New Architecture of the Distribution System Using Electronic Transformer

Presented to ESMO-2000 Panel on
Distribution Transformer, Breakers, Switches and Arresters
October 9, 2000

Presented by:
Roger Bergeron Researcher Appareillage Électrique

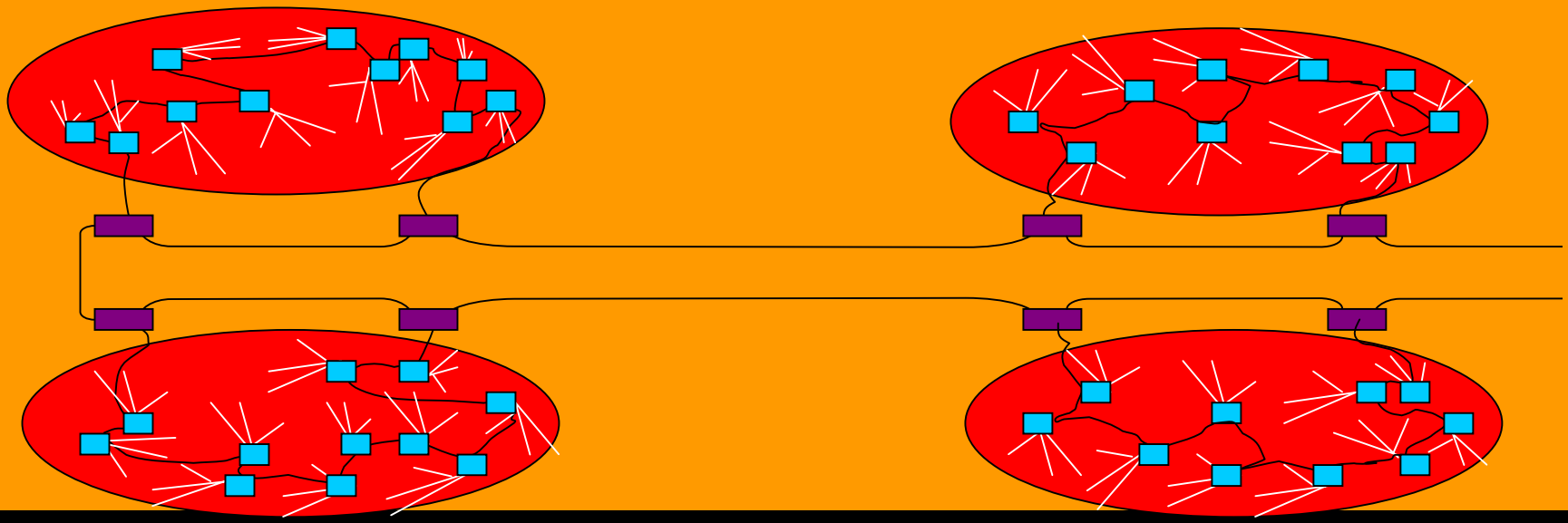
Contributors:
Karim Slimani Researcher Appareillage Électrique
Louis Lamarche Researcher Communication System
Bruno Cantin Researcher Communication System

