ITU Regional Training Workshop on
"Spectrum Management: Strategic Planning and Policies for Wireless Innovation"

Understanding Future use of Spectrum

Place: Algiers

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Presenter : Jan Verduijn

Session Objectives

Understanding future requirements for spectrum is critically important to ensuring future needs are met. In this session we will look at various bands and the types of information needed to assess future requirements

STUDENTS

Module Topics

- Spectrum Demand Requirements in High Priority Bands
- GE06 Planning and Analogue Shut-off (ASO)
- Overview of Planning Objectives and Future requirements for Wireless Broadband from the FCC National Broadband Plan

Aeronautical and Maritime Services - Communications, Navigational Aids and Surveillance

There are several developments in new systems which will likely drive demand.

- Development and renewal of large scale applications for navigation and surveillance of aircraft and ships include ground based, airborne and ship borne radars, automatic dependent surveillance broadcast (ADSB);
- GPS augmentation systems (including capability for landing guidance).

Aeronautical and Maritime Services - Communications, Navigational Aids and Surveillance

The range of aeronautical radionavigation applications is wide and is dependent on the intended use, the physical characteristics of the bands used, and their interrelationship in the overall air traffic control environment.

Applications include a multitude of systems. Examples include:

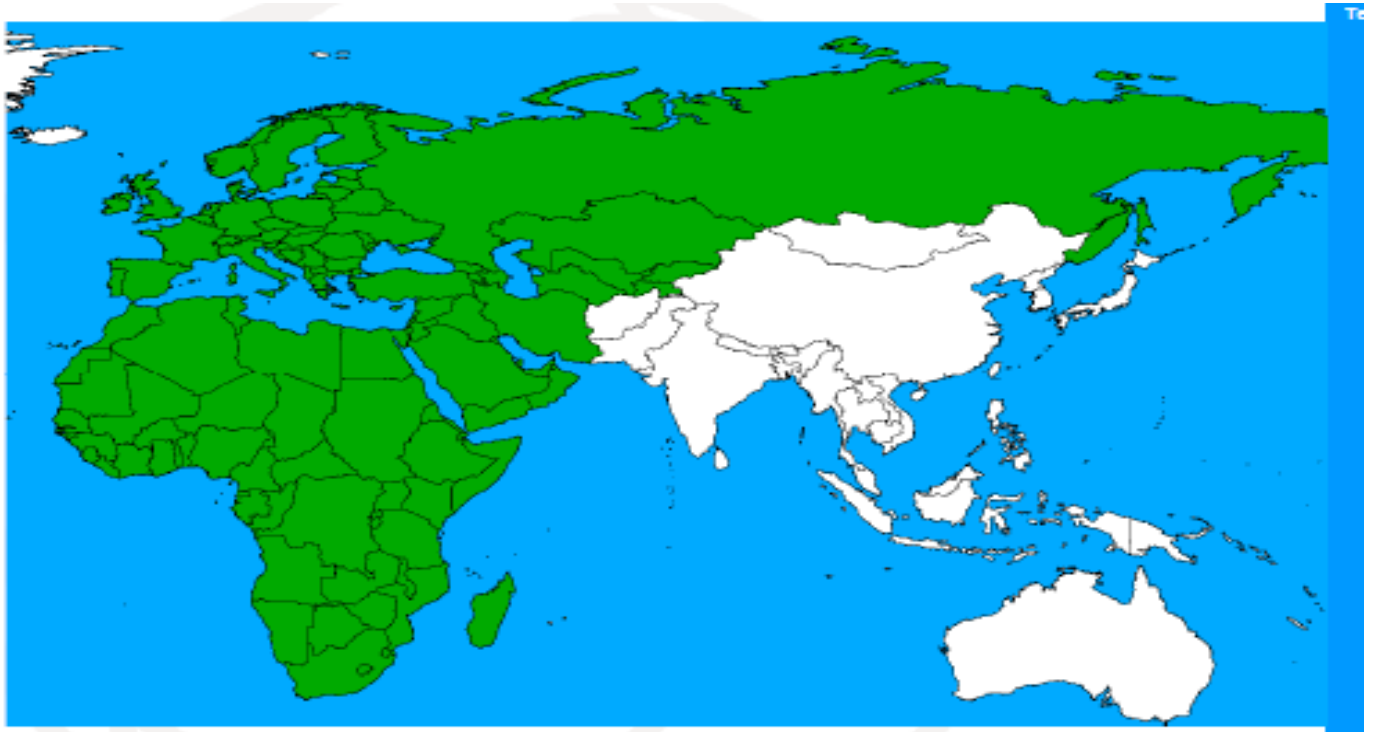
- Instrument Landing systems (ILS),
- VHF Omni directional Radio beacons (VOR),
- Distance Measurement Equipment (DME),
- Emergency Locator Transmitters (ELT),
- Anti Collision Avoidance System (ACAS),
- Secondary Surveillance Radar (SSR),
- Traffic Collision Avoidance systems (TCAS),
- Radar Altimeters, radio-determination station including radars and beacons,
- Microwave Landing systems (MLS),
- Airborne Weather Radars (AWR) and Airborne Doppler radars.

