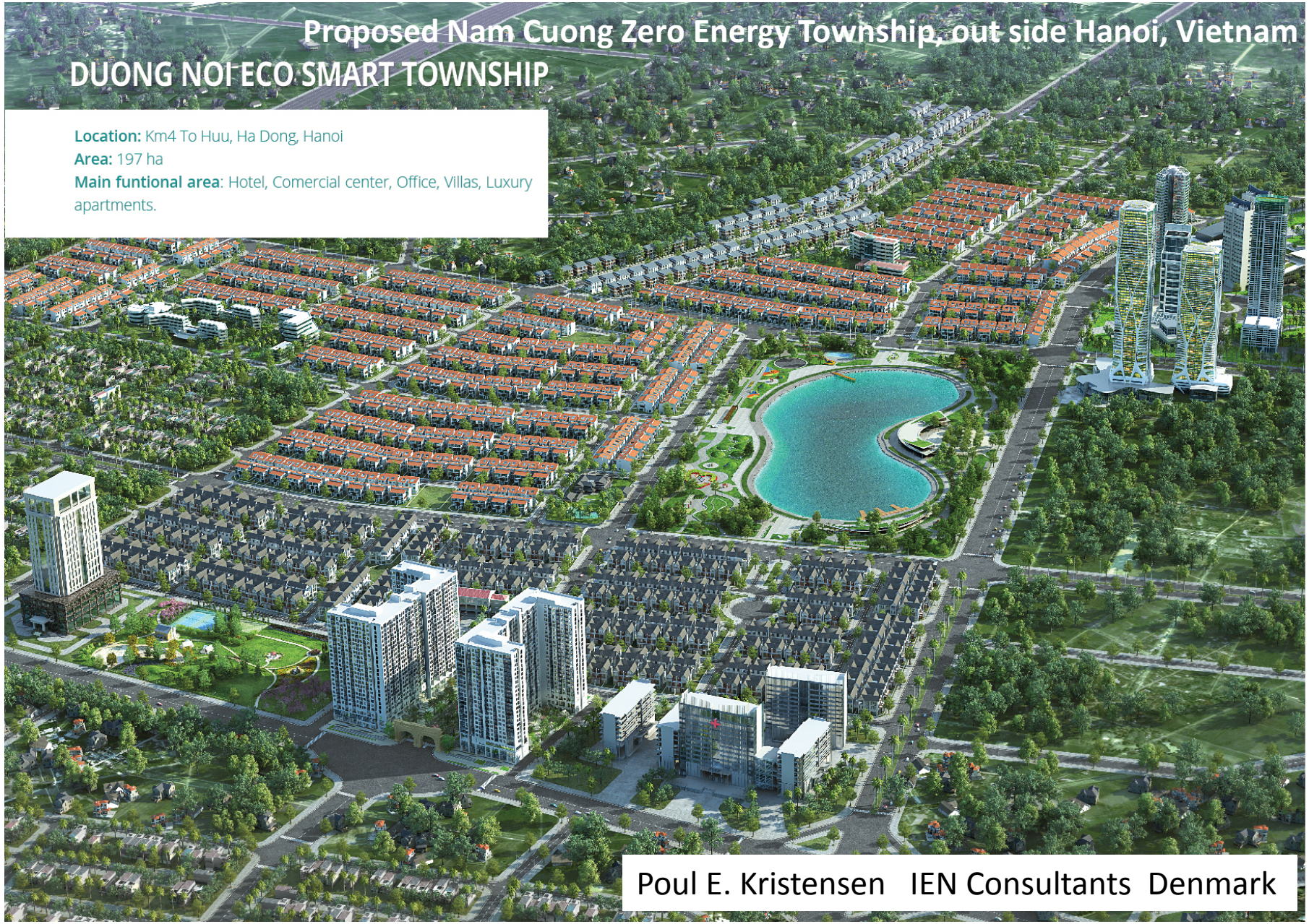
IEA Future Buildings Forum in Singapore 24 – 25 October 2017 at the BCA Academy



Poul E. Kristensen IEN Consultants Denmark

Poul E. Kristensen, Director
IEN Consultants
Hasselvej 30, 2830 Virum Denmark

Research and development on energy efficiency and RE in buildings since 1977 (Joined IEA SHC Task 1 in 1978)

1977 – 2000 Working internationally out of Denmark
2001 – 2017 Working primarily in Malaysia and Vietnam

2001 – 2012 : MD of IEN Consultants, Kuala Lumpur Malaysia
2013 – 2017 : WB/IFC Hanoi -Senior Technical Adviser - “Vietnam Green Buildings Program”
2015– 2017 : UNDP/GEF International Technical Expert on EE in Buildings – “EE Improvement in Buildings in Viet Nam”

Zero Energy Townships in Vietnam, a Macro-Economic Perspective

A Zero Energy Township is a township that produces all the energy needed in the township from renewable energy

A combination of energy efficiency in buildings and use of renewable energy

In the case of a Vietnamese township, the main energy technologies will be :

