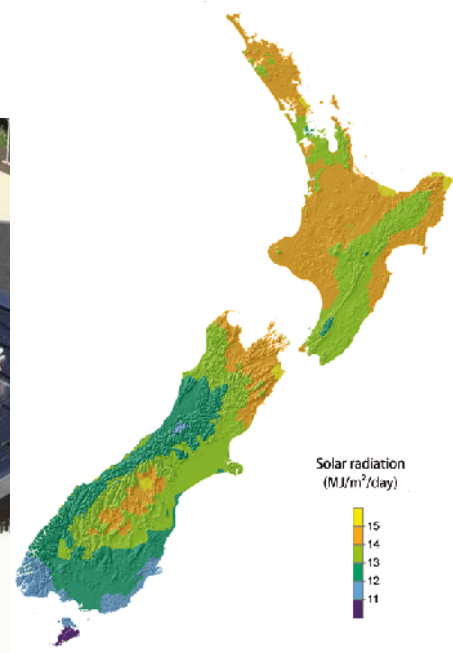


# The Potential of Solar Power in New Zealand

David Chae



# General Information About Solar in New Zealand



# Some General Facts About Solar

Largest growth of any energy industry in recent years

Clean and renewable energy source

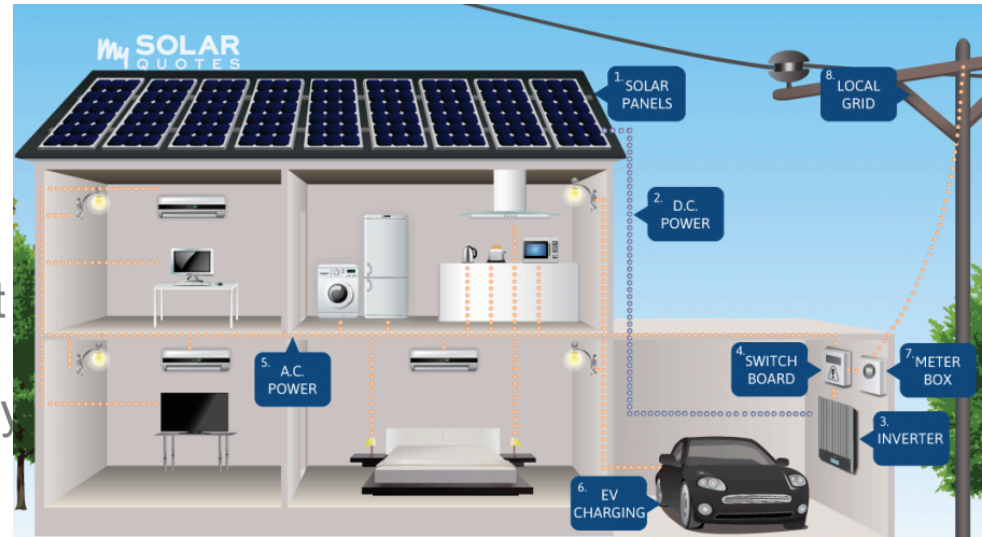
Project Sunroof

Low-Maintenance costs

Different functions:

CSV - light energy used to heat

PV - light converted to electricity



# Current State of Solar Power in NZ

Mostly non-existent -  $< 0.1\%$

If there is use, it is for residents who want to be off the grid

20-30¢/kWh to use energy from the grid

To sell back to the grid, companies buy back at a range from 5-16¢/kWh

Different companies have different rates and credit  
/discounts

No government incentives for solar

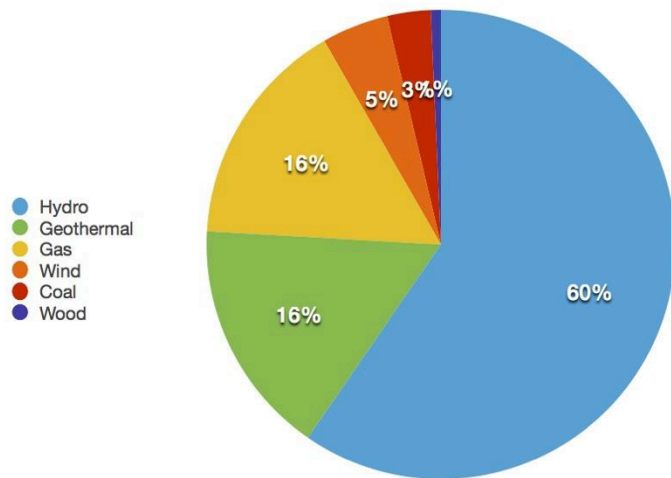


# The Grid

Renewables already play a significant part in contributing to grid

NEW ZEALAND'S ELECTRICITY  
GENERATION (12 months to Nov 2014)

GENERATION TYPE	PERCENTAGE
Hydro	59.6%
Geothermal	16.3%
Gas	15.8%
Wind	4.6%
Coal	3.0%
Wood	0.7%



# Disadvantages

Not economical

Intermittent because of climate regime

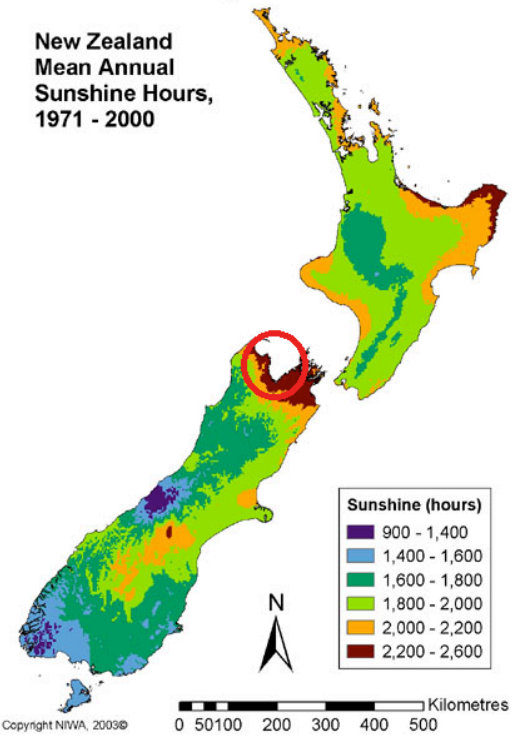
Independent of peak demand times of day

Not enough sun-hours the more south you go

Angle of incidence too high during the wintry months

Costs for transmission cables

New Zealand  
Mean Annual  
Sunshine Hours,  
1971 - 2000



# Major Keys to Success - An EGEE 437 Review

Goal of Solar Energy Design: To maximize the solar utility for a certain client/ stakeholder in a given locale.

The value of light is dependent on 2 things:

Demand

Cost of alternatives

Solar Reserves expand/contract with:

Need to avoid fuel costs

Technological advances that lower installation and materials costs



# Reasons for Hope

Cost of manufacturing and transport cheaper

About 70% cheaper to make solar panels than  
the 1980's

Most sunlight in the northern area of the north island encourages  
more possibilities of solar farms/residential installations

Good locale because the northern island has more electricity demand  
than the southern island

Less Dependence on transmitting energy between the two islands





# Case Studies



# Measuring the Solar Potential of Auckland and its Implications for Energy Policy

Investigation: the maximum potential energy that can be made available by efficiently installing PV systems on buildings throughout a city, from the central business district to low-density suburban areas

Purpose: to see if placing PV's in the city will reduce the electricity load and satisfy the demand during peak hours and encourage more electric vehicle charging

