

GEOSMART INDIA 2021

THEME **ADVANCING THE ROLE OF GEOSPATIAL
KNOWLEDGE IN INDIAN ECONOMY**



24-26 August 2021



HICC Hyderabad, India

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ROLE OF SMART METERING IN ELECTRICAL UTILITY

KULDIP KAUL
CONSULTANT
WORLD BANK

POWER SECTOR GLANCE -INDIA

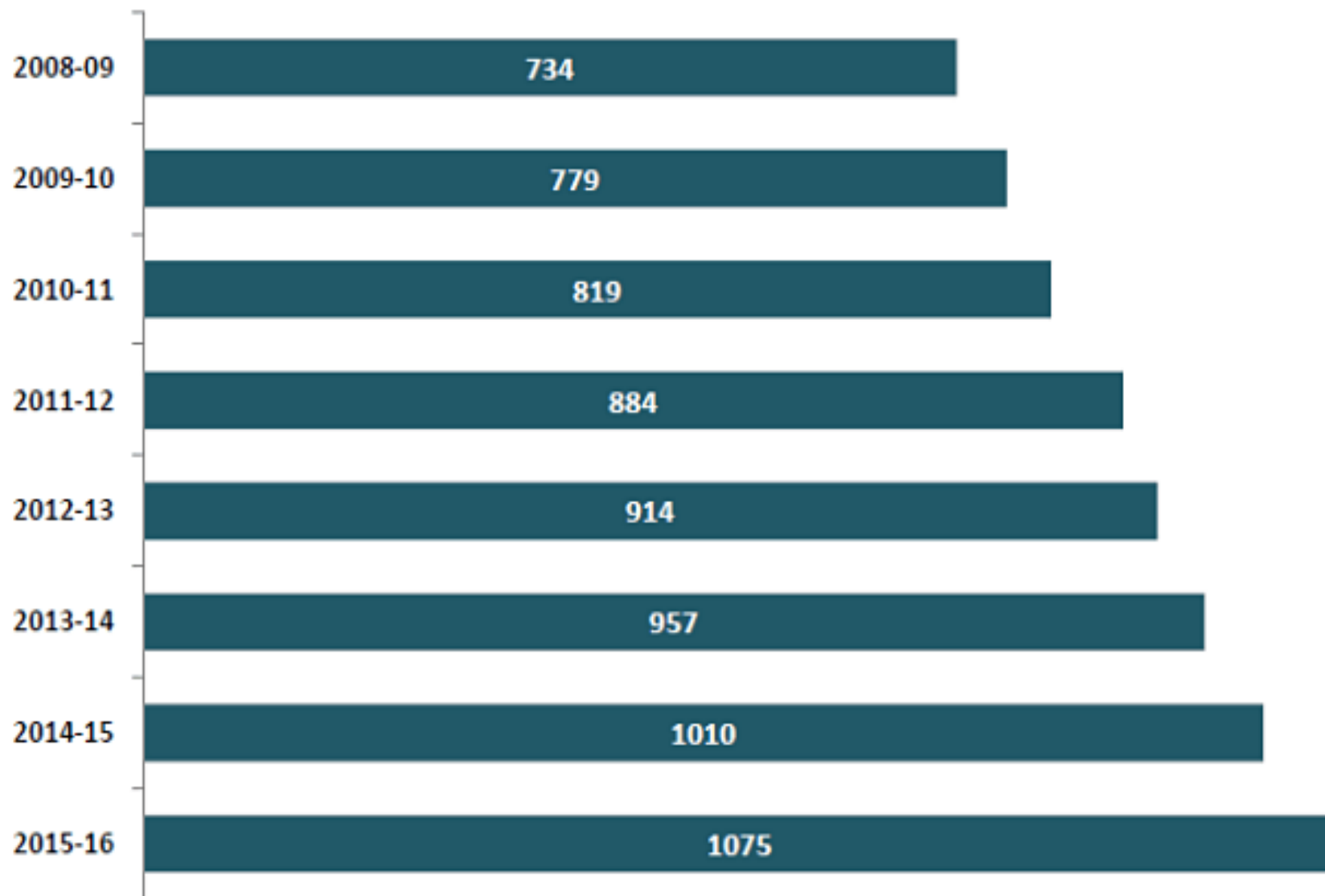
Sector	MW	% of Total
State Sector	83,922	24.3%
Central Sector	103,030	29.8%
Private Sector	159,096	45.0%
Total	3,46,048	

