Additional Notes

Minnesota River Crossings to New Prague Advisory Task Force

April 30, 2009

1) Notes from Ms. Prchal, Task Force Member

Raymond Kirsch

From: Mrsprchal@aol.com
Sent: Thursday, May 14, 2009 11:06 PM
To: Raymond.Kirsch@state.mn.us; Scott.Ek@state.mn.us; Georgie.Peterson@state.mn.us
Subject: Task Force Response for EIS.
Attachments: Reasons to avoid the LeSueur.doc

Please share the attached with Barr Engineering for the EIS statement. Thanks, Jodi

Recession-proof vacation ideas. Find free things to do in the U.S.

Reasons to avoid the LeSueur/Rice County Alternate Route (300th St/County Road 28/Rice County 2/60th St) according to the EIS statement and the PUC factors that are considered in route determination:

1. Human Settlements

a. Would destroy the rural integrity of the area.

b. Cultural Resources-Many century plus family farms would be impacted…many go back to the founding fathers of this area. Would also impact a cemetery in Rice County along Rice County 2. Landowners are proud of their land, many having had this land passed down for generations with the intent to continue to do so. Although CapX claims to have followed section lines/fence lines that really does not mean much since it is still not following any existing right of way and would impact still impact the landowners on both sides and in many cases it is going in the middle of fields.

c. Land Use-The alternate line runs close to towns that are growing and will continue to do so. Developing of the land may be inevitable and a high voltage line would greatly devaluate the land values that could have been much higher if there was no line. Also when non existing right of ways are used the entire right of way must be given by the landowner and in addition many of these locations would be affected as far as buildability in the future. In some locations the only feasible place to ever expand the operation or build a home is right where the line would be. This is just not fair if there are existing right of ways that can be used.

d. Socioeconomics-The alternate lines runs not only near but through many businesses. There are at least two daycares, many acres of farm fields (which when having to go around poles requires more time, spray, seed, and compaction of soil reducing the yield as well as possible breaking of field tiles), Kajer Organic Dairy Operation, working hay field operations, buffalo ranch, horse ranches, Pieper Dairy Operation, a woodworking business (Nytes), organic gardens and poultry operations which require electric fence, etc.

e. Community Services

f. Utility Systems-The line would pass through several gas pipelines-(south of New Prague and near Lonsdale). As in the case of Section 15/16 Lanesburgh township there is already an MVEC Electric line on the west side of Hwy 13/21 but on the east side of the highway is a bigger 69 KV transmission line as well.

g. Traffic/Transportation: There is a working railroad in section 15 Lanesburgh Township where trains run many times daily. The line would cross over the tracks in this section. There was information regarding possible issues with railroads in the application book. Crop Dusters may have issues and crop dusters are used in this area. There is also an airport near Webster which I know had concerns.

h. Safety and Health: EMF's are a concern for everyone including those on the alternate route. The alternate route follows small and narrow county and township roads where homes were allowed to be close to the road. Given that the road itself is narrow and the home can be close to the road it should be clear that there is not much area to work with compared to following a larger road where there is more right of way to begin with. There are many concerns about electric fences,fuel tanks, grain dryers, metal grain bins, metal sheds, large older tractors and combines that can all have affects from the high voltage lines. In many areas this

would pass extremely close or over these structures. During construction there would be dust and traffic issues. We have a developmentally challenged adult living on the farm. We also have asthma issues as well.

i. Noise- Many people in the rural areas keep their windows open all spring, summer and fall so noise would be heard from the lines.

2. Natural Environment:

a. Air Quality/Climate

b. Geology/Soils- We have prime ag land being threatened. The rich soil is perfect to grow beautiful crops. We know of other farmers who have had to deal with projects like this(just this past winter) and have had many issues with soil compaction. With large equipment there is no denying that the ground will become compacted and there is significant research that shows this will affect the yield for many years to come. It makes no sense to be affecting entire fields to get into the middle of them to place poles. When maintenance is needed, perhaps in the middle of a growing season the fields will be disrupted again for generations to come.

c. Water Resources- This line would affect wetland areas all along the area, would cross streams and cut through marshes. Many are also wondering how this will affect their private well.

d. Wetlands- The DNR/University of MN and private homeowners have all made attempts to maintain areas for natural preservation for wildlife. Documentation for most areas was submitted in public comments regarding this. This should be highly considered when doing an EIS.

e. Biological Resources- Eagle nests and birds have been witnessed where the lines would be placed, in addition to many species of animals and birds that make their homes in the ever decreasing natural areas. The increase in housing in the area has really made the areas that are left natural very desirable and vulnerable.

Economic and Land Use Resources

a. Agriculture-touched on above already but very important as these are not only family farms but businesses as well. There is also a tree farm(Al Dietz). The alternate route in these counties takes a hard hit at the farm fields and the natural areas when it cuts cross country. It doesn’t make sense to further hurt the agriculture sector when it is up against so much already and should be preserved.

b. Forestry- Again going cross country would deplete some natural wooded areas. These counties were part of the “Big Woods”.

c. Mining- I am not familiar with the mining in this area.

d. Recreation/Tourism- There are many places to hunt which get used heavily in the fall/winter/spring. Because the area is growing there are less and less places to hunt. Snowmobile trails run under the lines in many locations.

