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Governments Working Together to Save Energy.

Potential Impact of Lighting and Appliance Efficiency Standards on Peak Demand: The Case of Indonesia

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CLEAN ENERGY MINISTERIAL
Accelerating Transition to Clean Energy Technologies

ipeec International Partnership for Energy Efficiency Cooperation

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Super-efficient Equipment and Appliance Deployment

- SEAD Initiative – Largest Initiative of Clean Energy Ministerial - *"Governments working together to Save Energy"*
- SEAD raises the level of ambition by
  - Expanding the scope of existing efficiency programs *through international collaboration and peer networking*
  - Extracting maximum savings from existing efficiency programs *through technical capacity building, product prioritization and non-regulatory program development*
  - Establishing and strengthening programs in economies new to efficiency programs *through potential studies, technical support and coordination with development agencies*
- SEAD members = AUS, BRA, CAN, CHL, EU, GER, IND, IDN, JPN, KOR, MEX, RUS, SWE, UAE, USA, UK, ZAF
- SEAD is strategic, practical, hands-on and flexible – seizing opportunities and having meaningful impacts

Find out more from Gabby Dreyfus here at EEDAL

Peak Load Analysis

- Problem Statement – While focus of S&L programs is generally energy savings, reduction in generation capacity is a critical benefit in countries with rapidly growing electricity demand.
- Current Tool - SEAD uses LBNL's BUENAS model for end use electricity demand projections and efficiency opportunities.

therefore

- SEAD commissioned LBNL to combine BUENAS electricity demand model with end use load shapes to model peak load growth and mitigation potential, with Indonesia as case of study.
- Results indicate opportunity to avoid construction of up to 50 power plants by 2030 saving billions of USD in capital costs.
- This year's collaboration with ESDM expected to improve and expand upon this analysis

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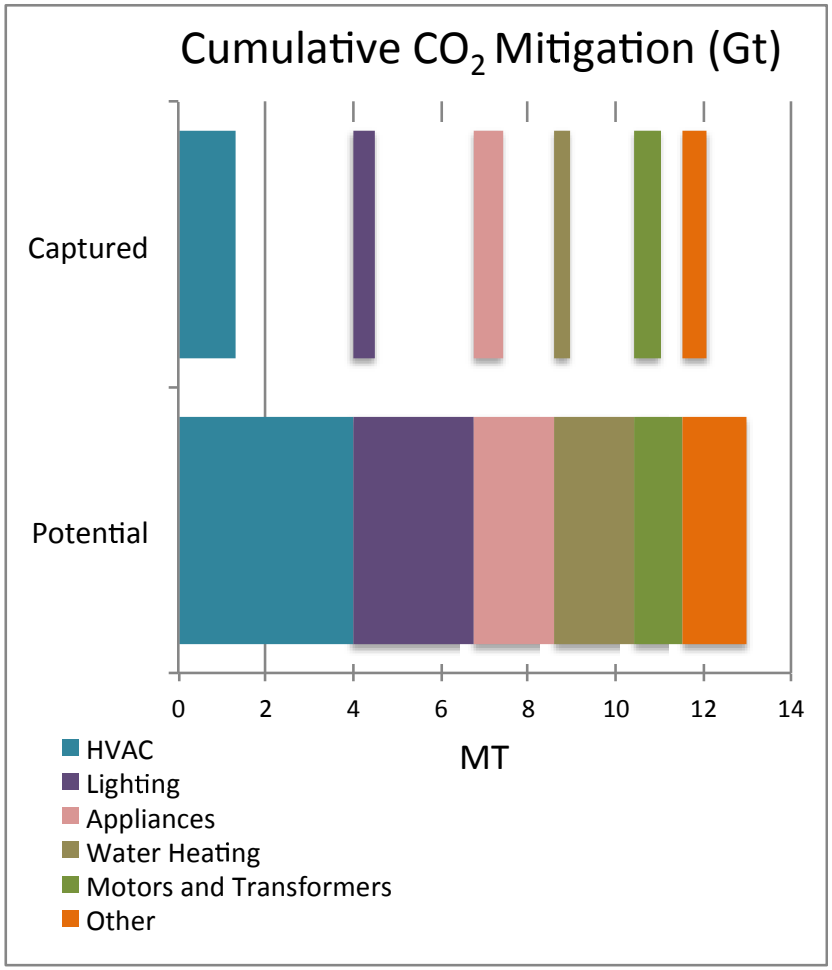
Bottom-Up Energy Analysis System (BUENAS)