Fuel	MW	% of Total
Total Thermal	2,21,768	64.1%
Coal	1,95,993	56.6%
Gas	24,937	7.2%
Oil	838	0.2%
Hydro (Renewable)	45,487	13.1%
Nuclear	6,780	2.0%
RES* (MNRE)	72,013	20.8%
Total	346,048	

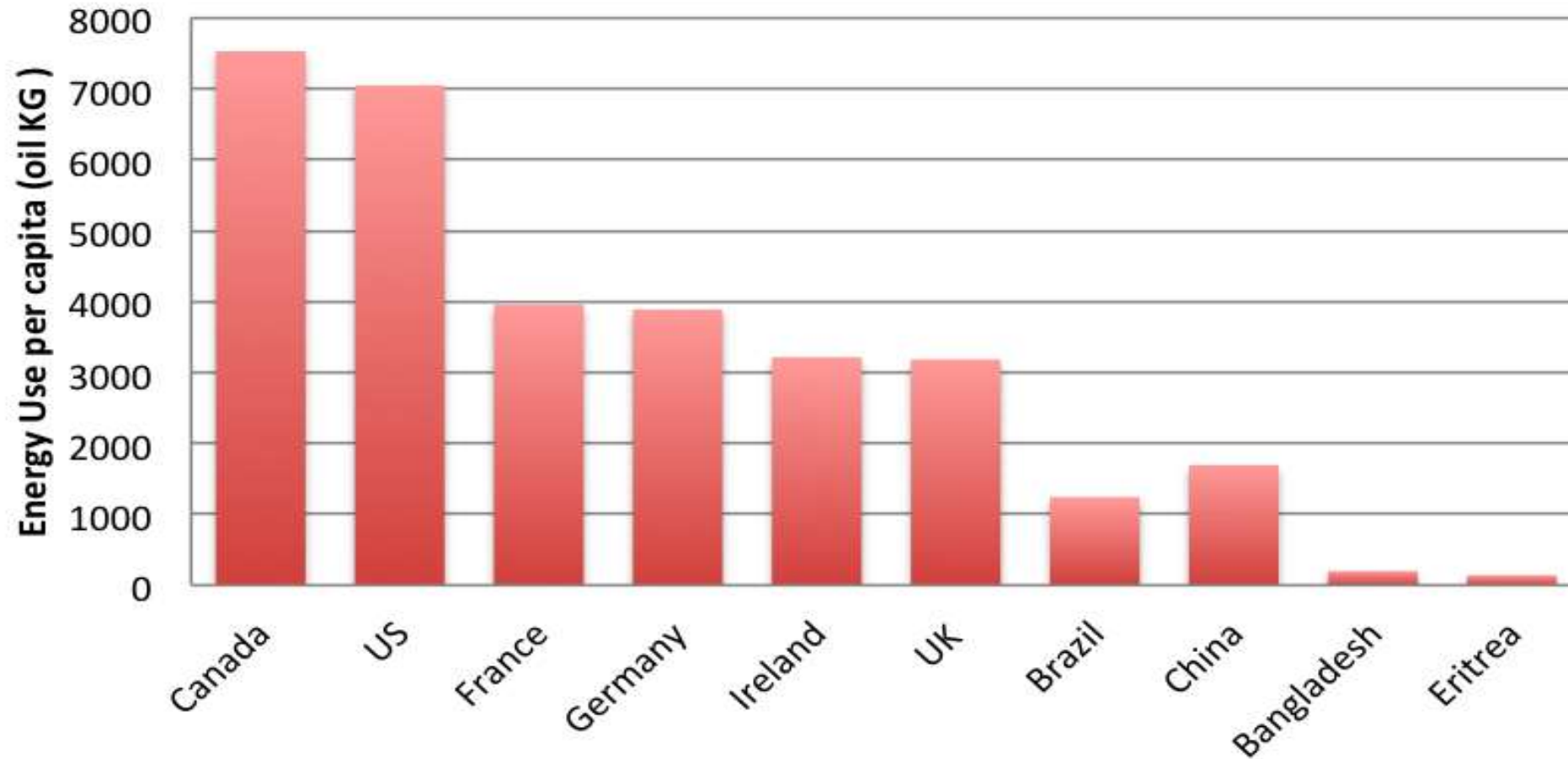
Distribution is the most important link in the entire power sector value chain. As the only interface between utilities and consumers, it is the cash register for the entire sector. Strengthening of sub-transmission and distribution networks in the urban areas.