In discussions with many residents about this issue everyone feels that this line should be run from Brookings south on 29, east on I 90, and then north on 35W. Substations could be built closer south or follow 14/99/and wind toward 35W. Another idea was to utilize underground mitigation near populated areas. Because of the sensitivity of the Le Sueur Crossing from an Environmental standpoint, cross in Belle Plaine and if homes/schools are an issue then start underground there and utilize the proposed extension of Scott County Road 2(see map Appendix B5 Sheet CH 29-

gray line) from 169 and follow it utilizing underground as needed. If the LeSueur Crossing must be utilized there are other roads that could be used(to avoid the Pyrotechnic factory) to connect up to this County Road 2 extension. I am not as familiar with these roads but many of them on the map showed very few homes on some of them.

No matter which route you go there are going to be homes close to the road, children waiting for busses under it or playing or sleeping under it. But to criss cross through the countryside upsetting natural preserved areas, following narrow roads or no road at all, cutting through private businesses, destroying entire family farms really does not make environmental, economical or ethical sense. I would welcome any further questions anyone may have or clarifications.

Thank you for your consideration,

Jodi Prchal, Czech Country Farms, Sections 15,16, 26 Lanesburgh Township
32155 Sanborn Dr Montgomery MN 56069
952-758-4213

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2) Notes from Ms. Prchal, Task Force Member

Raymond Kirsch

From: Mrsprchal@aol.com
Sent: Friday, May 15, 2009 8:15 AM
To: Raymond.Kirsch@state.mn.us; Georgie.Peterson@state.mn.us; Scott.Ek@state.mn.us
Subject: Fwd: underground transmission lines
Attachments: RE: underground transmission lines

Please see attached presentation on underground transmission lines. This is being done in many parts of the country and should be highly considered by the state of MN. This presentation talks about all the aspects how this can be done feasibly for considerable distances. With the technology available a push for this from the state to help protect us as citizens should be of utmost importance. Thank You, Jodi Prchal. Please forward to whoever helps in making these decisions.

Recession-proof vacation ideas. Find free things to do in the U.S.

Overview of Underground Power Cables at High/Extra Voltage Levels

2009

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Who are Europacable?

- Association of European Cable Manufacturers including:

ABB BRUGG CABLES Well connected. Nexans nkt cables PRYSMIAN CABLES & SYSTEMS Silec Cable

- Task Force: Harmonisation of Standards
- Working Group: High Voltage Systems (HVS)
- Shared Experience

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What are the goals of Europacable?

- Standardisation
- Promotion of innovative Technology for underground cables
- Ensure the complete and correct understanding of the technical specifications of cables
  - **Cables as an innovative and reliable technology**
  - **Environmental impacts**
  - **Representative costs**

- *EHV cables are rarely appropriate for an entire new AC transmission project*
- *Partial undergrounding can provide a compromise to allow a project to proceed without years of legal contests*

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Innovative & Reliable Technology

Environmental issues

Integration of cables in the transmission network

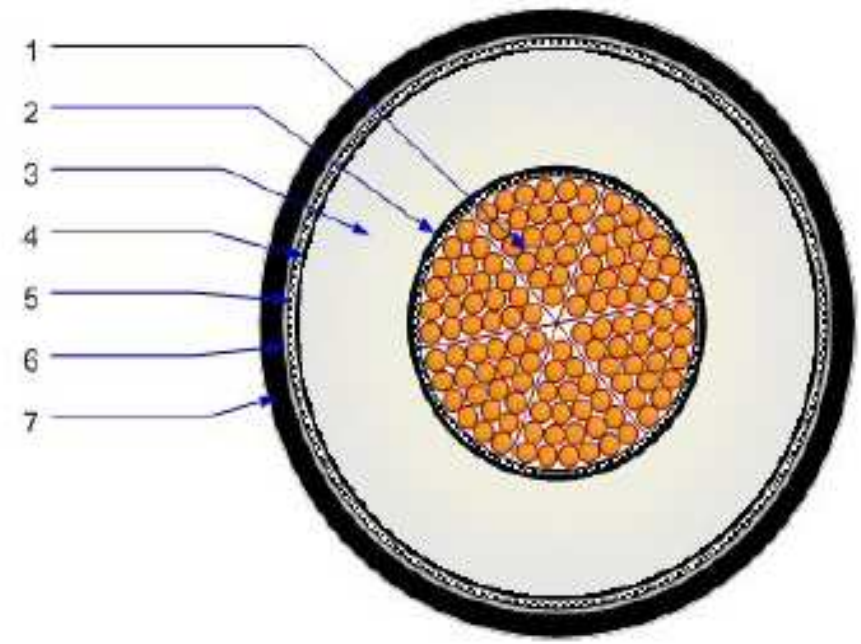
Representative costs

XLPE-insulated Cable

- More than 25 years commercial experience at HV levels (110-150 kV)
- More than 10 years experience at 400 kV – longest system (40 km of 500 kV - Japan)
- Current state of the art technology
- Easier installation and jointing
- Environmentally low risk
- Almost maintenance free

Cable design

1) Copper conductor (alternative Al)
2) Semiconductor
3) XLPE insulation
4) Semiconductor
5) Waterblocking
6) Welded aluminium sheath
7) PE outer sheath



Cable lengths & Cable Joint Bays

- 400 kV cables can be delivered in lengths of up to 1000 metres
- Joint Bays – generally unobstrusive underground structures

Overhead-Underground Transition Stations

- Can be size of tennis court, but in some cases a football field
- At voltages of 275kV and below, can be applied directly onto a pylon

Damage/disturbance

- Disturbance of underground cables occurs less frequently than for overhead lines
- Cables are not affected by severe weather
- Only outside influences can disturb/damage underground cables