Issues Addressed

- Present practice
- New concept
- Economical issue

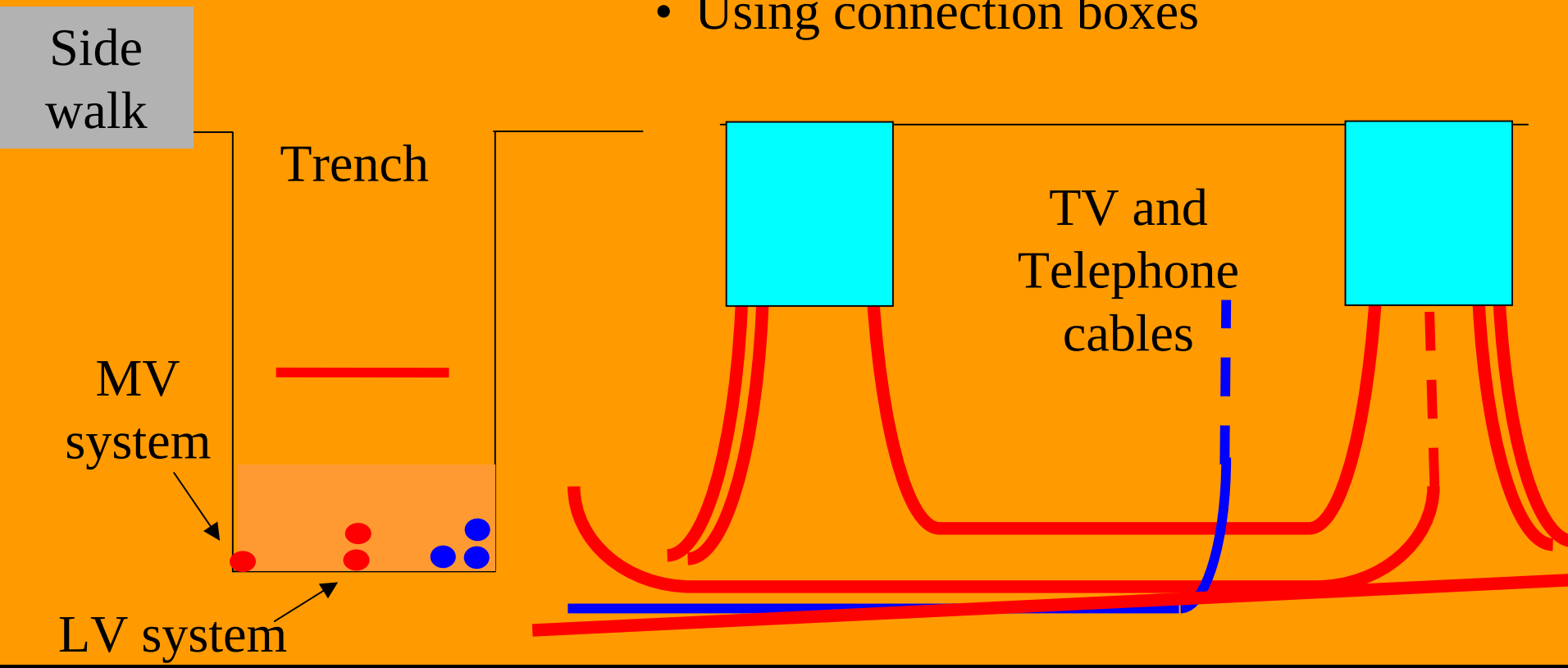
Present Practice : Power System for Residential Area

- Main MV feeder (underground or overhead)
- Local MV feeder: looped single phase
- MV-LV 100, 167-kVA Transformers (10 to15 customers/tx)
- LV radial 120/240 V network
- Cable drop