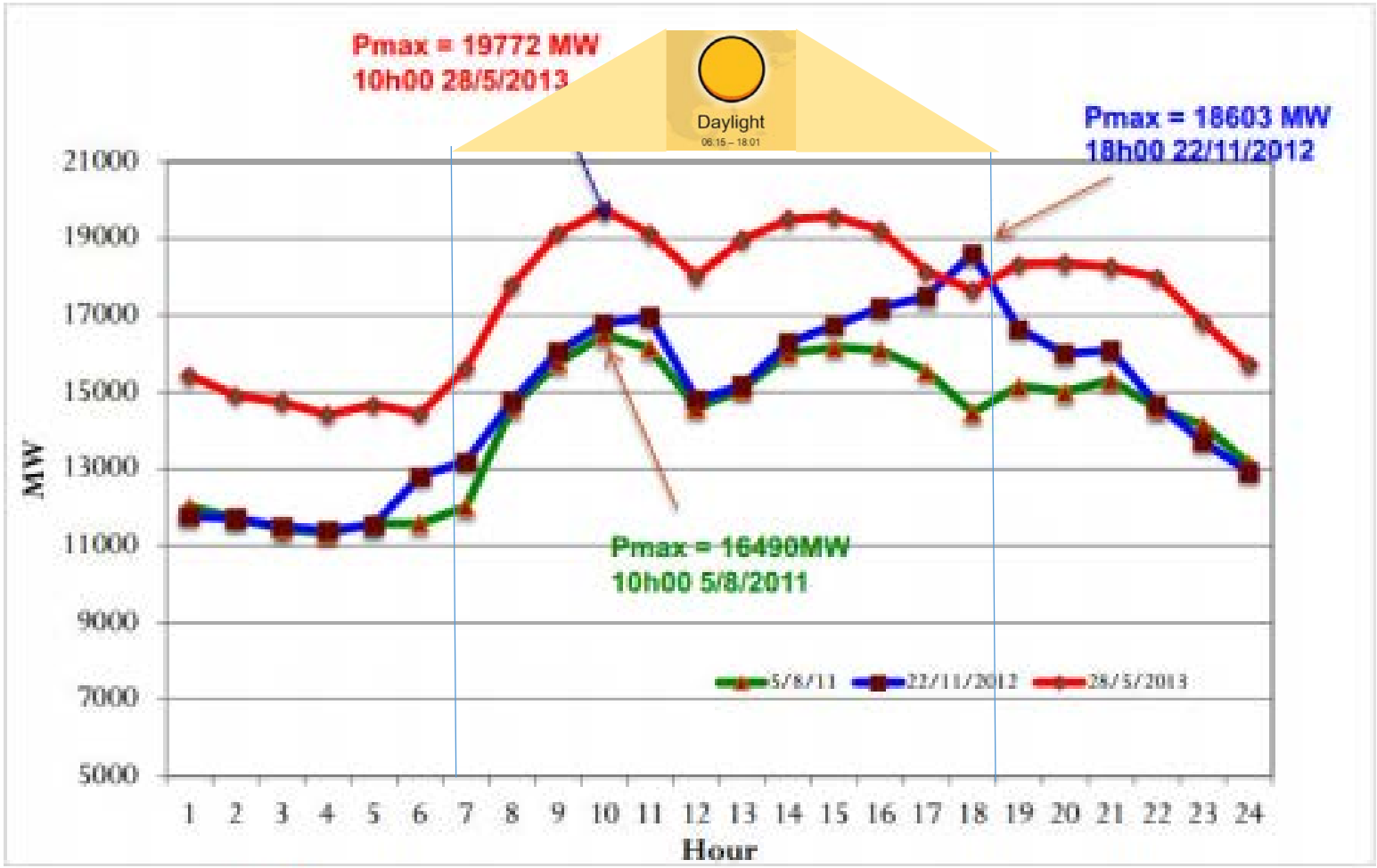
- **Advanced technologies to reduce energy consumption in buildings : 50% savings**
- **Solar electricity and solar energy for heating of hot water : 25% savings**
- **Hydropower electricity imported from the electric grid : remainder 25%**

- The NamCuong Zero Energy Township must be **a Smart Electricity City**

✓ Buildings are designed so that they have a reduced power consumption from the grid when local solar energy is not available,

✓ Import of electricity from the grid is reduced and happens only during off peak periods