Reliability

- Producers guarantee homogeneous cable quality according to international standards (IEC 62067)
- Repairs caused by damage
  - Quick & precise location identification
  - Repair time 2-3 weeks (if, as recommended, spare parts are kept in stock)

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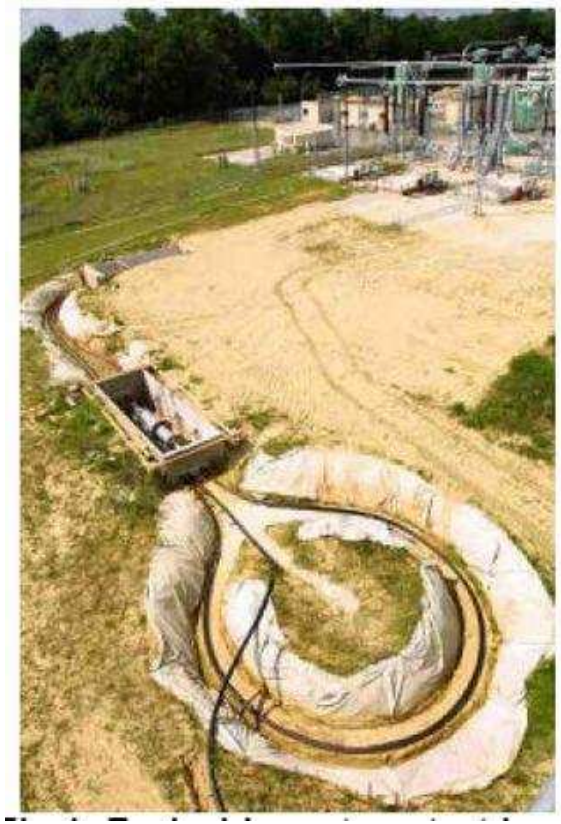
Life expectancy

- Innovative technology, with more than 10 years successful operating experience at EHV levels
- Careful long-term testing has been conducted and predicts a life expectancy of at mininum 30-40 years for XLPE cables



Examples of major 400kV projects in Europe

Location	Project	Cable circuits x length (km)	Cables per phase	Time period
Copenhagen	Elimination of overhead lines in urban area	1x22,1x12	1	1996 1999
Berlin	Connect West/East system	2x6;2x6	1	1998 2000
Vale of York	Area of outstanding beauty	4x6	2	2000/1
Madrid	Barajas Airport Expansion	2x13	1	2002/3
Jutland	Area of outstanding beauty, waterway & semi urban areas	2x14	1	2002/3
London	London Ring	1x20	1	2002/5
Rotterdam	Randstad waterway crossings	2x2.1	1	2004/5
Vienna	Provide power to centre of city	2x5.5	1	2004/5
Milan	Section of Turbigo-Rho line	2x8.5	2	2005/6
Switzerland/ Italy	Mendrisio – Cagno	1x8	1	2007/8

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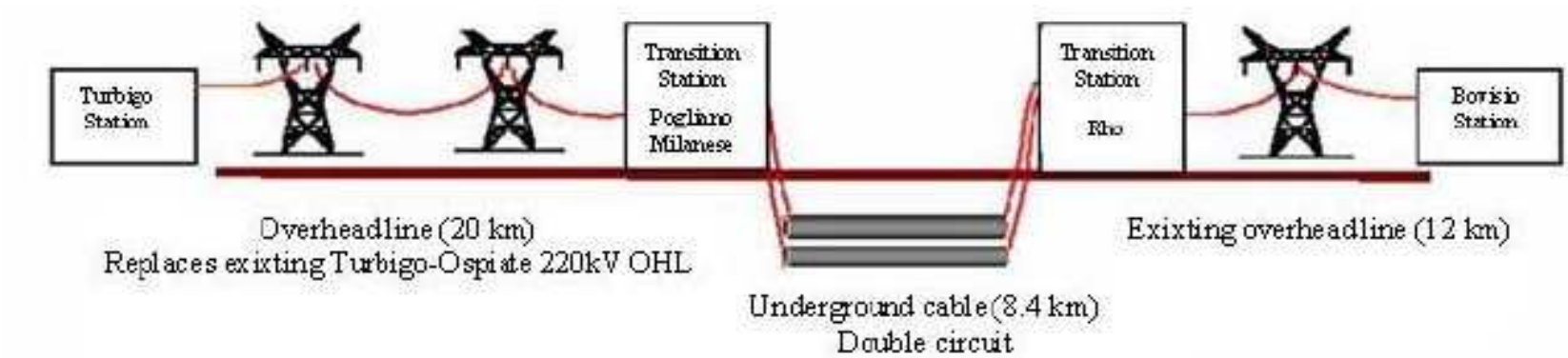
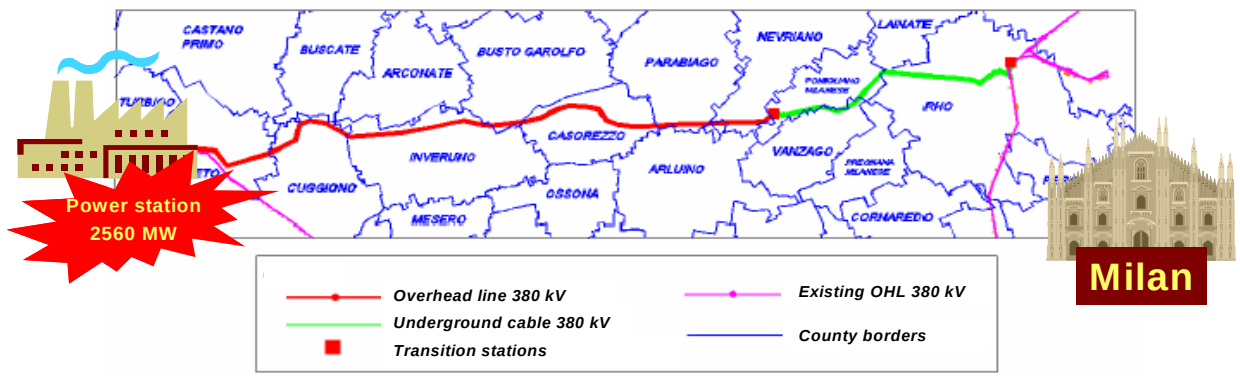
The Italian Turbigo-Rho 400 kV Project