Broadcasting - Radio and Television

- One of the primary influences on the demand for spectrum has been digitization of TV broadcast and Digital Switchover which continue to have significant implications on the demand for spectrum in the broadcast services as media and consumer behavior evolve. As well the configuration of digital services can vary significantly from one country to another.
- There are typically three platforms used to deliver TV to households:
  - Cable
  - Satellite
  - Terrestrial Broadcast Networks
- In some countries in Europe high levels of penetration exist for cable in providing non-terrestrial DTV services. In some Asian countries Satellite is the dominant means for receiving DTV services especially in rural areas where it is either a competitive model or the sole provider of DTV services.

Examples of Long Rang Planning Processes

- ITU Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz (RRC-06);
- Product: Regional Agreement GE06 (on the ITU world referred as “GE06”)
- After 17 June 2015 analogue services no longer protected and frequencies can be assigned for transmission of domestic digital services. GE06 digital plan transition period (between 17 June 2006 and 17 June 2015) requires prior agreement of neighbouring countries that may be affected.



DVB-T	Fourth Iteration	Third iteration	Second Iteration	First Iteration
Total	56533	55876	60227	62692
Assigned	55409	52229	51222	46333
% assigned	98.0	93.5	85.0	73.9

GEO6 Agreement and WRC-12

- GE06 has the binding force of a treaty and addresses 72,761 country requirements for the transmission of DVB-T and T-DAB services in frequency Band III (174-230 MHz) and DVB-T services in frequency Bands IV/V (470-862 MHz).
- Resolution 749 (WRC-07) and Agenda item 1.17 of WRC-12 tasks the ITU-R Sector to consider results of sharing studies between the mobile service and other services in the band 790-862 MHz in Regions 1 and 3, "ensure adequate *protection* of services allocated to the band and to take appropriate action".
- Joint Task Group 5-6 (JTG 5-6) established to study how mobile service can share the band 790-862 MHz band with:
  - Issue A: Sharing with the Broadcasting service;
  - Issue B: Sharing with the Aeronautical radionavigation service;
  - Issue C: Sharing with the Fixed service
- Further sub-divided by cases according either to an ITU-R Region (for Issue B and Issue C) or to whether the countries were or not Contracting Members of the GE06 Agreement (Issue A). See RR provision No. **5.2**.

ITU Digital Switch Over (DSO) Guidelines

- Policy & Regulation
  - Technology & Standards
  - Licensing Framework
  - International Reg's – GE06
  - National Spectrum Planning and Compatibility Studies
  - Assignment Procedures
  - Permits
  - Business Models
  - Digital Dividend
  - Public Information
  - Transition Models
  - ASO Planning
- Market & Business Development
  - Research
  - Equipment Availability
  - Business Planning
  - End-customer support

General Guidelines (1)

- The following general guidance was provided for Analogue Switch Off (ASO) planning in that it should commence as early as possible because and be as short as possible.

  The benefits of analogue switch-off will be reaped early (see section 2.14.1)214;

  - early planning will put any country in the requesting (leading) role when bi-lateral coordination with neighboring countries becomes necessary;
  - The longer the preparation time, the better the plan and the more spectrum will be available for broadcasting services (and any other services);
- Early planning allows sufficient time for testing migration scenarios, DTTB services and any other new broadcast service (e.g. mobile television);
- A shorter process is less costly. The minimum set simulcast duration will determine to a great extent the ASO duration.

