

Renewable Energy in the Commercial and Industrial Property Sector in South Africa

Yusuf Coovadia - Maverick Energy Consulting

Andrew Johnson- Osmotic Engineering Group



Topics

Renewable Energy: Opportunities and Challenges in the
Commercial and Industrial Property Sector in South Africa



- Basics and Overview of the C&I space
- Market and Policy Environment
- Challenges and Opportunities for the Sector
- For Architects

Commercial and Industrial Renewables Sector - Energy Basics



Renewable Energy: Opportunities and Challenges in the Commercial and Industrial Property Sector in South Africa

Types - Electrical & Thermal Renewable Energy

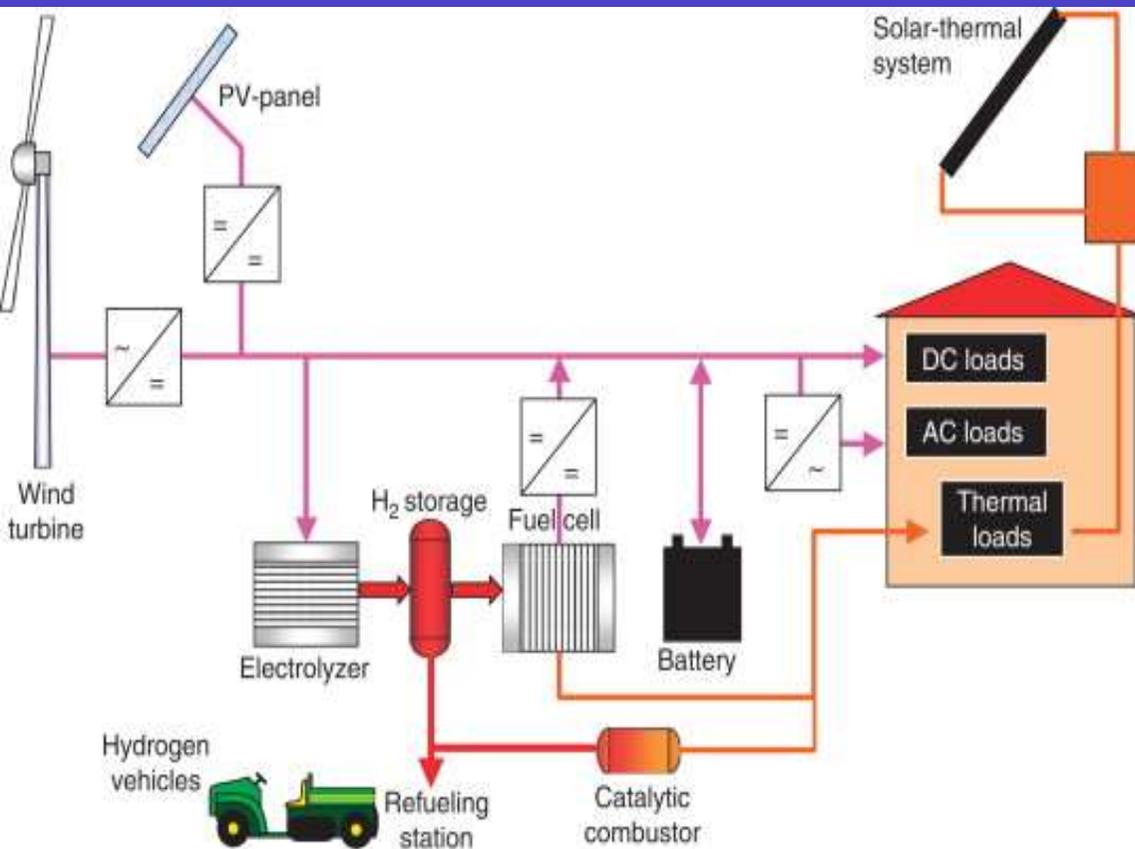
Let's talk Technology

- Electric - Solar Photovoltaic, Wind Turbines. Hydropower. Power from renewable resources
- Other RE Electric - Concentrated Solar Power / Biomass / Waste to Energy - All require turbine/engine to generate electricity.
- Gas, Diesel generators, coal power station , nuclear - Not renewable
- Storage (Batteries) - Not generators - they require input from generation sources e.g., pumped hydro schemes, large lithium-ion batteries.
- Thermal Energy - Solar Water Heating, Process Heat, District Heating, Passive Solar Technology, Heat pumps
- Power to X - creation of synthetic fuels like hydrogen, gas fuels, chemicals like ammonia using fuel cells

