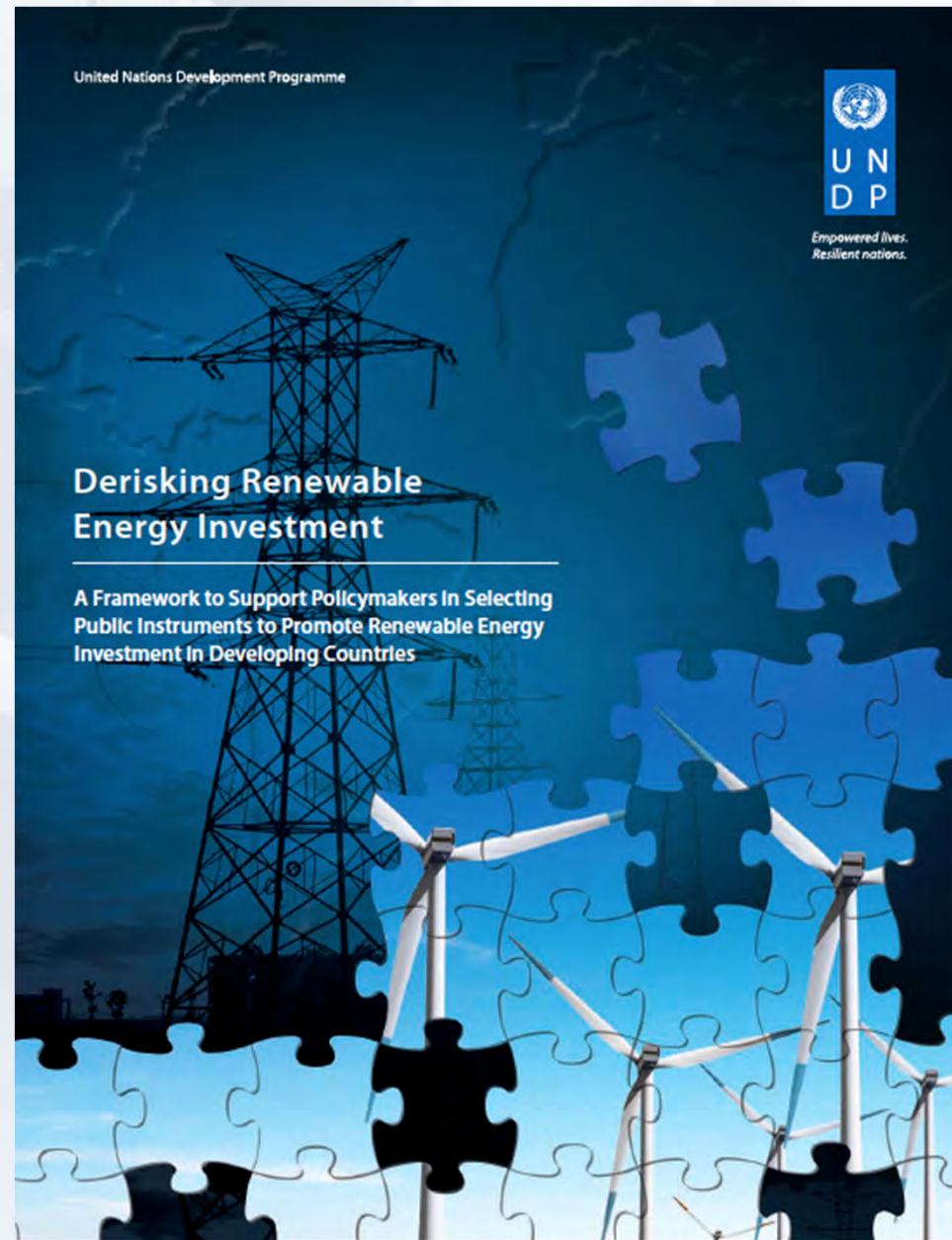


- The transition to a sustainable, low carbon power system will be faster, and easier if finance is available at scale and at reasonable rates
- The key to that remains creating and maintaining the right policy and regulatory conditions
- And this requires thinking of RE policy through the lens of **finance**, rather than economics

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February 2010



National Renewable Energy Laboratory
Innovation for Our Energy Future

NREL is a national laboratory of the U.S. Department of Energy,
Office of Energy Efficiency and Renewable Energy, operated
by the Alliance for Sustainable Energy, LLC.

Thank you.

Questions?

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