General Guidelines (2)

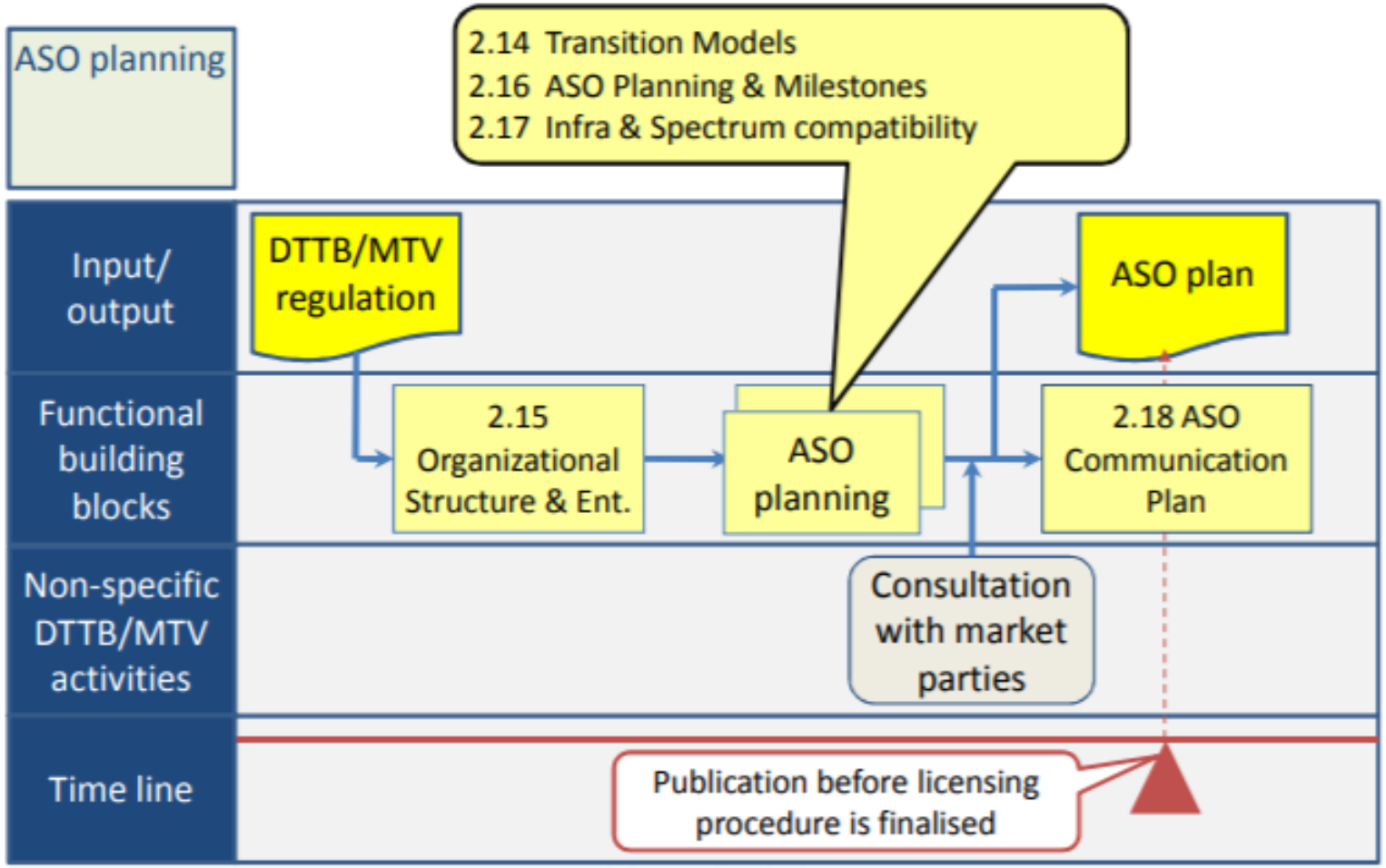
- Switch-off during nightly hours which is normally the best hour;
- Plan the ASO phases on the basis of the network planning (which is very often based on the spectrum availability) and technical possibilities, taken into account the specific weather conditions. The technical possibilities for changing antennas in the winter period could be limited - less of a problem some Asian and African countries;
- As a next step, plan the communication ‘around’ the technical network roll-out planning. Communication can start as early as 2.5 to 3 years ahead of switch-off to provide the public with general information on the ASO process. Normally 6 months to one year before the analogue switch-off date the affected viewers are informed about the actual switch-off date in (a specific region);
- Plan the communication process on the basis of the time necessary to ensure that viewer no longer depend on the analogue terrestrial platform.

