



SARI/Energy Lighting Initiative

Load Research & Implementation of an EE Lighting Program (Based on a case study: Sri Lanka)

M S Jayalath

Sr. Energy Consultant & LEED AP

EnergySolve International (Pvt) Ltd

(A member of the United States Green Building Council)

165/55, Sri Saddharmarama Mw, Nawala Road, Colombo 5, Sri Lanka

Tel: (94) 11 4926153 Fax: (94) 11 2368942

info@energysolveinternational.com

www.energysolveinternational.com

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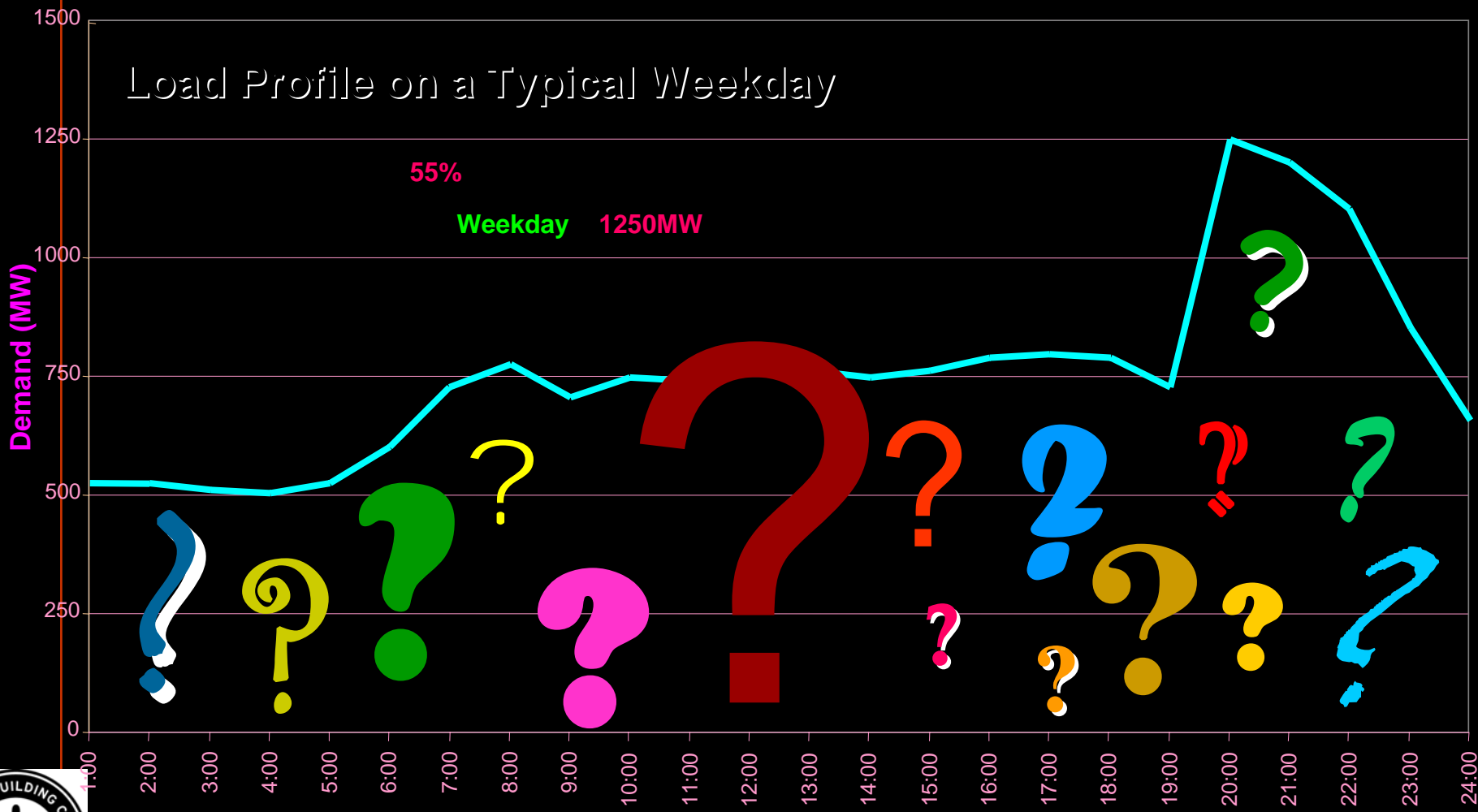
Presentation layout

- **Need for Load Research?**
- **Key Objectives of Load Research**
- **Approach to Load Research**
- **Key Results**
- **Need for load curve improvements**
- **EE initiative**
- **Load curve impact**





WHY Load Research?