- Metering of distribution transformers / feeders / consumers in the urban area.
- IT enablement of distribution sector and strengthening of distribution network.
- India is the 3rd largest producer of electricity in the world.
- The world loses \$89.3 billion annually through power theft.
- India loses US\$ 10- 15 billion annually.

Per Capita Electricity Consumption in India (in kWh)



Energy Use Per Capita



www.economicshelp.org | Source: World Bank

METERS

- The smart meter is an electrometer that measures electricity consumption by time repetition.
- The merit of these meters is that they send and receive (information / commands) to and from the main center

The Electromechanical Meters

- Cannot detect or record any tampering attempt.
- Cannot see any obvious damage save in location

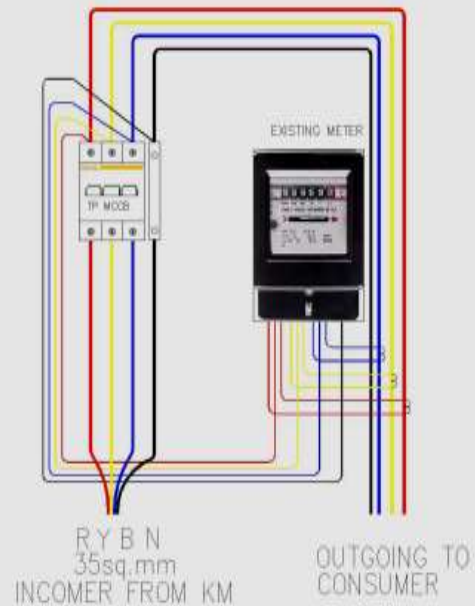


TAMPERING WITH ELECTROMECHANICAL METERS

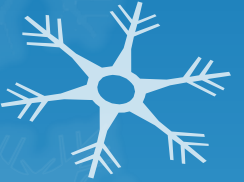


- Changing connection by opening / closing the lid without any evidence
- Putting a strong magnet to stop / tamper with the work of the meter.
- Inserting a metallic object / pin in meter to stop spinning.

TAMPERING WITH ELECTROMECHANICAL METERS



- Raising Voltage Terminal.
- Shortening connections Current Transformer (CT)
- Reversing Connection of Current Transformer (CT) single phase / three-phase



THE SMART METERS

- Time-Based Tariff (Multi-tariff).
- Consumption Statements to Subscriber and Corporation.
- Net metering.
- Notice of Current Outage/Restoring
- Electricity Current Disconnect/Re-Connect
- Load Determination for Demand Response (DR)
- Monitoring Electricity Current Quality
- Detection of Tampering/Theft of Electricity



THE SMART METERS

- All smart meters are shut down by the Corporation
- Any attempt to change plug in needs opening the meter cover.



DETECTION IN THE SYSTEM

OPENING LID

Event type	TERMINAL_COVER_O...	Occurred	Event Type	Component Id	Device Id
		2015-09-27 04:12:34.000	TERMINAL_COVER_OPENED	1369	13630285
		2015-09-16 08:38:22.000	TERMINAL_COVER_OPENED	10057	13626079
		2015-09-16 08:38:21.000	TERMINAL_COVER_OPENED	10057	13626079
		2015-09-16 04:12:34.000	TERMINAL_COVER_OPENED	1369	13630285

LEAKAGE PHASE

Event type	PHASE_LEAKAGE	Occurred	Event Type	Component Id	Device Id
		2015-09-11 21:05:34.000	PHASE_LEAKAGE	12347	13690485
		2015-09-10 23:33:10.000	PHASE_LEAKAGE	13139	13691134
		2015-09-05 09:19:08.000	PHASE_LEAKAGE	8338	13691401
		2015-09-05 09:19:07.000	PHASE_LEAKAGE	8341	13691463
		2015-08-30 11:33:11.000	PHASE_LEAKAGE	313	13641436

DETECTION IN THE SYSTEM



REVERSING SPINNING

Event type PHASE_ROTATION	Occurred	Event Type	Component Id	Device Id
	2015-10-04 00:27:39.000	PHASE_ROTATION	1413	13630270
	2015-10-04 00:00:51.000	PHASE_ROTATION	2784	13638291
	2015-10-04 00:00:44.000	PHASE_ROTATION	1413	13630270
	2015-10-03 23:51:01.000	PHASE_ROTATION	1413	13630270



