



Scaling up Net Metered

Rooftop Solar in Garments Industry

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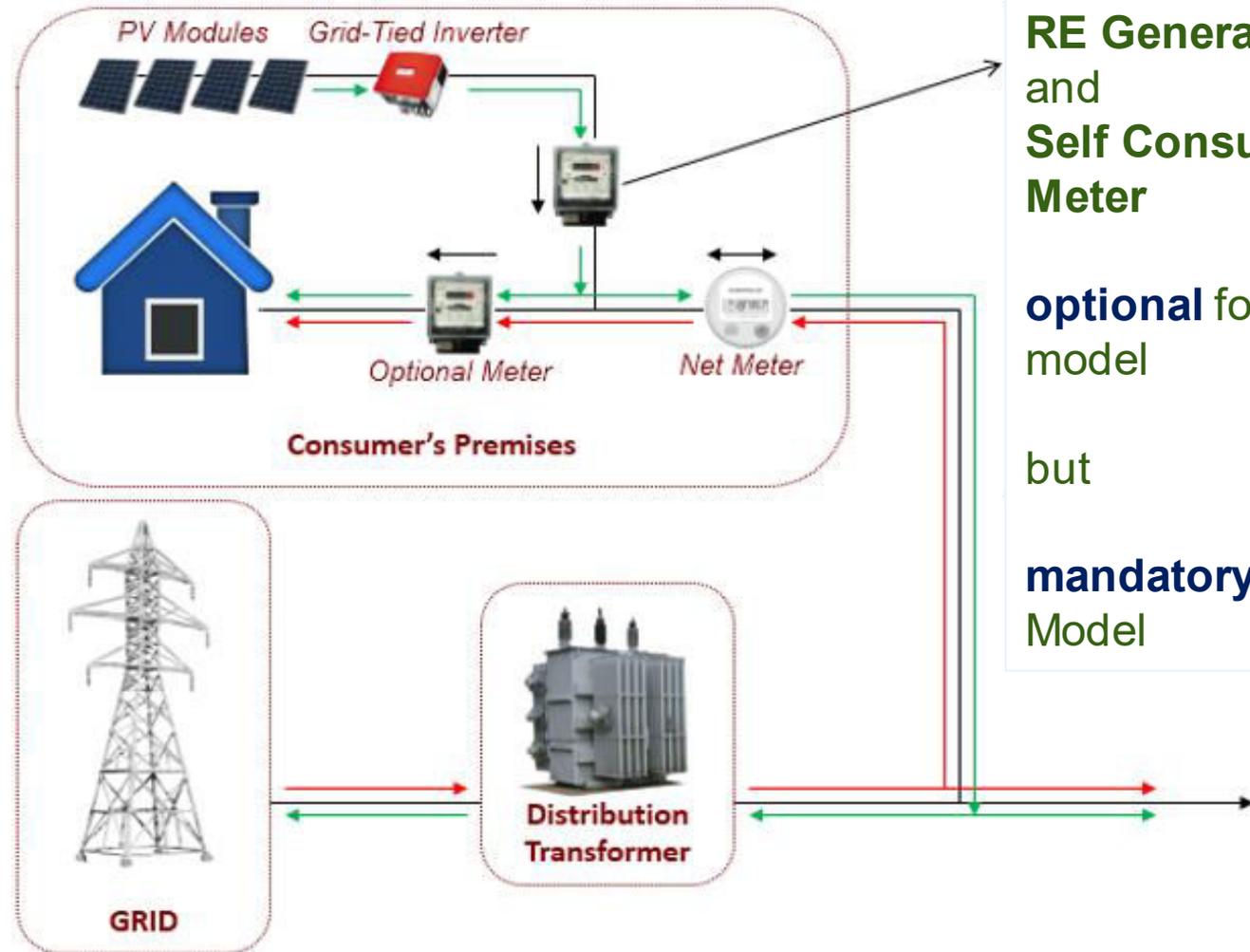


What is Net Metering ?