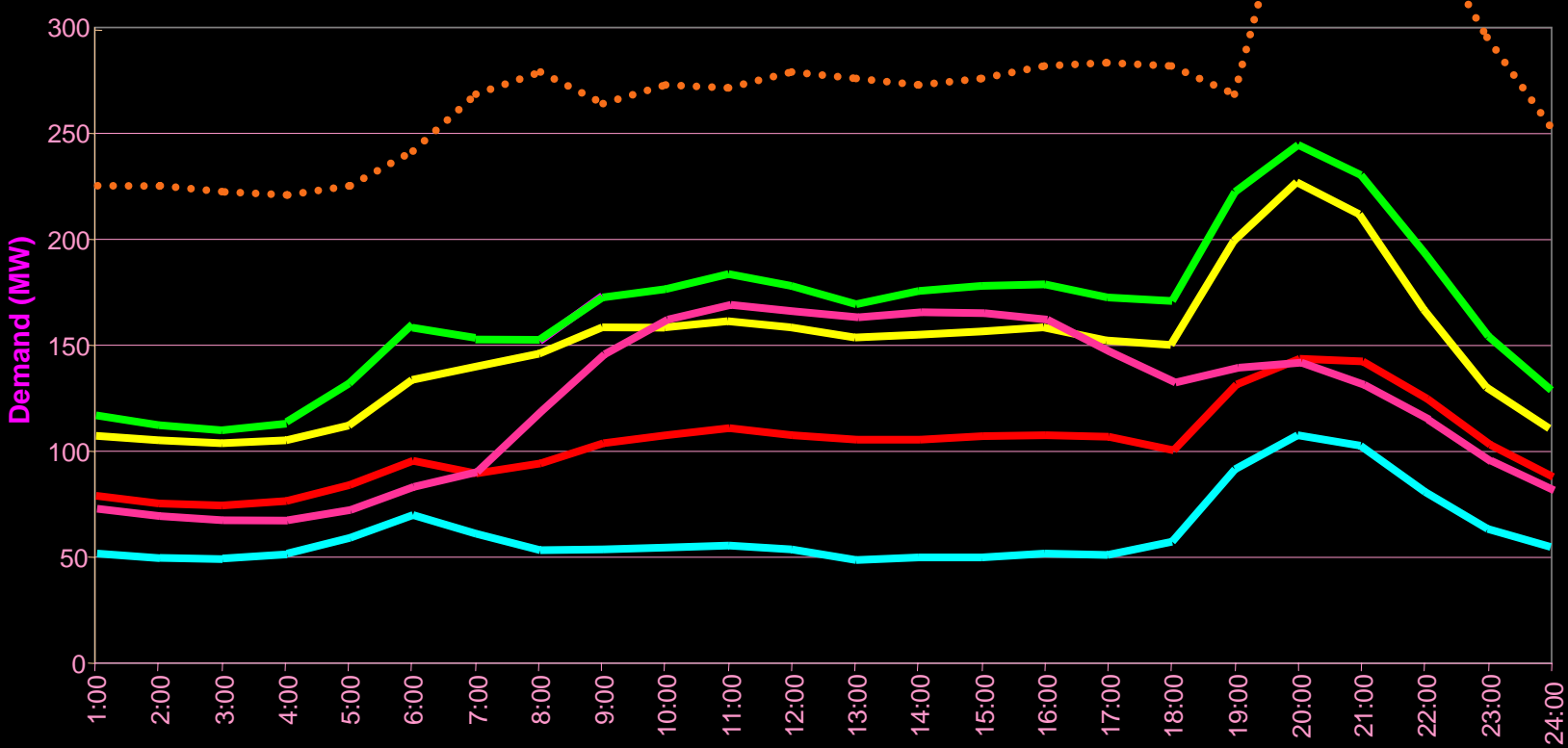




Load Shape Differences

Typical Weekday

- System
- Region 1
- Region 2
- Region 3
- Region 4
- Colombo





Key Objectives of Load Research

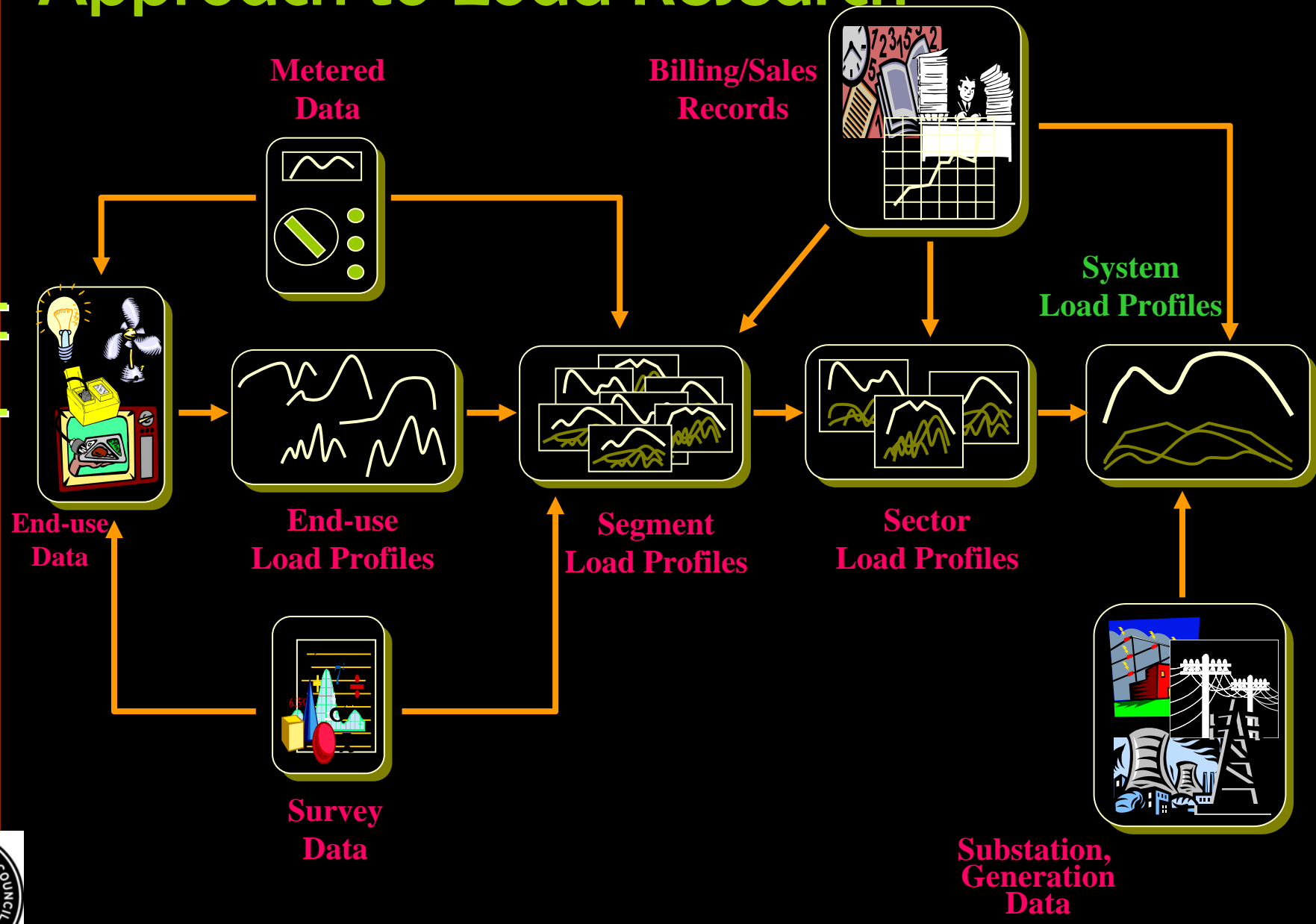
- Provide detailed breakdown and analysis of system load profile
- Provide input to;
 - DSM program design
 - Tariff restructure
 - Future expansion: generation, transmission & distribution planning
 - System Energy and Load Management
 - Load dispatch criteria





Approach to Load Research

Bottom-up Approach





Components of Load Research

- Customer surveys
- Analysis of survey data & development of end-use load profiles
- Metering of consumption patterns of identified customers
- Analysis of metered data and development of segment load profiles
- Analysis of annual sales data & development of sector load profiles
- Collection and analysis of GSS/feeder data
- Collection & analysis of Primary substation data
- Development of system load profiles