Timeline

- 1991: Start of discussions
- 1994 -2004:“Deadlock“
- June 2004: Decision on partial undergrounding
- March 2005: Construction
- May 2006: Activation



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The Italian Turbigo-Rho 400 kV Projekt

LINE ROUTE SIGNAL

AFTER THE CABLE LAYING

TRANSITION STATIONS

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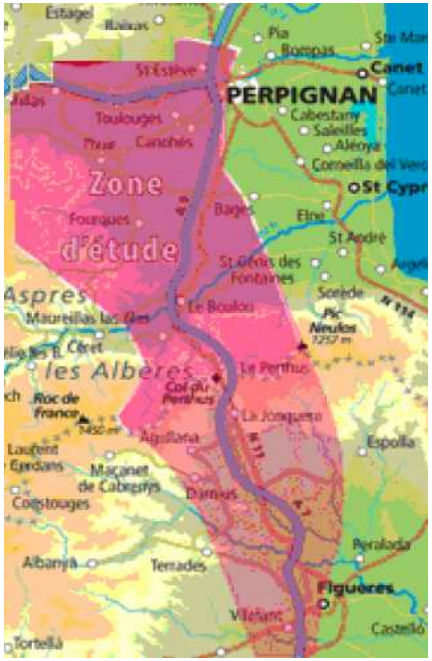
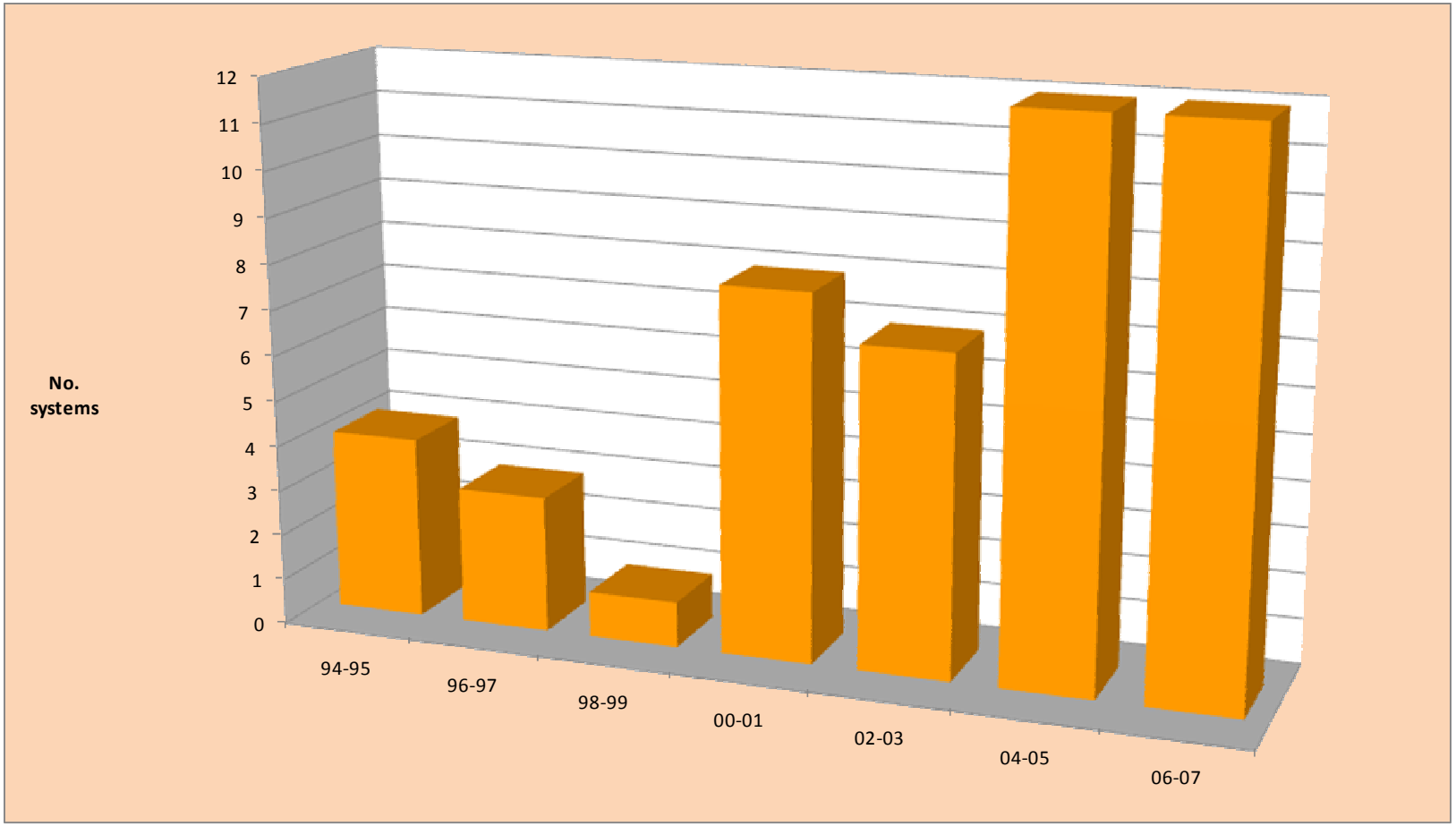
HVDC Cables

