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LiA Reflection Report

Placement: Power Markets team, Council on Energy, Environment and Water (CEEW), New Delhi. Eight weeks.

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1. Purpose, Argument, and reading guide

1.1 Purpose

I spent eight weeks with the Power Markets team at CEEW, a policy research institute in New Delhi that advises India's Ministry of Power. I went to work on a question with a clear practical stake: how should India pay power plants to be reliably available, not just to produce electricity. Over the placement I moved from reading how other countries answer this question to writing a comparison that puts real numbers behind it for one Indian state. This report sets out what I produced, what it changed in how I think about policy, and what the field taught me that no report could.

1.2 Central Argument

Electricity policy imported from another country carries assumptions about the country that designed it. Each deliverable I produced tested one such assumption against Indian conditions. The legal analysis asked who may see which data. The capacity market reports asked which foreign designs suit India. The reports and presentation on reliability asked how far a power plant can be counted on. The Excel report placed these questions in one comparison. Each stage narrowed the distance between a description of foreign practice and a decision an Indian regulator can take, and the field showed where the distance remained.

1.3 Reading Guide

Deliverables are labelled D1 to D5. Takeaways from the deliverables are T1 to T6, mechanisms of change are M1 to M4, leadership lessons are L1 to L4, and challenges in applying theory are R1 to R4.

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2. Eight-Week Summary timeline

Week	Activity	Deliverable	Pointers
1	Began a legal comparison of India's electricity data-sharing framework with EU Regulation	D1	T1, L1

Week	Activity	Deliverable	Pointers
	543/2013 and UK arrangements. Started work on technology-neutral tenders.		
2	Compared capacity market designs from Great Britain, the United States (PJM), Texas (ERCOT), and Germany with the options before India's regulator. Visited a solar module factory.	D2	T2, L4
3	Presented the reliability measure ELCC to the team. Short power cuts hit remote areas in the north. Three days of hiking in Ladakh, with nights in homestays.	D3, D4	T4, T5, L3
4	Developed an Excel tool for ELCC credits with two colleagues. Studied flexible ramping products. Adopted systems thinking as a working method.	D3	T4, Section 6.2
5	Analysed a firm renewable energy tariff, with comparators from the UK, PJM, Chile, and Brazil.	D2	T2
6	Designed the Excel comparison of five technologies for Gujarat.	D5	T6, L1
7	Added contract length to the model. Reconciled India's carbon-related taxes and levies to their sources.	D5, D1	T1, T6
8	Consolidated the model, listed the	D5	T6, L4

Week	Activity	Deliverable	Pointers
	datasets needed to replace illustrative inputs, and handed over.		

Observations of informal electricity connections and billing accumulated from Week 3 onward (T3, L3).

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3. The Argument Through Five Deliverables

3.1 D1. Legal analysis: who may see which data

The first deliverable compared India's national framework for sharing electricity data with EU Regulation 543/2013 and with arrangements in the United Kingdom. The EU regulation requires grid operators and market participants to submit data on demand, generation, and transmission for publication on a central platform. The comparison asked how far default publication suits India, where utilities, regulators, and grid operators hold commercially sensitive figures and hesitate to release them.

Later work depended on the answer. A capacity market, a reliability measure, and a comparison of technologies all require hourly demand and generation data, and the law decides who may supply it. I also reconciled India's carbon-related taxes and levies to their legal sources: a goods tax on coal, excise duties on petroleum, and two trading schemes for industry. These instruments reach fuels by different routes, so the effective cost of carbon differs by technology. A tender that claims neutrality between technologies must first record that difference.

T1. Rules decide what can be known before analysis begins. Any system we invent or develop must be adapted to the local regulations, in order to limit the disruption caused by our intervention and therefore to maximize the chances of real implementation.

3.2 D2. Reports on capacity markets and international examples

A capacity market pays power plants for being available when the grid needs them, separately from payment for the electricity they deliver. I compared four designs. Great Britain and PJM, a large regional grid in the eastern United States, run auctions that fix availability payments years ahead. Texas has no such payment and relies on high prices during shortages. Germany holds reserve plants outside the market. I compared these designs to the options reviewed by India's regulator, and I analyzed a tariff for firm renewable energy, with a fixed payment and a variable payment, using comparators from the UK, PJM, Chile, and Brazil.