System Profile: Region 1

Average Load Factor = 57%

Average Peak on a Typical Peakday = 252MW

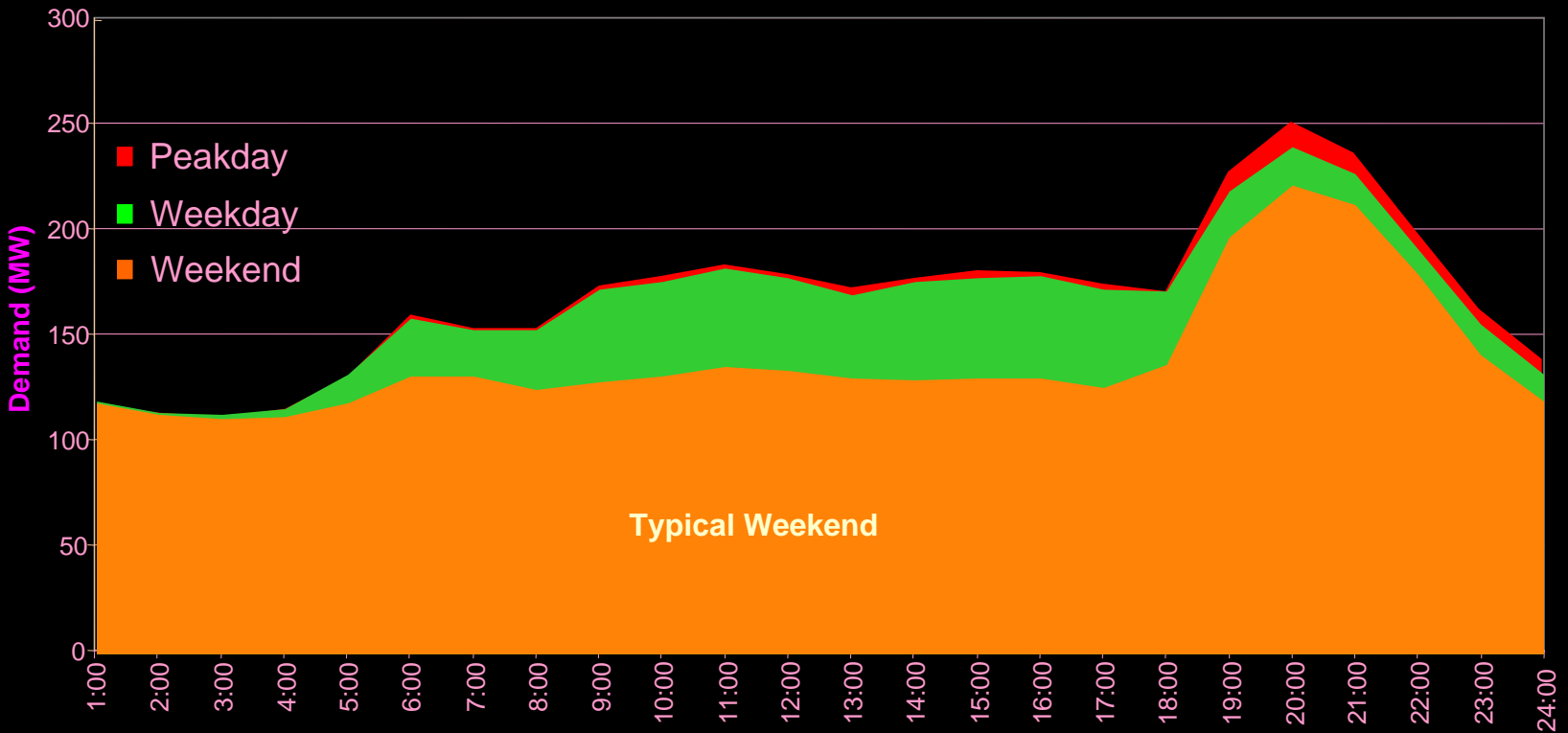
Contribution to System Peak = 19%

Average Peak on a Typical Weekday = 241MW

Contribution to System Energy = 24%

Average Peak on a Typical Weekend = 223MW

Typical Average Shapes

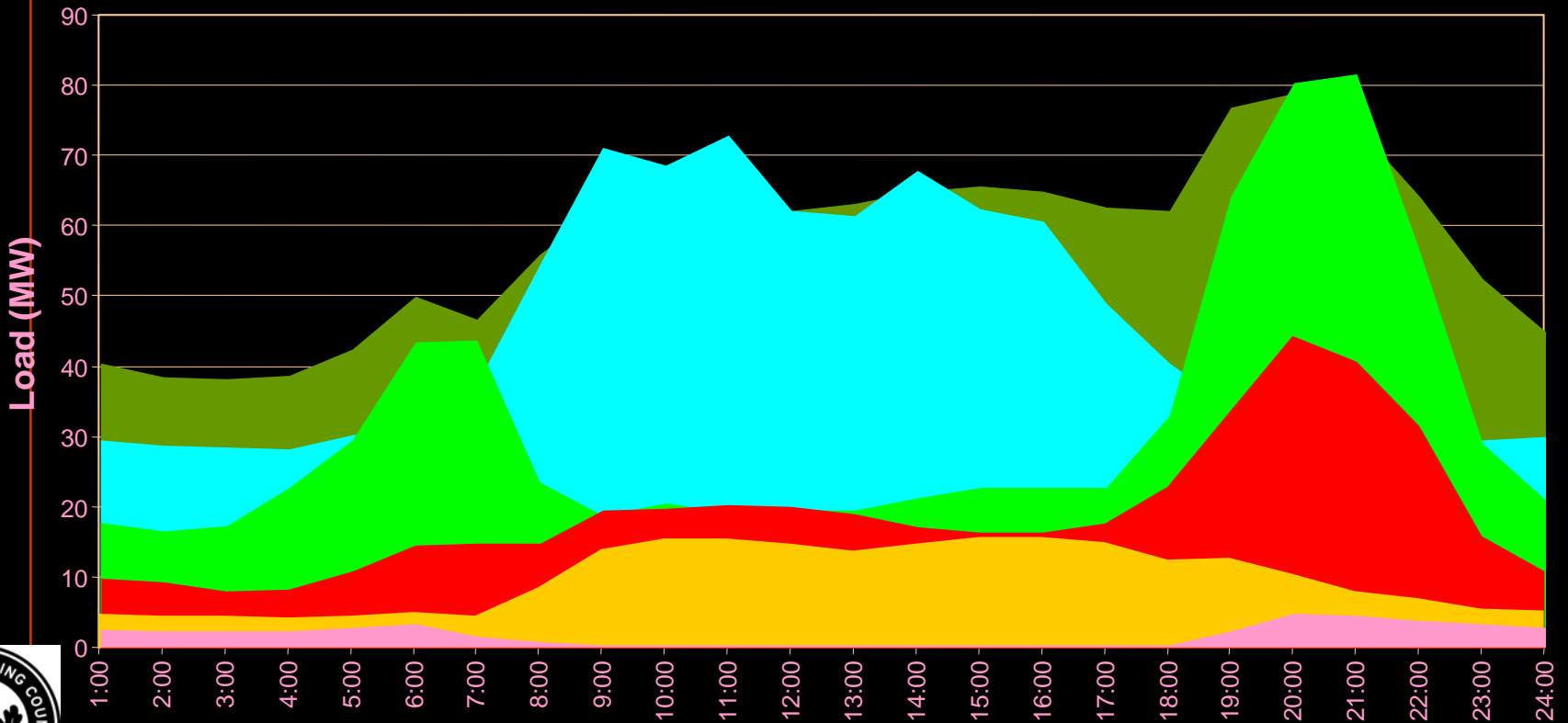




System by Sector (Typical Weekday)

Region 1

LECO – Distribution utility	39.6%	34.6%	32.7%
Bulk	29.2%	25.5%	12.6%
Domestic	23.6%	20.5%	33.3%
Small C&I (Inc. Religious)	06.5%	05.7%	04.3%
Losses*	N/A	11.6%	15.1%
Street Lighting	01.1%	01.0%	02.0%

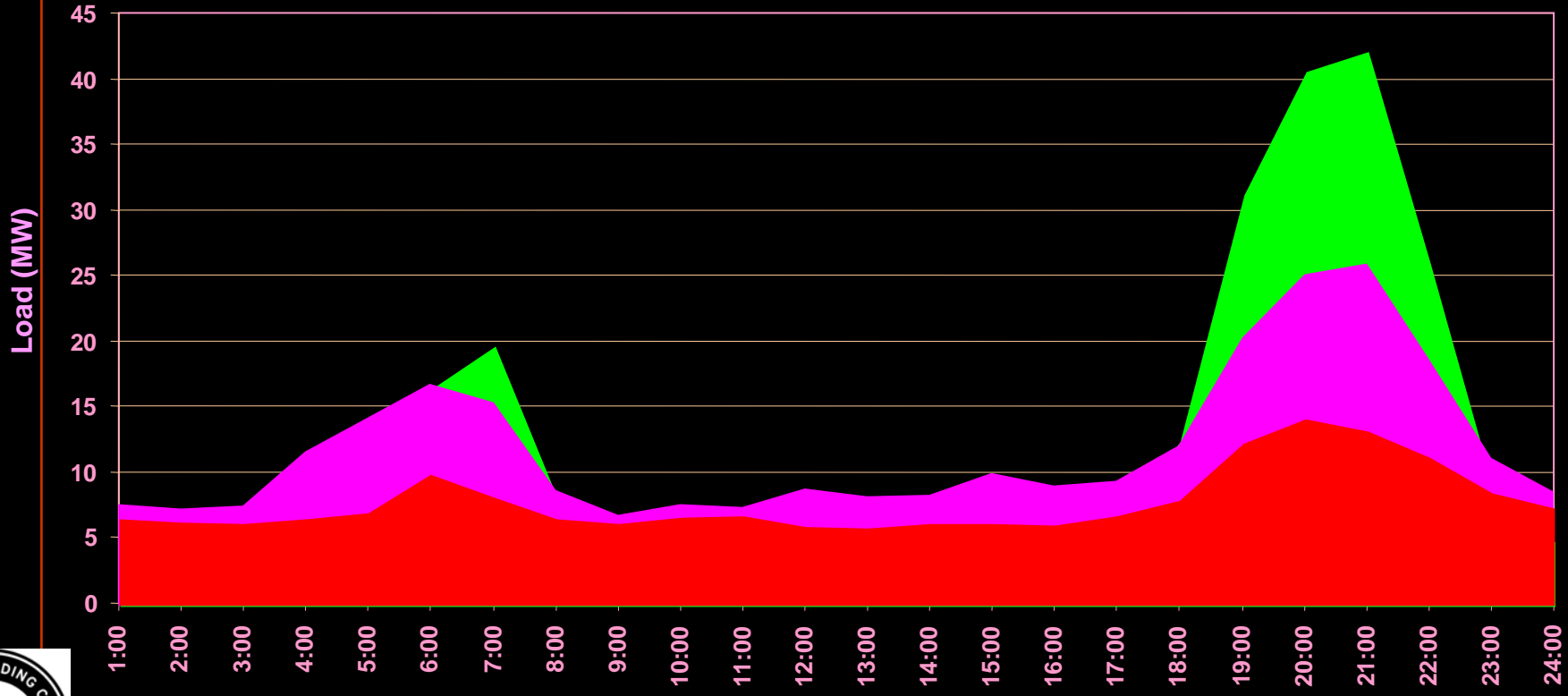




Domestic by Segment

Region 1

■ Domestic Small (1-90 kWh/month)	63.6	37.4	17.2	50.9
■ Domestic Medium (90-180 kWh/month)	25.2	38.2	10.6	31.4
■ Domestic High (>180 kWh/month)	07.0	24.4	06.0	17.7

