ANT ENERGY SOLUTIONS

NOEL DUNLOP

Chief Executive Officer

ANT
ENERGY SOLUTIONS

Telecommunications

- **Alexander Graham Bell** scientist, inventor, engineer, and innovator
- Credited with inventing & patenting the telephone
- Founded the American Telephone and Telegraph Company (AT&T) in 1885
- **He died on August 2, 1922 – 95 years ago**

Telecommunications - then and now

Impact of Technology: SIGNIFICANT

- **Lines & Poles** → **Microwave transmission, bluetooth, satellite**
- **Manual exchanges, labor intensive** → **Systems and software, technology driven**
- **Centralized, vertically integrated** → **Decentralized, internet platforms: Messenger, WeChat, Skype, Viber**

Energy

- **Thomas Edison**, prolific inventor and businessman
- Developed and patented a complete electrical distribution system for light and power
- Set up the world's first electricity power station in New York City
- ***He died on October 18, 1931 – 86 years ago***

Energy - then and now

Impact of Technology: LIMITED

- **Centralized System** → **Mostly centralized with a few microgrids**
- **Large generators with extensive pole and line distribution system** → **Most users rely on grid, distributed power**
- **Fossil fuel powered** → **2-3% renewable generation**

Confronting

Issues

Issues that confront us now:

- Growing energy demands in Africa, Asia, South America and the Middle East
- Ageing power generation and distribution infrastructure in developed economies
- Greenhouse gas emissions from burning of fossil fuels (Paris Accord)
- Pollution (other than greenhouse gases) especially in China, India and East Asia from burning fossil fuels

Confronting Issues

Issues that confront us now:

- The use of renewables impacting on energy system ***inertia***
- Improving efficiency and reliability – distributed and non-distributed

Decentralised power generation from renewables potentially offers cheap, clean power without expensive infrastructure - both in developed and developing economies.

Transitions to meet a reduced carbon footprint

Intermittent energy solutions:

- Wind
- Solar
- Geothermal
- Tidal
- Hydroelectric

Energy storage solutions:

- Super capacitors
- Fly wheels
- Batteries
- Hydro-storage
- Nuclear
- Hydrogen
- Thermal - molten salts
- Biomass

Transitions to meet a reduced carbon footprint

Lead times to establish a

greenfield site:

Nuclear	Coal	Gas	Renewable
10 + years (avg. 7.5 year build)	*7 years*	*5 years*	*2 years*

Emerging solutions economically viable now

- Solar, wind, tidal, hydro, geothermal
- Batteries
- Fly Wheels
- Hydrogen
- Hydro-storage (Pumped Hydro)

Emerging solutions economically viable now

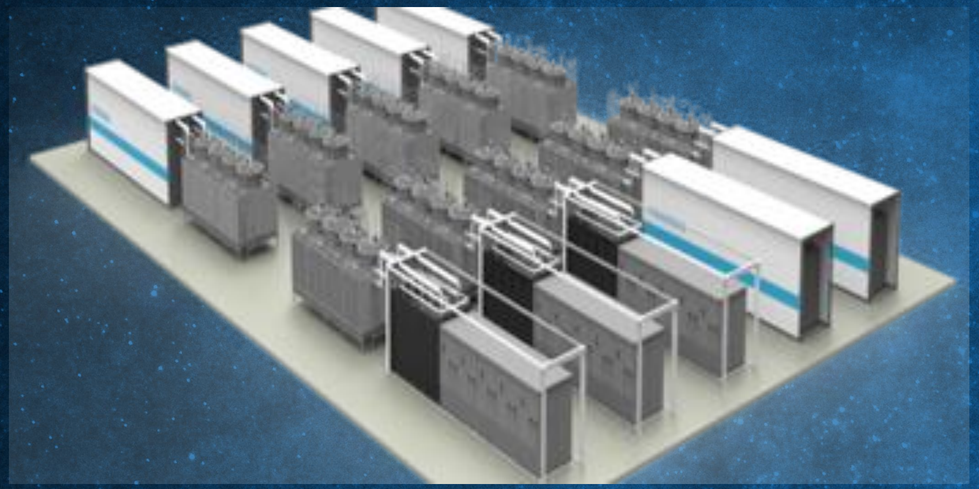
Batteries

Tesla's 80 MW PowerPack substation in Mira Loma, California

Tesla is also currently building a 100 MW battery in South Australia

Emerging solutions economically viable now

Hydrogen



10 MW Fuel Cell system cable of delivering dispatchable energy when needed

Emerging solutions economically viable now

Adoption of technology and business models

- System integration
- Software
- Business models
- Existing regulations

Utilizing technologies tomorrow

- Hydrogen rollout
- Tesla’s Giga Factory
- Flow batteries
- Zen Energy batteries
- Fly wheels
- Supercapacitors
- Pumped hydro

Utilizing technologies tomorrow

- Consumer Led
- Have greater control of the power they utilize
- Be able to share / sell power with local community
- Will demand that the energy is coming from a low carbon base
- Will want to be able to have energy when they need it
- Cities need to ensure that grids can be multifaceted to meet needs of the population
- Non-distributed versus distributed

The Future of Energy

Disruption is coming

- Uber, Airbnb, fintech products/services

Opportunities

- Systems and software integration
- New business models

Paradigm shift

- How users will manage their energy and what new business models can be achieved

THANK YOU