- HVDC technology represents a reliable form of electricity transmission and a cost efficient alternative when fully undergrounding long point-to-point connections
- To be integrated into the existing grid, HVDC links require a converter station
- Single core mass impregnated cables have a proven capacity limit at voltages up to 500kV and capacity of 1400A DC which corresponds to a maximum rating of 700MW for single core cables and 1400MW for bipole (two cables)
- The successful track record of HVDC technology is demonstrated by the fact that an increasing number of HVDC projects are being installed in Europe, e.g. the proposed TEN-E interconnections between France-Spain and Sweden-Norway



Interconnection between France and Spain

Number of EHV Cable Installations Globally



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Environmental Issues

Integration of cables in the transmission system

Representative costs

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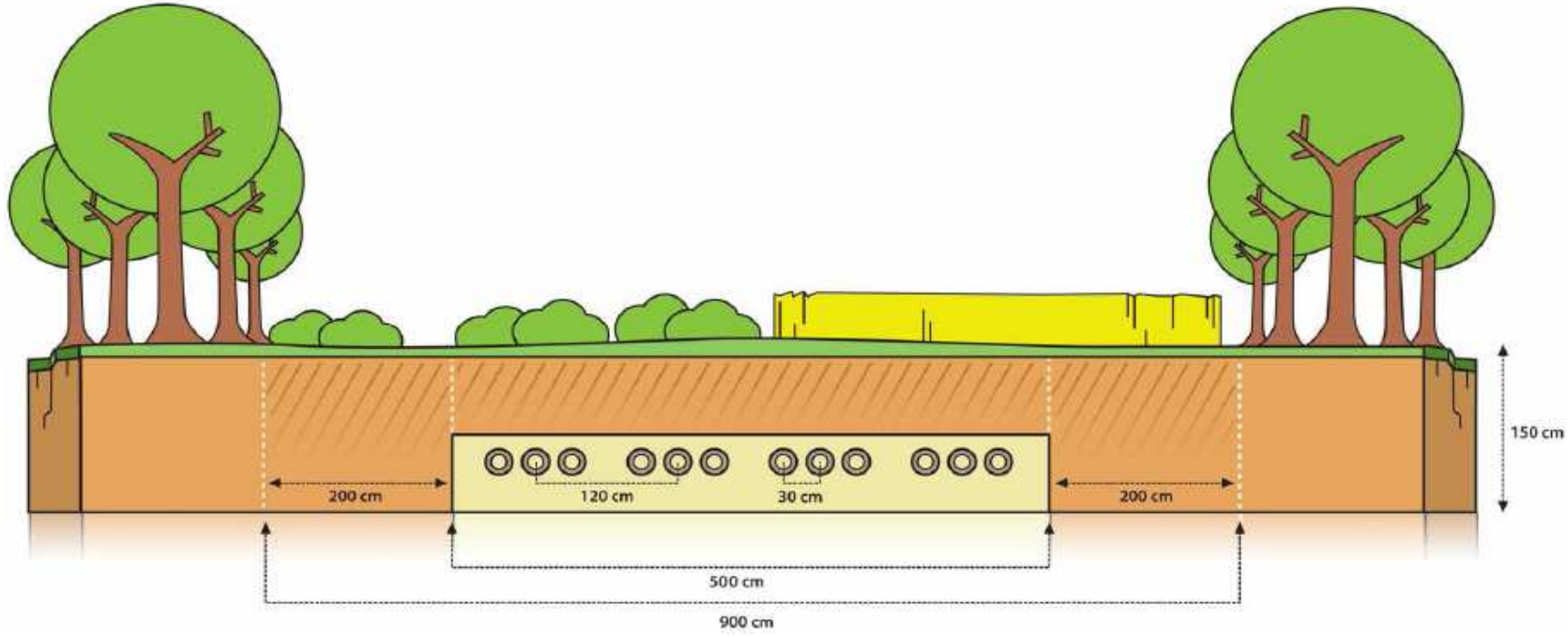
Trench width

- Dependent on the number of cables
- Number of cables depends on desired transmission capacity
- Maximum 2 cable systems for 1 overhead line system



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Construction issues – urban areas

- Trench per system: ca. 1.5m deep, 1 - 2m wide
- Access for heavy machinery needs to be made available along the line
- Underground cables can easily be placed next to, under or between roads
- Subsequently the area is re-instated to original condition

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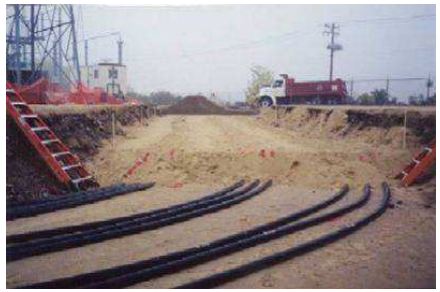
Countryside trenching

