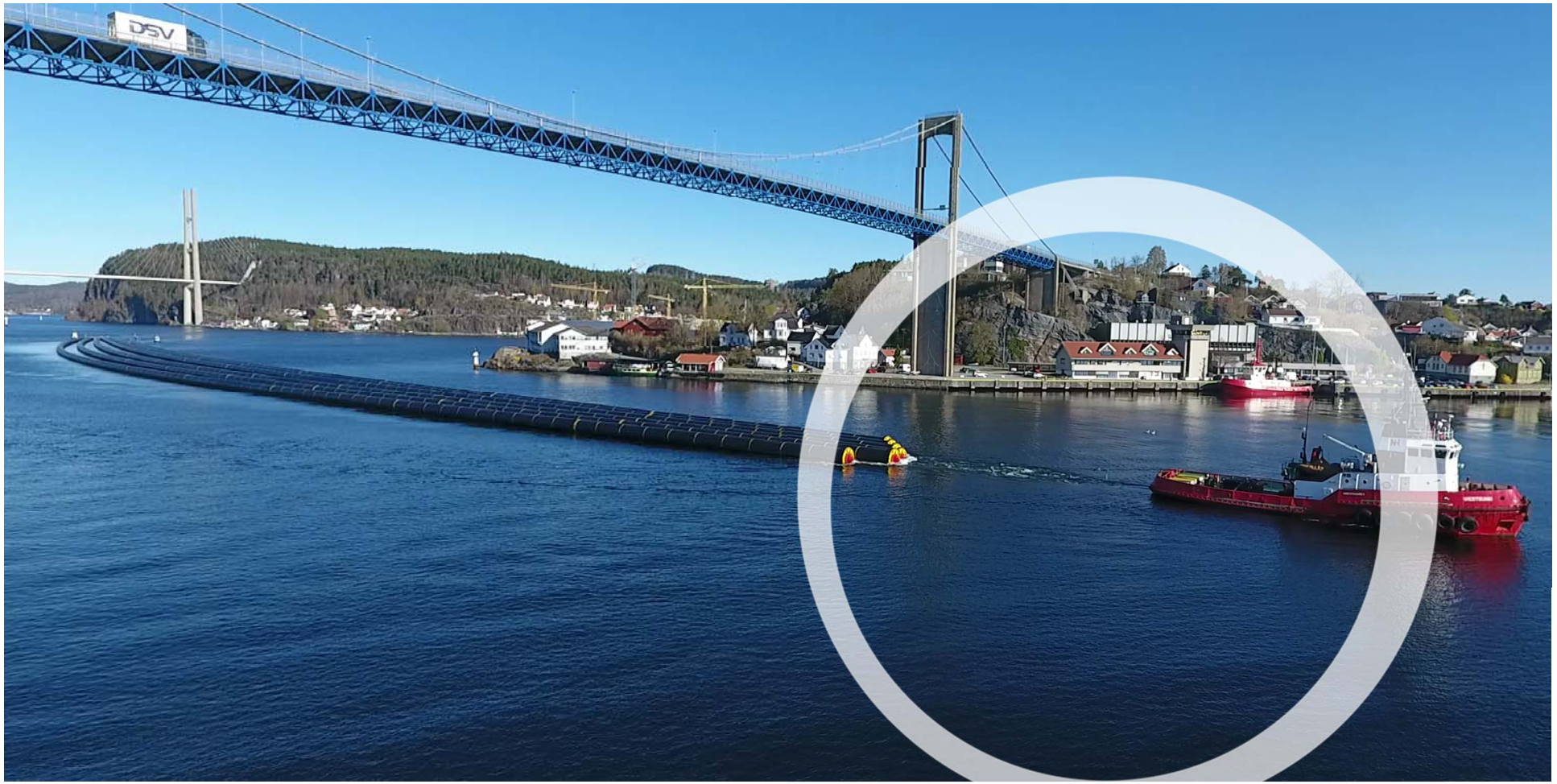

BENEFITS OF USING PE PIPES IN LONG LENGTHS – PROJECT EXPERIENCE

Ilija Radeljic, Technical Manager - LLLD Export

IPLOCA 2017 Convention, 25 - 29 September 2017

PIPELIFE

- **Overview**
- Polyethylene (PE) advantages
- Solid wall PE pipe advantages
- Production and transport – project experience
- Conclusion

OVERVIEW

- Focus on solid wall Polyethylene (PE) pipes in the **marine** environment.
- Production and transport advantages of Long Length Large Diameter (**LLLD**) **concept** for all **nearshore** and **offshore** projects.
- Examples from projects will be shown to better visualize various topics.