ELECTRICITY OUTAGE

Event type POWER_FAILURE	Occurred	Event Type	Component Id	Device Id
	2015-10-03 23:31:26.000	POWER_FAILURE	3140	13659129
	2015-10-03 00:18:36.000	POWER_FAILURE	8271	13630607
	2015-10-02 22:29:26.000	POWER_FAILURE	10818	13627586
	2015-10-02 22:29:26.000	POWER_FAILURE	10820	13627588
	2015-10-02 22:29:26.000	POWER_FAILURE	10819	13627587



DETECTION IN METER SCREEN



Serial Reverse

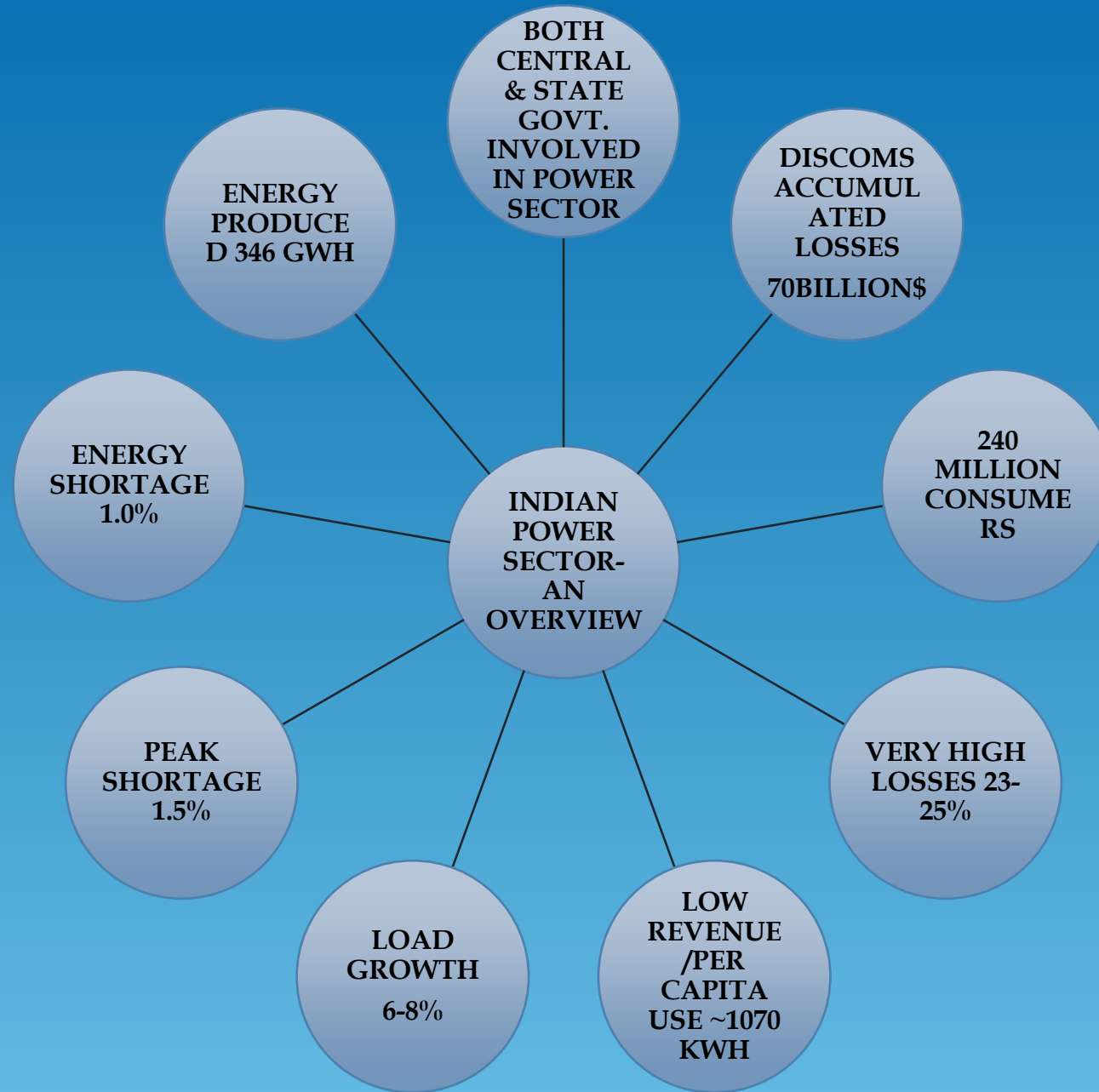
Voltages and currents	L₁	L₂	L₃	<p>Presence of phase voltages (L₁, L₂, L₃) and phase currents (I₁, I₂, I₃).</p> <p>The symbols L₁, L₂, L₃ flash if the phase sequence is reversed. The correct phase sequence (clockwise or counter-clockwise) can be parameterised.</p> <p>The current symbols I_x appear if the power of the corresponding phase exceeds the creep threshold.</p>
	I₁	I₂	I₃	