- Purpose and Scope
  - Global projection of appliance energy demand and greenhouse gas emissions through 2030
  - By Country - Currently covers 13 major economies that account for ~80% of global energy demand
  - Covers 15 building and industrial appliances and equipment ~450 equipment / country combinations
- Policy Scenarios
  - Cost-Effective Potential – Integrates BUENAS and Global Energy Efficiency Cost (GEEC) Database developed at LBNL to model *economic potential*'
  - Best-Available Technology – Most Aggressive scenario represents *technical potential*
  - Recent Achievements Scenario – Tracks accomplishments in previous years *(China not yet included)*
- Recent Applications
  - Analytical Framework for Super-Efficient Appliance Deployment (SEAD)
  - Input to IEA *World Energy Outlook*
  - Featured in IIASA Global Energy Assessment, IPCC 5th Assessment



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Why Peak Load Impacts?

Energy Savings Impacts

- Reduces fuel imports = energy security (not an issue for Indonesia)
- Saves consumers money = economic growth
- Reduces GHG emissions and air pollution

Peak Load Impacts

- Reduces shortages
  - Energy Security
  - Economic Security
  - Political Stability
- Avoids massive capital requirements of power plant construction, freeing resources for other development needs

How effective are efficiency programs (EES&L) at addressing peak load?

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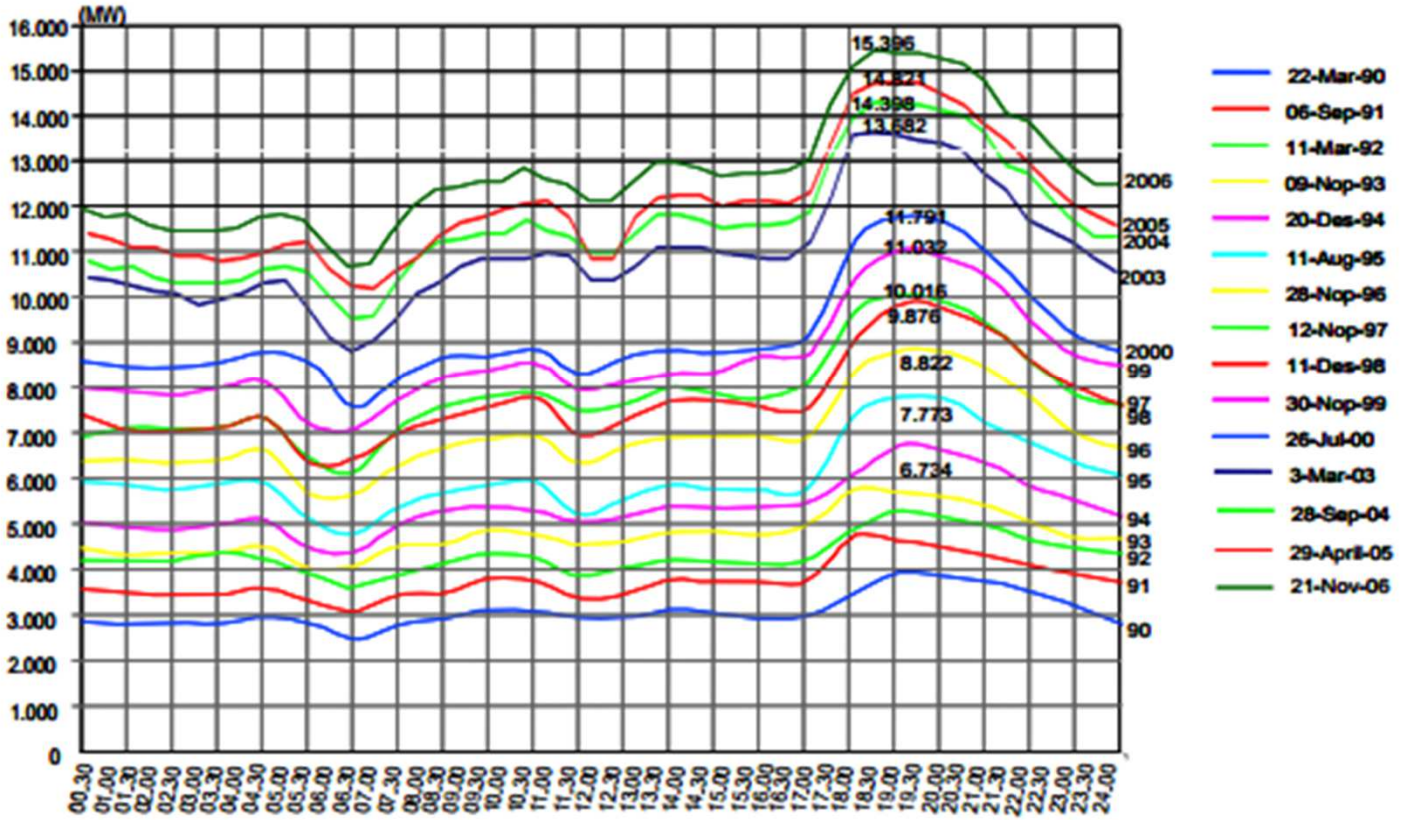
Indonesia Case Study

