



# TETRA for Utilities and other sectors

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**SELEX ELSAG**

Secure Networking Solutions

A Finmeccanica Company

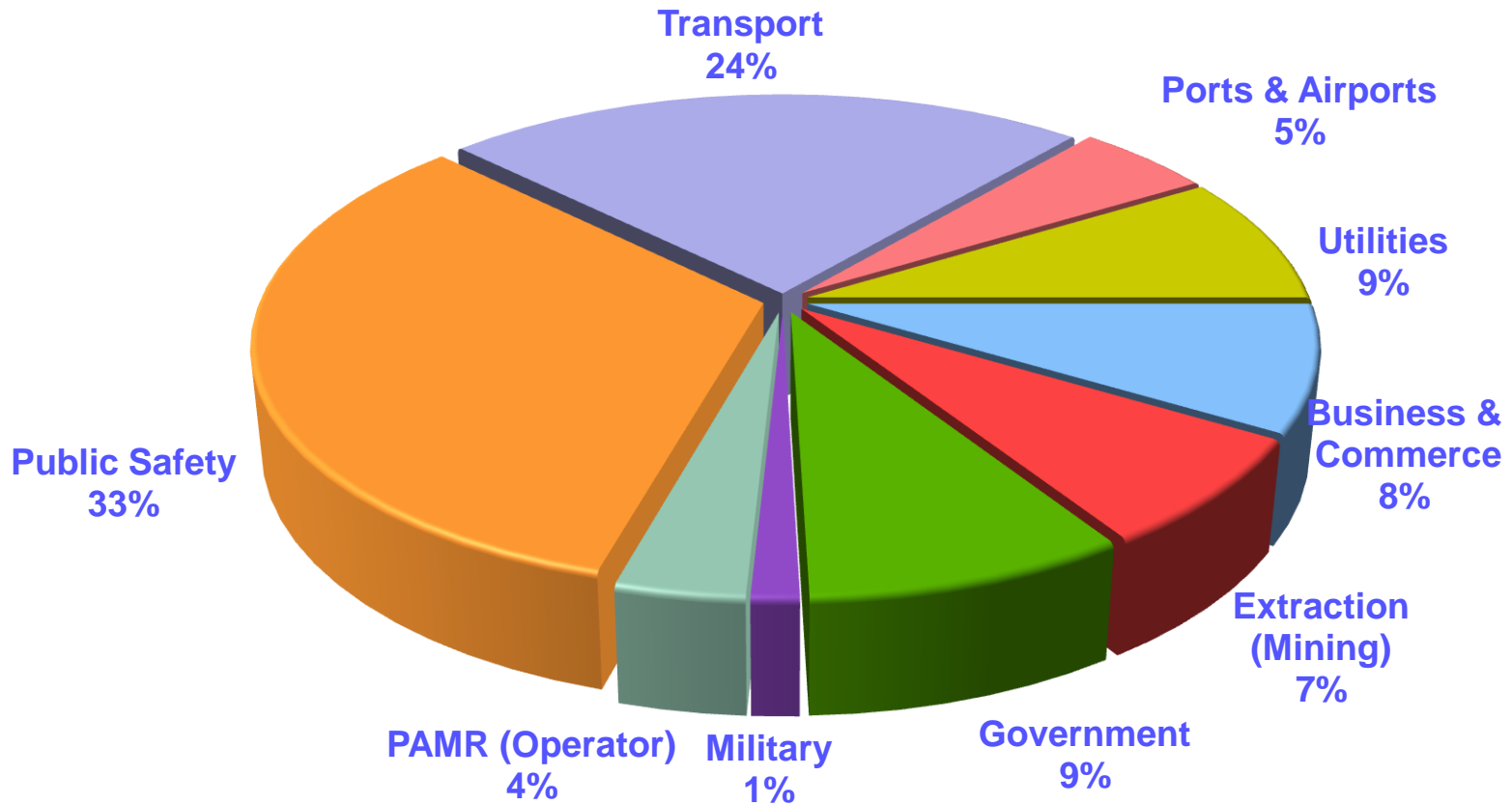
- **TETRA across market sectors**
- **TETRA in a nutshell**
- **TETRA success stories: not just PSS**
  - **Utilities**
  - **Oil & Gas**
  - **Transportation**
  - **Commercial & Industries**

# TETRA accross market sectors

# TETRA contracts

## Installed Systems

*by sector*



# TETRA in a nutshell

- **Voice**
  - **Group call - Fast call set-up and priority scanning**
  - **Individual & PABX/PSTN calls (half/full duplex)**
  - **Emergency & Pre-emptive calls**
- **Direct Mode (DMO)**
  - **Back to back communications**
  - **Repeaters and Gateways (to extend coverage)**
- **Management**
  - **Dynamic regrouping, dispatcher authorized call, multiple control channels, etc...**