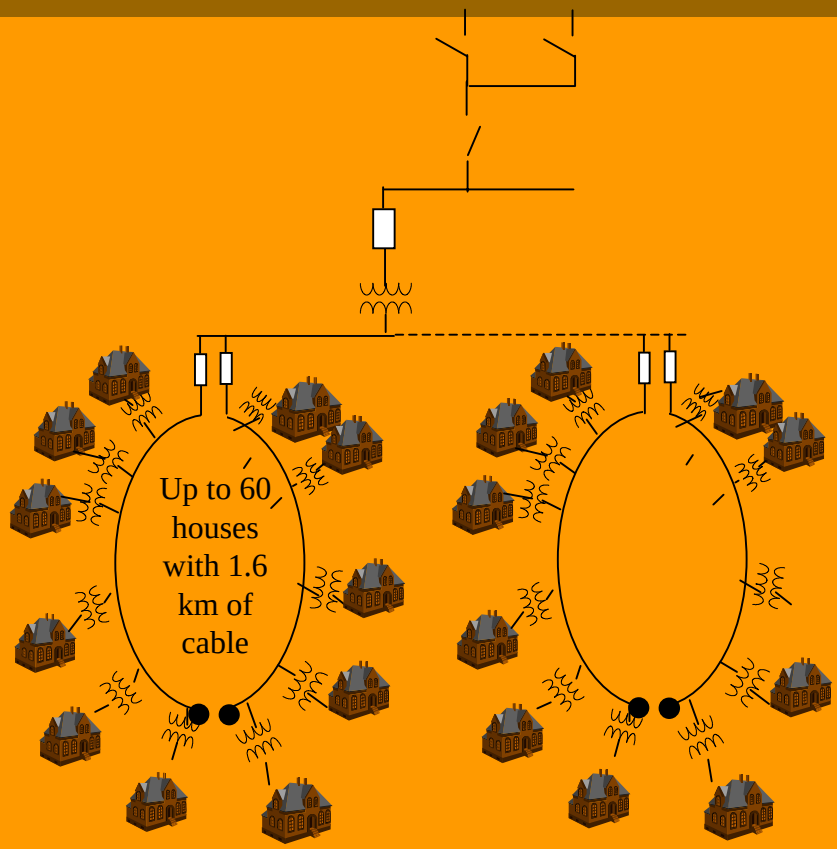


Present Practice: Underground Infrastructure

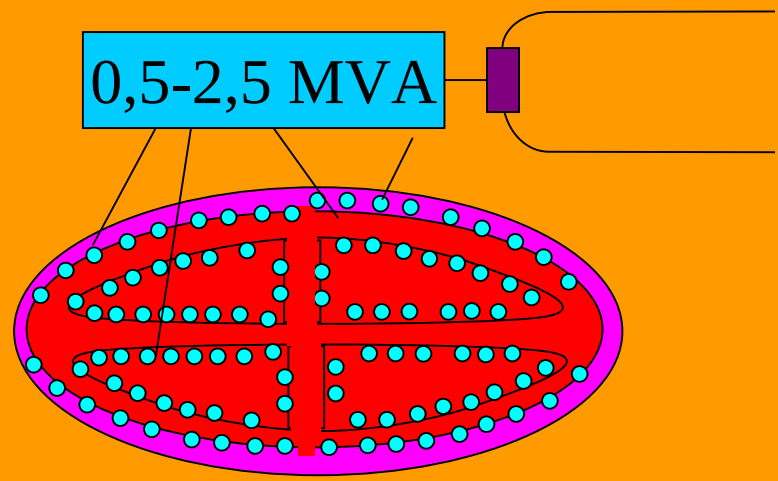
- Variable number of buried cables
- Using connection boxes