We will focus on solar photovoltaic, because:

- 1 . Its what we know
2. Largest by market share in South Africa
3. Happy to answer questions on other technologies if you have any

Commercial and Industrial Renewables Sector – Energy Basics

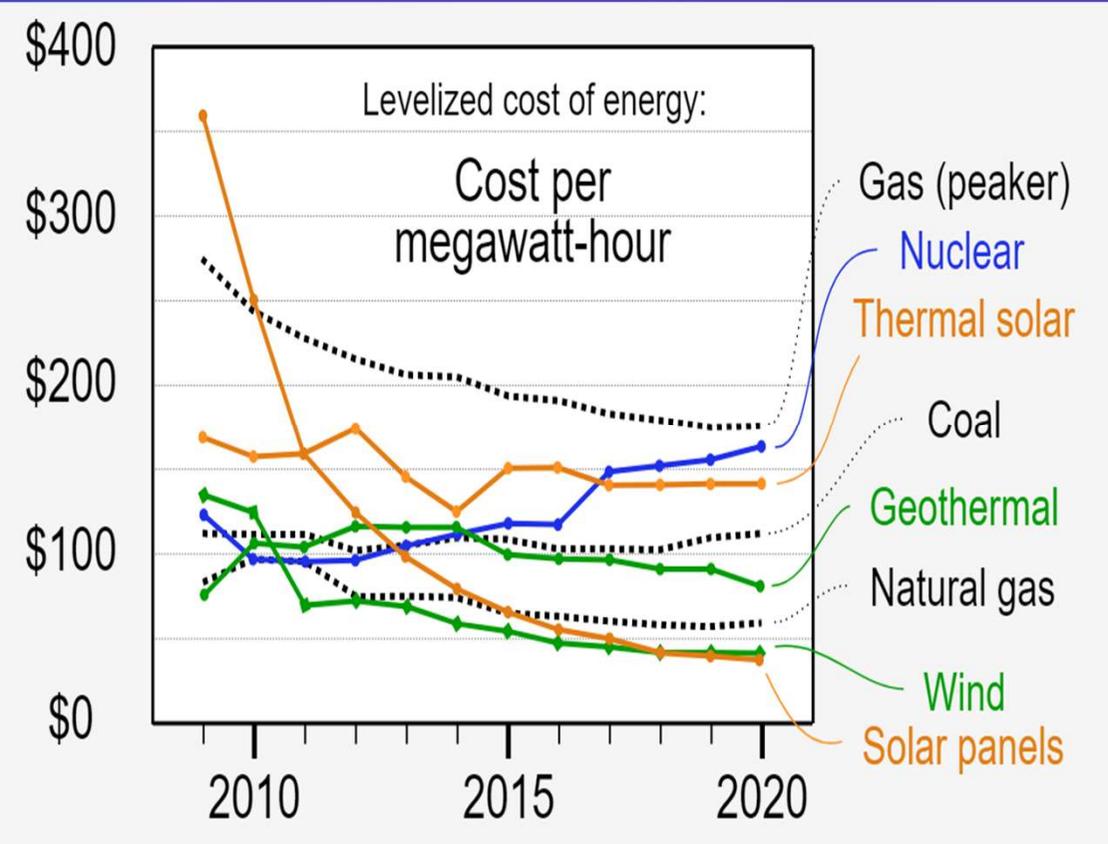
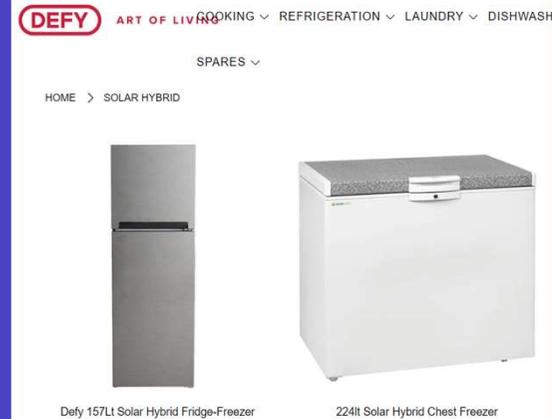