- **Status precoded**
  - **2-bytes precoded status for quick operational updates**
- **Short Data Service**
  - **Short text (140 chars) – Messages can be concatenated**
  - **Real time transmission (e.g. AVL, SCADA, Telemetry) or Store & Forward**
- **Circuit Data**
  - **Dial-up like data transmission up to 28.8 Kbit/s**
- **Packet Data**
  - **IP based packet switched data transmission – channel sharing among multiple users – up to 14-15 Kbit/s**

# TEDS

Packet Data Throughput (Downlink kbits/s)

Modulation	Channel Type	25 kHz	50 kHz	100 kHz	150 kHz
1/4 DSSS	15.6				
π/8 D8PSK	24.3				
4-QAM	11	27	58	90	
16-QAM	22	54	116	179	
64-QAM	33	70	175	269	
64-QAM	44	107	233	359	
64-QAM	66	160	349	538	

Note: All channels are 4 slots

- **TETRA Enhanced Data Service**
- **Introduced in TETRA Rel. 2**
- **Wideband IP based packet switched data transmission**
- **Fully integrated into TETRA**
- **Direct Access – TEDS only networks**
- **On 50 KHz channels > 100 Kbit/s**

- **TETRA standard Peripheral Equipment Interface (PEI) for application development on radio terminals**
- **Open Application Programming Interface for 3<sup>rd</sup> party application development on infrastructure side**

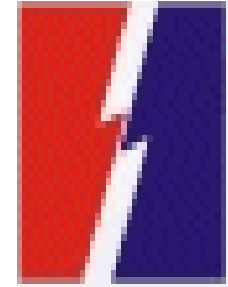
- **Availability & reliability**
  - **IP Based network architecture**
  - **Link redundancy**
  - **Disaster recovery configuration**
  - **Full redundancy of BS and switches**
  - **Base Station Fallback**
  - **Direct Mode (DMO)**
- **Full Interoperability**
  - **IOP Certification**
  - **Competition → lower prices & continuous improvement**

- **Radio terminals for “special” use**
  - **ATEX certified HH for intrinsic safety**
  - **Data modems for SCADA/Telemetry**
  - **Covert radio units**
  - **Avionic terminals**
  - **Portable Radio Dispatchers**



# Utilities

HRVATSKA ELEKTROPRIVREDA d.d.