নেট মিটারিং নির্দেশিকা-২০১৮
[১৪ নভেম্বর ২০১৯ খ্রি. তারিখে সংশোধিত]



টেকসই ও নবায়নযোগ্য স্থালানি উন্নয়ন কর্তৃপক্ষ (স্ট্রেডা)
বিদ্যুৎ বিভাগ
বিদ্যুৎ, স্থালানি ও খনিজ সম্পদ মন্ত্রণালয়
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার



RE Generation Meter and Self Consumption Meter

optional for CAPEX model

but

mandatory for OPEX Model

First Published: 28 July 2018

Revision: 14 Nov 2019

Energy Calculation and Settlement

Billing Period: Monthly

$$\text{Monthly Billing Unit (BU)} = I - E - C$$

BU > 0, Consumer will pay BU, Demand Charge, Vat etc.

BU = 0, No energy charge
Demand charge and Vat only

BU < 0, No energy charge
Demand charge and Vat only

C=|BU| unit will be credited for Next month or Settlement for June

I: Electricity Import

E: Electricity Export

C: Credit Amount

Settlement Period: Fiscal Year (July – June)

C > 0, Utility will pay to consumer @ 33 kV Bulk rate

C = 0, No payment by distribution Utility



Eligibility Criteria

- ✓ All **3 phase** consumer classes of LT, MT and HT
- ✓ Applicable only for **RE sources**
- ✓ After self consumption, surplus electricity can be exported to the grid
- ✓ Up to **70% of sanctioned load**; but not exceeding **10 MW**



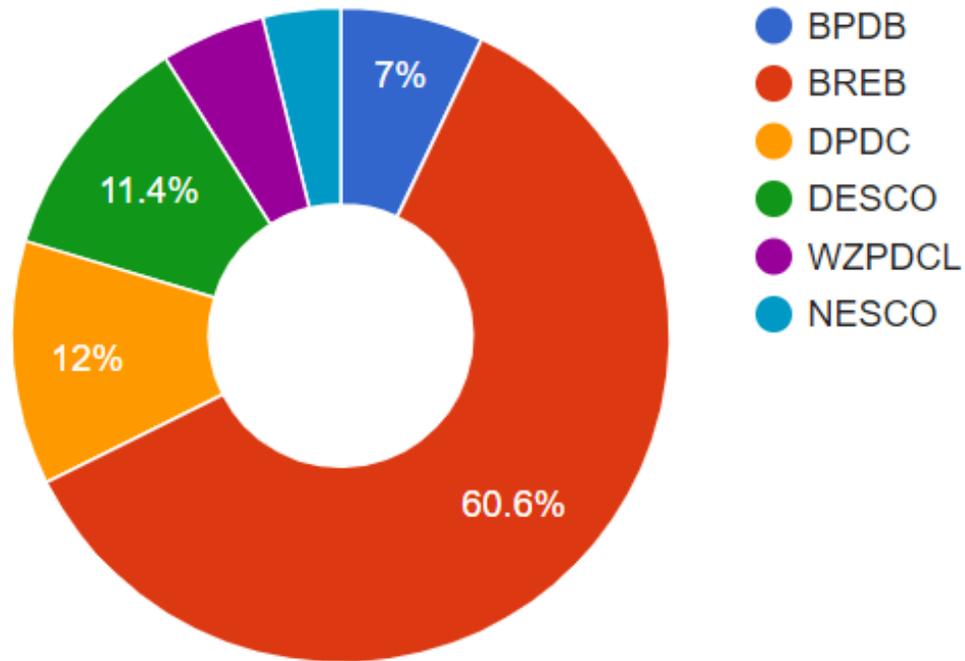
Modalities

- CAPEX- Capital Expenditure
 - Own Finance
 - With Loan
- OPEX- Operational Expenditure



Net Metering Progress

Share of Installed Net Metering Systems (MW)



