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UK-China Science Bridge in 4G Wireless

Keynote:

A Personal Perspective of Wireless Telecom Advances: The Three Waves

Dr Walter Tuttlebee, OBE
Executive Director
Virtual Centre of Excellence in Mobile & Personal Communications

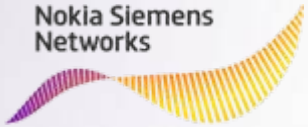
Preface: Brief Introduction of VCE

Introducing Mobile VCE

Strategic Industry-led Research

- Strategic, Industry-led, technology research
  - Objective: technology innovations for industry growth
  - Many companies can no longer ‘cover all bases’ in house
  - Many recognise the benefits from open innovation with others
  - Harnessing the top UK research Universities, amongst the very best in Europe
- Not-for-profit company, established in 1996
  - Owned by its members – global industry players
  - Supported by / work closely with Government
  - Industry-led Board of Directors appointed by its members
- MoU with SHRCWC (WiCO)
- My 4th visit to China in 5 years…

Our Industrial Members – many of the world's leading communications companies – define & steer our long-term, world-class research



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www.mobilevce.com

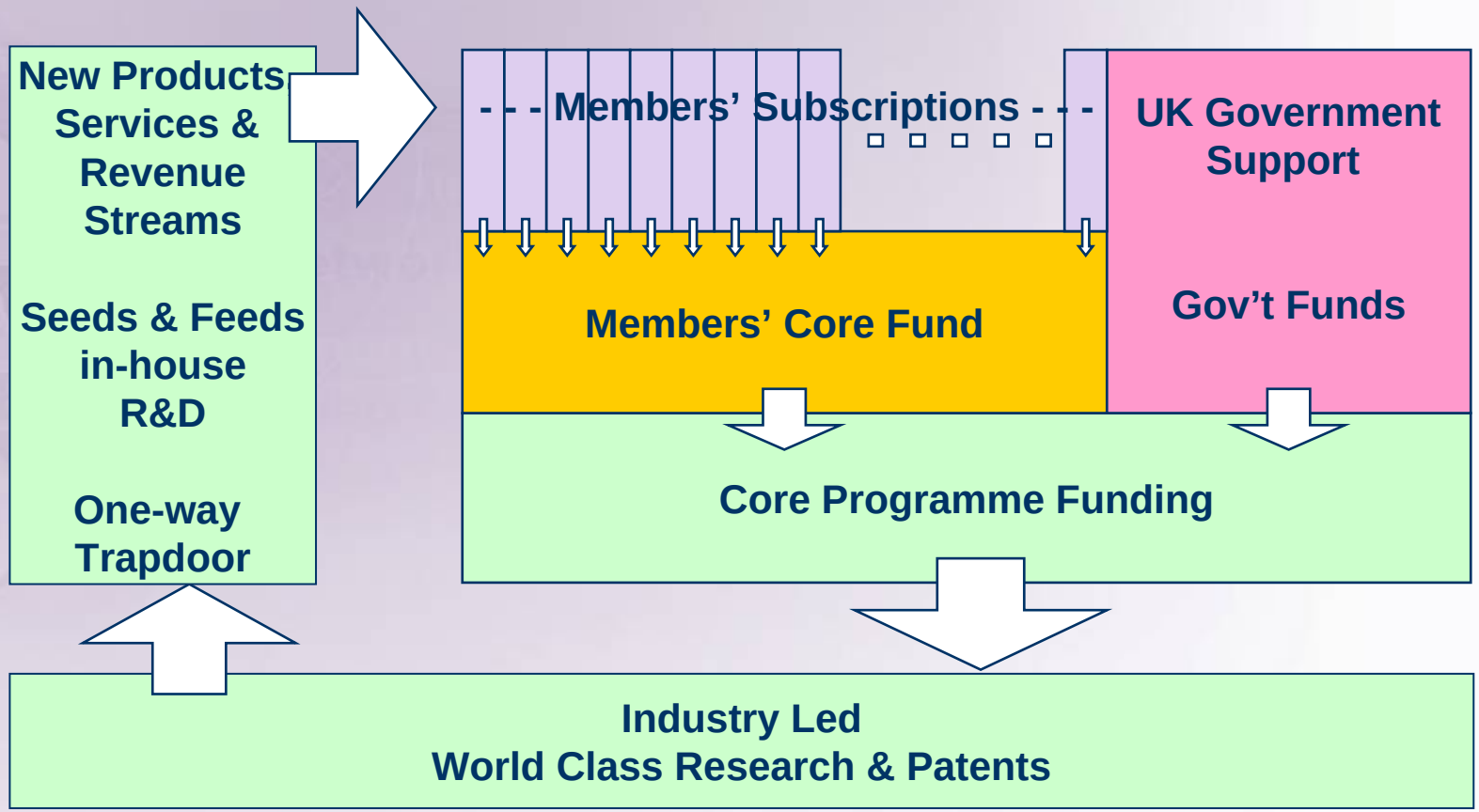
Note: other companies from China are invited to join