- Indonesia joined SEAD in 2014 after this project already initiated
- Features of electricity demand
  - High expected electricity demand growth between now and 2030
  - Much of this growth expected in a small number of residential end uses
  - Uniform hot climate decreases need for regional / seasonal modeling

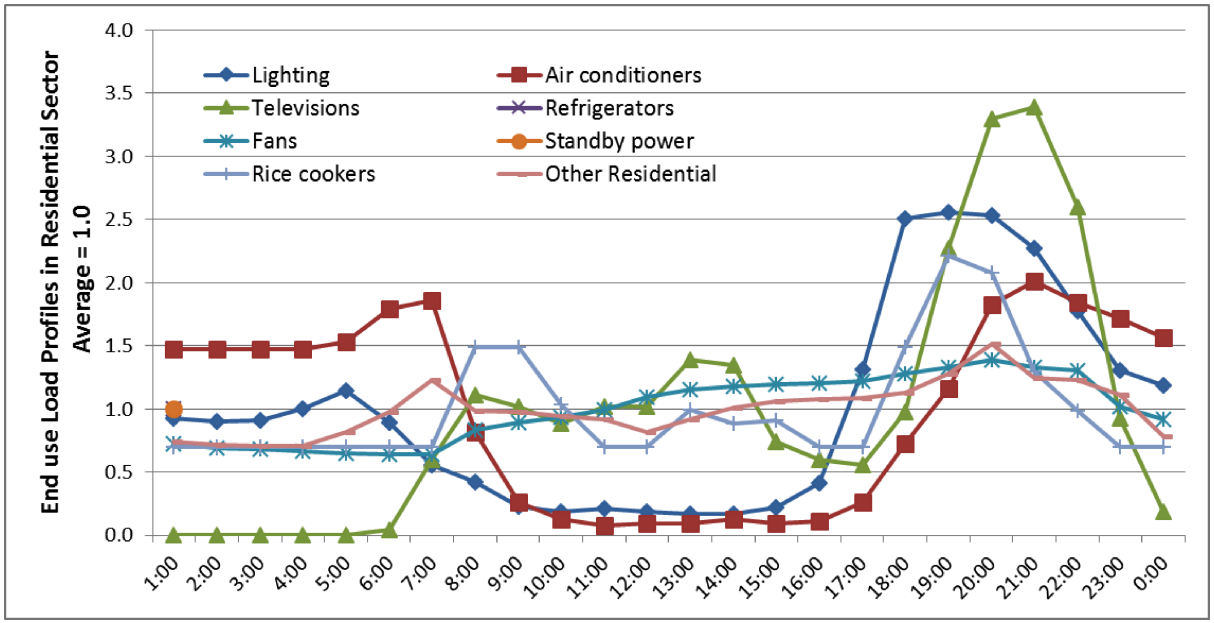
Indonesia Electricity Load Curve

Figure 2 Java-Bali Daily Load Curves on Annual Peak Day (1990 – 2006)



Java-Bali system represents ~73% of Indonesia electricity demand.

Load shapes the key Additional Parameter to BUENAS



Load shapes show variation of load over average demand.

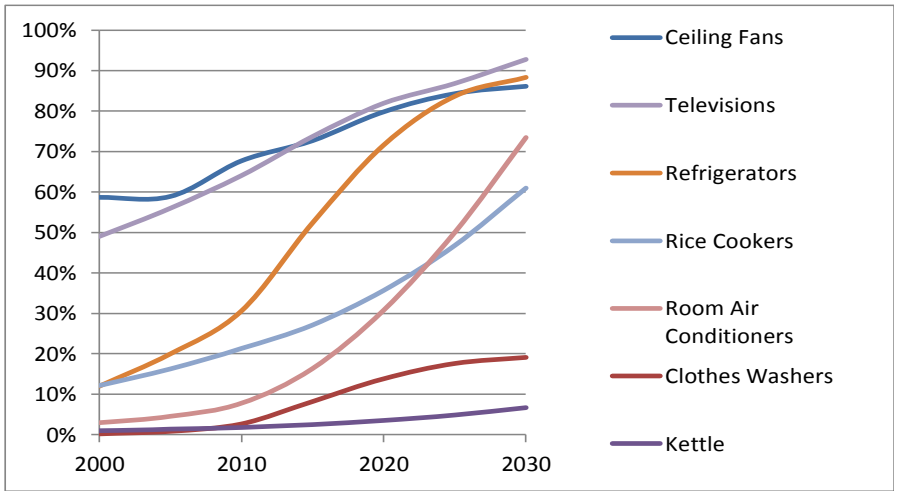
Source:

1) *Lighting: Tanoto et al., 2012*
2) *Air conditioning: http://www.terrapass.com/science-technology/demand-response/*
3) *Televisions: Garg et al., 2010*
4) *Refrigeration: Reliance Energy, 2010.*
5) *Fan: Kubota et al., 2009*
6) *Rice cooker & Other residential: Shimoda et al., 2003.*

Average annual unit energy consumption (UEC) from BUENAS distributed over the day according to representative end use load curves. Models hourly variation / assumes no seasonal or regional variation.

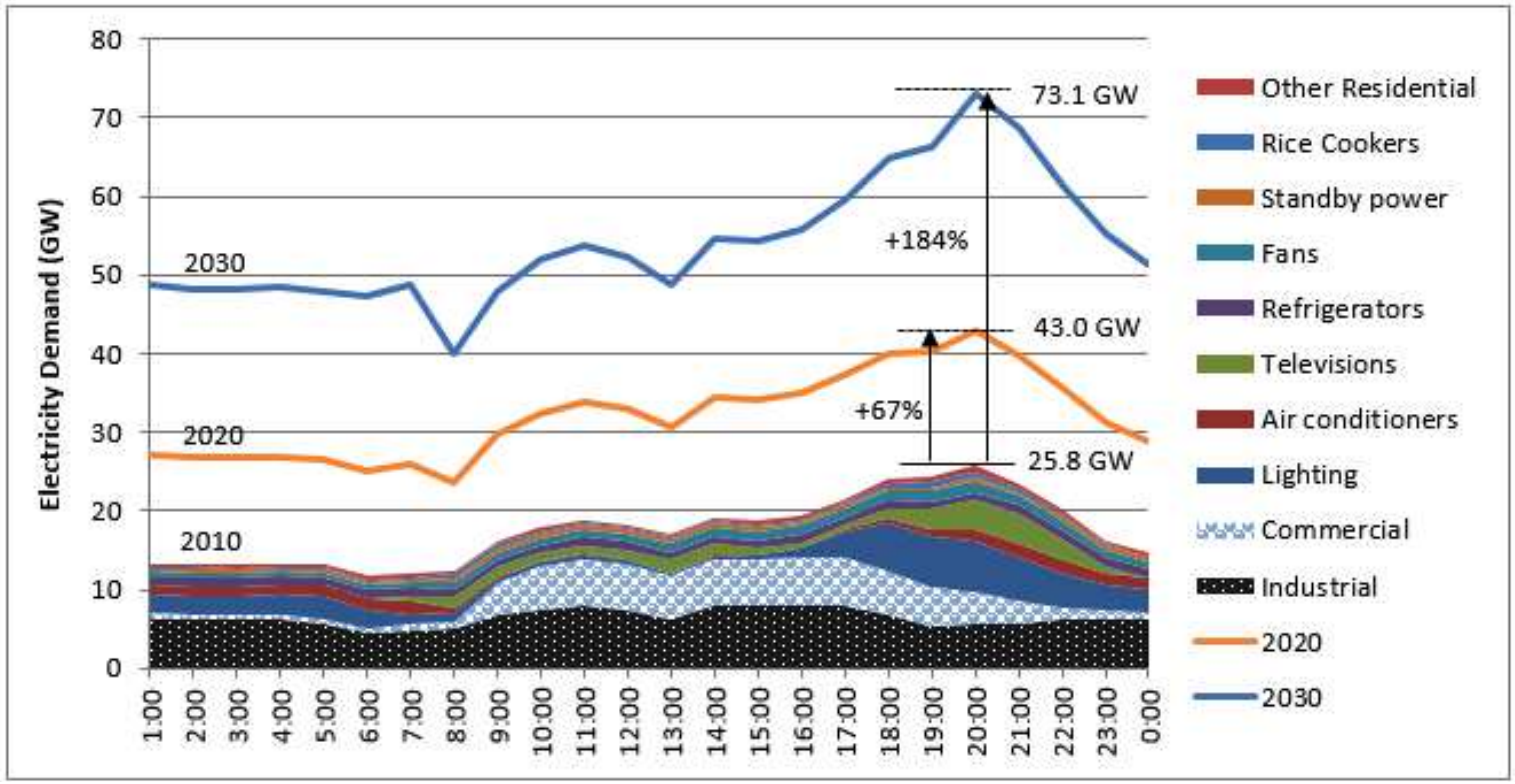
BUENAS Energy Demand Projection