- Construction time depends mainly on ground conditions
- Trenching requires access for heavy machinery along the line
- A variety of “non-invasive“ procedures are available to pass under sensitive areas, roads or nature reserves
- Depending on the type of vegetation, landscape can be completely reinstated within 18-24 months



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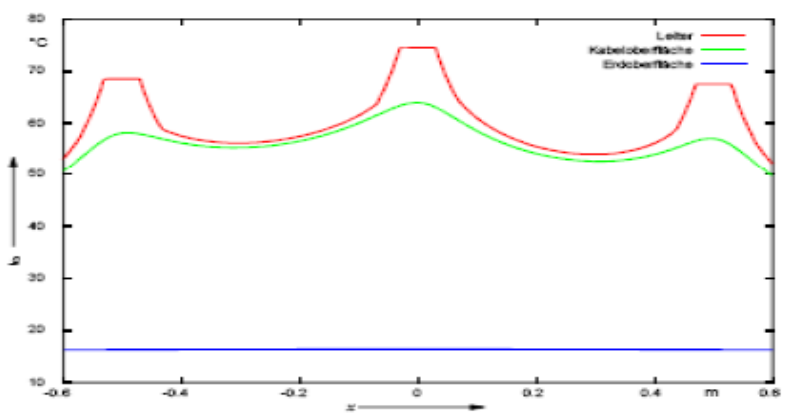
Possible heating of ground

- Operating temperature of cable depends on the current carried & load factor
- Heat distribution depends on the backfill material around the cable
- Impact is “strictly local and very limited“ (Ecofys 2008 report for Irish government)
- Extreme Conditions: Soil directly over the trench can heat up by approx. 2 ℃
- 5 metre from the cable, no impact



Temperature increase caused by 380kV single-core XLPE cable calculated by FEM modelling temperatures in the conductor plane (—), in the plane directly above cables (—), and at the soil surface (—).

Source: University Duisburg-Essen

Environmental issues

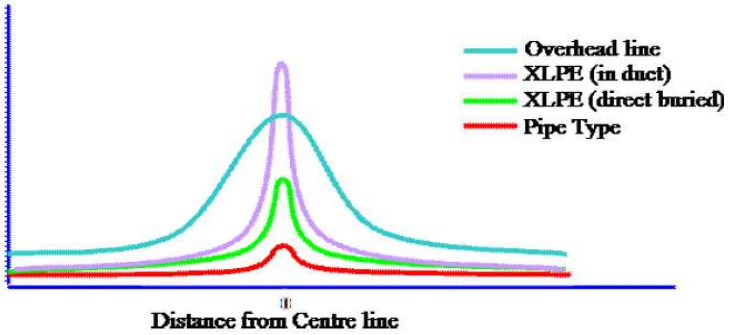
Europacable

Use of land

- No restrictions for the cultivation of land
- Agricultural farming possible

Cable System

- No electric field
- Can be engineered to emit a lower magnetic field than overhead line
- No noise emitted, whereas overhead lines suffer (“korona discharge´)



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Innovative & Reliable technology

Environmental issues

Integration of cables in the transmission system

Representative costs

Integration in the transmission system

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- Insertion of new interconnections in existing networks requires detailed planning
- AC cables can be directly intergrated into the existing grid
- Studies on several 400kV transmission grids show that the characteristics of underground cables can in many cases be beneficial to the overall performance of the network
- A grid study should be carried out for long cable connections i.e. more than 20km to evaluate whether additional installations are needed to provide reactive compensation
- If needed, these additional measures (shunt reactors) can be applied at existing substations and do not require any extra compound

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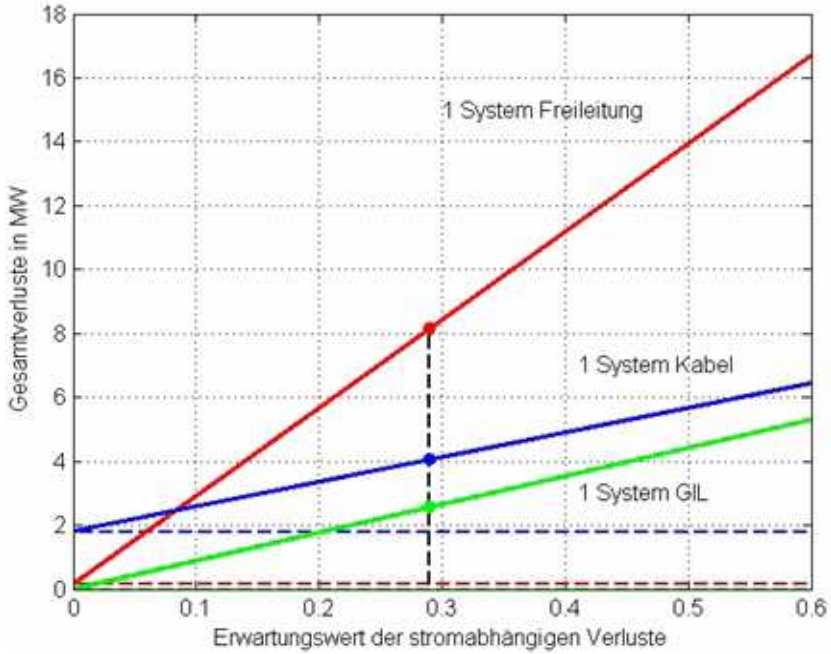
Transmission losses