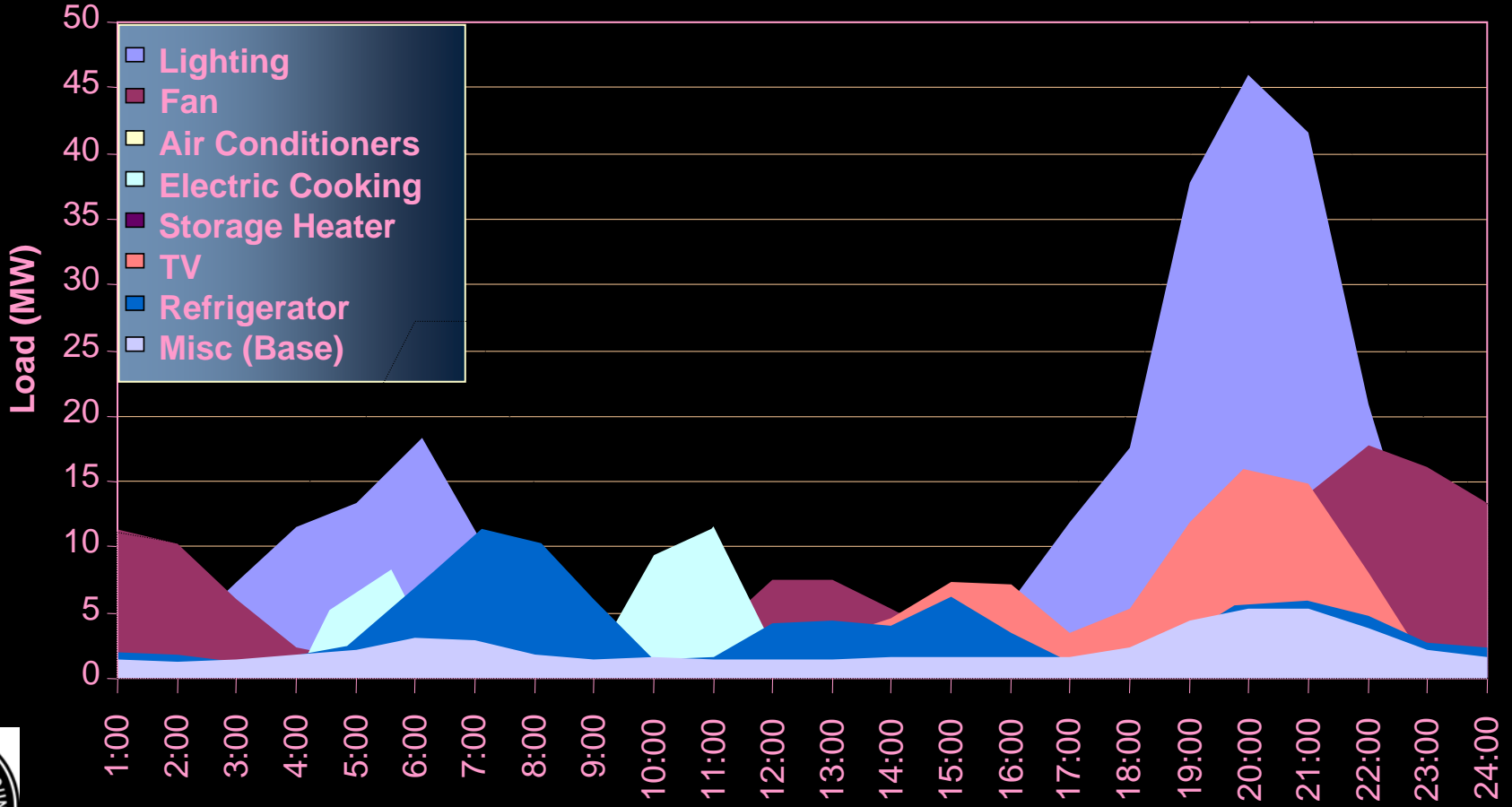




Domestic Whole by End-Use

Region 1

Lighting	35.9%	07.1%	19.4%
TV	15.1%	03.0%	06.5%
Refrigeration	14.1%	02.8%	01.7%
Fan (Ventilation)	17.3%	03.4%	03.7%

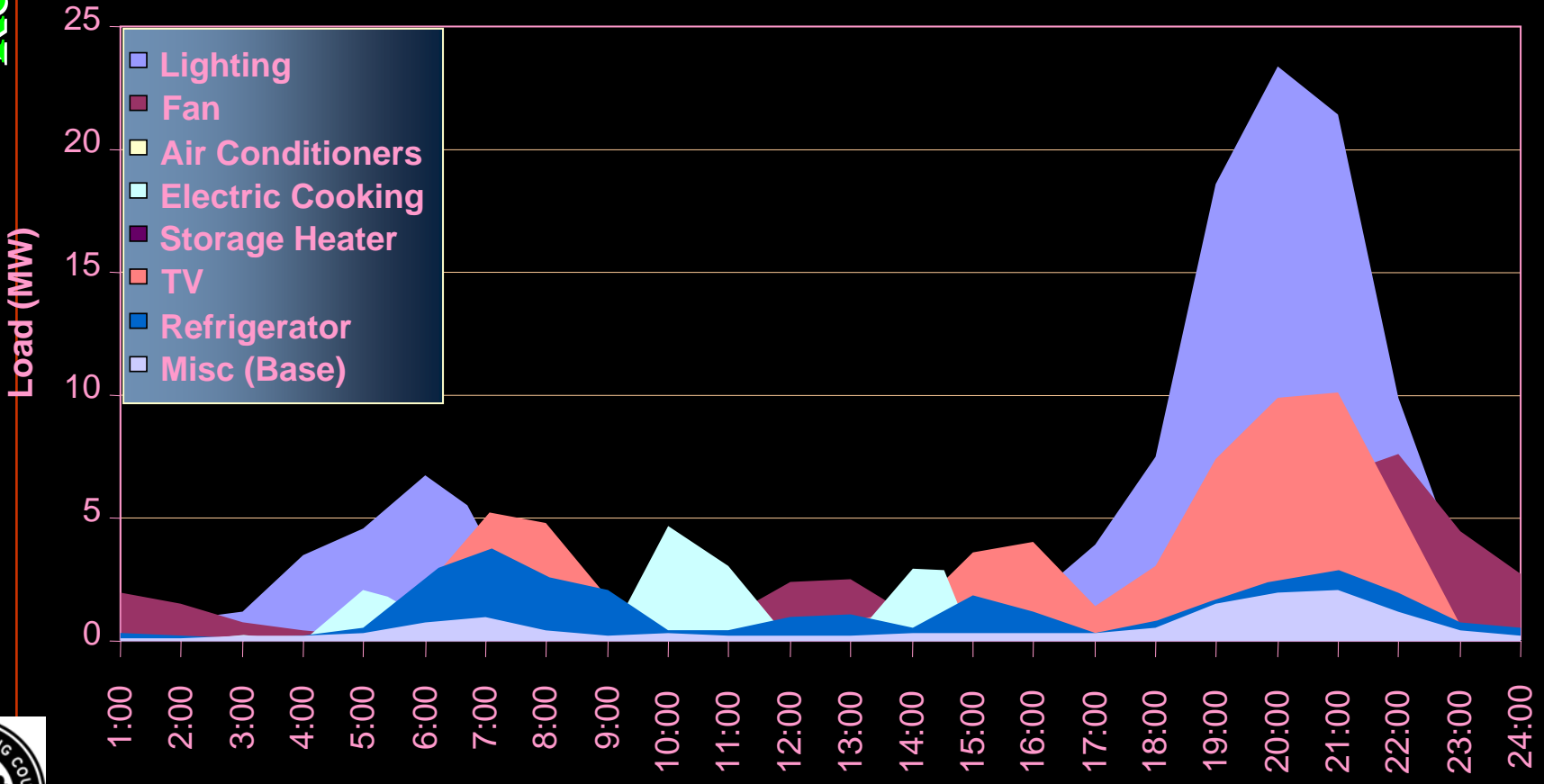




Domestic Small by End-use

Region 1

Lighting	41.0%	15.6%	29.2%
TV	23.6%	09.0%	12.4%
Refrigeration	12.1%	04.6%	02.0%
Fan (Ventilation)	13.6%	05.2%	05.0%