- Unit Energy Consumption
  - Efficiency *x* Capacity *x* Hours of Use
  - From Other Country Data
- Ownership Rates
  - From Sales Data
  - From Econometric Modeling



	2010 UEC	2020 UEC	2030 UEC
Air Conditioners	1,416		
Refrigerator	574	618	650
Television			
LCD	233	53	53
CRT	192	176	176
Plasma	305	224	224
Fan	224		
Clothes Washer	150		
Rice Cooker	242		
Kettle	216		

Business as Usual Forecast



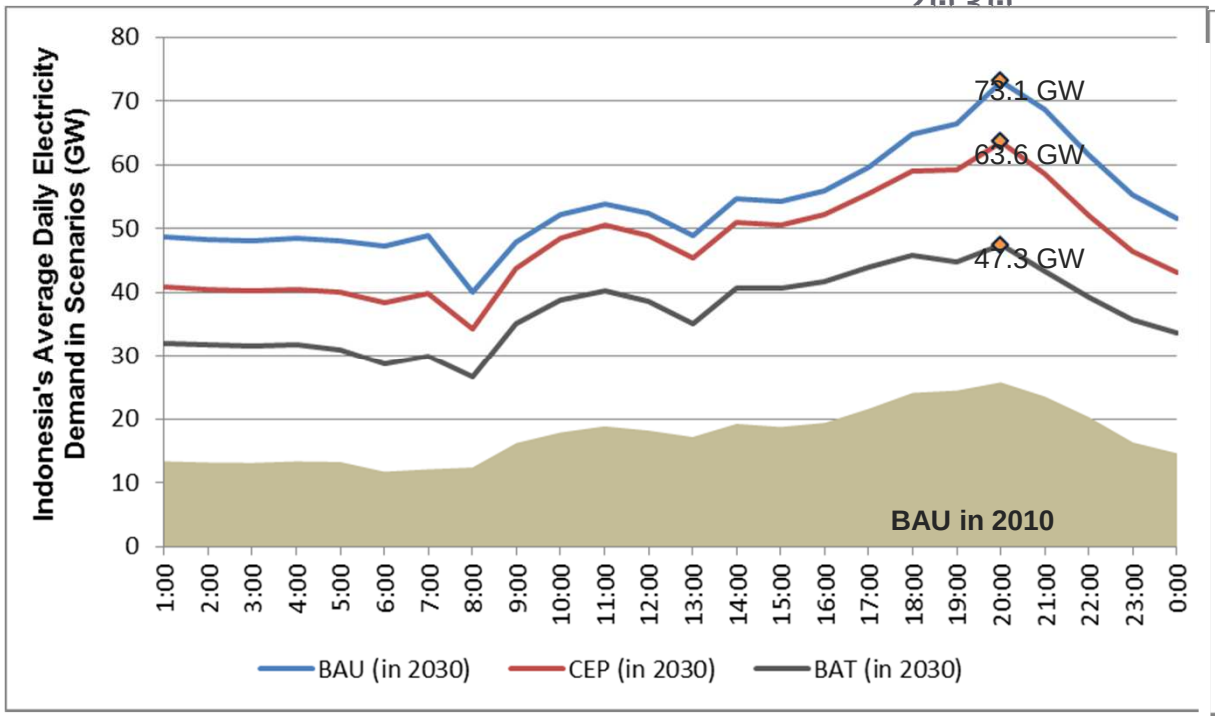
Forecast confirms tremendous growth in peak load from 25.8 GW* in 2010 to 43 GW in 2020 (34 new 500 MW plants) to 73.1 GW in 2030 (95 plants)