I began with the expectation that the strongest foreign design could be adapted with limited changes. The comparison contradicted it. India's generation mix, demand pattern, and regulatory capacity differ from those of the countries that designed these instruments. Each design rests on conditions India has only partly established: dispatch guided by

price, accurate metering, and buyers who pay generators on time. But more broadly, the whole procurement system in India is currently divided between renewables and thermal in a way that makes it difficult for them to compete on economic costs alone. More work is needed to harmonize their cost structures before setting competition loose upon them, lest the market procure inadequate or inefficient generation.

T2. Instruments carry assumptions about the country that designed them. Or more generally, about the context in which they were first implemented. Sometimes one must bring reforms to allow for the model to apply, but sometimes one must discard the model and create one better adapted to local conditions.

3.3 Field evidence: how electricity is used and billed

The reports treated demand as measured and priced. Outside the office I saw households and small businesses draw power by connecting directly to overhead cables. A bill cannot follow consumption that no meter records, so billing in such settings bears little relation to use. Distribution utilities then collect less than they pay for power, and they are the buyers who would fund a capacity payment.

Two consequences follow for the designs in D2. Consumers who pay a price unrelated to their use have no reason to cut demand at peak times, which weakens the demand-side participation on which PJM relies. Generators who expect late or partial payment raise their bids to cover the risk, which raises the cost of any capacity payment.

I am loosely calling this “field evidence” although I did not study this particular issue systematically or methodically. But it does matter because it points to a problem which may not even occur to an economist in the office, but which becomes immediately visible to anyone who spends a few minutes walking the streets of Delhi.

T3. Any intervention must be adapted not only to top-down regulations (T1), but also to norms of behavior which can only be noticed empirically (on the ground). So here, payment-based market designs weaken where consumption is neither measured nor billed. A design question includes the condition of the meter and the bill.

3.4 D3. Reports on ELCC: measuring reliable contribution

ELCC (effective load carrying capability) states how much of a plant's rated output the grid can count on when demand is highest. A solar plant contributes little at an evening peak. A battery contributes according to how long it can discharge. The measure lets a regulator pay each technology for what it reliably provides. With two colleagues I developed an Excel tool that assigns these credits from dispatch data, which required conversations about which assumptions were defensible.

The measure changes with the system it describes. In a stylised example, the credit for solar falls from 55% to 19% as solar rises from 10% to 50% of peak demand. A credit calculated today misdescribes a contract that runs for fifteen to twenty-five years.

T4. The needs of a given system (the policy needs, intervention needs, even research and data needs) change as it matures. So here, a reliability measure describes one system at one time. A credit fixed in a contract holds its value only while the

system stays close to the one measured.

3.5 D4. Presentation on ELCC for decision-makers

The 24-slide presentation explained ELCC to policymakers and went first to my team. I wrote it for readers who set rules and do not run models. Each slide stated a claim, the evidence, and the assumption on which the claim depends. The team then decided to convert the presentation into a data-based tool, so the presentation changed the plan of work.

Presenting before any tool existed forced me to state assumptions that colleagues could contest. Contested assumptions cost less to change at that stage than in a finished workbook.

T5. A measure influences decisions after translation into terms that decision-makers can contest.

3.6 D5. The Excel report: one comparison of five technologies

The Excel report compares five technologies in Gujarat: solar and wind, batteries, renewables paired with batteries, coal, and nuclear. For each, it lists yearly cost (repayment of construction cost plus running cost) and yearly earnings from three services: selling electricity, keeping the grid's frequency steady, and relieving overloaded transmission lines. A unit of electricity sells once, so each technology assigns every unit to one service, and the report records those shares. The gap between cost and earnings is the capacity payment the technology needs to break even. The regulator sets a value for capacity by any method it prefers, and the report compares the two figures.

Two features respond to policy questions. Contract length changes the result, because a component whose life is shorter than the contract must be rebuilt, and the report adds that cost. A regulator can also fix an energy price for the calculation, while the report values energy at real time-of-day prices when judging worth to the system. The scale is 5 technologies, 4 services, and 6 time-of-day price blocks.

Four errors appeared in early versions: an arbitrary weighting of the four services, a double penalty for the intermittency of solar and wind, a fixed price applied to electricity never sold on the market, and an assumption that a battery charged from its own solar plant pays nothing. Each arose where a hidden step or a change of unit escaped inspection. I corrected each by stating the unit and showing every step.