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POLYETHYLENE (PE) ADVANTAGES

- Marine environment puts significant demands on the pipelines, but polyethylene (PE) pipelines have the following crucial properties:
  - **Flexibility** and **fatigue** resistance – allows S-bend installation, sea transport and storage
  - **Abrasion resistance** – excellent resistance against wear over time
  - **Chemical resistance** – wide range of resistance against chemicals
  - **Non-corrosive** – eliminates the need for coatings, cathodic protection or other methods for preventing corrosion

POLYETHYLENE (PE) ADVANTAGES

- …benefits continued:
  - **Non-toxic** – not toxic to flora or fauna; approved for drinking water use
  - **Smoothness** – much smoother than other materials which is retained over time
  - **Weight** – lighter than water, pipes will always float unless ballasted

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SOLID WALL PE PIPE ADVANTAGES

- Proven, decades old extrusion technique
- **Solid** wall structure without any voids or air pockets
- Inner and outer surface of the pipe is smooth and cross-section is **uniform**
- The pipes presented in case studies were produced according to international (ISO 4427) or European standard (EN 12201)

SOLID WALL PE PIPE ADVANTAGES

- Compared to non-solid wall pipes:
  - Greatly increased **axial and bending** resistance
  - Constant wall thickness ensures no weak points during **welding**
  - Calculable **limit** of the pipe during installation
  - Increased safety due to much greater **robustness**
  - Small **scratches** do not influence the integrity of the pipe
  - Much higher overall **safety** and tolerance to installation stresses

SOLID WALL PE PIPE ADVANTAGES - IN LONG LENGTHS

- **General overview of PE pipeline system in long lengths:**
  - **Joints** are usually the most sensitive points in the system
  - Reducing joints (mechanical or butt fusion) greatly increases the **safety, longevity**, **reliability** and **maintenance** of the system
  - **Long length** pipe of 600 m has **only 2 joints** at the ends, pipeline made from short lengths (12-15m) needs 40-50 more joints
  - **96% reduction** in joints per pipe segment can be achieved if long length pipes are used
  - Joining of pipes in big sizes (>OD2000mm) by welding requires **skilled labor, equipment** and sufficient **time** for each weld with **increased risk**
  - Safe **transport** over sea and **storage** on the sea
  - Greatly reduced **ovalization** (cca 1-1.5%)
  - Pipes can be produced with the **custom length** as desired by the marine contractor

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CASE 1.

MOSTAGANEM, 1450 MW COMBINED CYCLE POWER PLANT,
ALGERIA, 2015-17

PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- EPC project by Samsung C&T, Korea
- Project worth: 1.37 billion $
- Delivery of LLLD PE pipes and fittings OD2500, SDR26&30, 10000+ m in three tows

MOSTAGANEM, 1450 MW COMBINED CYCLE POWER PLANT, ALGERIA, 2015-17

SAMSUNG C&T

سونلغاز
sonelgaz

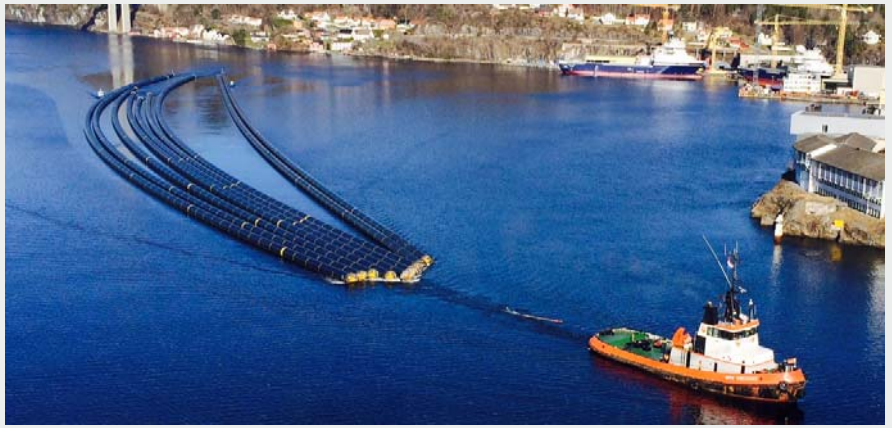
شركة هندسة الكهرباء و الغاز
Compagnie de l'Engineering de l'Electricité et du Gaz

PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- 5 parallel intake lines, each 2 km long
- **Custom** lengths (15x480 m, 5x501.5 m and 1x315 m)
- Pipes pre-assembled for **sinking**
- Easy **storage** of 6100+ tons of pipe by floating on the sea
- Only 70 **welds**
- Only 35 **joints** in total

CASE 2.