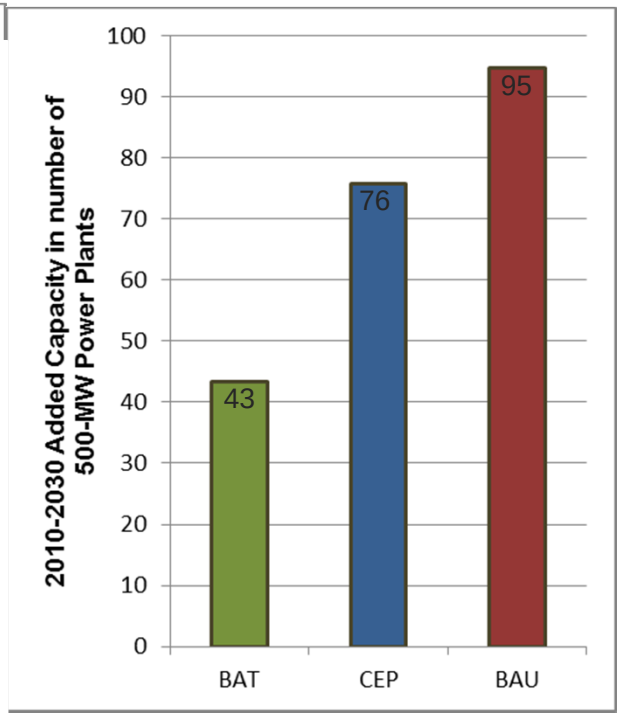
**Modeled peak load in 2010 4.4% higher than actual peak load.*

Peak Load at 2030 under Efficiency Scenarios

Scenarios:
- BAU: Business-As-Usual
- CEP: Cost-Effective Potential
- BAT: Best Available

EES&L (MEPS) in Indonesia could eliminate the need for up to **50 new 500-MW power plants (i.e., 26 GW additional capacity)** by 2030





Source: LBNL

Conclusions

- Potential impacts are huge – Of the 95 power plant additions projected, between 20-50 could potentially be avoided with energy efficiency standards and labels.
- Over half of these savings come from air conditioners, refrigerators and lighting, so a few programs could significantly reduce need for new capacity, if aggressive enough and soon enough.
- Indonesia has established a program with support from BRESL (GEF). SEAD providing technical assistance this year.
- Upcoming SEAD work plan with Government of Indonesia includes BUENAS modeling and refinement of peak load analysis. These Insights may help prioritize and encourage next steps.