Energy Accounting

Supply and Demand & Least cost Generation

- Multiple technologies to meet energy demand
- AC power is instantaneous, if you make it you use it or store it in a battery. Or DC an option.
- Energy is measured in joules, BTU, calories etc. We use kWh for electrical – this is a physical quantity of energy
- Most commercial and Industrial buildings might have a combination of technologies to meet energy needs.
- E.g. – One client in Midrand uses City Power, Gas Generation from Egoli Gas pipeline, Solar PV, Solar Water Heaters, Concentrated Solar for process heat + Diesel Generators

Commercial and Industrial Renewables Sector - Energy Basics



- Prices of Solar and Wind have come down over the years
- Very often companies will develop a **Least Cost Generation Model** to determine what is the optimum technology combination.
- These usually project over long periods of time such as 20 years to understand the levelized cost of generation. E.g., diesel generator is relatively cheap, but fuel for 20 years makes it costly
- Other factors: Cost, access to finance, space, access to fuels, good solar/wind resource at location, regulations, ensuring security of supply, decarbonization targets etc. **multiple factors to consider**

Commercial and Industrial Renewables Sector - C&I market



What is the C&I Market ?

1. Residential 3kW - 30kW
2. Commercial/Industrial 50kW-5MW
3. Utility Scale 5MW - 100MW

Companies, Businesses, Universities, Government Buildings, Manufacturing Facilities.

Examples: Corporate Buildings, Data Centres, Office Blocks, Residential Developments, Manufacturing Plants etc.

All have different energy and electricity needs

Solar PV - Embedded Generation

Rooftops

- Cheapest
- Fixed tilt panels
- Can work for most surfaces such as corrugated iron, flat concrete roofs - Various mounting options
- Most common solution currently used



Carports

- Useful in space constrained areas where rooftops are not enough or not suitable
- Quite a few off the shelf solutions in South Africa.
- Retrofitted solutions may require replacement of supporting structures - panels are about 20kg per m²



Land

- Ground mounted systems
- Opens up options for larger systems
- Panels can be mounted on tracking tables (most often single axis tracking) -higher yield



Solar PV - Embedded Generation

Rooftops

- Solutions for roof top uses are varied and applications increasing.
- Rooftop solar tiles - not as efficient as panels and are more costly
- Consider cleaning practically - significant drop in efficiency if panels are not clean.

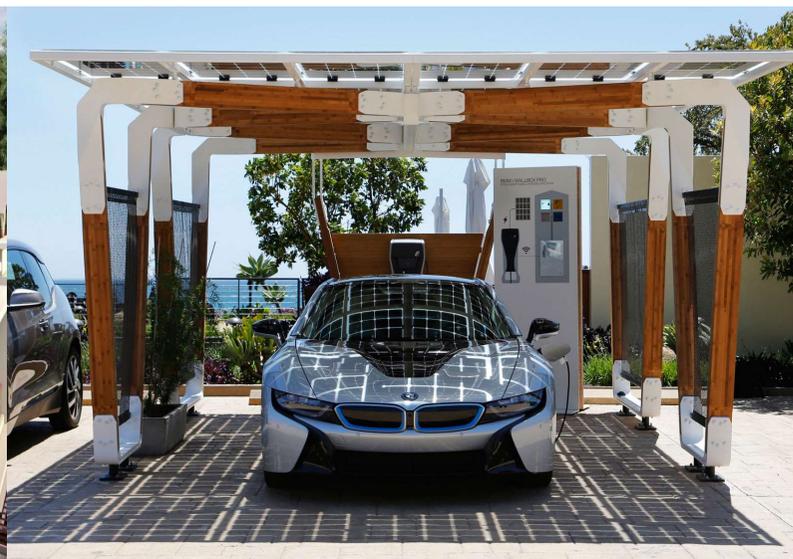
Carports

Example calculation for one parking space

Carport with 10 parking spaces	108 modules can be installed
Installed PV capacity	40 kWp (4kWp/parking space)
PV annual yield	40,000 kWh (4,000 kWh/parking space)
E-vehicle consumption (eGolf)	12,7 kWh/100 km
Distance travelled per parking space per year	$(4,000 \text{ kWh}) / (0.127 \text{ kWh/km}) = 31,000 \text{ km}$ Enough to cover the annual mileage of the average car user