Utility Name	Installed Capacity	Quantity
BPDB	1.28 MW	247
BREB	10.09 MW	204
DPDC	2.07 MW	227
DESCO	1.99 MW	282
WZPDCL	0.87 MW	167
NESCO	0.81 MW	39
TOTAL	17 MW	1166

Source: www.renewableenergy.gov.bd, Last Access on 30.12.2020



CAPEX: Case Study (Self finance)

Rooftop Space
500 Sq.m

Solar System
60 kWp

SL#	Item	Price	Share
1	Solar PV Module	15,90,000/-	53%
2	Module Mounting Structures	2,40,000/-	8%
3	Solar Grid-tied Inverter	5,00,000/-	16.66%
4	Hybrid/Fuel Save controller	1,50,000/-	5%
5	Monitoring & Communication System	45,000/-	1.5%
6	Energy Meter (SCM + SGM + NEM)	50,000/-	1.67%
7	PVC Pipe and Combiner Box	50,000/-	1.67%
8	Earthing/Lightning protection, cable and maintenance free Chemical earthing	80,000/-	2.67%
9	Cables, Connectors and other parts	1,20,000/-	4%
10	Cleaning system: Walkway, Handheld unit, Pump etc.	30,000/-	1%
11	Safety Equipment for O&M: Rapid Shut-down Device, Circuit breaker, Surge protector etc.	65,000/-	2.16%
12	Transportation, Installation & Interconnection, Commissioning	50,000/-	1.67%
13	Design & Consultancy	20,000/-	0.66%
14	Legal Communication & Other costs	5,000/-	0.17%
15	Environmental Consultancy	5,000/-	0.17%
TOTAL PROJECT COST		30,00,000/-	100%

Cost/Wp
BDT 50



CAPEX: Case Study (Self finance)

Installation and Operational Expenditure		
1	Initial Investment Cost	30 Lac BDT
2	Inverter & Others replacement cost at 11 th year [25% of IIC]	4.1 Lac BDT [FV: 7.5 Lac]
3	Regular Maintenance [5% of Annual Return]	4.13 Lac BDT [38-40 Th.BDT/Yr]
4	Insurance Cost [0.5% of IIC, Every Year]	1.77 Lac BDT [15 Th.BDT/Yr]
5	Total Cost in Present Value	40 Lac BDT



CAPEX: Case Study (Self finance)

Standard Solar Electricity Generation @100% Module Efficiency: **1200 kWh/kWp/Year**

0.8% Annual Degradation

Y0	100%
Y1	98%
Y2	97.2%
Y3	96.4%
Y4	95.6%
~	~
Y20	82.8%

Yearly Electricity Generation Assumption

Y1= 71281 kWh, Y2= 70273 kWh, Y3= 69697 kWh, Y4= 69121 kWh,
Y5= 68545 kWh, Y6= 67969 kWh, Y7= 67393 kWh, Y8= 66817 kWh,
Y9= 66241 kWh, Y10= 65665 kWh, Y11= 65089 kWh, Y12= 64513 kWh,
Y13= 63937 kWh, Y14= 63361 kWh, Y15= 62785 kWh, Y16= 62209 kWh,
Y17= 61633 kWh, Y18= 61057 kWh, Y19= 60481 kWh, Y20= 59905 kWh

20Yr's Electricity Gen.: 13,07,978 kWh

Net Metering Calculator : <https://nemcalc.sreda.gov.bd>



CAPEX: Case Study (Self finance)

Consumer Class	BDT/kWh	+5% VAT	PV of 1 st Yr SE	Pay Back Period	Net Present Value (NPV)	IRR
LT Commercial Flat	10.30	10.82	7.3 Lac	6.42 Yr	52.86 Lac	23.22%
LT Commercial Offpeak	9.27	9.73	6.57 Lac	7.12 Yr	44.8 Lac	20.71%
LT Small Industrial Flat	8.53	8.96	6.04 Lac	7.8 Yr	39.01 Lac	18.89%
LT Small Industrial Offpeak	7.68	8.06	5.44 Lac	8.72 Yr	32.36 Lac	16.77%
MT Industrial Flat	8.55	8.98	6.06 Lac	7.78 Yr	39.17 Lac	18.98%
MT Industrial Offpeak	7.70	8.09	5.45 Lac	8.7 Yr	32.52 Lac	16.82%