Thank You

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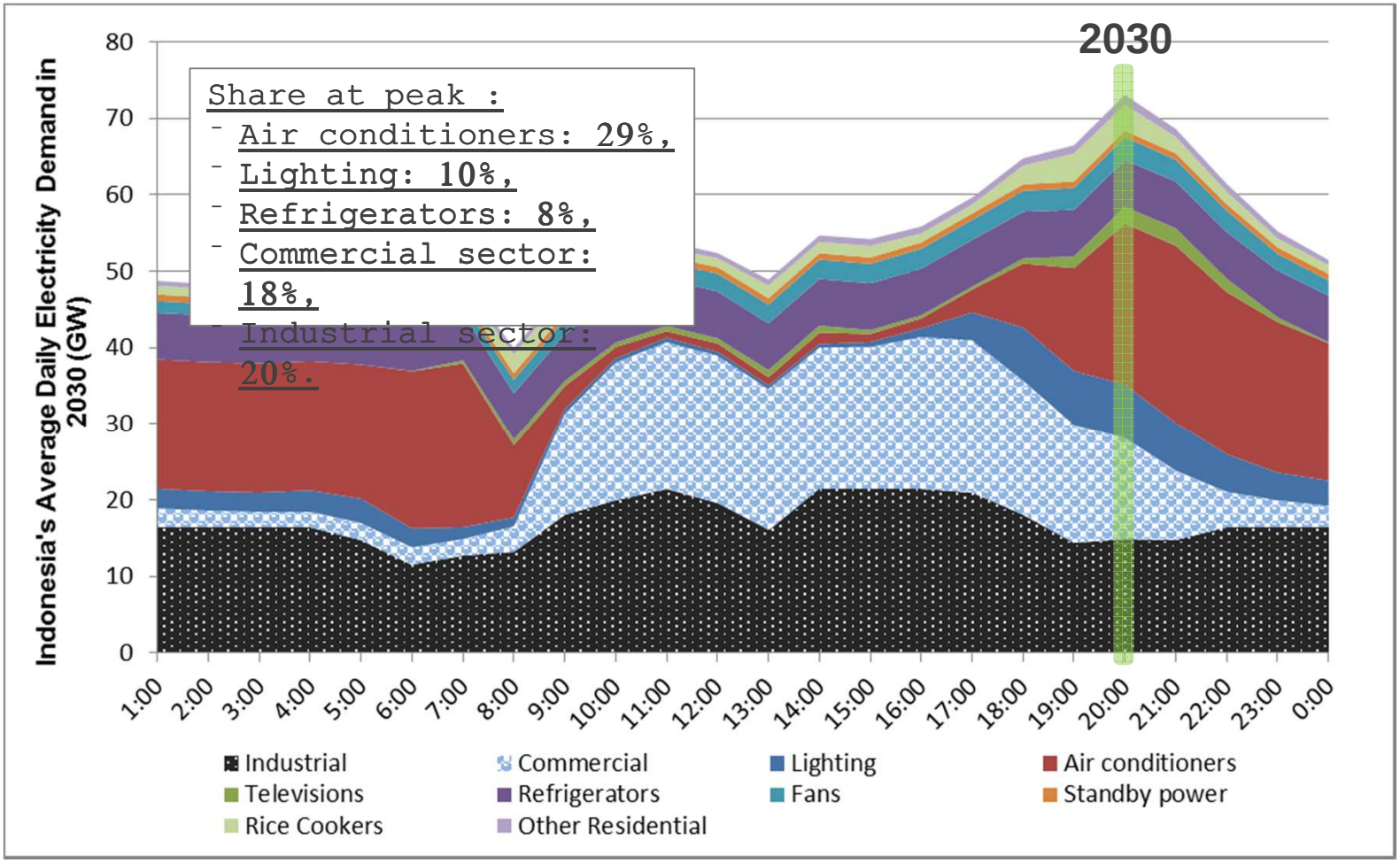
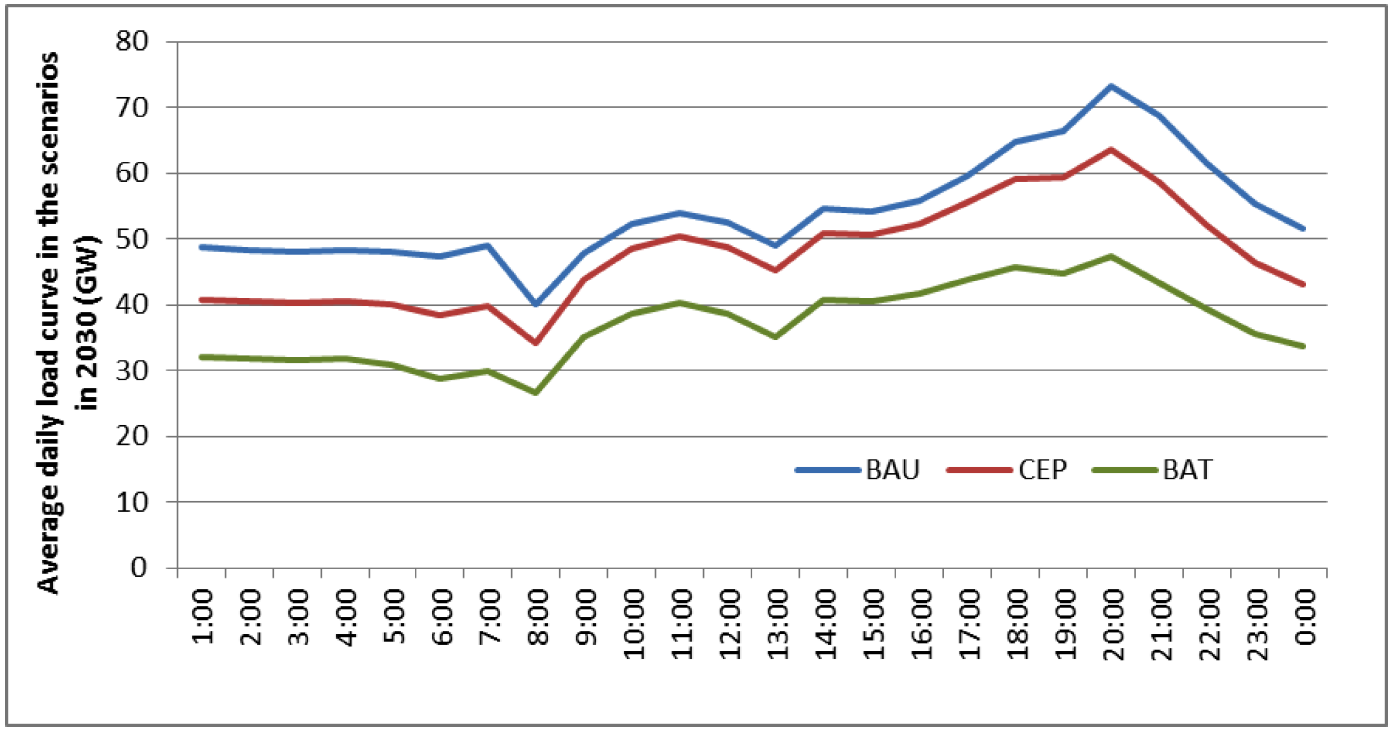
Details of Electricity Demand at Peak Load at 2030