Negative Energy Direction (Reversed Contact)

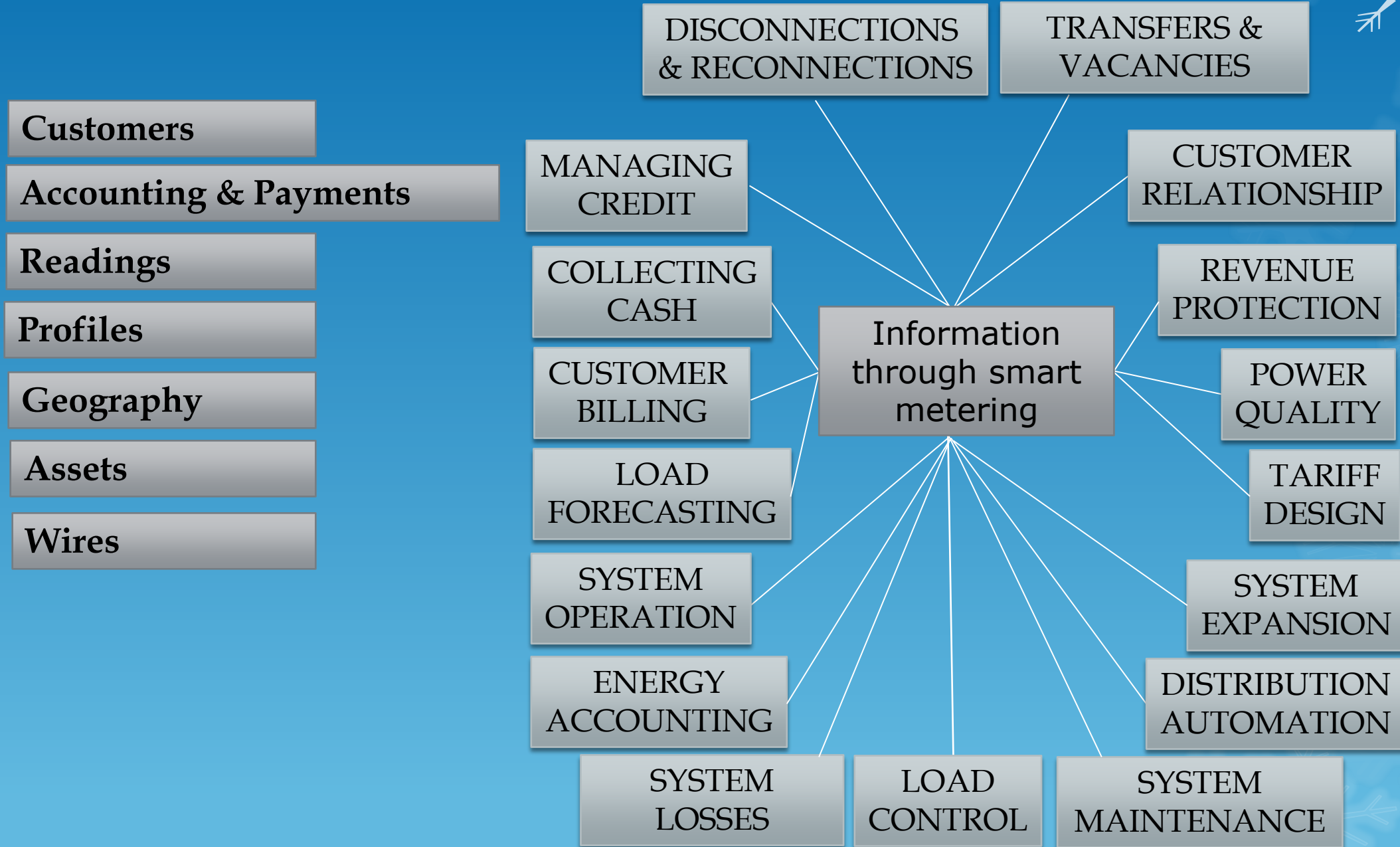
L₁	L₂	L₃	<p>Symbol I₃ flashes: Negative energy direction in this phase Warning symbol can flash</p>
I₁	I₂	I₃	

Meter Terminal Removal Detection

Event	Display	Symbol
Terminal cover removed	Selected arrow is blinking.	
Main cover opened	Selected arrow is lit.	