Inflation Rate:

5.65%

Source: Bangladesh Bank & BBS

Co-benefit:

CO₂ Reduction

618.67 ton

Levelized Cost of Solar Electricity

LCOE: 3.10 BDT/kWh



CAPEX: Case Study (With Loan)

IDCOL *	
Facility	Term Loan
Loan amount	80% of the project cost
Tenor	10 years
Grace period	1st year (principal only)
Repayment	Quarterly
Interest rate	6% (Fixed for Loan Tenor)

Case Study Project	
Initial Investment cost	30 Lac BDT
Loan amount (80%)	24 Lac BDT
Yearly Principal Payment (LA/9)	2,66,667₹

Year	Rem. Principal	Principal Pay	Interest	PVF	Interest in PV
Y1	24,00,000₹	0₹	1,44,000₹	0.943396	1,35,849₹
Y2	24,00,000₹	2,66,667₹	1,44,000₹	0.889996	1,28,159₹
Y3	21,33,333₹	2,66,667₹	1,28,000₹	0.839619	1,07,471₹
Y4	18,66,667₹	2,66,667₹	1,12,000₹	0.792094	88,714₹
Y5	16,00,000₹	2,66,667₹	96,000₹	0.747258	71,737₹
Y6	13,33,333₹	2,66,667₹	80,000₹	0.704961	56,397₹
Y7	10,66,667₹	2,66,667₹	64,000₹	0.665057	42,564₹
Y8	8,00,000₹	2,66,667₹	48,000₹	0.627412	30,116₹
Y9	5,33,333₹	2,66,667₹	32,000₹	0.591898	18,941₹
Y10	2,66,667₹	2,66,667₹	16,000₹	0.558395	8,934₹
END	0₹	24,00,000₹	8,64,000₹		6,88,882₹

Cost of Money **6.89 Lac BDT [23% of the initial investment]**

LCOE **3.60 BDT/kWh** Payback period will increased by at least **1 yr.**

* IDCOL: Infrastructure Development Company Ltd.



OPEX Model (LT Flat)

Hassle free solution for the consumer

Tariff of the consumer : **8.53 BDT/kWh**. Let, Negotiated OPEX tariff : **7.50 BDT/kWh**

1st year: Electricity Generation **71,281 kWh**

Benefit of Industry Owner	Benefit of OPEX Investor
$71,281 \times (8.53 - 7.50)$ = 73,419 BDT	$71,281 \times (7.50 - 3.60)$ = 2,77,996 BDT

20 years: Electricity Generation **13,07,978 kWh**

Benefit of Industry Owner	Benefit of OPEX Investor
$13,07,978 \times (8.53 - 7.50)$ = 13,47,217 BDT	$13,07,978 \times (7.50 - 3.60)$ = 51,01,114 BDT

No risk for industry owners, only paying for the generated electricity



System Installation Procedure

SL	Stage	Max. Time duration	Responsibility
1	Application submission to the respective distribution utility office	5 working days	Utility
2	Application Evaluation [Building, Connection point and Distribution System]	10 working days	Utility
3	System Installation	8 months	Consumer
4	System Evaluation	10 working days	Utility



Equipment Standards

SL	Product Name	Name of Standards
1.	Solar Module/Panel	BDS IEC 61215 BDS IEC 61730-1:2019 BDS IEC 61730-2:2019
2.	Inverter (All) <i>[Off-grid and Grid-tied, both]</i>	BDS IEC 62109-1 BDS IEC 62109-2
3.	Grid-tied Inverter	BDS IEC 61727:2020 BDS IEC 62116:2020