Land

- Can be used in combination with other land uses such as farming, agriculture
- Water - floating solar systems to cover up dams and canals



Market and Policy



Tariff

- Eskom & municipalities currently have several electricity tariff structures for different customer categories.
- C&I customers with a notified maximum demand (NMD) greater than 1 MVA who are supplied directly by Eskom are typically on a Time of Use (TOU) tariff structure, namely the Megaflex tariff
- Rooftop solar PV installations (0.5-1.5 R/kWh)
- Megaflex fixed demand charges not offset by Solar PV

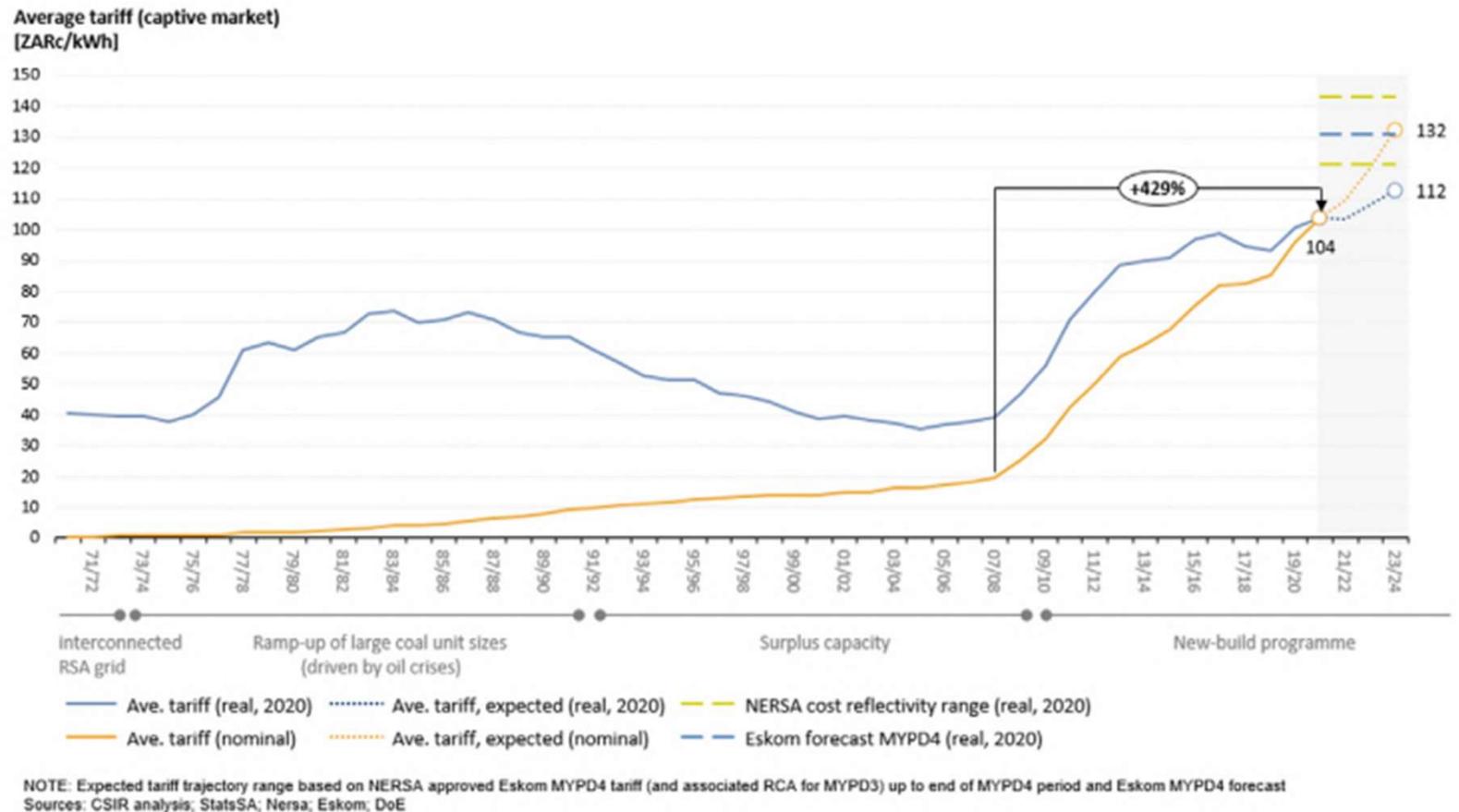


Figure S.1: Average wholesale tariff trajectory (Real and nominal) 1970 to 2020. Source: CSIR Analysis

Market

Context

- 2020 – 1,313MW in Total, 813MW utility scale and 500 MW of distributed generation of which 400MW was in the RSA C&I segment.
- 30-40% of entire market in next few years
- 15.6% hike in electricity tariffs in 2021, a further 9.6% increase expected in 2022 – Market expected to grow significantly
- market size at over 1.15 GW as of 2020

Drivers

- Outside of developed countries, South Africa had the largest share of companies actively sourcing renewable energy*
- Cost, access to finance, space, access to fuels, good solar/wind resource at location, regulations, ensuring security of supply, decarbonization targets etc. multiple factors to consider

Market Mechanisms