INFO. NEED FOR DISTRIBUTION MANAGEMENT



INDIAN DISCOM STORY

Positives: Early adapters of electronic meters for all segments. Meters with high accuracy and tamper detection capability

Could not appreciate

- Changes required in Discom processes to convert data to business decisions
- Many did not build computing and IT system and support team
- Indian power system conditions. Surges, spikes, over voltage, high temperature, poor installation
- Social side of power theft

Lagging :Moving in circles on meter data collection

Impact

- No details around the drivers and variability of energy loss
- Outcome, no real benefits out of installing electronic meters for several Discoms

At par with global technological developments. World's first smart meter jointly developed in India in 1988.

World leaders in addressing Tamper & fraud issues.

Comprehensive design and manufacturing capability in India : Around 25-30 million per year.

Indian companies are ready with smart meters and have implemented AMI solutions in Developed and Developing economies. Smart meters exported out of India.

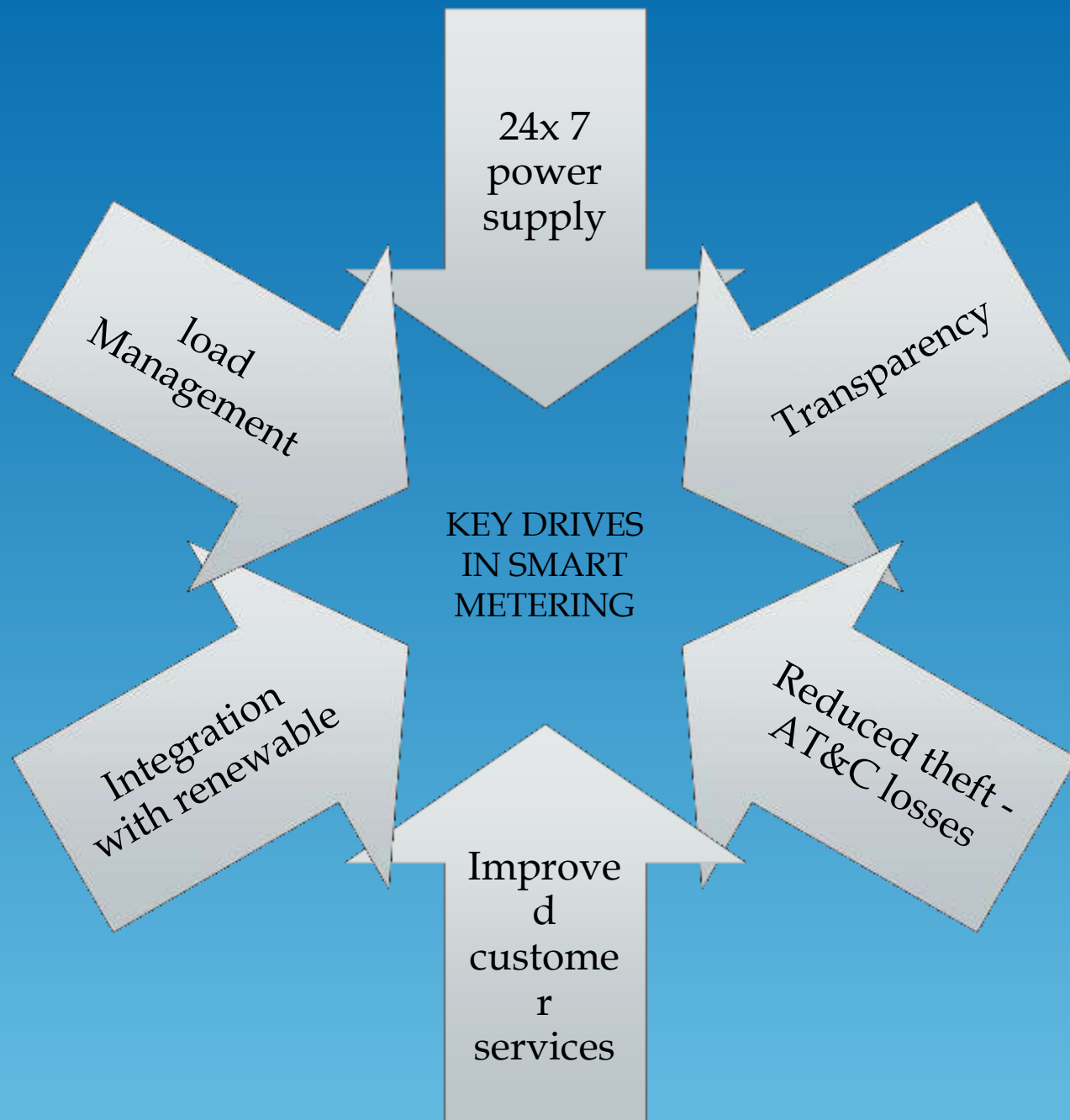
Around 1/3rd of global "Smart Meter"/Smart technologies design/Engg. is based in India.