Installation Standards

- ✓ DIN VDE0100 (General Requirements), VDE 0100-712 and VDE-AR-N 4105 (Special Requirements), IEC 62446 (Inspection) and VDE 0100-520 (Cable and Power line selection)

SL	Product Name	Name of Standards
1.	DIN VDE 0100-100 (IEC 60364-1:2005)	Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions
2.	DIN VDE 0100-712 (IEC 60364-7-712:2017)	Low voltage electrical installations - Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems
3.	VDE-AR-N 4105 (Anwendungsregel:2018-11)	Generators connected to the low-voltage distribution network Technical requirements for the connection to and parallel operation with low-voltage distribution networks
4.	IEC 62446-1:2016 (AMD1:2018)	Photovoltaic (PV) systems - Requirements for testing, documentation and maintenance - Part 1: Grid connected systems - Documentation, commissioning tests and inspection
5.	DIN VDE 0100-520 (IEC 60364-5-52:2009)	Low-voltage electrical installations - Part 5-52: Selection and erection of electrical equipment - Wiring systems



Mounting Structure

Sloped roof



A standard rail system

Dual tilt system

Flat roof



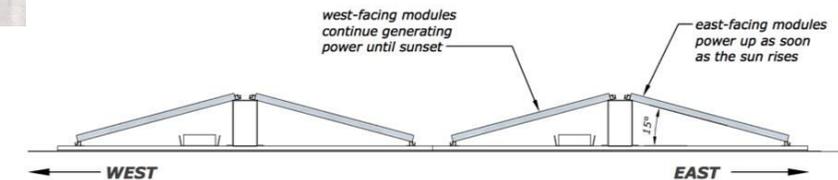
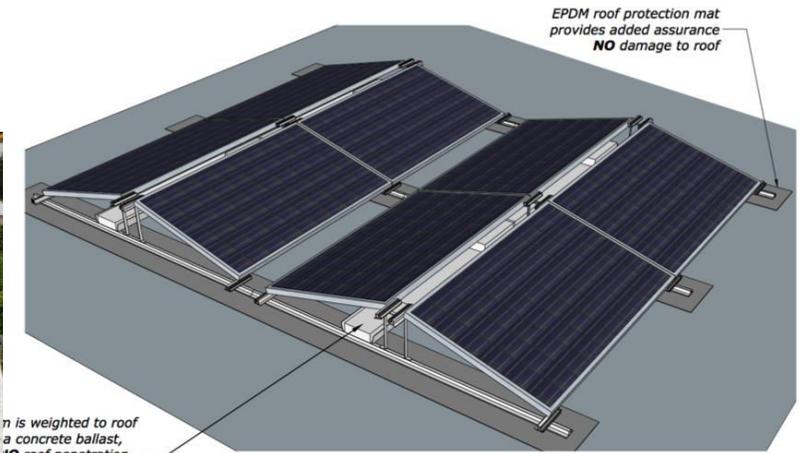
Rail-based mounting system



