ST. PAULS CHAMBERS

Legal and Regulatory issues

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Subjects

- Early stage ‘battery farms
- Areas of interest for regulation
- International Harmonisation of regulation
- Key Challenges

Failure to Regulate

- New technology requires new legislation.
- Advances in science are quicker than advances in law – 10 years to draft a new law or standard
- Consequences can be farcical

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Early stage battery farms and Smart Grid

- The concept utilizes the EV battery waste stream as a means to store wind energy to increase wind energy capacity factor, improve utilization, and make more efficient use of EV batteries prior to recycling.
- **Michigan** an ideal location many of the battery and car manufacturers are located. Michigan is on track to meet a 10% renewable portfolio by 2015 with over 1100 MW of planned new wind projects to be installed by then
- **Golden Valley Electric Authority in Fairbanks**, a nickel-cadmium Battery capable of producing 27 MW of electricity for 15 minutes for backup in extreme cold.
- **Sabano Llana, Puerto Rico** lead acid battery. It was retired after only 5 years service and replaced in 2004.
- **The batteries available for the battery farm will consist of reject and PC batteries. The rejected batteries are assumed to operate in the battery farm for ten years while the PC batteries are assumed to operate for five years.**

Areas of interest for Regulation

- Materials and other Hazards
- Service of the smart grid
  - Load differences
  - Worst case scenarios - customer, home, cities
- Recycling
  - Lead
    - coma, convulsions, mental retardation seizures & death
  - Sulphuric acid: highly dangerous
    - Irritation, burns, eyes, upper respiratory failure
  - China already has a culture re mopeds
- Nanotechnology risks
  - Human exposure(limited)
  - Recycling

Material and other hazards

- Short circuiting due to overcharging /discharging
- Generation of gasses (explosive atmosphere)
- Lithium: overheating can cause explosions
- Lead – acid spills
- HASS and LASS
  - 500 vehicle accidents per annum
  - 200 acid and non vehicle battery
- Ingestion by babies (also magnets)
- Precautions include
  - Ventilation
  - Protective clothing
  - Manual handling regulations [FLT, carts, protective kit]

Consequences of failure of transmission grid

- Various forms of power outage
  - Transient Fault (momentary) ie faulty power line
  - Brown out drop of voltage (as with lightening)
  - Blackout (total loss of power)
- Millions of $ damage to computers, cell phones, dishwashers, water treatment plants.
  - Silicon Valley rolling blackout $75m losses
  - 2000 1 hour outage in Chicago – delay of $20 trillion trades
  - Sun Micro Systems estimates cost to the company of of $1m per minute
  - 2003 blackout in north east USA cost $6 billion economic loss
  - US $4.5 billion of 2009 Recovery package for power grids
  - November 2006 extensive European Blackout following a planned routine disconnection of a German powerline

Harmonisation of Regulation

- The need for consistency
- Current , China and EU Smart grid and battery regulations
- Consequences of failure to regulate
  - Segway
- OECD work
- International Energy Agency Regulators Network
- Recently General Electric signed a strategic cooperation agreement with State Grid Corporation of China and the Chinese Academy of Sciences to jointly develop smart grid standards.

OECD work

- International work which is multidisciplinary
- Already established national frameworks (chemical safety)
- Already established international frameworks
- OECD assists countries in implementation of national polices to guarantee responsible development of nanotechnologies
- Includes safety evaluation for human health and environmental safety

IEA Roadmap launch

- Announced in a speech by Chief Exec Mr Tanaka, 4th April 2011.
  - Several large scale system wide demonstrations are urgently needed
  - Greater international collaboration is needed
- Regulation – urgent work required to;
  - Develop regulatory mechanisms for deployment and costs models/investment
  - Address regulatory and policy barriers that hinder development of regional smart grids
  - Tackle Cyber security
- Potential to reduce global CO2 emissions by over 2 gigatonnes pa by 2050 (largest possible benefit by far in China).