Figure A- 15: Hourly load curve of the peak day



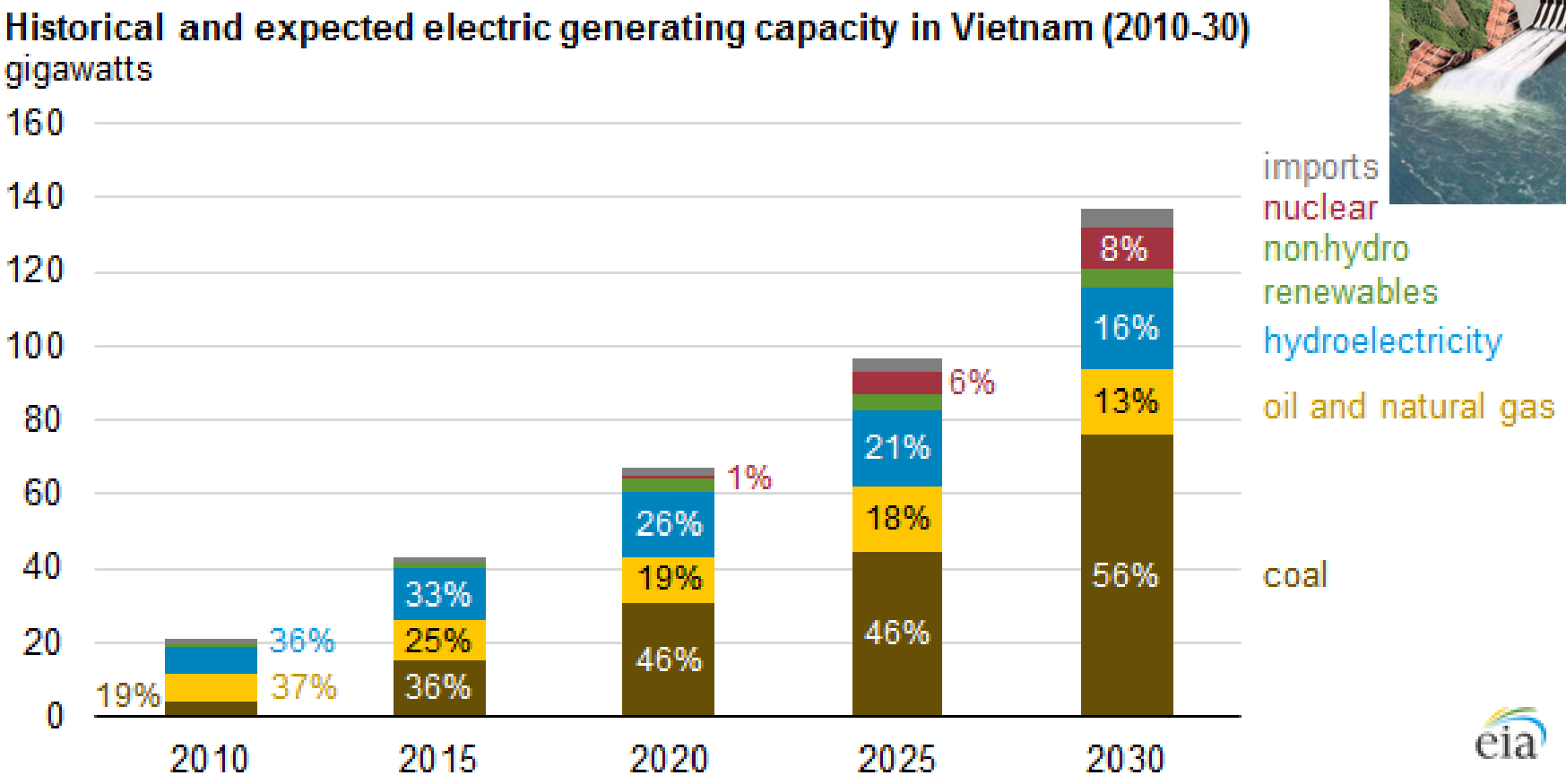
Source: EVN (2013b)

Copenhagen has the ambition to become the 1st Carbon Neutral Capital in the World By 2025

Reduce carbon emissions, create green growth, enhance quality of life.