T6. A good comparison of systems replaces argument about principles with argument about numbers. Therefore a quantitative model is usually necessary if the intervention is to remain adapted to the changing needs of the system (T4) and give policymakers evidence-based decision power (T5)

3.7 The Thread

Deliverable	Question	Finding	Open point
D1 Legal analysis	Who may see which data?	Rules fix the data available to every	Which data India will treat as restricted

Deliverable	Question	Finding	Open point
		later stage	
D2 Capacity market and international reports	Which foreign design suits India?	Every design rests on conditions India has only partly established	Which preconditions to establish first
Field evidence	Is consumption measured and billed?	Often neither	Extent and cost of the gap
D3 ELCC reports	How far can each plant be counted on?	The answer changes with the system	Credit values from Gujarat data
D4 ELCC presentation	How do decision-makers contest the measure?	Stated assumptions allow challenge	Adoption by the regulator
D5 Excel report	What does each technology need beyond market earnings?	The gap differs by technology and by contract length	Validation against Indian tender bids

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4. Societal Impact

4.1 Beneficiaries and the Sustainable Development Goals

CEEW advises the Ministry of Power, and the Central Electricity Regulatory Commission is considering a capacity mechanism. The hypothesised chain runs from my analysis to team advice, from advice to procurement rules, from rules to investment in firm capacity, and from investment to reliable supply for consumers. It serves SDG 7 (affordable, reliable, and modern energy) and, through the choice between low-carbon and thermal capacity, SDG 13 (climate action).

4.2 Metrics

Metric	Value
Placement	8 weeks
Deliverable types	5
Jurisdictions studied	6 (United States, Great Britain, Germany, European Union, Chile, Brazil)
Capacity market designs compared	4
Carbon-related instruments reconciled to source	4 (goods tax on coal, petroleum excise duties, carbon credit trading, energy-efficiency trading)
ELCC presentation	24 slides
Excel report scope	5 technologies, 4 services, 6 time blocks

Metric	Value
Use of the Excel report by a regulator during the placement	None

4.3 Mechanisms of Change

M1. Naming what does not transfer prevents adoption of designs whose conditions are absent. A reform that fails after adoption wastes years of investment decisions. A list of preconditions (T2) lets the regulator test each one before choosing. *Indicator:* preconditions stated in official consultation papers.

M2. Billing reform becomes a condition of any capacity payment. A capacity payment depends on utilities paying generators. Unbilled consumption reduces utility revenue, and the resulting payment risk raises bids (T3). *Indicator:* the share of consumption metered and billed in the utilities that would fund the payment.

M3. Published assumptions allow regulators to revise credits over time. A credit whose assumptions are public can be revised when the system changes (T4, T5). *Indicator:* scheduled review dates for credit values.

M4. A comparison by service gives technology-neutral tenders a common basis. A tender that compares solar and coal on one price hides which service drives the difference (T6). *Indicator:* tender documents that report each bidder's payment need by service.

4.4 Limits of the Impact Claim

1. My Excel report runs on illustrative inputs. The team will populate it with data, and it is essential that it be regularly updated.
2. My field observations are personal and unsystematic. They suggest a hypothesis about billing and payment risk that utility data must test. But about that CEEW is very conscious and is running its own research on ‘aggregate technical and commercial losses.’
3. A capacity payment would change which plants get built, which would change prices. The model holds prices fixed.
4. Every conclusion about capacity depends on a value benchmark the regulator sets.

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5. Personal Impact: Ethical Leadership

I take ethical leadership to require three practices: stating the uncertainty that others rely on, reporting findings that contradict one's own expectations, and learning from people with more field experience.

5.1 Ambiguity: Defining Common Terms

The hardest ambiguity I met was not in the data. It was in language. "Value" was the word that came up most often in my first weeks, and it meant something different to each person

who used it: an engineer's sense of technical performance, an economist's sense of price, a regulator's sense of fairness between technologies. Economic theory gives value a precise definition, the price a good would fetch in a competitive market, but electricity is not traded like a single good. It is several things at once, sold at different times, to different buyers, under different rules. Applying a theory built for one good to a system that behaves like several overlapping markets meant that the first task was rarely calculation. It was agreeing, with colleagues who had spent years in the sector, on what a shared word was actually meant to capture.

This shaped how I worked as much as what I produced. Before I could compare technologies, I had to sit with the team and separate "value" into parts that everyone in the room would define the same way: what a plant sells, when it sells it, and what it is paid for. Only once that mapping was agreed did a number mean the same thing to an engineer, an economist, and a regulator. I found this to be a leadership question as much as an analytical one. A junior researcher who proposes a definition is also asking a team to change how it talks, and getting that agreement took more patience than getting the arithmetic right. It taught me that applying theory to a real institution is not a one-way translation from the abstract to the concrete. It is a negotiation over what the abstract terms are even supposed to mean, conducted with people whose working vocabulary the theory has to fit.