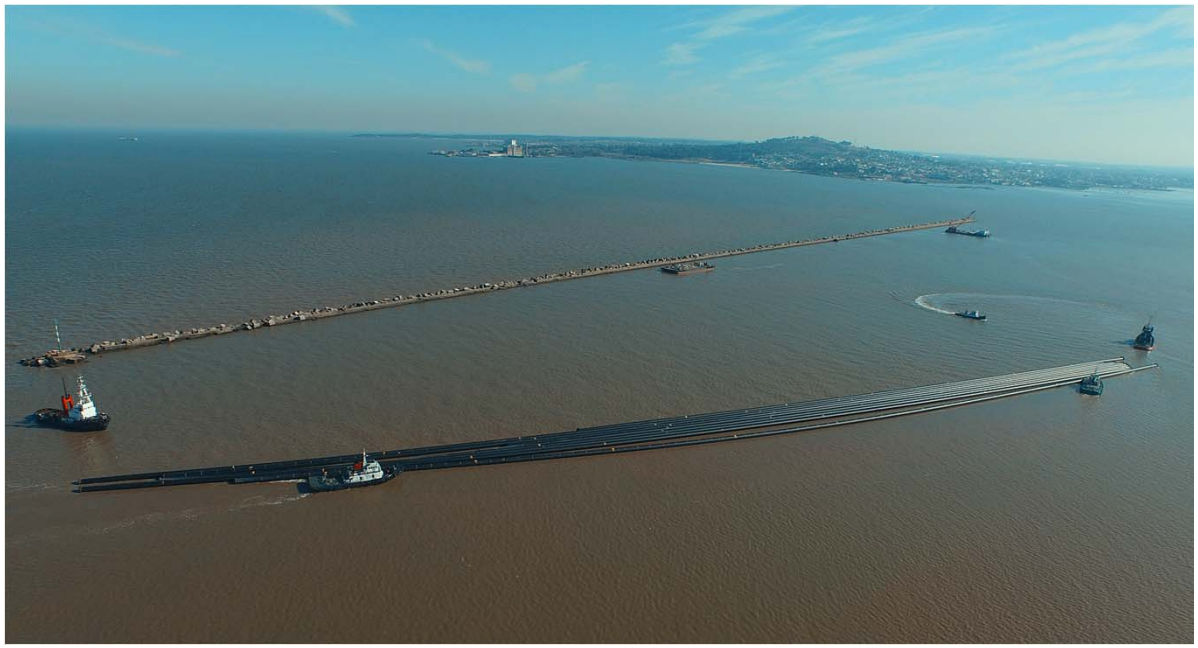
PUNTA DEL TIGRE, 530 MW COMBINED CYCLE POWER PLANT,
URUGUAY, 2015



PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- EPC project by Hyundai E&C, Korea
- Project worth: 741 million $
- Delivery of LLLD PE pipes and fittings OD2000, SDR30, 4000+ m and engineering assistance

PUNTA DEL TIGRE, 530 MW COMBINED CYCLE POWER PLANT, URUGUAY, 2015



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PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- 2 parallel intake and 2 outfall lines, each 2 km long
- **Custom** lengths (2x495 m, 2x475 m, 2x362 m, 2x342 m and 1x475 m)
- **Concentric reducer** was welded to pipe end for transport
- Delivery over the Atlantic ocean, with **7500 Nm** crossed and **3 months** of travel in total

CASE 3.

TAKORADI, 340 MW COMBINED CYCLE POWERPLANT, GHANA, 2014

PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- EPC project by MITSUI, Japan and KEPCO, Korea
- Project worth: 260 million $
- Delivery of LLLD PE pipes and fittings OD2500, SDR30, 8800+ m in 4 tows

TAKORADI, 340 MW COMBINED CYCLE POWERPLANT, GHANA, 2014

PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- 2 parallel outfalls, 1.5 km each
- 2 intakes, 2.7 km each
- Custom **lengths** (8x560 m, 1x532 m, 1x584 m, 3x501 m and 3x567 m)
- Pipes pre-assembled for the **sinking**
- Easy **storage** of 5800+ tons of pipe by floating on the sea

CASE 4.