Introducing Mobile VCE

Why Companies Join…

- Ensure the Future
  - Awareness of new technology opportunities & threats
  - A ‘window on the future’ – strategic research themes
- Access People & Expertise
  - Companies build trusted relationships with the top academic teams over a sustained period of time
  - Companies recruit our researchers as ‘known capabilities’, who they have worked with and who know how to deliver what industry needs
- Cost Sharing & Partners
  - Sharing vision with other companies at the pre-competitive stage results in strategic research that can create new markets
  - Reduced costs / wider research scope through joint funding

Mobile VCE Operating Model



- High financial gearing
- Strengthens the research base available to the global industry
- Known, qualified, research staff who appreciate industry's needs

Our Member Companies Shape our Research

A Global View

- Mobile VCE Industry Members, based in the key Geographical Regions, develop shared long term vision:
  - Europe – strong traditional 'telecom' providers…
  - America – home of the free market, of the Internet pioneers…
  - Asia – high growth markets, new suppliers, new requirements…
  - ALL the global players seek to have a global view, which is coloured to differing degrees by heritage and ability to embrace change

- Role of Industry & Universities
  - Research Challenges - Industry members
  - Technical Approaches - Academic members

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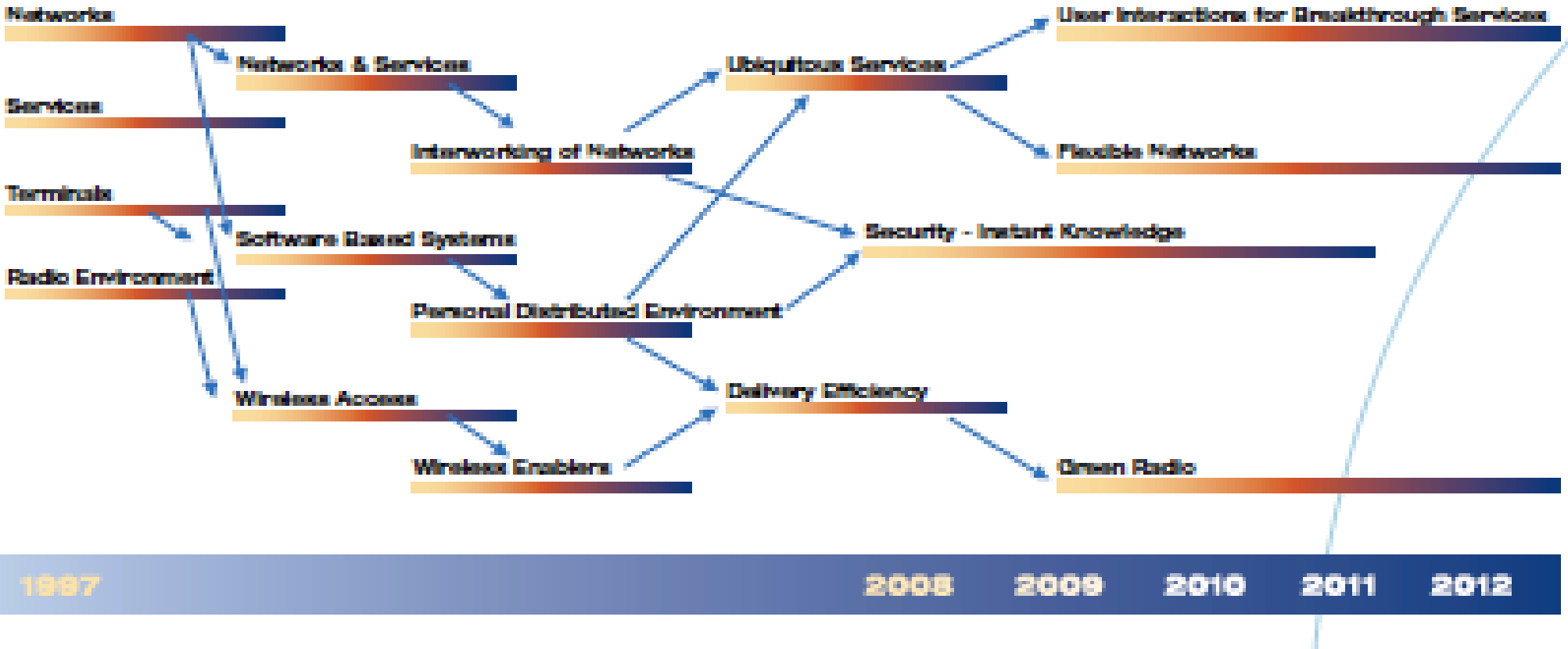
Evolution of Mobile VCE's Research