New Concept of Low-voltage, Three-phase, 600-V Looped Network

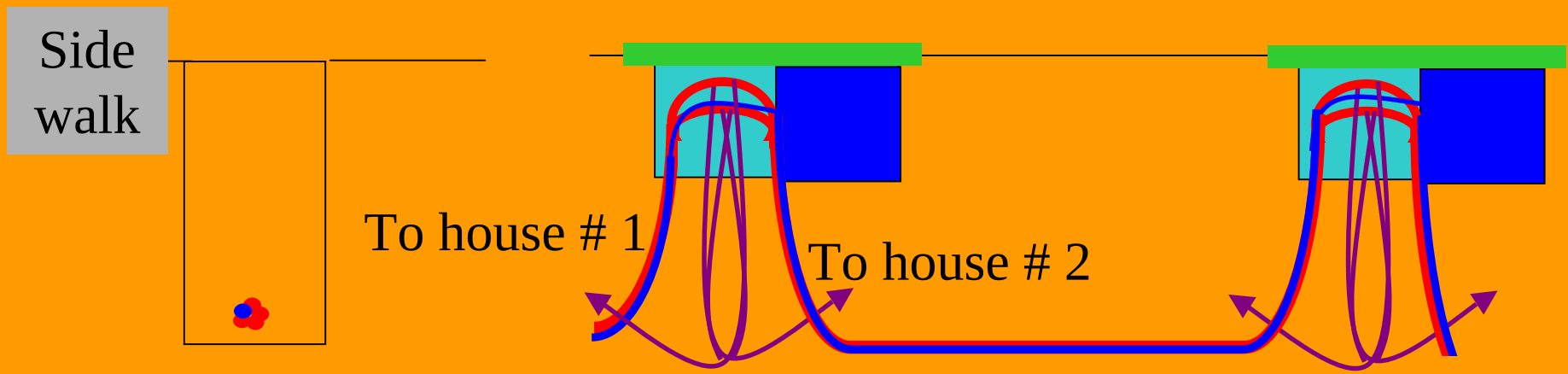


Medium-voltage system located in peripheral of living area

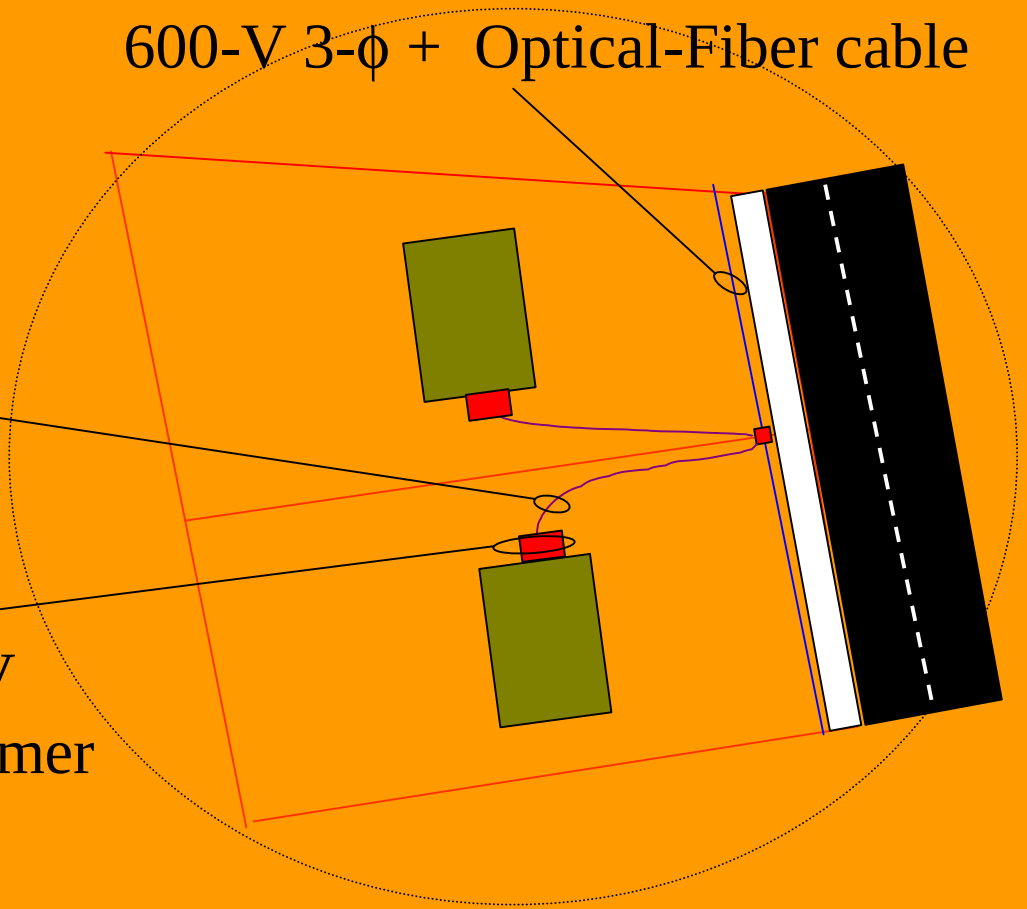


Proposed simplified infrastructure for underground

- Simplified cable plow approach with 1 cable (no trench to dig)
- Simplified connection box in two sections (power and multimedia)
- Each connection box serves two houses.



Combined Utilities to Houses



Cable Plow

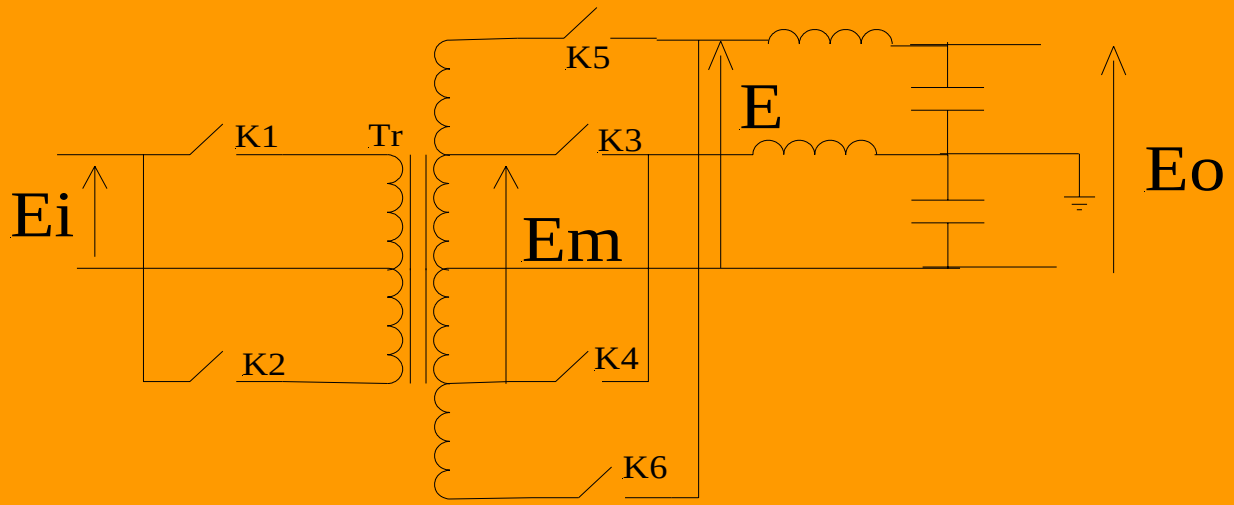
- Up to 3 inches
- Up to 42 inches deep
- Speed action with vibration