WESTERMOST ROUGH WIND FARM 210 MW
UNITED KINGDOM, 2013

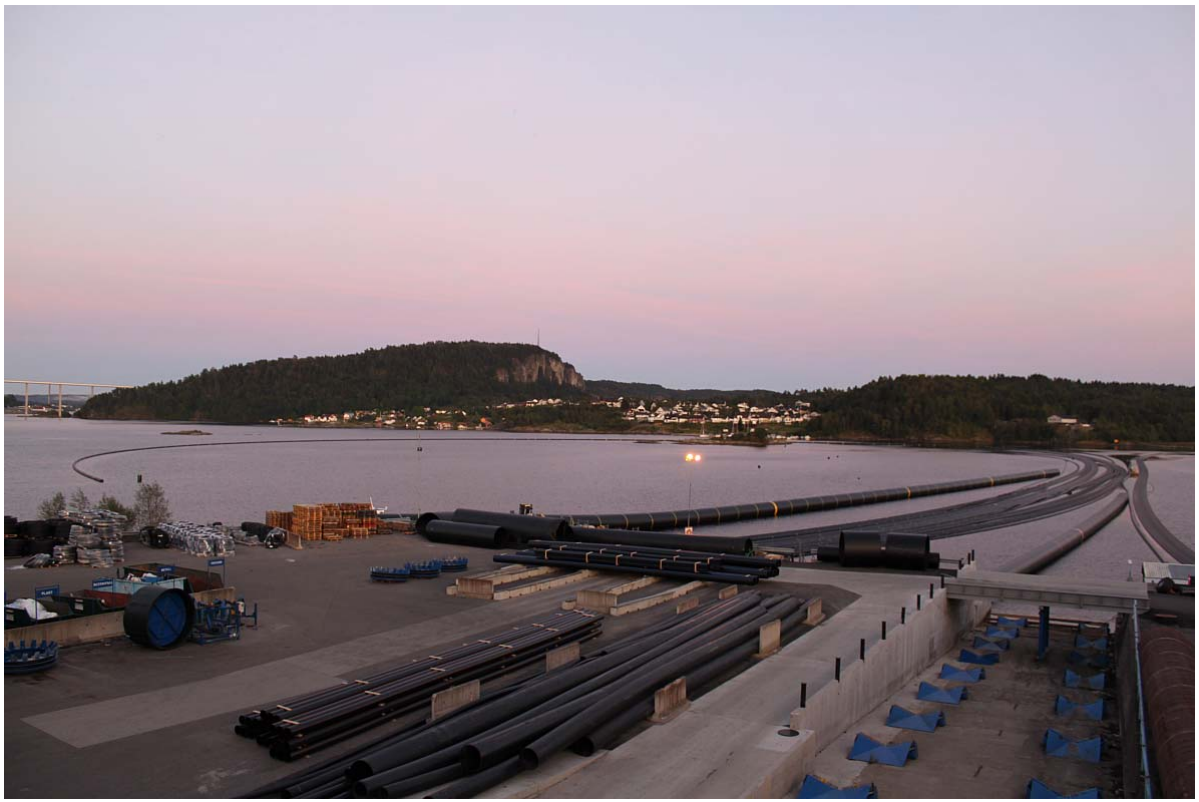
PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- Marine project by VolkerInfra, United Kingdom
- Project worth: 500 million £
- Delivery of LLLD PE one extra long pipe OD710, SDR13.6, 1015 m

WESTERMOST ROUGH WIND FARM 210 MW
UNITED KINGDOM, 2013

PRODUCTION AND TRANSPORT – PROJECT EXPERIENCE

- **Conduit** for power cable
- **No welds requirement**
- **Extra long 1015 m** pipe was produced
- **High thickness** - SDR13.6
- Installation by Directional Drilling



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CONCLUSION

Benefits in a nutshell:

Minimum amount of welds

Custom pipe lengths

Efficient and safe transport

Storage on the sea

Reduced or eliminated on-site welding

Pre-assembled for the sinking

Increased safety

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Thank you for your attention!

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