Core Research Evolution



A Personal Perspective of Wireless Telecom Advances & the Changing Role of China

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Personal introduction…

- 1970s – BSc/PhD – Electronics/Nonlinear Optics
- 1980s – Plessey Research
  - Radio design, moving into digital consumer communications in the mid-1980s -> digital cordless, GSM and early 3G/UMTS
- 1990s – Siemens – foundational European 3G research
  - FRAMES – input into the ETSI 3G standards (Siemens TDD)
  - MBA degree, Management & Business Development, complementing technology activities …
  - First book ‘Cordless Telecoms in Europe’ – translated into Japanese, a foundation of PHS !
  - Served on UK Government committees
- Since 2000 – Chief Executive of Mobile VCE
  - Many Asian companies are VCE members
  - Led numerous Industry missions to & have participated in Governmental / bilateral meetings with Japan, China, Korea, etc

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Talk Structure

- Global Market Developments
- "The Three Wireless Waves"
  – Some Key Shifts in Technology
- China in the Three Wireless Waves
- Conclusions

Global Market Developments

The Telecoms Industry Landscape

Key Changes

- Since the 1990s – Europeanisation, then Globalisation
- Since the early 2000's – Boom, Bust & Stabilisation
  - Spectrum auctions – hype & hope
  - Huge global market growth BUT reducing margins !
  - Industry Competition, Downsizing & Consolidation
    - Infrastructure, Handset & Semiconductor manufacturers
    - Emergence of China – R&D as well as manufacturing
- Since 2005 - the next stage of transition
  - Evolving Business Models
    - From voice to broadband access (cf fixed & mobile operators)
    - From handsets to services (cf Nokia, Apple)
    - From infrastructure supply to network operation (cf Ericsson)

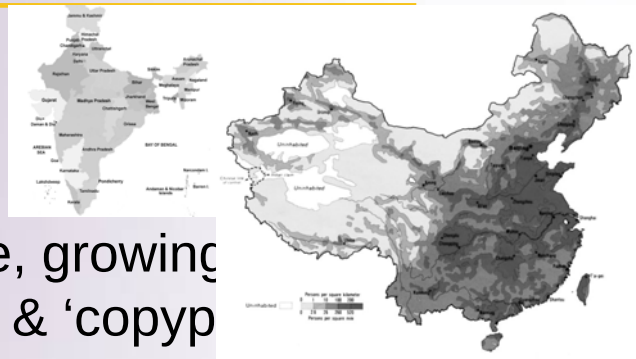
Mobile Markets

Market Size

- The 2001 Downturn – concerns over market saturation… however, the reality was…
- Strong & rapid growth
  - Feb 2009: 4bn mobile users globally
    - 20 years to reach the 1st bn (1Q 2002)
    - + another 3.5 years to reach 2nd bn (3Q 2005)
    - + another 2 years to reach 3rd bn (3Q 2007)
    - + another 1.5 yrs to reach 4th bn (1Q 2009)
  - 1180m handsets shipped in 2008
  - >50% of China's population today has a mobile phone
    - Nov 2008 634m people (Source: MIIT)
  - Globalised competition & consolidation amongst both manufacturers and telecom operators
  - 2008 was a turning point in mobile broadband

Mobile Markets

Two Distinct Drivers …



- Developing Markets
  - Voice has been the dominant usage, growing introduction of low cost $30 phones & 'copyp
  - Communications & information access are recognised tools for economic development
- Developed Markets
  - Voice is saturated - operators must find new revenues
    - This is driving service innovation and new product creation
  - Mobile + Fixed – global operational consolidation
- Paradigm Shift
  - Service innovation becomes a key evolutionary driver, not just in developed markets, but increasingly globally…

Rapid Change – 2008 [More Ahead !]