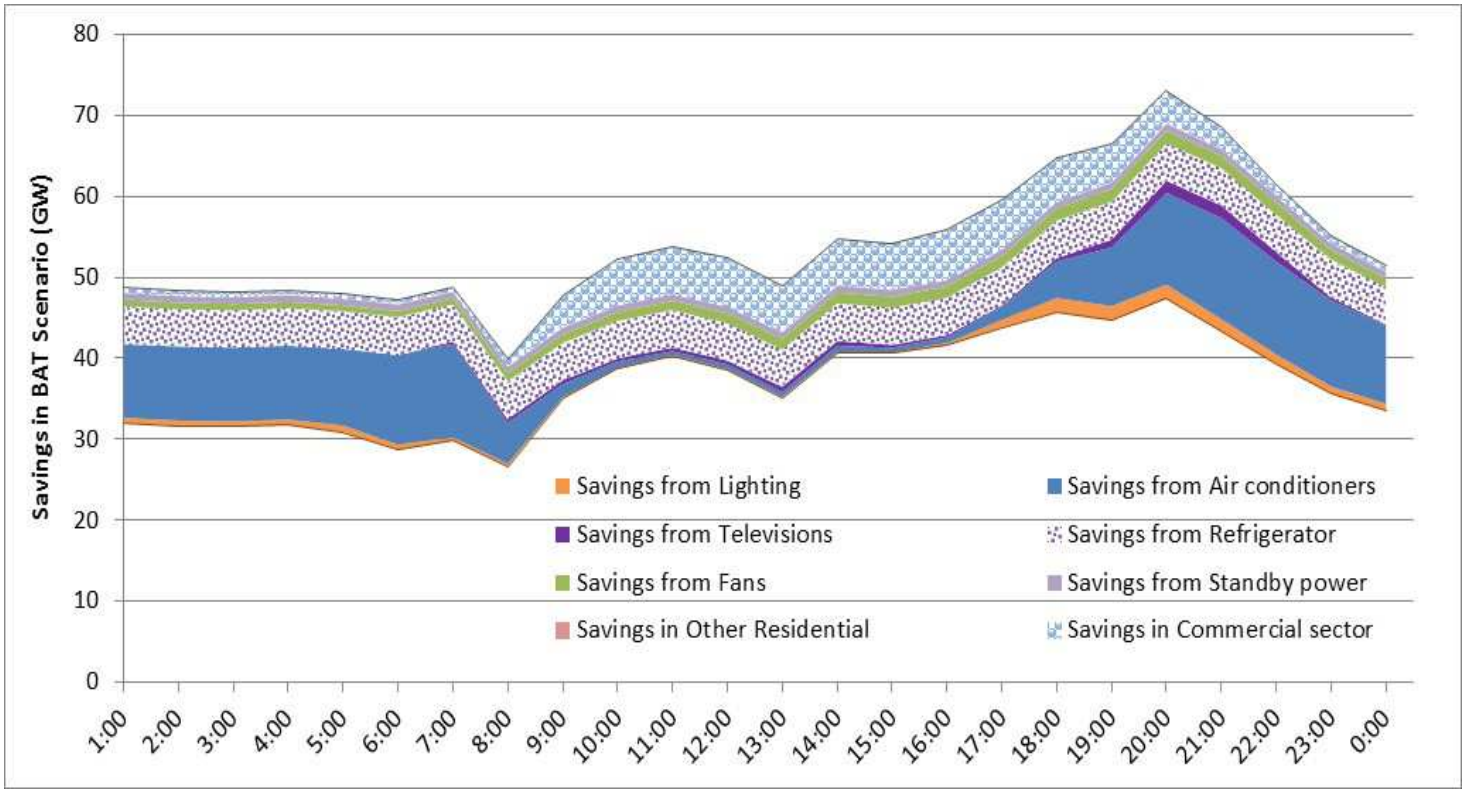
Source: LBNL

Efficiency Opportunities



- Savings from efficiency standards could save 13% (CEP) and 35% (BAT) relative to BAU. These savings correspond to 19 and 51 power plants, respectively

Efficiency Opportunities



Nearly 70% of savings from 3 products: air conditioners (44%), refrigerators (18%) and lighting (7%)