# DIMORAS

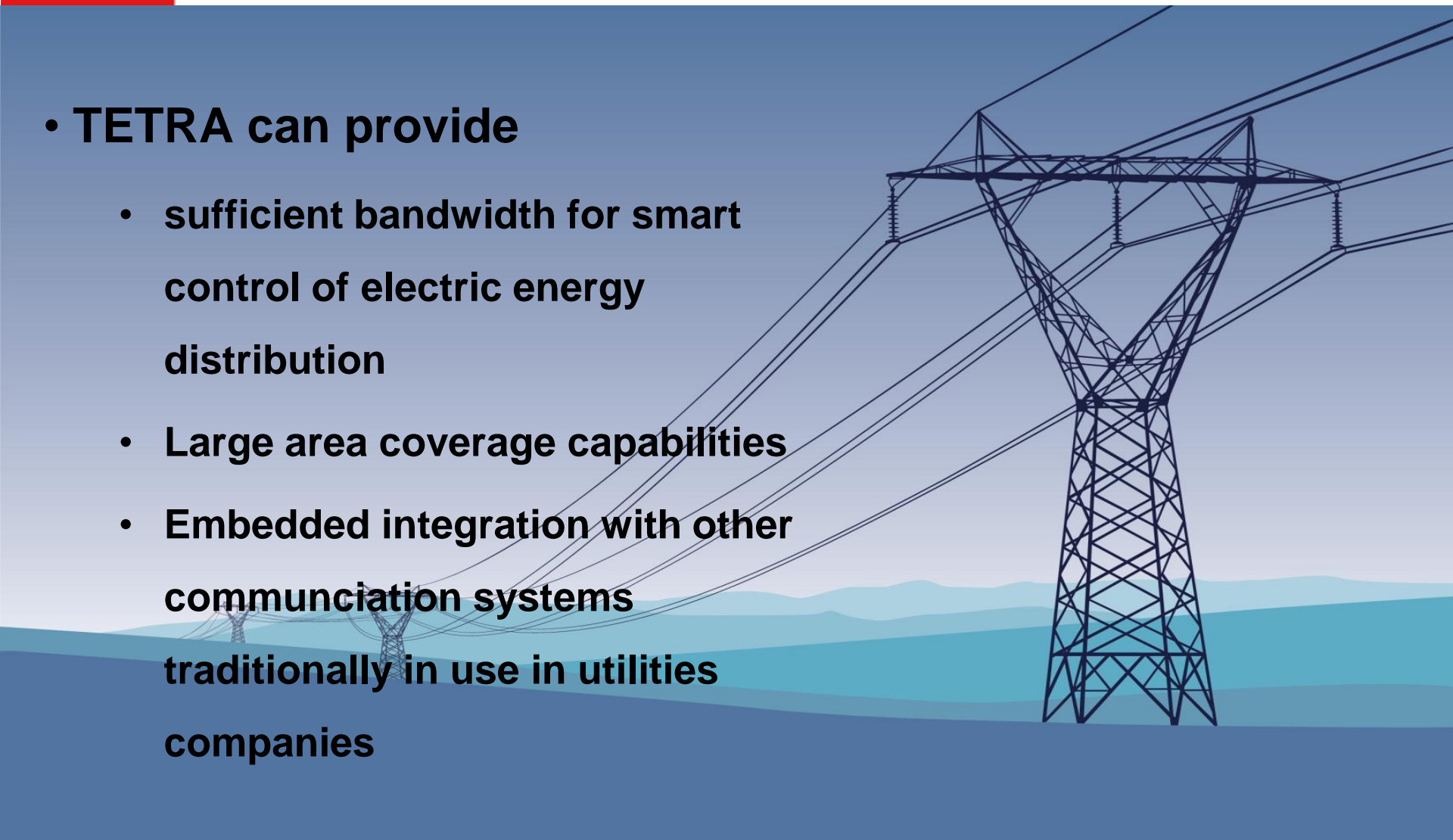
**(Digital MOBILE RAdio System)**

**Slavonija & Baranja Region - Croatia**

- **TETRA network replaced previous analogue radio system, in Slavonija & Baranja regions**
- **Largest network in HEP as regards no. of radio terminals (1050) and covered area (18 BS)**
- **Running since 2002**
- **Radically changed people communication routine**

- **Speech service for operation management**
  - Individual and PABX/PSTN calls
  - Group call - Fast call set-up & priority scanning
  - DMO for local communications
- **Data**
  - SDS for exchange of **SCADA** information (Telemetry & Tele-controlling of power plant)
  - Data service for **data** exchange (database query and image transmission)

# TETRA for Smart Grid

- **TETRA can provide**
    - **sufficient bandwidth for smart control of electric energy distribution**
    - **Large area coverage capabilities**
    - **Embedded integration with other communication systems traditionally in use in utilities companies**
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# Oil & Gas

# Russia – Transneft

The system cover about 800 Km of pipeline from Yaroslavl to Primorsk (active since 2003)



First network in the 410-430 MHz band for civil applications in Russia

# TETRA use

- **Mobile voice/data communications**
- **SCADA telemetry & telecontrolling**
- **GPS location reporting**
- **Video surveillance and perimeter protection**
- **Maintenance activities support**
- **Early Warning for gas/oil leaks**



## • Infrastructure

- no. 1 Switching and Control Node with GW interface (ISDN PRI)
- no. 21 BS at 410-430 MHz with 2 carriers (i.e. 5 traffic channels)
- no. 1 Network Management System

## • Terminals (from different suppliers)

- N. 2 Remote Dispatcher Station
- N.500 Hand Held
- N. 100 Mobile Station

Yaroslav Control Room Center



Selex Elsag Radios



SEPURA Radios



- Each BS is equipped with directional panel antennas with high antenna gain (14 dBi)
- The half-power beam width of 65° (H-plane) allows to realize long distance radio coverage near to the pipeline
- In each direction two panel antennas are installed, for bi-diversity
- The BSs are equipped with no combiner in order to increase the the power transmission value: +3 dB
- Field testing proved coverage extends from BS (25 W) up to:
  - **50 km** for mobile radios (10 W)
  - **20 Km** for handheld radios (1 W)

# Transport

# Singapore Metro



Malaysia

Malaysia



### SINGAPORE MRT/LRT

- █ North South Line
- █ East West Line
- █ North East Line
- █ Circle Line (under construction)
- █ Bukit Panjang LRT
- █ Sengkang LRT
- █ Punggol LRT

- NE4 Chinatown
- NE5 Clarke Quay
- NE7 Little India
- NS23 Somerset
- EW11 Lavender
- EW12 Bugis
- EW17 Tiong Bahru
- CC2 Museum
- CC3 Convention Centre
- CC4 Millenia
- CC5 Nicoll Hwy

- **Driverless metro system**
  - **Train Integrated Management System (TIMS) connected to TETRA on-board radio**
  - **TETRA as only communication link between OCC and trains**
- **Simultaneous voice calls & SDS as a key feature for the system**
- **APIs provided for integration with other train management applications in OCC**

- **Remote control of**
  - **onboard systems (e.g. configuration)**
  - **Passenger Information System (PIS)**
  - **on board CCTV**
- **Handling of Passengers Emergency Calls (PEC)**
- **Train and station announcement**
- **Vehicle performance data acquisition to predict maintenance needs and prevent unexpected breakdowns (optimization of maintenance costs)**

# Commercial & Industries

# Italy - LSCT



- **Mobile voice/data communications between control room and personnel within the container terminal**
- **Personnel and vehicle management & tracking**
- **Telephone calls to PABX/PSTN**
- **Text messaging for work service management**
- **Real time information on status of the vehicles and cranes**
- **Integration with SAP System**

**One more case...**

- **They have**
  - **red handheld radios**
  - **to handle continuously oil products**
  - **very very fast vehicles**
  - **very robust mobile radio on cars**
  - **encrypted communications**

# ...really special!

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**THANK YOU!**