- iStuff & Apps Stores
  - iPhone – Apple – Touchscreen interface is now a ‘must-have’
  - iPlayer – BBC – On-demand high quality content
  - iTablet (Open Source & MIDs) – cf Nokia N810 Internet Tablet
- US 700MHz Auctions, Whitespace Spectrum
  - Role of ‘New’ players - Google, Microsoft
    - Open access rules have been driven by Google
  - Established players (Verizon, ATT) consolidated positions
    - a basis for LTE commercialisation
- Europe: Wireless Broadband
  - ‘France Numerique Vingt Cent Douze (2012)’
  - ‘Digital Britain’

“The Three Wireless Waves” (a simplified perspective)

A Paradigm Shift has been happening…

Geographical Markets	The West	⇨	The East
Growth Drivers in the West	Volume	⇨	Service Innovation
Network Platform	Circuit switched Designed for voice	⇨	Packet switched / IP Designed for data Commercial VoIP
Telco Services (Network-Service Separation)	My Customers, with My Services, on My Network - Walled Services	⇨	My Customers, with My Services, via Others' Networks - Open Mobile Internet
Service Convergence (BFMC)	Separate Fixed, Mobile, Broadcast services	⇨	Content delivery via multiple channels and network types
Wireless	High Cost, Limited Choice of Standards	⇨	Many new emerging technologies at all levels

"The Telecoms Paradigm Shift", W Tuttlebee, IEE Communications Engineer, Oct/Nov 2006

The First Wave: Communication

(a simplified perspective)

- 1985 to 1995 - Digital Cellular (2G)
  - **Opening Up Latent Demand to talk**
    - People want to telephone from wherever they are
  - **Regional Standards**
    - Europe – GSM, replacing multiple national standards
    - USA – multiple standards – CDMA (IS95), DAMPS, etc
    - Japan – PDC, a national standard to export
    - Why ? Different views & ways of thinking…
  - **Long Term Outcome**
    - ***Groupe Spéciale Mobile*** ➔ ***Global Standard for Mobile***
    - Happened slowly – 1995 USA acceptance was a major factor

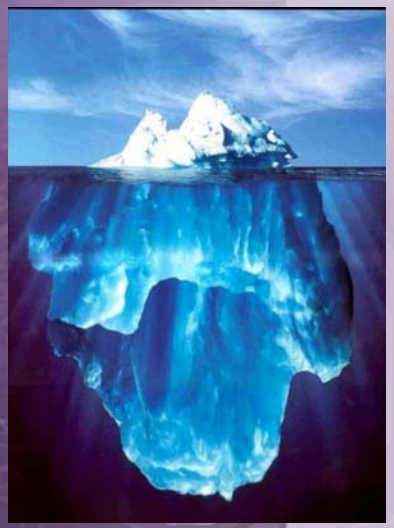
The Second Wave: Information

(a simplified perspective)

- 1995 to 2005 – Internet & IP go Mobile (3/3.5G)
  - **Opening Up Latent Demand for Information**
    - People want information wherever they are
    - European 3G research began late 1980s – synergy with the (new) Internet
  - **Regional Approaches**
    - Europe – steady collaborative engagement with Japan, China …
    - Japan – early delivery using i-mode, pro-active in 3G & 4G
    - China – major market growth, intl collaboration, FuTURE…
    - America – slow starters, fighting IS95 & analogue battles, later new wireless initiatives driven by Intel (WiFi, WiMAX)
  - **Outcomes**
    - ***3G/WCDMA – slow start, BUT HSPA is now delivering***
    - 4G – has meant different things to different people

      (marketing vs technology !)

Open Wireless Internet



- **WiMax - the visible 10%** (of the Iceberg)
  - 2003 HPi and WiBro (Wireless Broadband) in Korea
    - Key decision for Korea in 2004 – to merge with IEEE 806.16
    - Delayed the development of WiBro – impact on local rollout
  - Manufacturer & operator support has weakened
    - …even before the economic downturn
- **Open Wireless Internet is here – the emerging 90%**
  - Mobile operators accept it is the only realistic option
    - What the market wants is an operator's opportunity
    - Mobile broadband access revenues are replacing voice
- **Q. What will Open Wireless Internet enable ?**
  - What comes next & what could it enable ?
  - Research questions – not development issues

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The Third Wave: Personalisation

(a simplified perspective)

- 2005 to 2015 – Personalised Services ('my-G')
  - **Opening Up Latent Demand for MY Service**
    - People are individuals & everyone wants something different
  - **Wireless & the Internet are only two of the enablers…**
    - Europe – a wealth of contextual, personalised, computer science based research, not fully connected with telecoms
    - America – following the Intel lead of changing the game, driven by open-Internet thinking from Google, Apple, et al (iPhone, Android…)
    - Asia – is the new mega-mass-market – and can hence stimulate requirements-driven innovation that would not otherwise happen
  - **Outcomes**
    - Too early to say, **but** the markets will be global, so …
    - Companies must understand how other regions think