Ballasted mounting system



Anchored mounting system



Inverter Type Selection



Micro Inverter



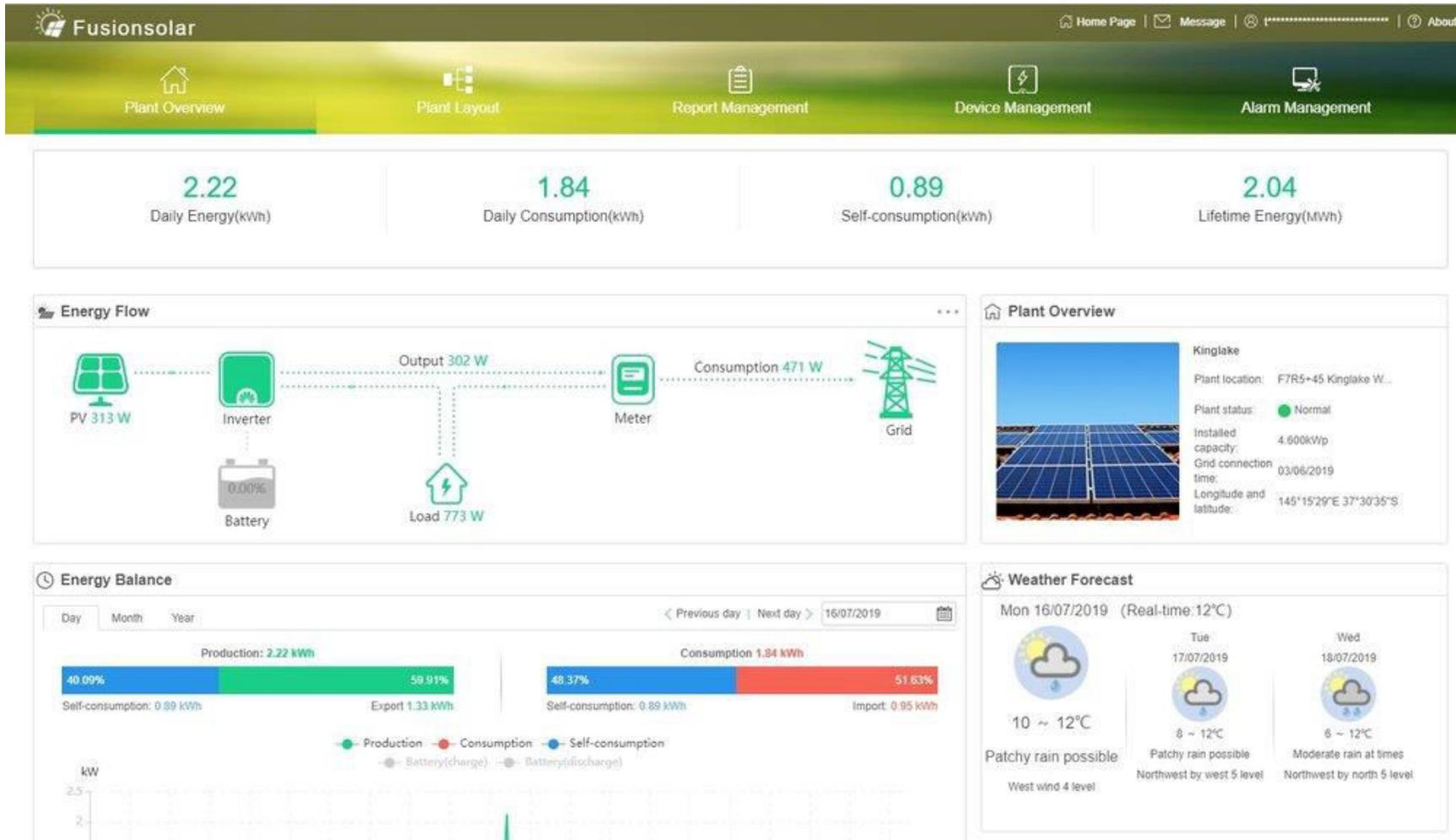
String Inverter



Central Inverter



Inverter Monitoring Platform



Available through: Web browser and app



Rooftop solar PV system offers an **attractive option** for future development.

Thank you

[To download the copy of the Net metering Guideline,
visit: <https://solar.sreda.gov.bd>]



CO2 Emission Calculation

From: BPDB Annual Report 2018-19, Fuel Type Wise Electricity Generation

Fuel Type	Generation (GWh)	Gen kWh	Emission Rate (kg/kWh)	kg	
Hydro	725	725000000	0.024	17400000	
Natural Gas	48,306	48306000000	0.49	23669940000	
Furnace Oil	11,426	11426000000	0.65	7426900000	
Diesel	2,022	2022000000	0.6	1213200000	
Coal	1,230	1230000000	0.82	1008600000	
Solar	39	39000000	0.048	1872000	
Power Import	6,786	6786000000	0	0	AVERAGE (kg/kWh)
Total	70,534	70,534,000,000		33,337,912,000	0.473