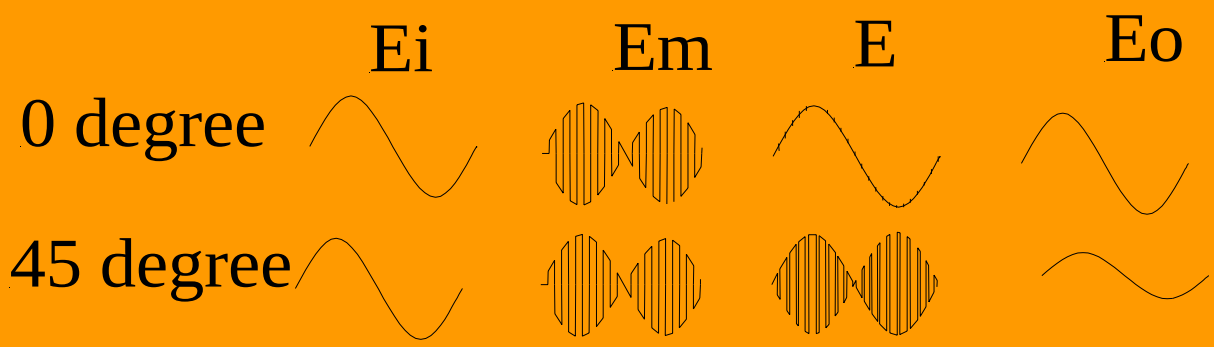
Other Approaches Used in European Countries

Sidewalk Approach

Electronic Transformer at the Main Entrance

Example of Electronic Transformer Topology





Why Intermediate Voltage Approach?

- It reduces the cable diameter in the trench. Modern cable plow can bury up to 3-inch diameter cable.
- Reduces the MV system and the related hardware.
- Simplifies the maintenance and the operation.
- Reduces the cost by 50%.

Economical issue for 247 customers

Type of power system	Actual practice ($)			New approach ($)		
Description	Quantity	Electrical	Infrastructure	Quantity	Electrical	Infrastru
Main transformer	17 X 100 kVA, 6 X 167 kVA	**133 067**	**59 800**	1 X 2,5 MVA	**55 167**	**8 000**
Electronic transformer	Not applicable			247 xfo 25 kVA	**141 360**	**37 200**
MV cable in living area	4 834 m	**119 489**	**152 892**	**----0.00 $----**		
Low-votlage cable	6 010 m	182 125	**256 256**	6500 m	191 000	**54 975**
Connectors	**476 barres**	**84 496**		**494 con.**	**3 458**	
Cable drop	6000 m	311 243	**295 412**	5 115 m	265 334	**24 618**
Low-votlage protection	**Not used**			**6**	**13 000**	
Total		830 420	764 360		**669 319**	**124 793**
Grand total		1 594 780		794 112		
Difference	-50%					
Cost per customer	6 457$			3 215$		

Conclusions

- Simplification of cable plow that speeds the construction
- Reduction or elimination of MV system in living area resulting to reliability improvement
- 600-V system up to the house with the electronic transformer,

Conclusion

- Reduce the coordination between utilities during the construction
- Supply the three phase for apartment or commercial building

⇒ <u>Important cost reduction</u>

Questions ..