Around 700k meters with switches deployed, began a decade ago in the country.

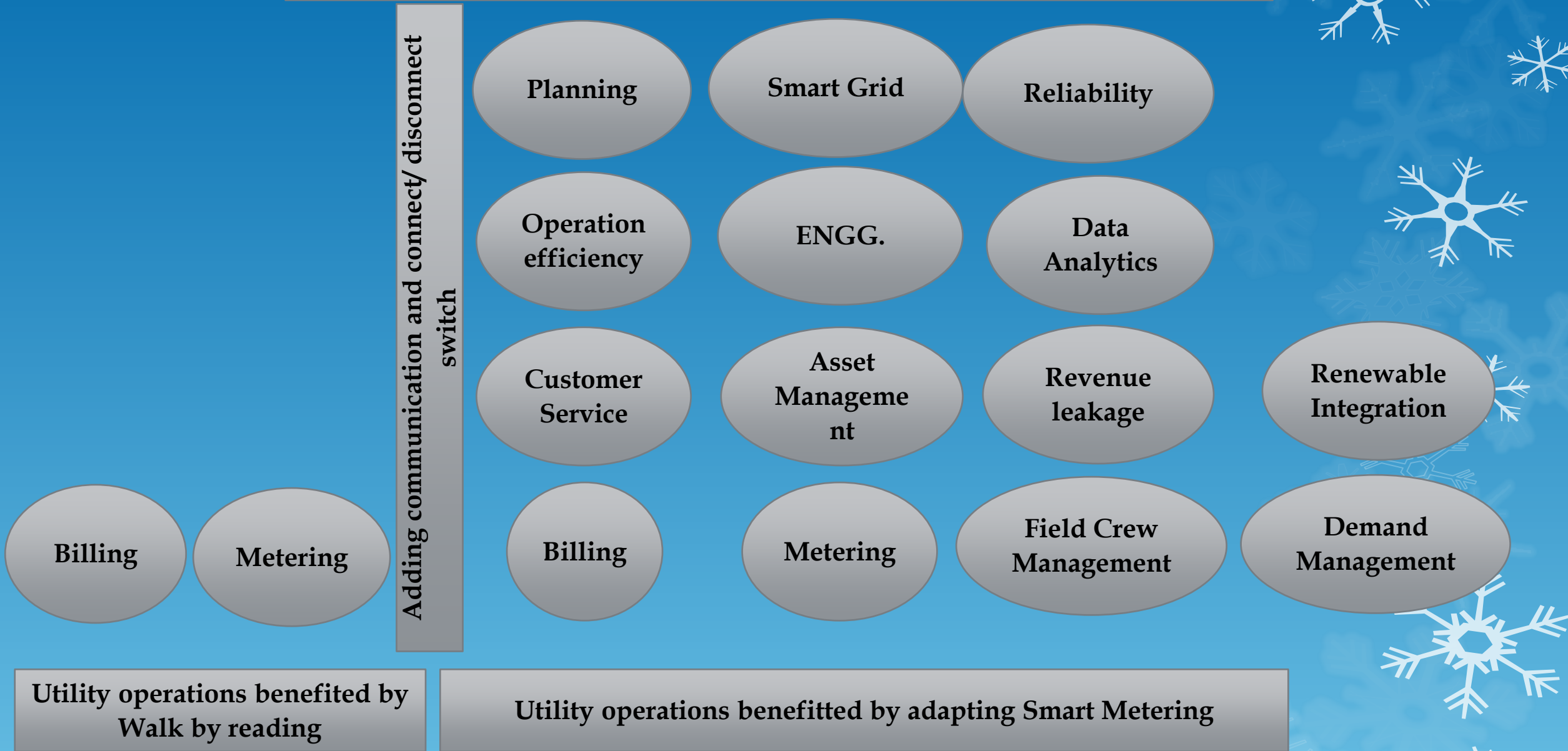
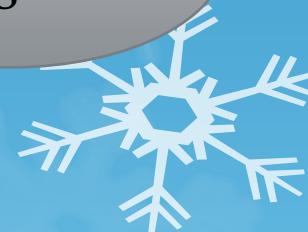
Around 5 million meters with various communication links working. Bulk supply points success.