General Guidelines (3)

Preferably, decide the allocation of the ‘digital dividend’ before any ASO plan is drafted because:

- Spectrum re-farming, due to alternative allocation of the ‘digital dividend’ might either interfere in the ASO planning or require re-planning after the ASO process and broadcasters might be very reluctant to cooperate (again);
- To facilitate solid network planning, frequency availability should be determined otherwise the number of scenarios will increase and complicate the ASO plan;
- A carefully drafted ASO creates some leverage for negotiating spectrum for broadcast services, rather than non-broadcasting applications

Regulator's roadmap
ASO Planning



ITU Guidelines & Assistance

- Guidelines for the Transition from Analogue to Digital Television Broadcasting
- First version published in 2010 (Region 1 area)
- 2nd in 2012 (for AP area)
- New release published this year (Global version)
- Available on www.itu.int
- ITU-D assisted countries to develop their Roadmap

Cellular

- Mobile phones are ubiquitous always on devices for 24/7 communication and mini-computing. For example, China is the largest mobile market with over 750 million subscriptions at the end of 2013.
- The success of Smart phone variants has spurred operators to push beyond their 3G plans and begin to deploy new technology types such as TD-SCDMA, LTE, WCDMA.
- This growth in demand for bandwidth creates additional demand for fixed links. It is quite likely that technological constraints will cause any additional demand to be concentrated in bands below 3-4 GHz.

Land and Public Mobile Radio

- End user demand for new consumer oriented land mobile systems such as Family Radio Systems and GMRS (462/467 MHz) are increasing.
- In a not so recent study (NTIA 1995) of the importance of land mobile radio systems for public safety, a need for 200 MHz of additional spectrum within 10 years was identified based on a prediction that the number of systems was expected to double between 1995 and 2005 .
- Existing land mobile spectrum meeting increased demand for mobile communications continue to operate in very congested urban areas.
- Digitization of land mobile systems has created efficiencies and cost reduction which have opposite effects on demand. Digitization leads to spectral efficiency while cost reduction promotes overall demand for systems

Fixed Wireless Access Services

- In many countries especially emerging economies, mobile broadband is all but displacing fixed broadband in new long-range high power deployments.
- Demand will be influenced by choice of markets (urban highly concentrated and highly penetrated markets and rural areas) and choice of technologies (WCDMA, WiMAX, LTE, FDD or TDD) and whether there are new entrants.
- End user demand has been characterized by increasing demand for data over voice with new applications appearing such as Video-MMS and Mobile TV which require significant band width.
- Currently, spectrum is in higher bands which permits re-use but at a cost. Short range deployments continue to grow with rapid development of new technologies and devices using primarily unlicensed bands.

FCC - National Broadband Action 2010

- In 2010 the FCC published its National Broadband Action plan which identifies four main objectives:
  - Promote World-Leading Mobile Broadband Infrastructure and Innovation;
  - Accelerate Universal Broadband Access and Adoption, and Advance National Purposes Such as Education and Health Care;
  - Foster Competition and Maximize Consumer Benefits Across the Broadband Ecosystem;
  - Advance Robust and Secure Public Safety Communications Networks.
- The first goal – Promoting Mobile Broadband Infrastructure – has four main objectives:
  - Make an additional 500 megahertz (MHz) of spectrum available for mobile broadband within the next ten years.
  - Increase opportunities for unlicensed devices and innovative spectrum access models.
  - Expand incentives and mechanisms to reallocate or repurpose spectrum to higher-valued uses.
  - Improve the transparency of spectrum allocation and utilization.

Satellite Services

- Satellite services are a significant user of the spectrum below 30 GHz There are three categories of service used in evaluating demand for satellite services due to the very different nature of each of these services and the frequencies in which they operate;
  - mobile satellite services (MSS) - 1-3 GHz L band and S band;
  - broadcast satellite services (BSS) 11-14.5 Ka Band ;
  - and fixed satellite services (FSS) 3, 5, 7, 10, 20-29 Ka Bands.

References for further reading:

- FCC - National Broadband Action March 2010.
  www.fcc.gov/Daily_Releases/Daily_Business/2010/db0923/FCC-10-174A1.pdf

Thank you