China and the Third Wireless Wave

The Emergence of Asia

Three nations…

- **Japan**
  - Missed out on GSM – developed PDC, but could not export
  - Invested in Europe in 1990s, secured IPR in 3G WCDMA
  - Strong technology and R&D from the start
- **Korea**
  - Came from nowhere in telecoms
  - Teamed with Qualcomm to develop CDMA, to compete w GSM
  - Had to learn ‘what is research’ (cf Samsung story)
- **China**
  - Collaboration with Siemens (and others) in mid-1990s, supported emergence of TD-SCDMA, FuTURE, FuTURE+
  - Large investments in China (to access the market)
  - Since early 2000’s – emergence of Huawei & ZTE

China in the Three Waves

- **First Wave: 1985-1995**
  - China was barely in the game
  - …but saw the importance of mobile & the need to get into 3G
- **Second Wave: 1995-2005**
  - Goal: self-sufficiency & own IPR
  - Approach: FuTURE, Collaboration with Europe
  - Technology: TD-SCDMA own standard
  - Outcome: 3G technology standard but will it really fly ?
    - Difference between a standard & a market
- **Third Wave: 2005-2015**
  - Convergence on LTE as a single global standard
  - China's Future Role: LTE-TDD ? LTE-A ?

China – Threat & Opportunity

- **China & Wireless**
  - China missed 3G, like Japan, missed GSM, BUT…
    - …China built relationships with Europe and created its own
  - TD-SCDMA – Why ? (My Question in 2004)
    - Technological & IPR self-sufficiency ? or…
    - As an IPR bargaining tool ?
    - '3G license decisions will come soon' – 2004 !
    - A. As a strategic necessity, managed opportunistically
  - 2009 – Licensing & Restructuring finally here
    - TD-SCDMA is being widely deployed by CMCC – but marketplace acceptance for 3G success is far from certain
    - China is seeking to leverage TD-SCDMA into LTE-TDD
    - It cannot do this alone, and has realised that it cannot do it without accepting non-Chinese 3G as well
    - Partnership means compromises and win-win for all parties

Aside: Why is Europe so Important ?

- **The European Difference (it is not *just* technology)**
  - The 1970s – each country supported its national champions
    - France-Alcatel, Thomson; Germany-Siemens, SEL; UK-GEC, Plessey, STC; Netherlands-Philips…
  - The 1980s – the legacy of the European ideal
    - Framework Programmes - RACE / ACTS / IST– were about culture change, not just technology research !
    - Legacy – a generation of young researchers who learnt to work naturally across geographical, cultural and company boundaries and became a generation of senior executives who carry these values
    - Collaboration, Partnership, Sharing, Open Innovation
  - Contrast with North American independence
    - The ethos of Silicon Valley
    - Anyone can do it (and you're allowed to fail)
    - But … 'I don't need to partner…'

Concluding Remarks

Conclusions

- Opportunity from the first Two Waves
  - Information & Communications for the next 3bn customers
  - Green Wireless – same capability, lower energy consumption
  - Wireless-in-everything - the 2nd Century of Radio
- New Markets of the Third Wave
  - Consumer: Personalised Lifestyle Support Services
  - Business: Opportunities to Transform other Industries
- Prospects for China
  - Local opportunities are huge – a potential weakness & strength
  - Operators & suppliers must look to global customers & partners
  - Understanding comes through *being in* other markets & cultures and *listening* – decisions made in Beijing will work no better than ones in Chicago ;-)
  - Partnership & Presence – distributed R&D (like Japan & Korea)

Conclusions

- **China Culture**
  - China has developed strength in wireless technology
  - China must avoid the US/Japan weakness of ‘independence’
  - In today’s global markets, technology strength is *necessary but not sufficient* – partnerships and shared understanding is needed

- **Riding the Third Wireless Wave**
  - Today’s situation…
    - A new economic climate of protectionism
    - Note the European reaction to the ‘buy American’ provision, which is now to be dropped from Obama’s legislation
    - DoCoMo funding handset developments with Japanese suppliers
  - China must avoid looking inward & being ‘self-sufficient’
    - Collaboration & Partnerships will build success
    - The UK-China Science Bridge a valuable vehicle in this
    - Need to focus on what industry will NOT do – be complementary

Thank you !

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For more information about Mobile VCE please visit our website and/or contact

Dr Walter Tuttlebee

E-mail: *walter.tuttlebee@mobilevce.com*
Tel: *+44 1256 338604*
WWW: *www.mobilevce.com*