- Losses for overhead lines and cables depend on system design and loading
- Independent studies have demonstrated that cables have lower transmission losses, due to larger conductor sizes



Source: ForWind-Study 2005

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Environmental issues

Integration of cables in the transmission system

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Costs: Underground Cables versus Overhead Lines

- Each project is unique: It is not possible to make generic cost estimates
- Undergound cables are - at installation – more expensive than overhead lines due to higher product and installation costs
- Cost comparisons often only address costs of installation and ignore life cycle costs such as maintenance, losses, outages
- The cost of installation/civil works can represent up to 60% of total costs, which will benefit local companies

Latest life cycle analysis confirms that the cost factor compared to overhead lines can be as little as 2-5 times

Representative costs

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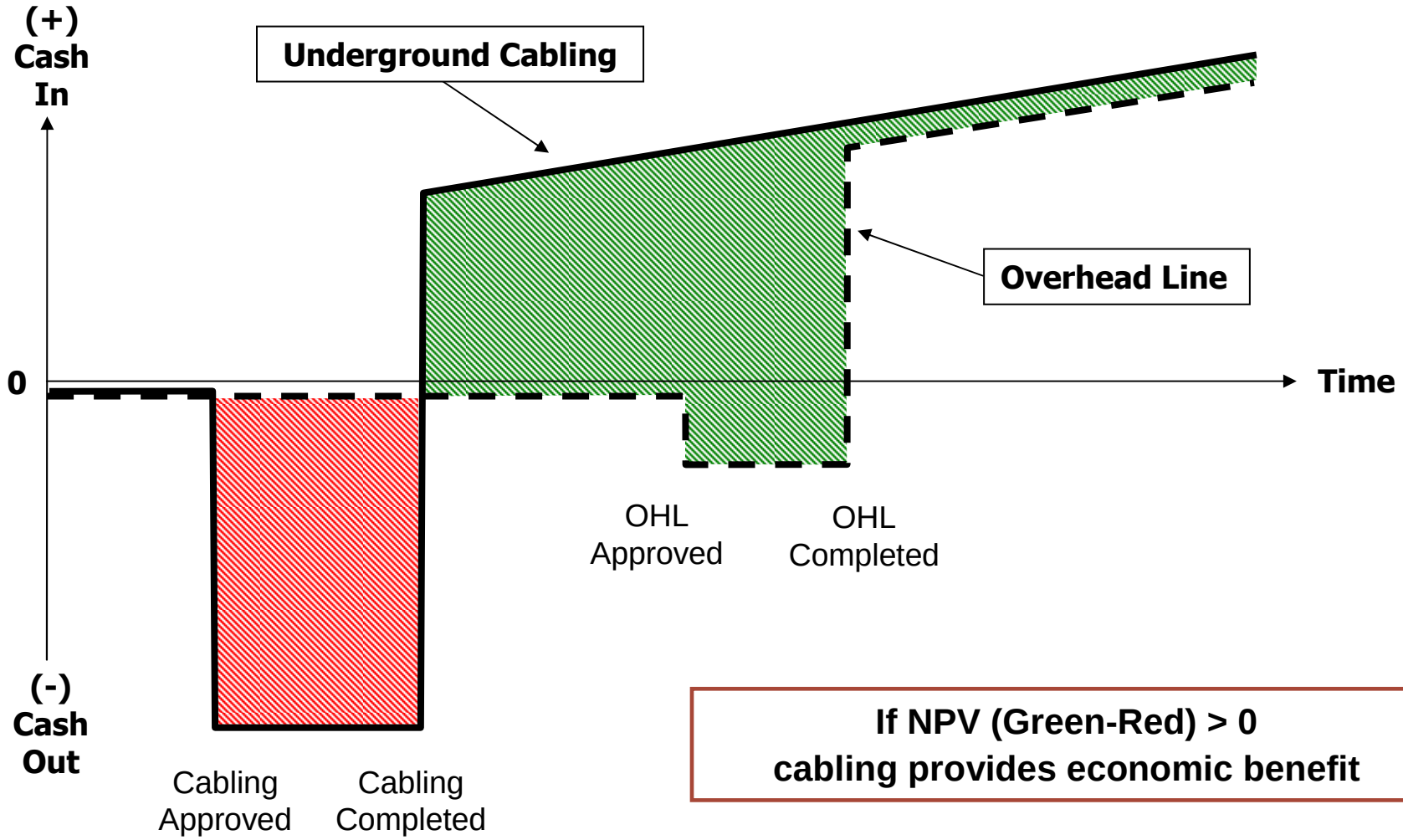
Timing & Potential Economic Benefits – Cash Flow Profiles



If NPV (Green-Red) > 0
cabling provides economic benefit

Representative costs

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Impact of underground cabling sections of new OHL on consumer bills in Lower Saxony Germany:

- Cabing would increase the average domestic electricity price by 0.004 Cent per kilowatt hour

- For a four person household using 4500 KWh per year, the additional cost would be 18 Cents per year