IEA Modelling Load Shifting using Evs in a Smart Grid Environment [2010]

- Predicts that EV's will account for 10% of total electricity supply by 2050
- Using 2500 TWh (new demand)
- Tremendous capacity – Vehicle2Grid
- Excellent statistical availability, to monitor use of the vehicles
- Main benefits would be seen in Western Europe and Japan. USA and China would see a reduction in CO2 emissions (limited other benefits as both have high 'middle load' resources eg gas and stored hyrdo)

US: a piecemeal approach

- US Electric Drive Vehicle Deployment Act – to fast track deployment of ev and plug in technology.
- Allows the US Sec of Energy to award up to $300m to 10 deployment communities to serve as hubs for ev manufacturing and proving grounds for best practice
- IEA have published a Smart Grids Technology Roadmap – focus on regulation to drive investment rather than safety

The Global Smart Grid Federation

- Global stakeholder organisation committed to creating smarter, cleaner electricity around the world.
- US Gridwise Alliance, Korea Smart Grid Association, Indian Smart Grid Forum, Japan Smart Community Alliance, Smart Grid Australia, Smart Grid Canada and Ireland
- Policy issues are on the agenda – including reliability and accessibility.

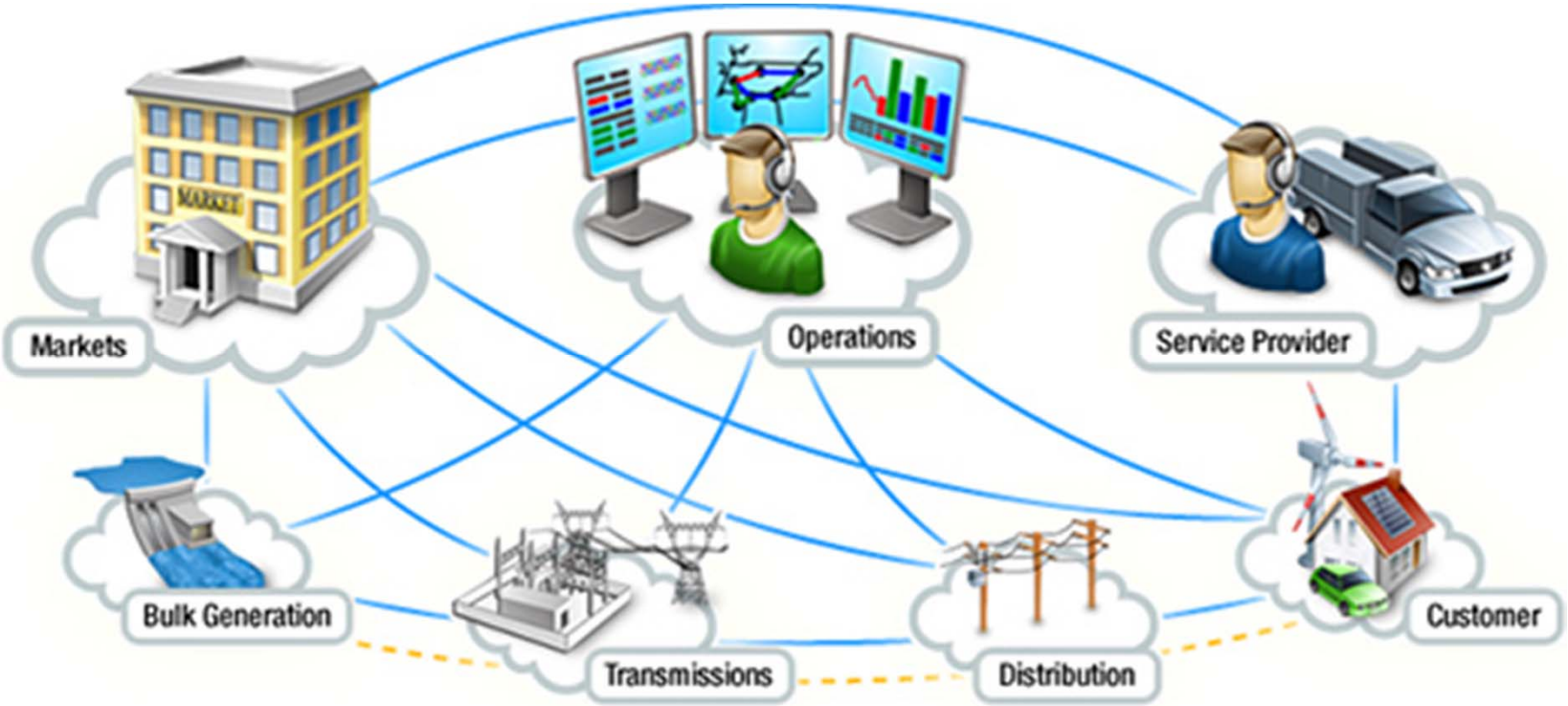
IEEE working groups

- **Three Task forces**
  - Power Engineering looking at interoperability
  - Information Technology – privacy, security, safety
  - Communications technology. Who defines the attributes of information

- **IEEE 2030.1** guidelines for EV's in the smart grid. The most comprehensive document available deals with
  - End to end approach
  - Review of existing standards and new standards required
  - Standardisation for manufacturers.
  - Does not consider the wide range of regional differences.
- **IEEE 2030.20** utility storage systems for transmission and distribution networks
  - Guidance on technical characteristics for storage systems
  - Integration with electric power infrastructures.
- http://smartgrid.ieee.org/

IEEE Smartgrid Conceptual Framework.

- End to end smart grid system
- 7 domains are all interrelated



Smart Grid Regulation in China

- Government energy organisations.
  - The state electricity regulatory commission founded in 2002
  - The National Development and Reform Commission founded in 2003 – overall planning authority
  - National Energy Administration – headed by Premier Wen Jiabao
- Electric Power Law 1996
  - protection for investors, consumers and producers