COPENHAGEN - CARBON NEUTRAL BY 2025

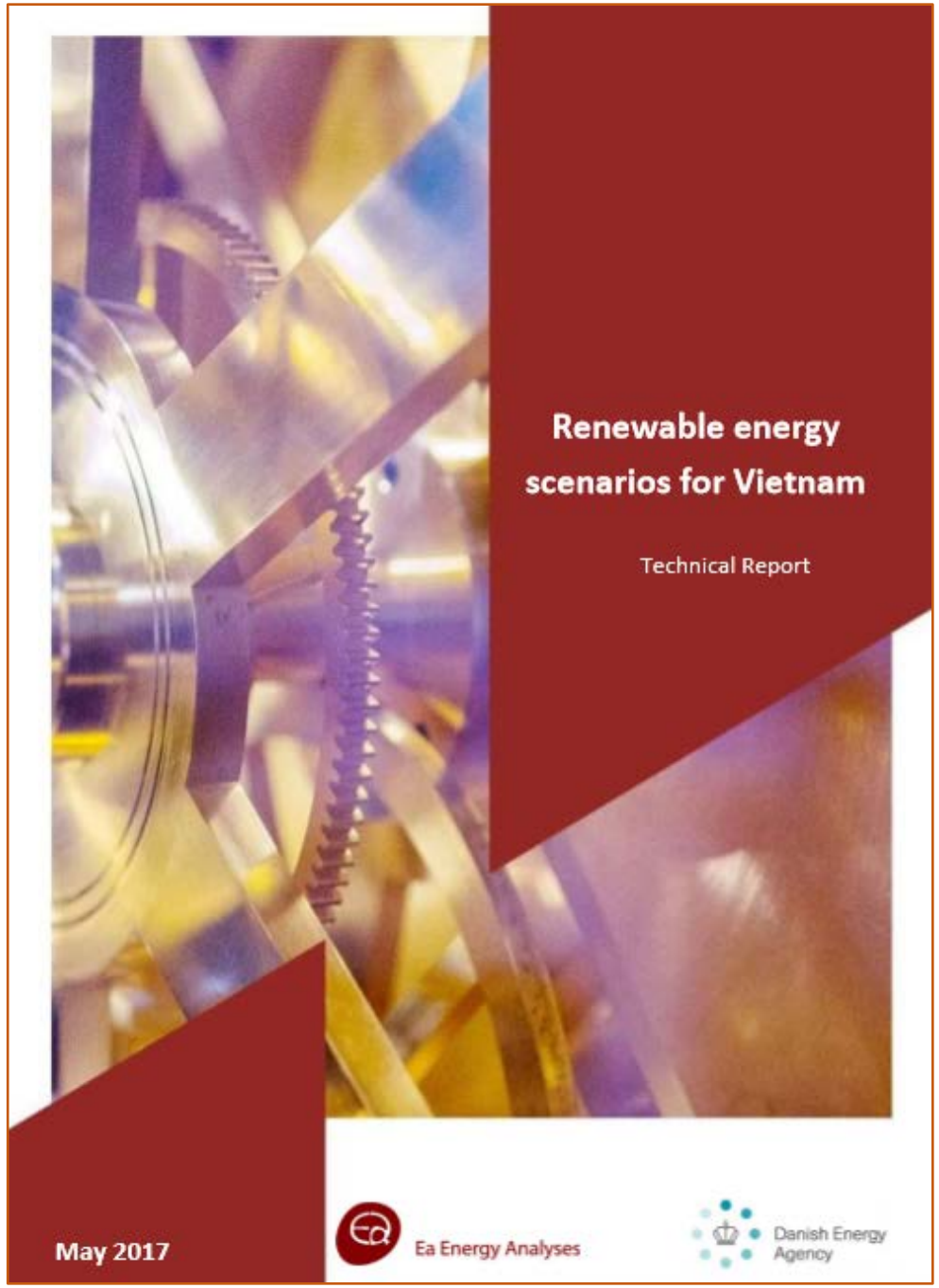
CITY OF COPENHAGEN

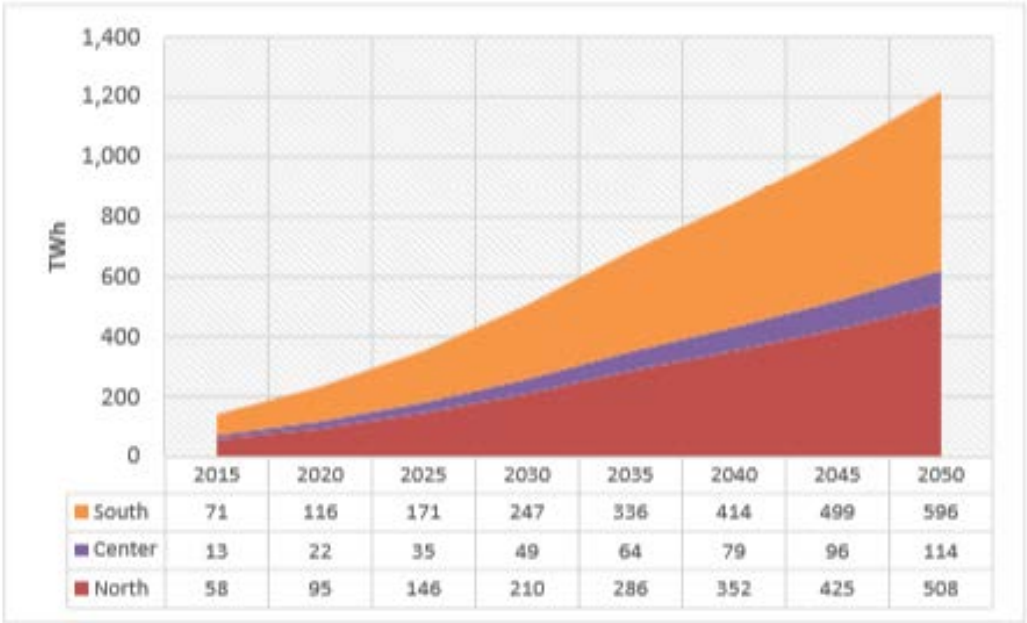


Hydroelectricity covers around 20% of total electricity load.