Discoms experienced mixed success. few really utilised the data. System integration challenges faced.





VALUE DELIVERY FROM SMART METER



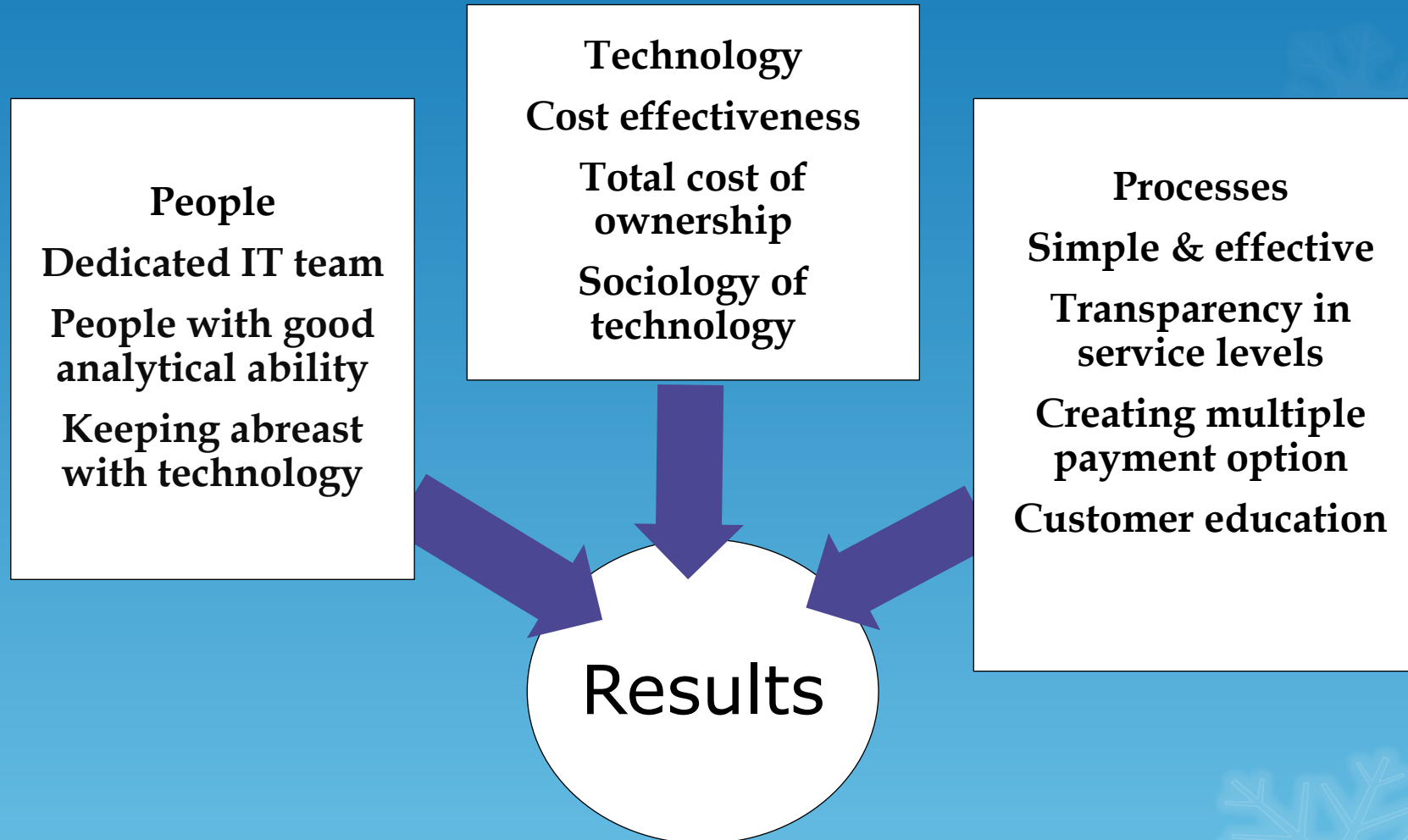
Utility operations benefited by Walk by reading

Utility operations benefitted by adapting Smart Metering

TECHNOLOGY ALONE CANNOT SOLVE PROBLEMS

People, processes and technology must come together

Consider value delivered rather than cost alone



THANK YOU