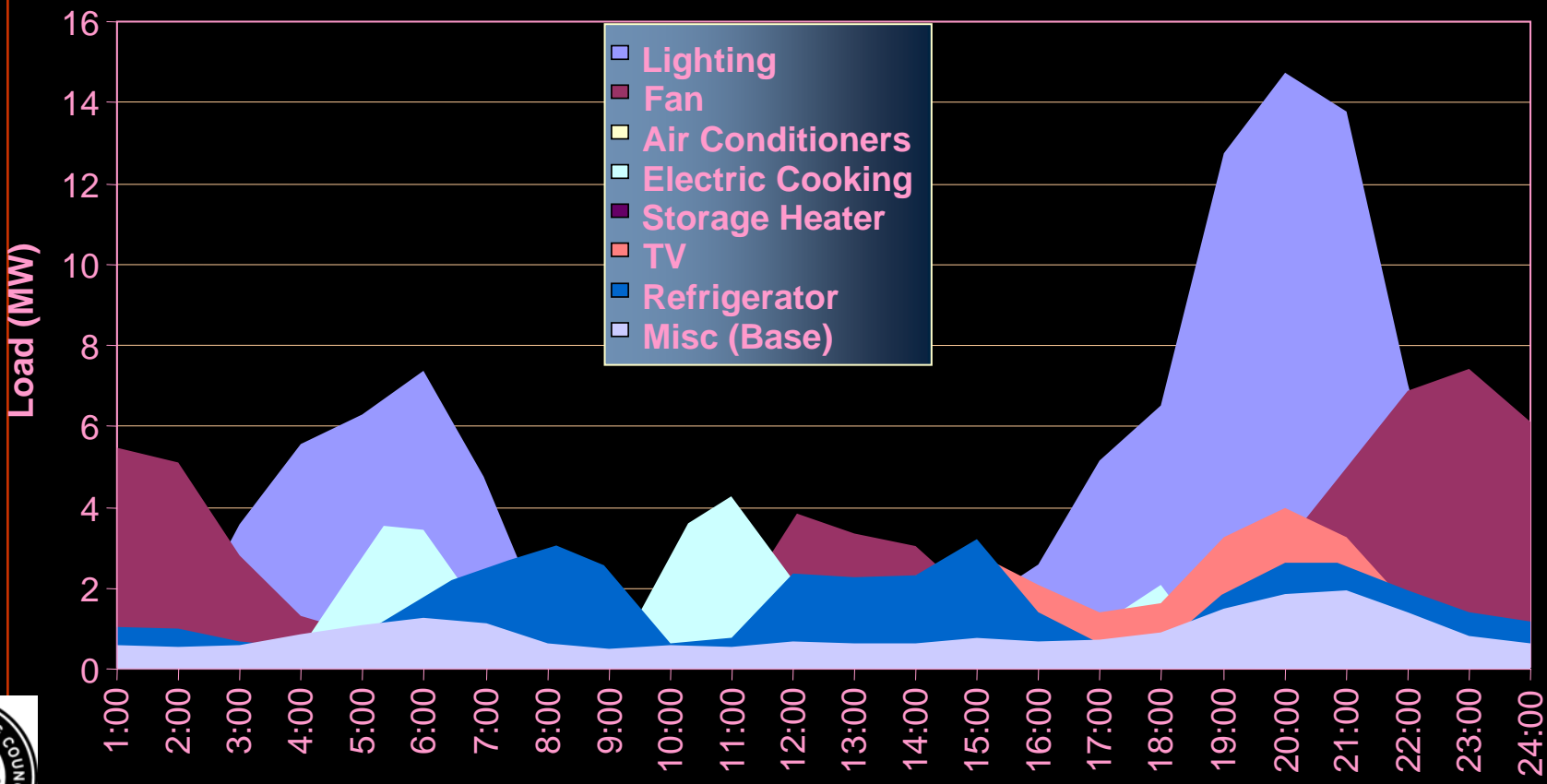




Domestic Medium by End-Use

Region 1

Lighting	34.4%	12.9%	18.4%
TV	11.1%	04.2%	05.0%
Refrigeration	17.0%	06.4%	02.0%
Fan (Ventilation)	20.0%	07.5%	03.8%

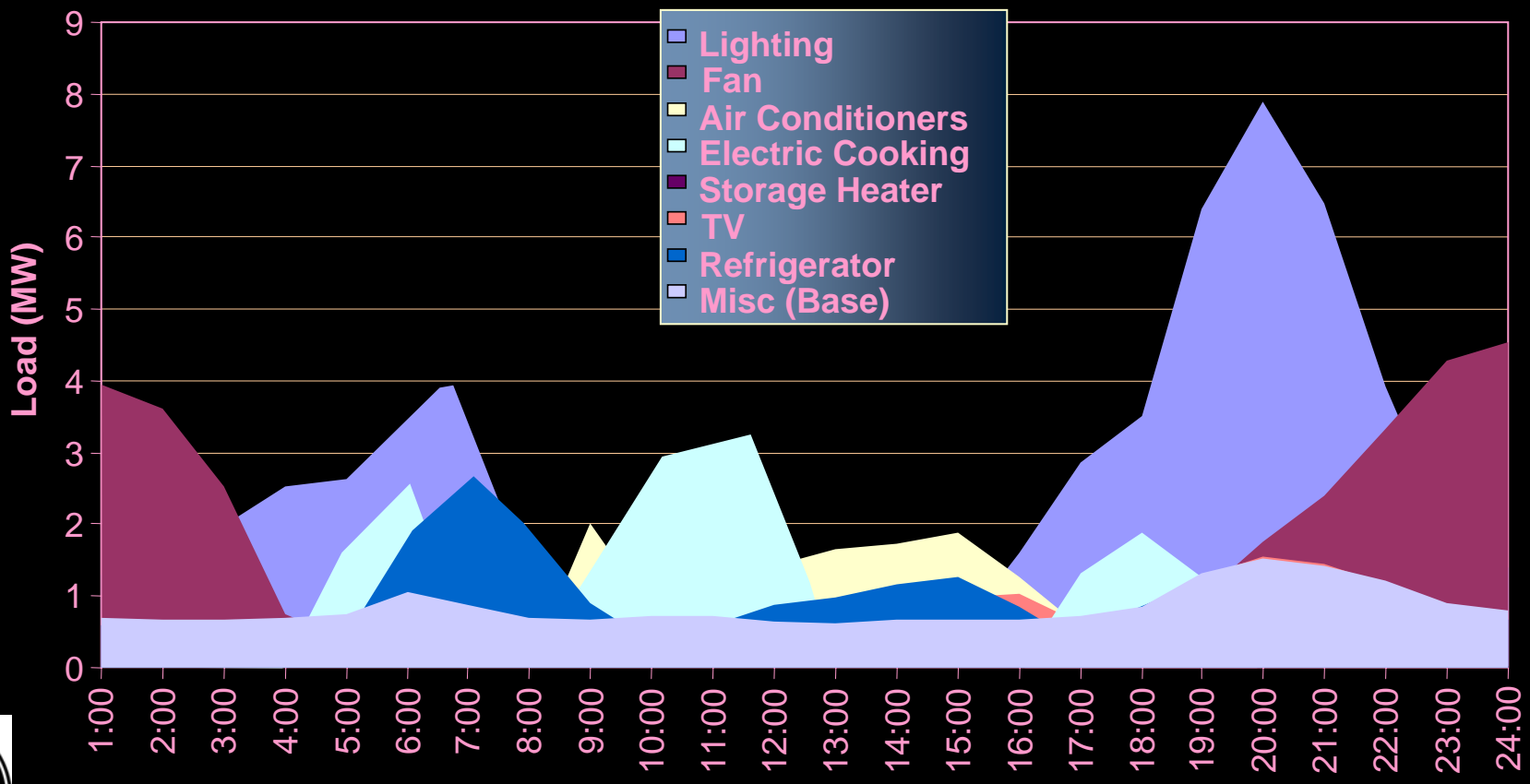




Domestic Large by End-use

Region 1

Lighting	30.4%	07.4%	09.8%
TV	08.1%	02.0%	01.9%
Refrigeration	12.8%	03.1%	01.1%
Fan (Ventilation)	18.9%	04.6%	02.2%