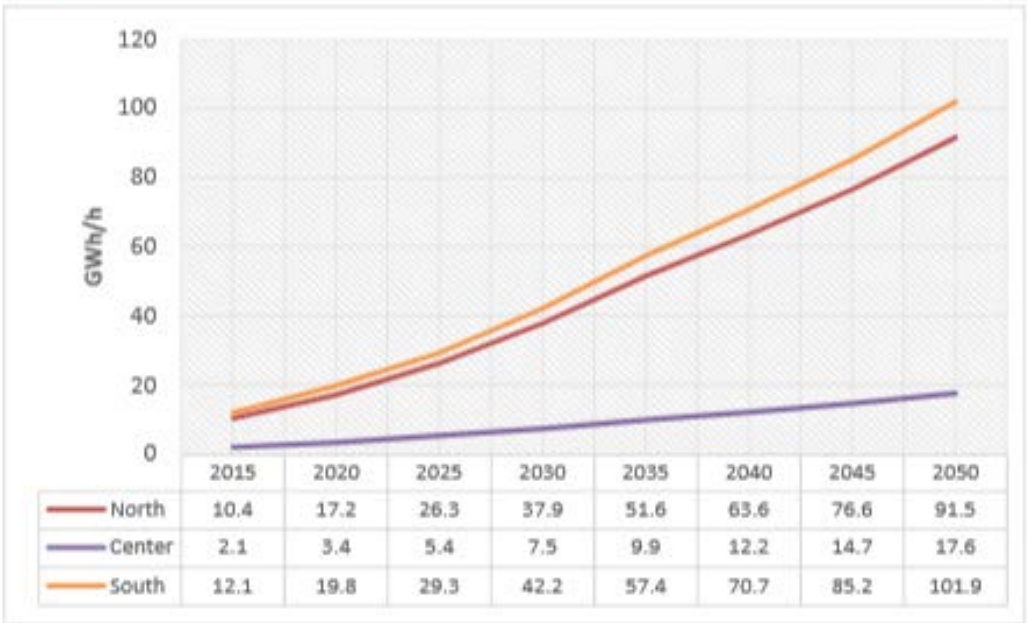
The Zero Energy Community can only draw 20% of normal electricity consumption (kWh/year)

The Zero Energy Community should draw 0% of normal peak power (kW)



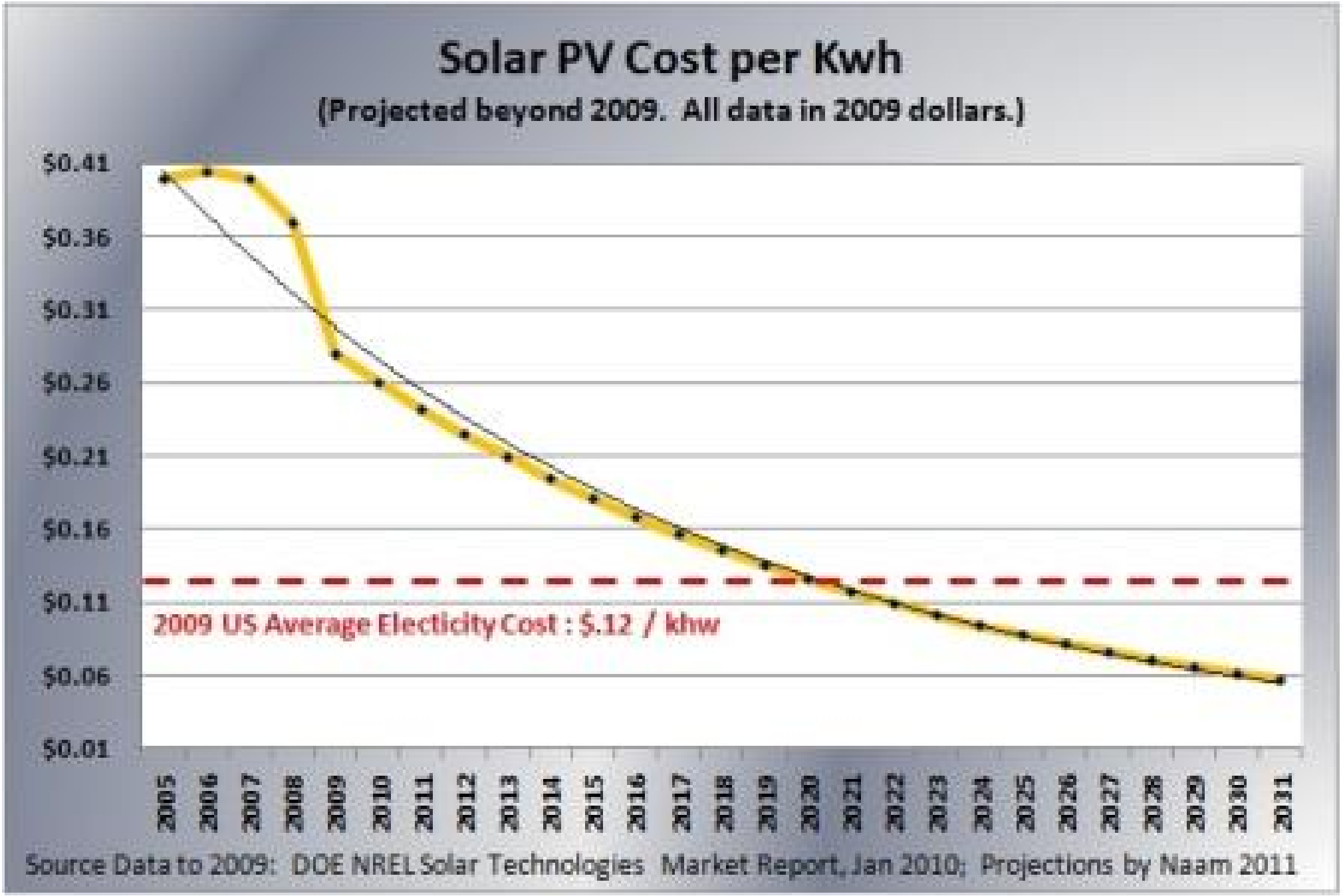


	2015	2020	2025	2030	2035	2040	2045	2050
South	71	116	171	247	336	414	499	596
Center	13	22	35	49	64	79	96	114
North	58	95	146	210	286	352	425	508