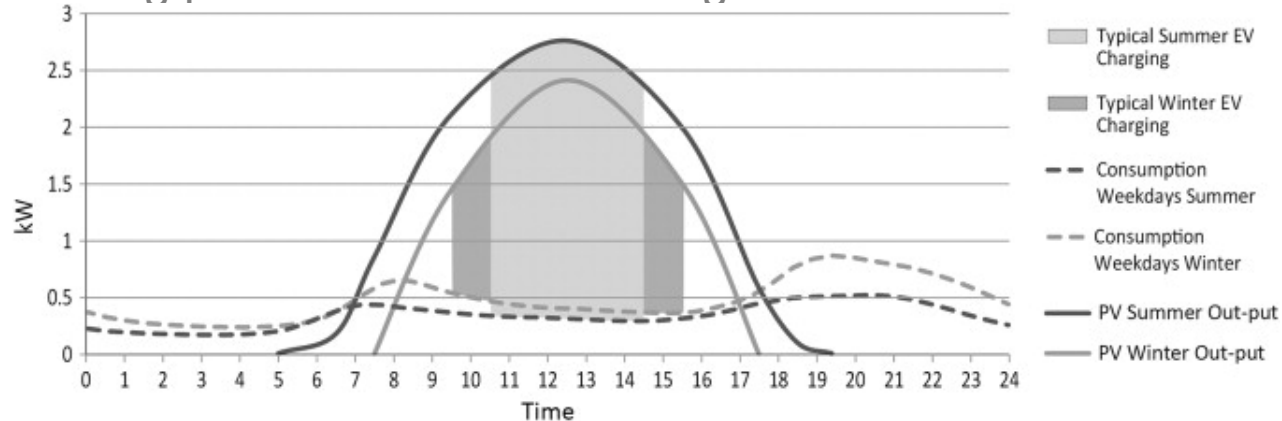


Figure 1: Typical use of energy in a residential abode of an Auckland resident

# Measuring the Solar Potential of Auckland and its Implications for Energy Policy

Study labeled solar water heater as more important than PV, in analyzing the limitations of roof space

Client Choices with a smart meter:

1. All surplus fed into the grid
2. Electricity fulfills the need of the household first before feeding into the grid
3. Energy doesn't feed into grid, store surplus in batteries

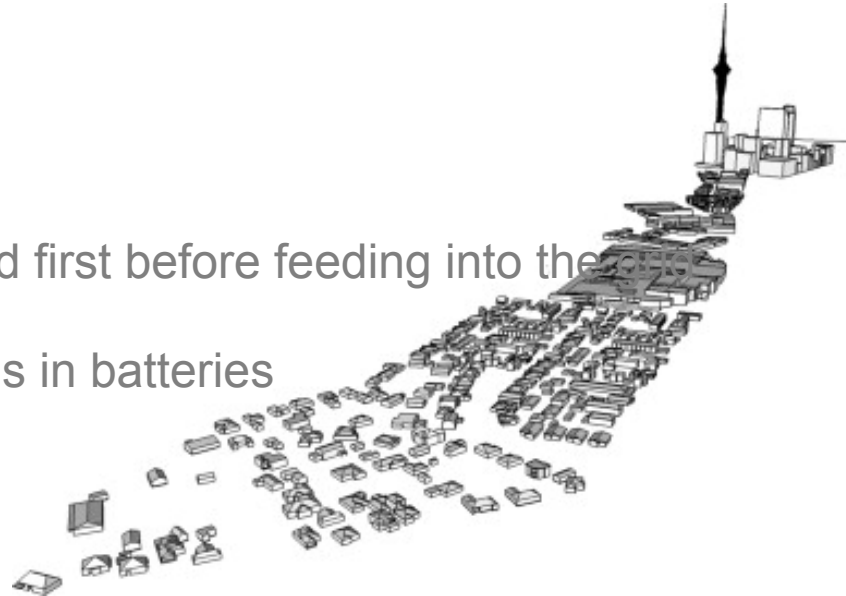


Figure 2: typical portion of city from city center to outer suburban Auckland

# Measuring the Solar Potential of Auckland and its Implications for Energy Policy

Results:

Lower density housing has highest solar potential

Trends and reasons

Even if we were to charge electric vehicles, we would still have a surplus of energy and feed it into the grid

Suburbs will be energy collectors to support themselves first and then supply it to the grid to residents inside the city

# Photovoltaic Solar Power Uptake in New Zealand

Purpose: to understand the impact of PV's in New Zealand

Methods: an application sent by distribution companies asking customers about details of residential solar panels

Conclusions:

Data too raw - solar is only starting to be adopted

High solar potential - 2% of electricity needs with current data by 2020

Returns are 25% greater in northern New Zealand than in the southern island/ areas

# Photovoltaic Solar Power Uptake in New Zealand

## Trends

### Annual PV Site Applications

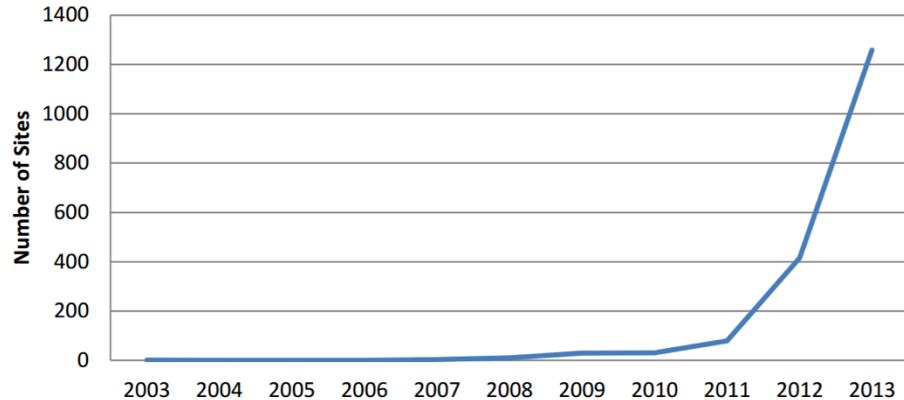


Figure 3: The number of PV sites among clients over the last decade dating up to 2013.

### Cumulative PV Capacity

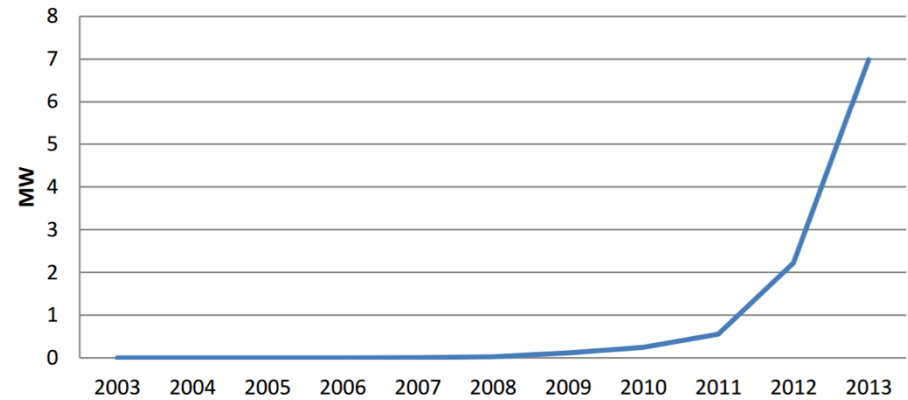


Figure 4: The cumulative PV capacity over the last decade dating up to 2013.

# Future of Solar in New Zealand

Government influence

Incentives

Awareness

Cheaper manufacturing/transport/installation

Public Opinion

Investment in better technologies



# Works Cited

Byrd, Hugh, et al. "Measuring the solar potential of a city and its implications for energy policy." *Energy policy* 61 (2013): 944-952.

Miller, Allan, et al. "Photovoltaic solar power uptake in New Zealand." (2014).