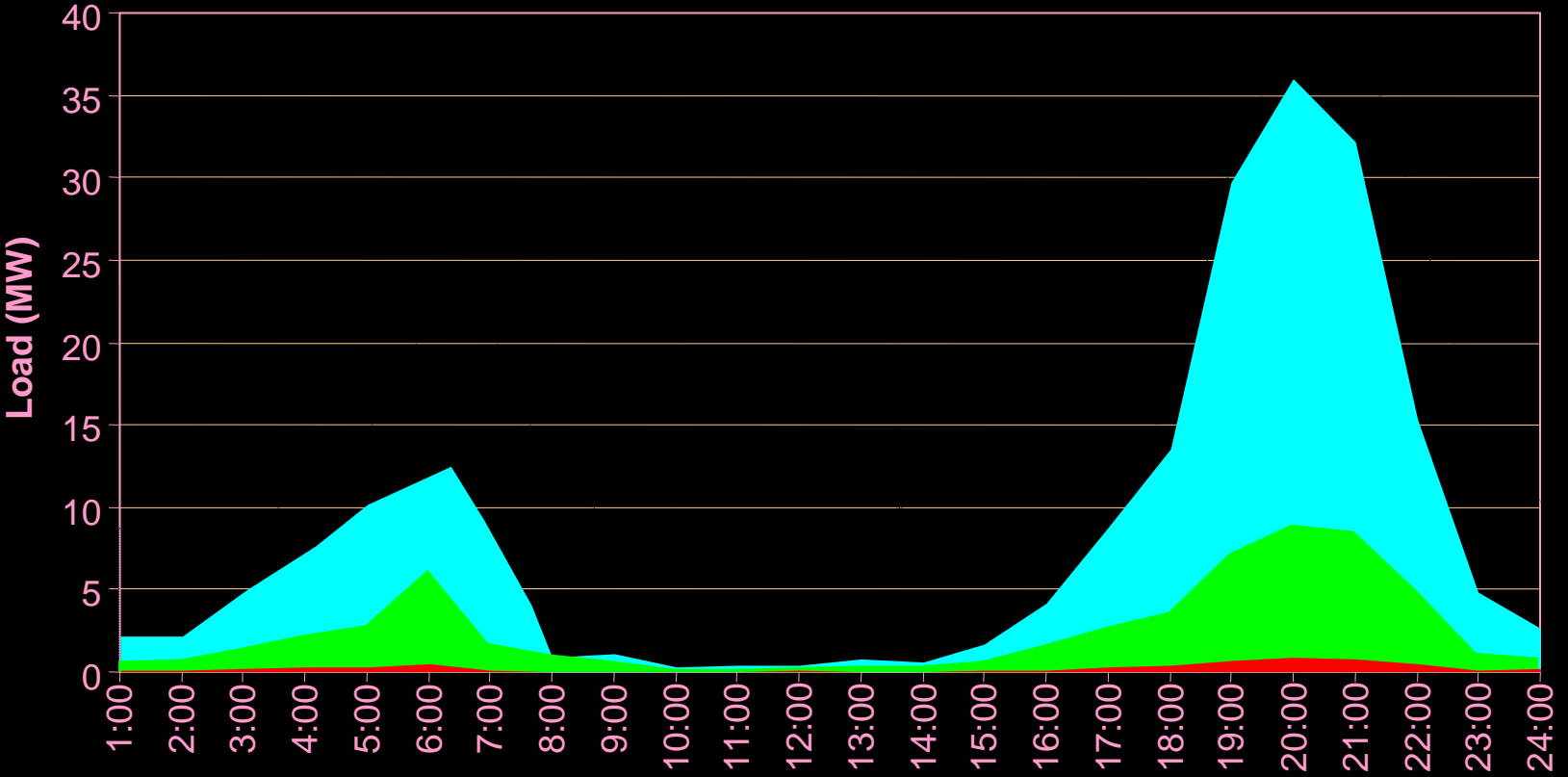




Domestic Lighting by Technology

Region 1

■ Incandescent	27.0%	05.3%	15.2%
■ Fluorescent	08.2%	01.7%	03.8%
■ CFL	00.8%	00.2%	00.4%





System Profile: Colombo

Average Load Factor = 56%

Average Peak on a Typical Peakday = 186 MW (at 11:00 a.m)

Contribution to System Peak = 11%

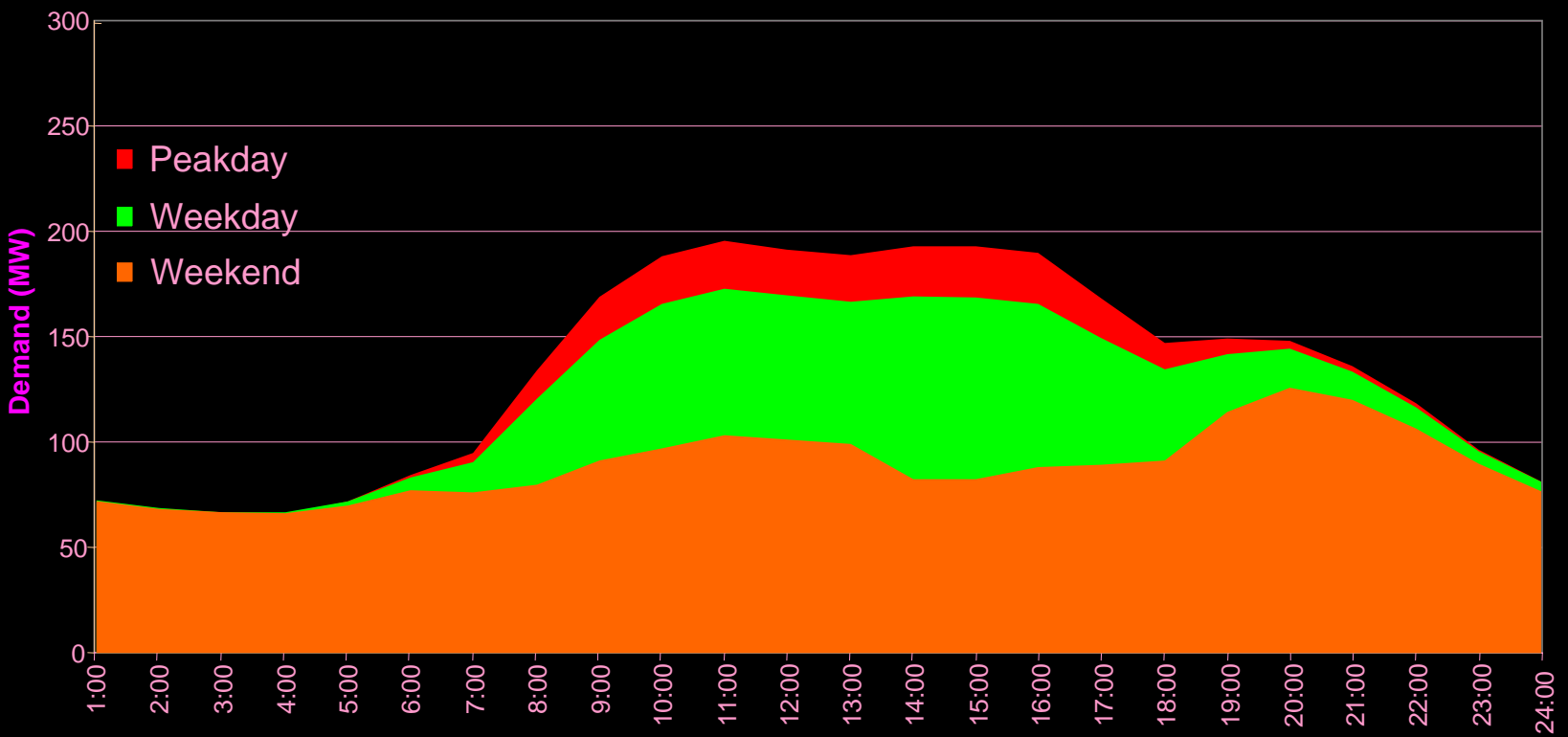
Average Peak on a Typical Weekday = 166 MW (at 11:00 a.m)

Contribution to System Energy = 16%

Average Peak on a Typical Weekend = 120 MW (at 08:00 p.m)