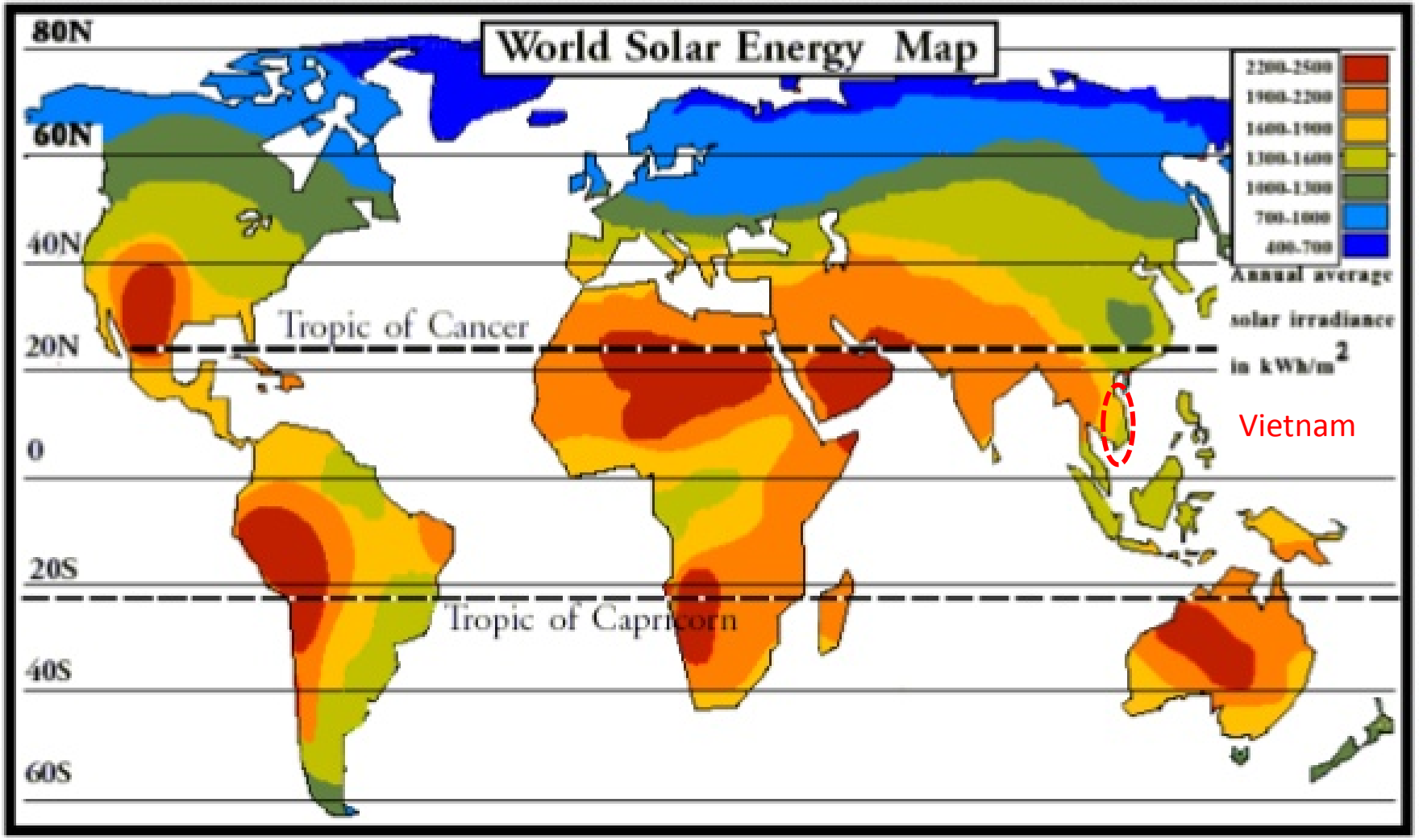


	2015	2020	2025	2030	2035	2040	2045	2050
North	10.4	17.2	26.3	37.9	51.6	63.6	76.6	91.5
Center	2.1	3.4	5.4	7.5	9.9	12.2	14.7	17.6
South	12.1	19.8	29.3	42.2	57.4	70.7	85.2	101.9

Figure 2: Annual electricity demands per control region (above) and peak demands per control region (below).


Solar PV Cost per Kwh
(Projected beyond 2009. All data in 2009 dollars.)
$0.41
$0.36
$0.31
$0.26
$0.21
$0.16
$0.11
$0.06
$0.01
2009 US Average Electicity Cost : $.12 / khw
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Source Data to 2009: DOE NREL Solar Technologies Market Report, Jan 2010; Projections by Naam 2011