- Companies buy Renewable Energy Systems from Companies who install them (EPC).
- Buy Electricity – Sign a Power Purchase Agreement with an Independent Power Producer who puts asset on your roof/land – require large amount of financial security
- Leasing/Renting – ‘Lease to Own’ model
- Many innovative financing options in the market
- Wheeling – RE facility is located somewhere else and the power ‘wheeled’ over Eskom/Municipal Network

Policy and Regulation

IRP 2019	Licensing Exemption	Regulation	Tax Benefits	Carbon Tax Act
<p>Government acknowledges that Distributed Generation can contribute 500MW by 2030.</p> <p>Will probably be significantly higher</p>	<p>President Ramaphosa changed licensing threshold for DG from 1MW to 100MW</p>	<p>Changes to the Electricity Regulation Act that will allow for easier trading of Electricity</p> <p>Energy Action Plan - net billing framework for municipalities</p>	<p>Recently announced tax exemptions on solar PV panels</p> <p>Tax benefit (12b) applies 100% accelerated depreciation in the first financial year.</p>	<p>Carbon Tax to be levied on emitters involved in fuel combustion, industrial processes and emissions</p> <p>Carbon Offset projects possible - less carbon tax</p>

- **Considerations**
- **Benefits**
- **Challenges**



Commercial and Industrial Renewables Sector - Viability

Case Study Bayside Mall

01

500kWp solar PV plant located in Tableview, Cape Town, installed by Sustainable Power Solutions.

Technology:

2000 Trina Solar modules
30 Danfoss FLX PRO 17 inverters (17kW 3PH)
3300sqm roof space

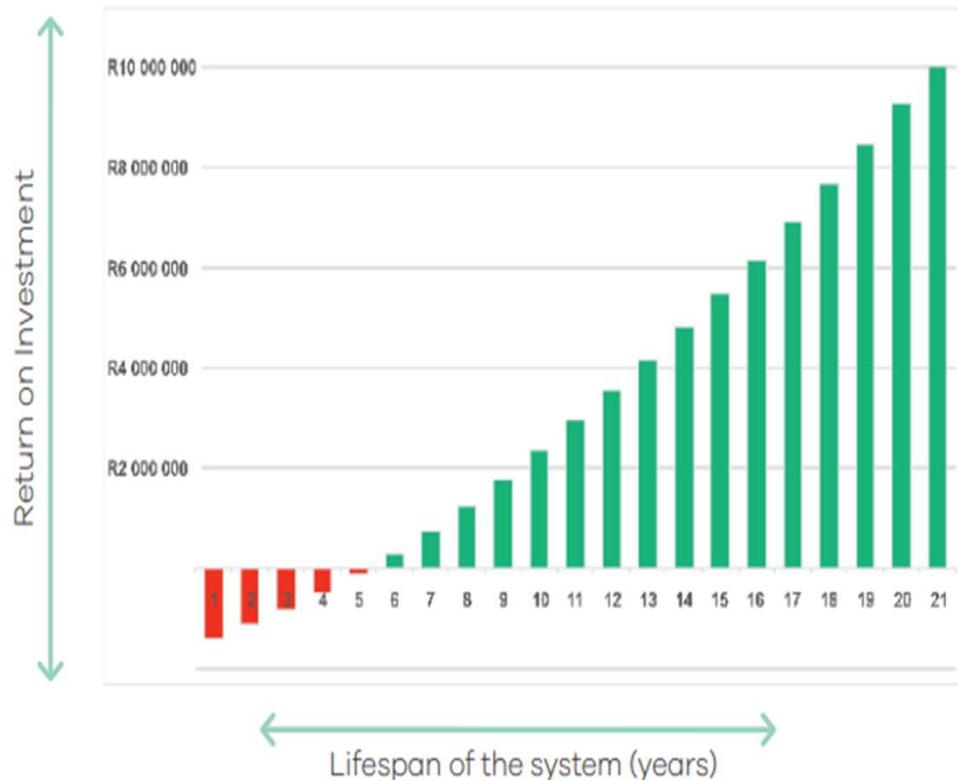
Return on Investment:

775MWh generated annually
5% reduction on electricity costs p.a.
8 years payback period
767 tonnes p.a. carbon emissions saved

Assessing Viability

The financial viability of solar PV is dependent on a number of different factors:

- **Installation size:** larger projects produce cheaper electricity
- **Technology choice** and exchange rate: prices still vary and some components need to be imported
- **Location**, roof type and direction: influence the amount of sun reaching the solar panels
- **Financing model:** depends on the client's risk profile or financial standing
- **Current electricity tariff:** solar PV's viable increases as electricity tariffs increase.
- **Consumption patterns:** Eskom charges a peak charge during periods of highest use



Benefits

Client Business Case

- Solar PV can save businesses up to 16% in electricity costs, meaning systems can often pay for themselves within 3 - 8 years of installation

loadshedding significantly increases the value proposition - cost of unserved energy



Property Developers

- Cutting electricity cost, increase reliability, augmenting energy supply
- Uninterrupted power will provide developers and landlords with an important differentiator to appeal to buyers and tenants
- Protect rental income by retaining tenants who can be sure of stable supply.

Remote Developments

- Wildlife Lodges, Game farms use an exceptional amount of diesel for running generators
- Solar PV plus battery storage was traditionally considered too expensive
- Now becoming comparable to Diesel for certain applications where large amounts of fuel are used.

Challenges

Challenges

- Lengthy and complex process for companies
- High upfront costs
- Access to Finance
- Long term business uncertainty
- Eskom moving to increase proportion of fixed cost charges

Risks

- Difficult for Developers to determine requirements, cost vs return, find and compare suppliers
- Bakkie Brigade - Large amount of people who are not qualified are designing and installing substandard systems
- Mismatch between rental agreements and system lifetime 5yrs-vs 25yrs

Post Installation

- Safety Hazards from Solar PV and Batteries
- Underperformance of poorly designed and constructed assets
- Maintenance

For Architects

Rooftops

- Large, flat, north facing flat surfaces are the best for solar PV
- Can combine east and west facing roofs that will give a morning and evening peak
- South facing roofs generally avoided unless space is an absolute issue
- Shading constraints – shading significantly affects system performance

Structural Considerations

- Roofs and other structures will need to be assessed for weight bearing suitability
- Most roof structures can be accommodated. Besides asbestos and very old roofs
- Post tensioned concrete is difficult to assess for a retrofit
- Carports might need to be replaced entirely

Client engagement

- Consider the clients energy needs during design phase
- Understand space constraints and impact of shading.
- Understanding that best solution is probably a combination of technologies on one site such as solar PV, solar thermal, absorption chillers, gas and diesel



Yusuf Coovadia

yusuf@maverickenergy.africa

Andrew Johnson

Andrew.Johnson@oegplc.com

www.osmoticingineeringgroup.com

Resources:

SAPVIA

Green Building Council

Thank you

Presentation title