Contribution to Day Peak = 21%

Typical Average Shapes

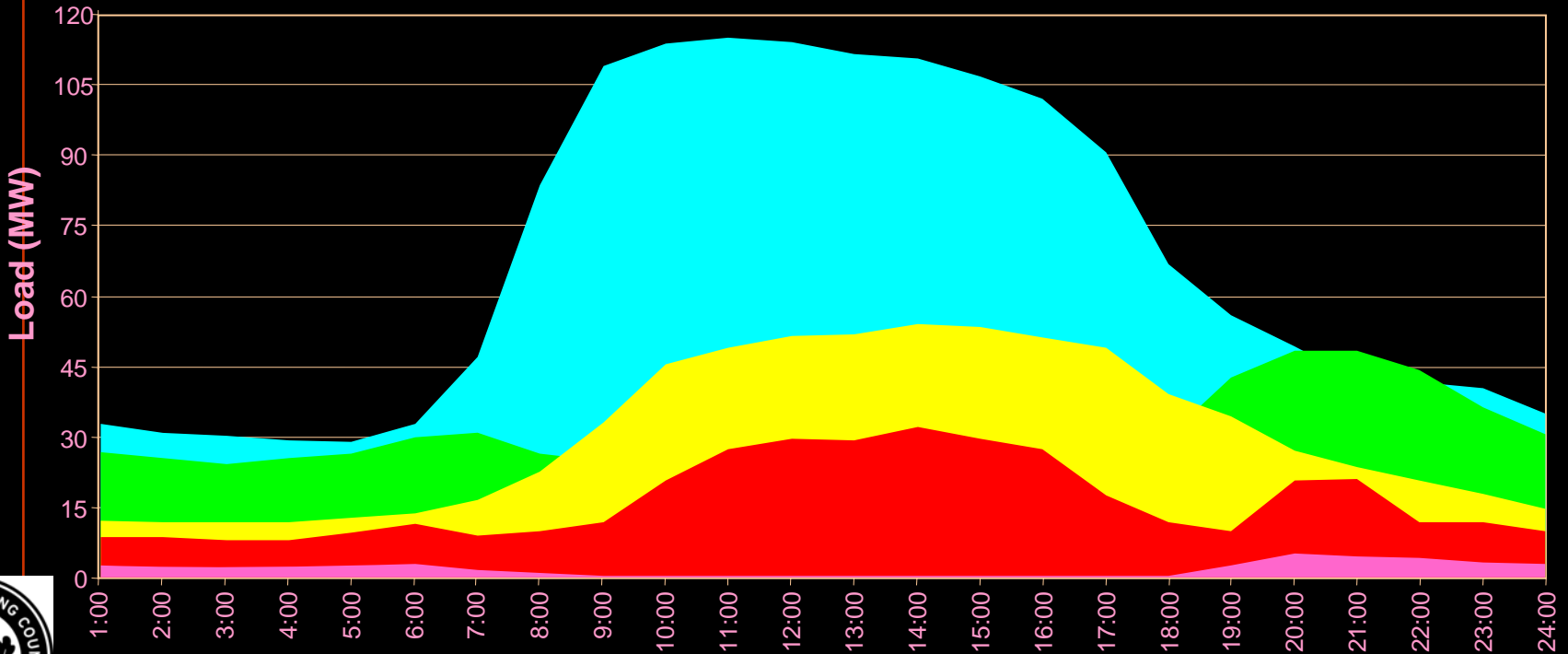




System by Sector

Colombo

■ Bulk	50.1%	42.5%	54.5% (at 11:00 a.m.)
■ Domestic	25.8%	21.9%	27.3% (at 08:00 p.m.)
■ Small C&I (Inc. Religious)	22.6%	19.2%	23.2% (at 11:00 a.m.)
■ Losses*	N/A	11.1%	13.2% (at 11:00 a.m.)
■ Street Lighting	01.4%	01.2%	00.1% (at 11:00 a.m.)





DSM Options Suitability by Region

	Top 3					General			
	CFL	HFL	Domestic Refrigerator	Efficient Fans	HE Motors & VSD	Commercial A/C	EEB Code	TOU Tariffs	Tariff Restructure
Region 1	✓		✓		✓			✓	✓
Region 2	✓				✓	✓		✓	✓
Region 3	✓	✓			✓			✓	✓
Region 4	✓		✓		✓		✓	✓	✓
Colombo	✓	✓		✓		✓	✓		✓





EE Lighting Project: Goals

Short-term:

- ***Reduce night peak***
- ***Reduce impact from power crisis in 1996.***
- ***Reduce high thermal costs to the utility.***

Long-term:

- ***Reduce long-term demand increase.***
- ***Improve load factor.***
- ***Reduce investment on infrastructure.***
- ***Improve reliability & reduce system loss.***

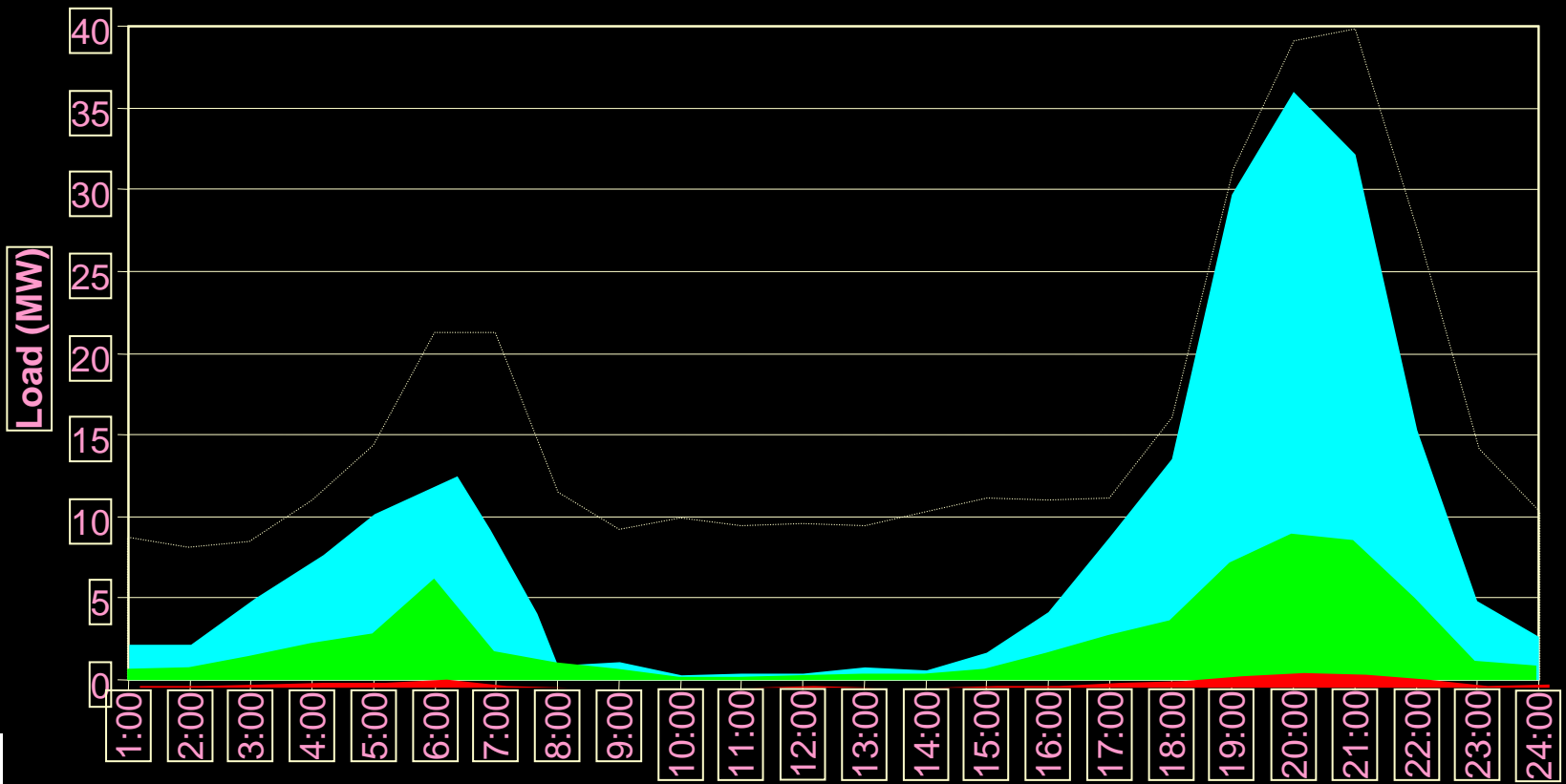




Retail Sector Lighting by Technology

(Typical Weekday)

- Incandescent 27.0%
- Fluorescent 08.2%
- CFL 00.8%





EE Lighting Project

Technologies Available/Selected

- *Compact fluorescent lamps with integral ballasts: electronic & magnetic ballast.*
- *Compact fluorescent lamps, modular type.*
- *Linear fluorescent lamps.*

Technology selected:

CFL with integral ballasts: electronic & magnetic





CFL program: *Main features*

Financing:

- *An interest free loan to purchase lamps from utility.*
- *Government grants an import duty wavier.*
- *Loan repayment in 12 installments with electricity bills.*

Other features:

- *Marketed by listed suppliers in a competitive environment.*
- *Quality standards for lamps.*
- *Compulsory 2 year warranty.*
- *Independent testing arranged for supplier registration.*





EE lighting program:

Total benefits: end 2000

- *Number of lamps purchased = 261,000*
- *Number of lamps purchased by free riders due to increased publicity = 1,235,000*
- *Savings:*

Demand Saving = 74 MW

Energy Saving = 110 GWh/annum

- *Cost effectiveness:*

Reduced supply costs = Rs. 650 Million/annum

Customer bill savings = Rs. 456 Million/annum

Program costs = Rs. 18 Million/annum

Net Benefit to the Utility = Rs. 176 Mil/annum



EE lighting program

Further improvements

- ***Further reduction in prices.***
- ***Lamp + control gear standards & labeling.***
- ***Lamp + control gear testing facility to be established.***
- ***New programs to grant lamps with new connections.***
- ***A concession for customers in defined poverty levels.***



***YOU COULD CONTRIBUTE
TO LIGHT UP
THEIR LIVES***

At a reduced price
for a limited period only

**Use Compact Fluorescent
Lamps**
and conserve electricity

Lasts
Longer than
ordinary bulbs
Saves 80%
Electricity

The advantages of CEB Loan Scheme:

- No initial payment.
- Cost recovery in 12 equal monthly installments with Electricity bills.
- No interest payment.
- Two year guarantee on CFLs.