- China Energy Conditions and Polices 2007, includes development of an emergency response system for power safety and reliability

Other initiatives

- China Electricity Council 1998 – mission to enforce industrial management
- State Grid Corporation SGCC – has been active in developing smart grid standards
- 2005 law to increase solar and wind power to 10% of Chinas total energy consumption but recent report by State Electricity Regulatory Council - 50% of electricity produced by wind ended up unused.
- New regulation of wind through **competitive bidding process** rather than a **feed in tariff** – to cool down the market has caused nervous reaction from investors

China Batteries.

- Fact Sheet Kimbery Go and Ericka Scull 2008/9 identifies problems
  - 1,400 battery manufacturers, produced 30.5 billion batteries in 2005, 13.9 billion used in China.
  - Lead batters for EV's and e bikes result in 30% growth in market per year
  - Lead acid batters in small scale operations – 50% of the lead is lost into the environment
  - Lead battery waste can discharge into waterways and soil
  - Problems with illegal dumping. Antimony has entered the toy supply chain.

China Battery regulation

- Occupational Diseases Prevention and Control Act 2002 defined new Occupational Exposure Limits, introduced fines, revocation of licences and prosecution.
- 2006 report shows lead levels still increasing in battery factories and smelters.
- Despite battery recycling spots, recycle rates below 5% in main cities. Result new recycling plant in Beijing 2008 and more recycling bins.

Hangzhou Electric Taxi

- Hangzhou is said to be a pioneer among Chinese cities in the deployment of plug-in vehicles. In late January, the city announced that 15 electric Zotye Multiplas and 15 battery-powered Haima Freema would serve as taxicabs on its streets.
- Plans had called for that electric fleet to hit 200 units by year's end, but the blaze is likely to alter the city's scheme.
- A Zotye made electric taxi spontaneously exploded in Hangzhou approximately on **April 13**. Fire fighters supposedly arrived at the scene within minutes, but couldn't control the blaze.
- According to the China Auto Web, the vehicle turned into a "fireball," but luckily, the driver and two passengers escaped without injury. The exact cause of the fire has not been revealed.
- Chevrolet Volt – 2 unexplained fires in one garage being investigated in Barkemstead, Conneticut. **GM say battery not to blame.**

Zhejiang Online – Qianjiang Evening News Analysis: Sun Yan)
car/2011-04-13/1500466.php