World Solar Energy map



Integration of Solar PV in the facades

Experiences with Energy Efficiency in Malaysia and Vietnam

Ministry of Energy, Malaysia

Energy Commission, Malaysia

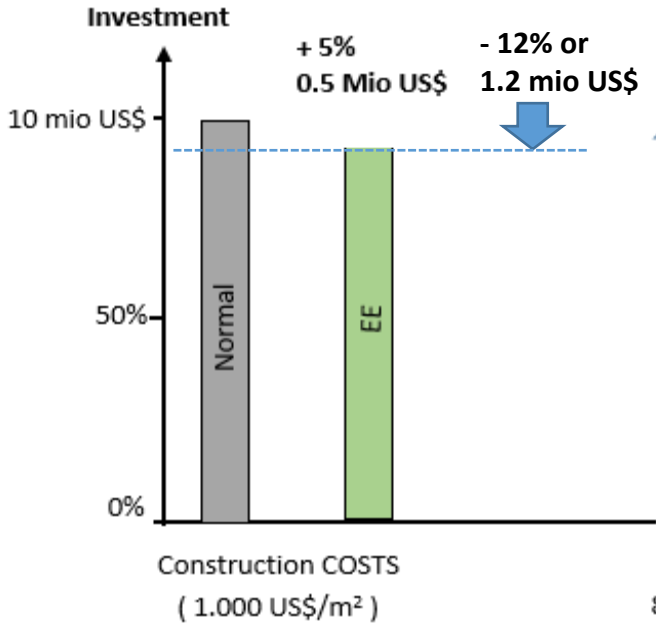
- Costs for going green : 2 – 5% extra construction costs
- Saving on Energy Bill : 30 – 60%
- Payback period for Green Buildings : 3 – 6 years

FPT Building, Da Nang Vietnam

Sarawak Energy HQ, Malaysia

Green Buildings are Cheaper than Grey Buildings

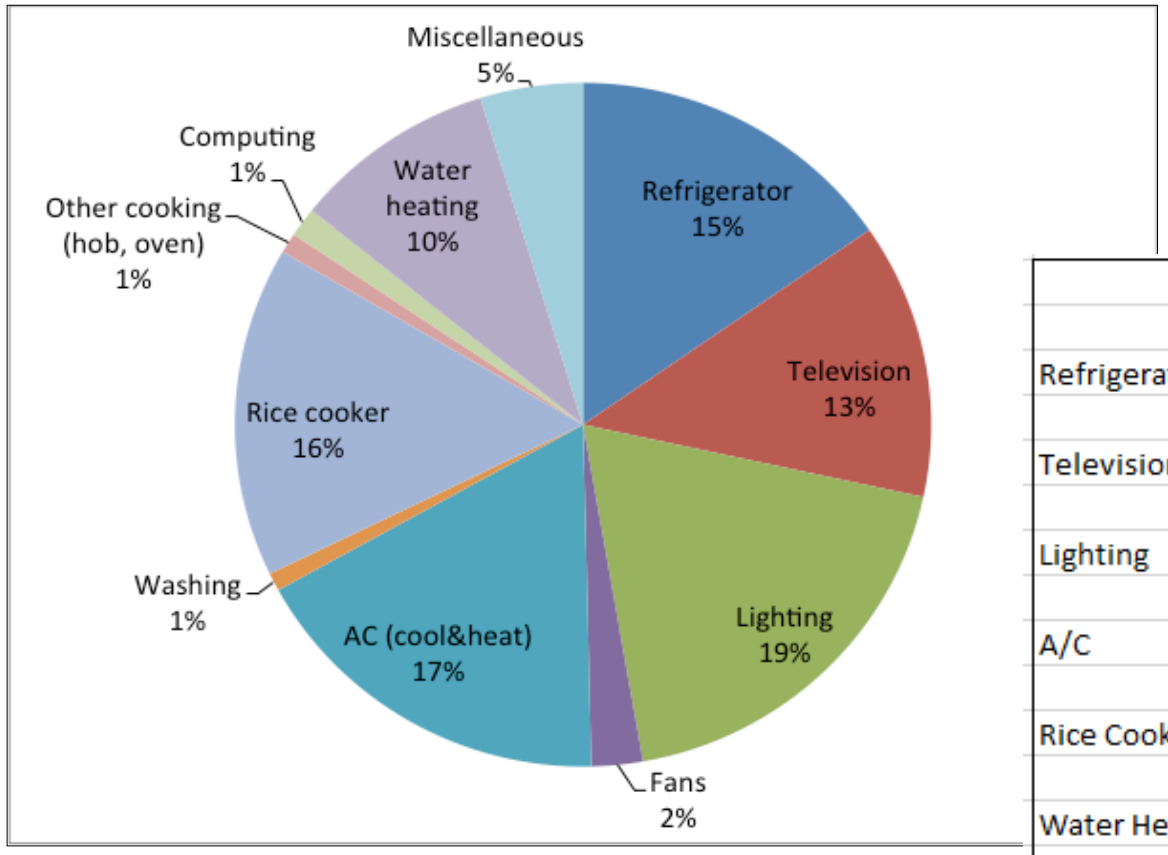
10.000 m² office building



+ Savings on Energy Consumption (40 – 50%)

+ Savings on CO_2 Emissions (40 – 50%)

Estimate of Energy Savings Potential for Domestic Buildings



Vietnam Energy Efficiency Standards and Labelling Program:
Australian Government Support Project

Market Survey, September 2012

Preconditions so that ***new power plants are not needed***

- The buildings can buy 20% electricity from EVN (Hydropower)
- The buildings must draw minimum power from the grid during peak hours (9.00 – 17.00 hours)