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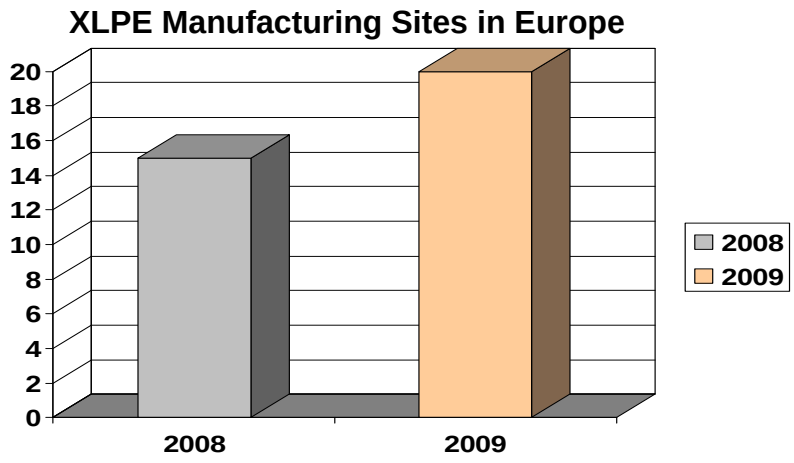
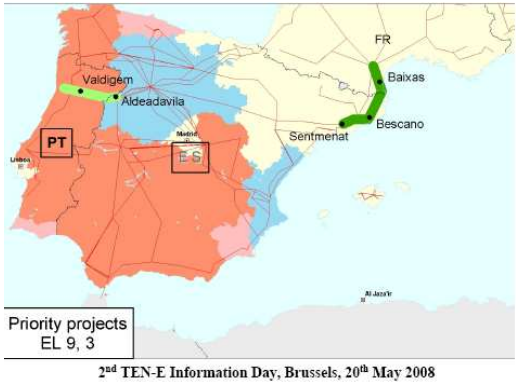
Capacity

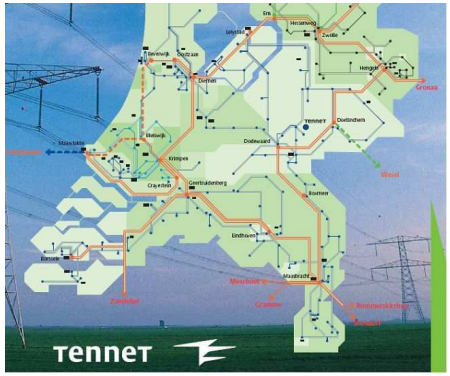
- Increasing demand for EHV XLPE insulated cables
- European Cable industry is expanding production capacity
- Baed on annual capacity of 120 – 140 km per year: Annual production of 2,000 – 3,000 km per year
- Sufficient capacity to meets demand in Europe to 2015



Ongoing underground cable projects in Europe:



TEN-E Interconnector
France - Spain



TENNET “Zuidring
Randstad”

BREMEN
Delmenhorst
Cloppenburg
Vechta
Diepholz
Lohne
Bassum
Twistringen
Wildeshausen
Sulingen
Nordhorn
Lingen
Meppen
Leer
Emden
Aurich
Norden
Wilhelmshaven
Oldenburg
Bremerhaven
Cuxhaven
Stade
Buxtehude
Soltau
Celle
Hannover
Osnabrück
Bielefeld
Minden
Hameln
Hildesheim
Göttingen
Kassel
Fulda
Eisenach
Erfurt
Gotha
Jena
Leipzig
Halle
Magdeburg
Braunschweig
Wolfsburg
Salzgitter
Potsdam
Berlin
Cottbus
Frankfurt
Dresden
Chemnitz
Zwickau
Plauen
Hof
Bayreuth
Coburg
Würzburg
Aschaffenburg
Darmstadt
Mainz
Wiesbaden
Koblenz
Trier
Saarbrücken
Karlsruhe
Stuttgart
Heilbronn
Ulm
Augsburg
Kaufbeuren
Kempten
Bregenz
Innsbruck
Salzburg
Linz
Wels
Passau
Regensburg
Nürnberg
Erlangen
Bamberg
Ansbach
Ingolstadt
Landshut
Deggendorf
Straubing
Amberg
Weiden
Cham
Kitzbühel
Kufstein
Lienz
Villach
Klagenfurt
Graz
Leoben
Bruck
Wien
Eisenstadt
Sopron
Szombathely
Zalaegerszeg
Pécs
Kecskemét
Szeged
Debrecen
Miskolc
Eger
Salgótarján
Ostrava
Brno
Olomouc
Pardubice
Hradec Králové
Liberec
Ústí nad Labem
Plzeň
Karlovy Vary
Cheb
Ostrava
Katowice
Opole
Wrocław
Legnica
Jelenia Góra
Zielona Góra
Poznań
Gorzów Wielkopolski
Szczecin
Koszalin
Bydgoszcz
Toruń
Gdańsk
Gdynia
Sopot
Olsztyn
Ełk
Białystok
Łomża
Ostrołęka
Warszawa
Płock
Ciechanów
Łódź
Piotrków Trybunalski
Kielce
Sandomierz
Tarnów
Rzeszów
Przemyśl
Lublin
Zamość
Chełm
Biała Podlaska
Siedlce
Ostrołęka
Radom
Ostrowiec Świętokrzyski
Kielce
Częstochowa
Katowice
Bielsko-Biała

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FACTS:

- **Cables are a modern, innovative and reliable technology**
- **Environmental impacts are limited and manageable**
- **When comparing costs, look at whole life-cost**

- *EHV cables are rarely appropriate for an entire new AC transmission project*
- *Partial undergrounding is an alternative for:*
  - *land with outstanding natural or environmental heritage*
  - *Areas where land is unavailable or planning consent is difficult to obtain within an acceptable timeframe*

Overview of Underground Power Cables at High/Extra Voltage Levels

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