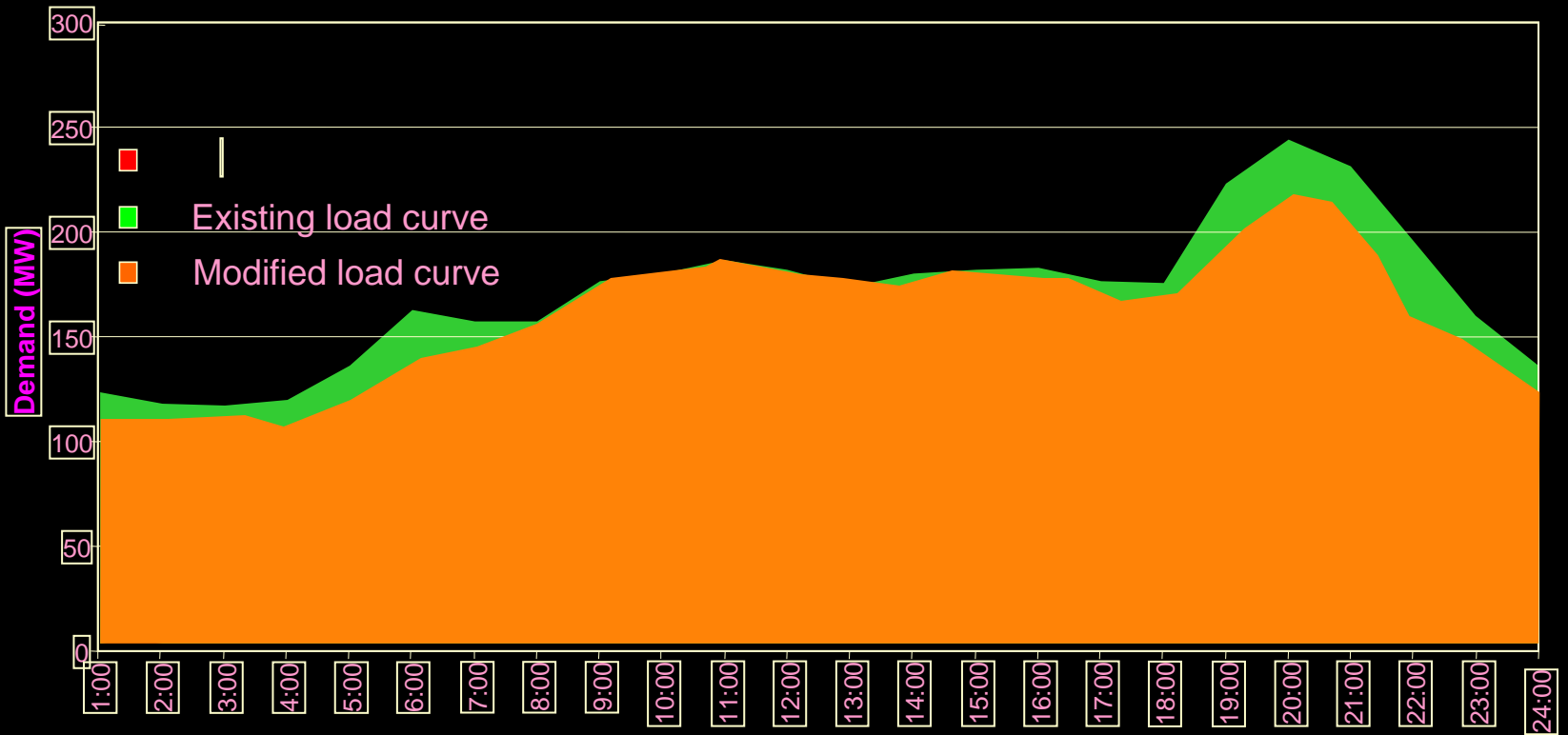
CEB offers a loan scheme to Domestic & Religious purpose customers to purchase energy saving compact fluorescent lamps (CFLs).

Loan agreement forms are available at our Area Offices

A message from the Demand-Side Management Branch
CEYLON ELECTRICITY BOARD
"A contributor to the Global Energy Saving Drive"



Improved System Profile

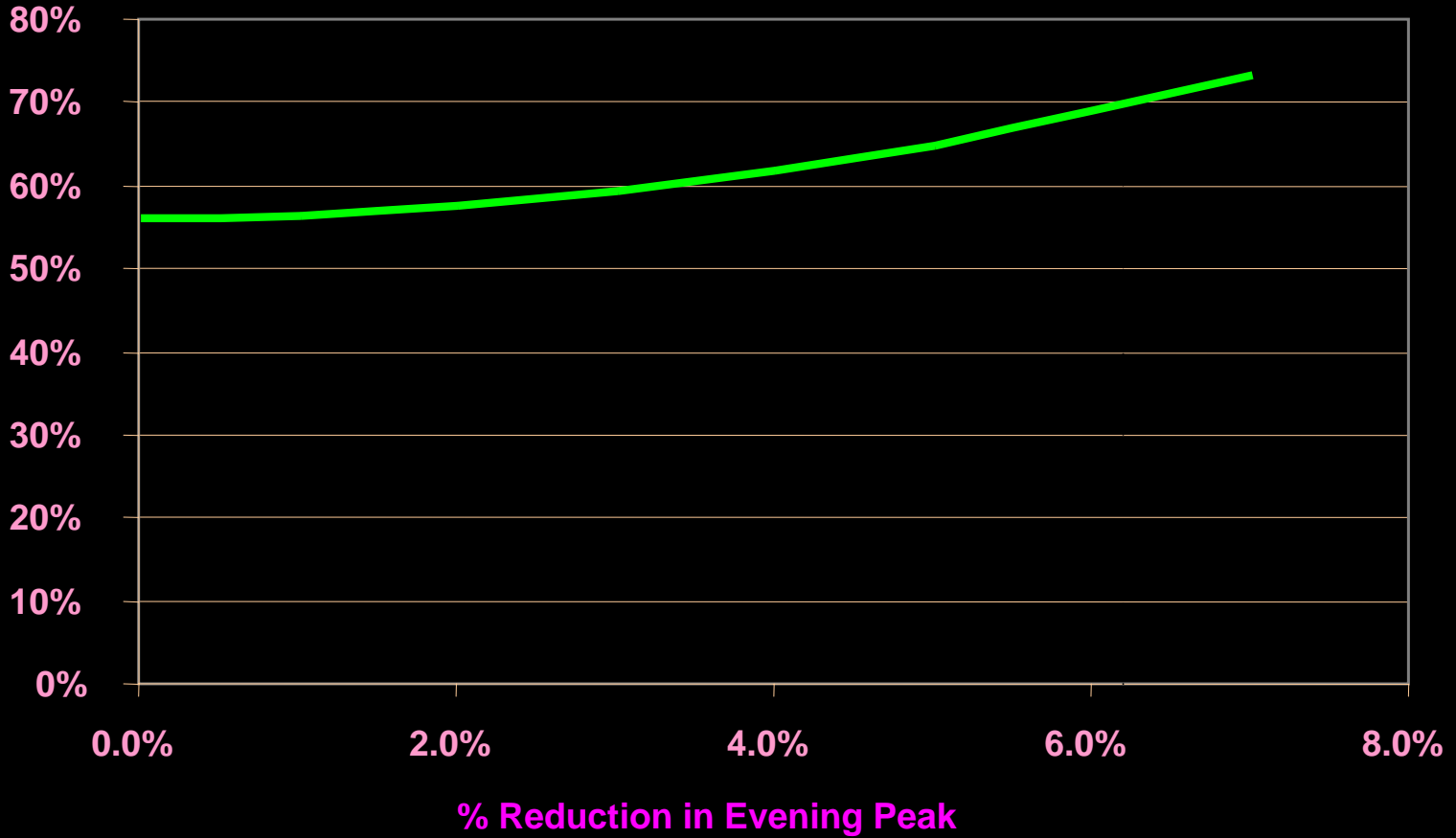




Implication of DSM on Load Factor

Regional 1

Load Factor





Green Building (LEED) Certification and Lighting



Daylighting

+

With LEDs!!!!!!!!!!



Case studies....



BRANDIX CASUALWEAR, SEEDUWA



CKT APPAREL, AGALAWATHTHA



VTA SCHOOL, AHANGAMA



VTA SCHOOL, SAMANTHURAI



References

- CEB load research – 1996/8
- CEB DSM initiatives - 2000





END

An EnergySolve Presentation

www.energysolveinternational.com

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