L1. A shared definition is a precondition for cooperation. From a researcher’s point of view this is the well-known question of “operationalization of variables”. But the lesson generalises beyond this placement, indeed beyond research: a leader who assumes agreement on terms, rather than establishing it, discovers the disagreement only when outputs no longer add up. Establishing a common definition early costs time up front and saves more of it later, in work that would otherwise need to be redone once the mismatch surfaces.

5.2 Friction: findings that contradicted expectations

I began the capacity market work expecting to adapt a leading foreign design. The evidence contradicted the expectation, and I stated the contradiction in the Week 2 memo. My own errors in the Excel report produced a second friction. I corrected each when found and recorded the corrections in the workbook notes.

L2. A finding that contradicts the starting hypothesis belongs in the first report, when the cost of changing course is lowest. Early reports shape colleagues' plans, so a delayed contradiction spreads into later work.

5.3 Cultural nuance: informal arrangements carry information

Two observations changed how I work, especially in relation to development work (perhaps my main career observation).

- **Office.** The team's tea breaks let me ask engineers basic questions about dispatch without a formal request. Some assumptions in the ELCC tool came from those exchanges.
- **Cables and bills.** Direct connections and unreliable billing showed that formal rules

describe intended behaviour and informal practice determines results. A regulator who designs for the rule from afar misses the practice.

L3. Informal networks carry information that formal channels omit, and asking early costs less than correcting later.

5.4 Honesty about uncertainty

Every placeholder in the Excel report carries an "illustrative" label and a named source for real data. Readers include people who can act, and an unlabelled placeholder can enter a policy memo as a finding.

L4. Label uncertainty where a number is created.

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6. Research Connection and the Theory-Practice Gap

6.1 Systems Thinking

Systems thinking comes up constantly at CEEW, and that has shaped how I think about my work: systems thinking. The idea is about solving problems sustainably, or for the future. In short, no energy policy works for long if it only solves the problem in front of you. A subsidy that works while the funding lasts but collapses the moment it is withdrawn has not really solved anything. Systems thinking involves mapping out who else is affected by a decision, and what they will do in response to it, before deciding whether it will hold up. A generator responds to the payment it is offered, a regulator to fiscal pressure, and a consumer to prices only where prices reach them. The billing evidence (T3) marks a place where the price never reaches the consumer.

A good design accounts for that adjustment in advance rather than discovering it later. This is, in essence, applied economics: incentives, information, and the fact that markets are made up of people and institutions reacting to each other. The notion of systems is also closely connected to sustainability, since any good development intervention should set up a system of incentives that makes the benefits last beyond the end of the external intervention/funding.

6.2 Where Theory Met the Market

R1. Values that theory treats as fixed change with the system. ELCC falls as more solar joins the grid, and solar earns less per unit as more solar sells in the same hours (T4). Contracts last longer than the system stays still.

R2. Theory treats energy, capacity, and grid services as separate products, and a unit of electricity sells once. The model must assign each unit to one service. The assignment shares matter most and rest on the least data.

R3. Instruments depend on institutions. Flexible ramping products, used in California, assume real-time dispatch and prices that reach generators within minutes. Where dispatch is centralised, the instrument creates new problems, so infrastructure precedes mechanism (T2).

R4. Price and output vary together over the day. Sorted demand and price curves

discard timing. Six time blocks keep timing and lose detail within each block. Theory gives no rule for the number of blocks, and data quality sets the limit.

6.3 Changes in Position

I began the placement expecting one correct value for capacity. The value depends on a benchmark the regulator chooses. I expected markets for separate services to clear separately, and physical output couples them. I expected international comparison to supply answers, and it supplied a list of questions for India to answer.

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7. Conclusion

I came to CEEW to study how countries pay for reliable electricity, and I leave with a working comparison of five technologies and a clearer sense of what such a comparison can and cannot do on its own. The deliverables built on each other: legal groundwork on data, international comparison, a reliability measure, and a model that puts them together. Each stage narrowed the gap between foreign example and Indian decision, and the field kept showing me where the gap remained wide. The next steps are not mine to take alone. The model needs real Gujarat data in place of the illustrative figures I used, and its results need testing against actual tender outcomes before any regulator relies on them. My own next step is smaller: to stay in contact with the team as they take this work forward, and to see whether the questions I raised about billing and metering find their way into the next round of policy design.

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