		Savings on kWh		Savings on peak load 10.00 am	
Refrigerator	15	75%	11%	100%	15%
Television	13	50%	7%	100%	13%
Lighting	19	75%	14%	75%	14%
A/C	17	40%	7%	90%	15%
Rice Cooker	16	0	0%	90%	14%
Water Heating	10	100%	10%	100%	10%
Michellaneous	10	50%	5%	50%	5%
	100		54%		87%
Draw from EVN			**20%**		**13%**

Energy Efficient Buildings is the cheaper solution

It is cheaper to build an Energy Efficient Building than to build power plants

- One MW saved in buildings is cheaper than one MW extra power plant capacity

  \+ we save on electricty costs for the comsumer

  \+ we save CO_2 emissions for the enviornment

Effective Financial Instruments must be based on this economic reality

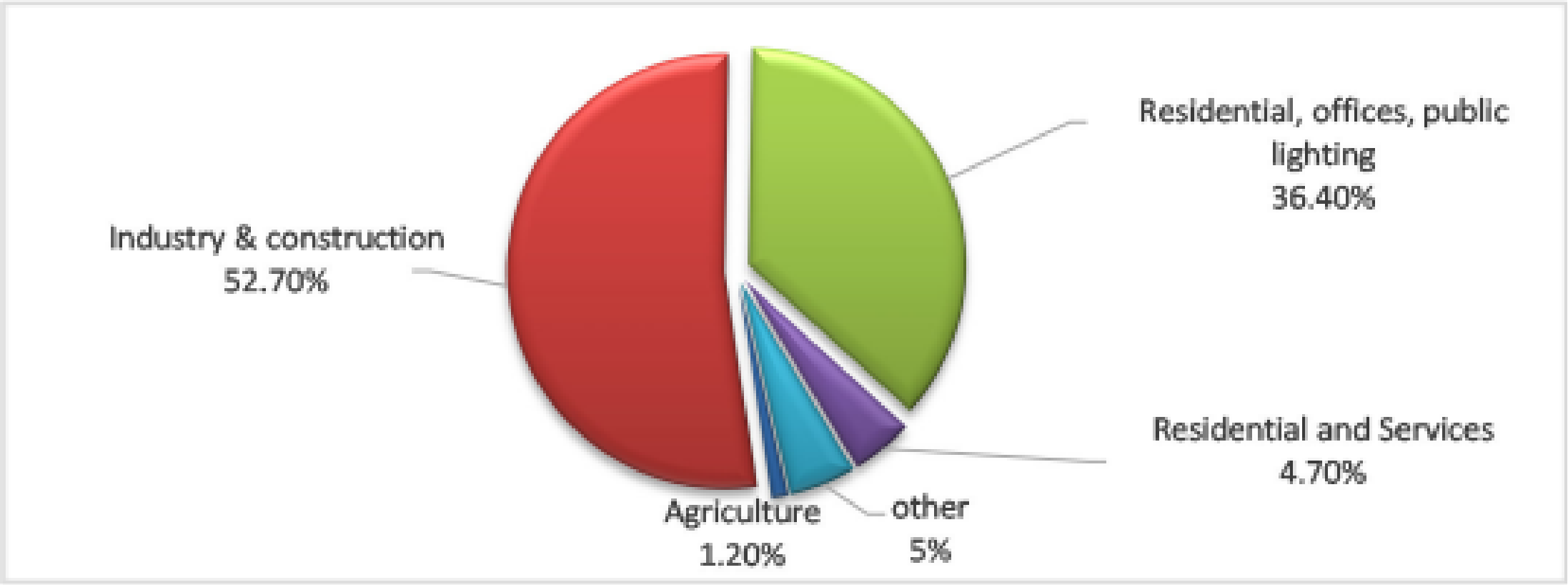
Proposed Nam Cuong Zero Energy Township, Hanoi, Vietnam

Key prequisites for implementation :

- ❑ Saving MW´s is cheaper than building MW´s
- ❑ Cooperation with the utilities is critical (EVN : Electricity of Vietnam)
- ❑ Support by the Government of Vietnam : Ministry of Industry and Trade MOIT
- ❑ Technologies for energy efficiency and solar PV are technologically mature and financially competitive
- ❑ Recognition by the International Energy Agency can be most importrant for further progress

- ❑ **Advanced technologies to reduce energy consumption in buildings : 50% savings**
- ❑ **Solar electricity and solar energy for heating of hot water : 25% savings**
- ❑ **Hydropower electricity imported from the electric grid : remainder 25%**

Figure A- 20: Electricity consumption in Viet Nam by sector in 2012



Source: EVN (2012)

Examples of Zero Energy Cities in the world

- **Copenhagen**, with 1. 2 million inhabitants, is striving to be **the worlds first Zero Energy Capital by 2025**

Around the world there are several initiatives to develop and demonstrate Zero Energy Townships.
Some of these are :

- **Z-Net Uralla in Australia** between Sydney and Brisbane is developing a Zero Energy Township

- **Crisfield's community in Maryland US** is developing a Zero Energy Township, primarily based on wind energy

- **Beddington Zero Energy Development (BedZED)** north of London is an existing Zero Energy Township, based on solar electricity and biomass