



Long term critical infrastructure planning: the perspective of EDF

INSeapTION Global User Workshop

June 9, 2020

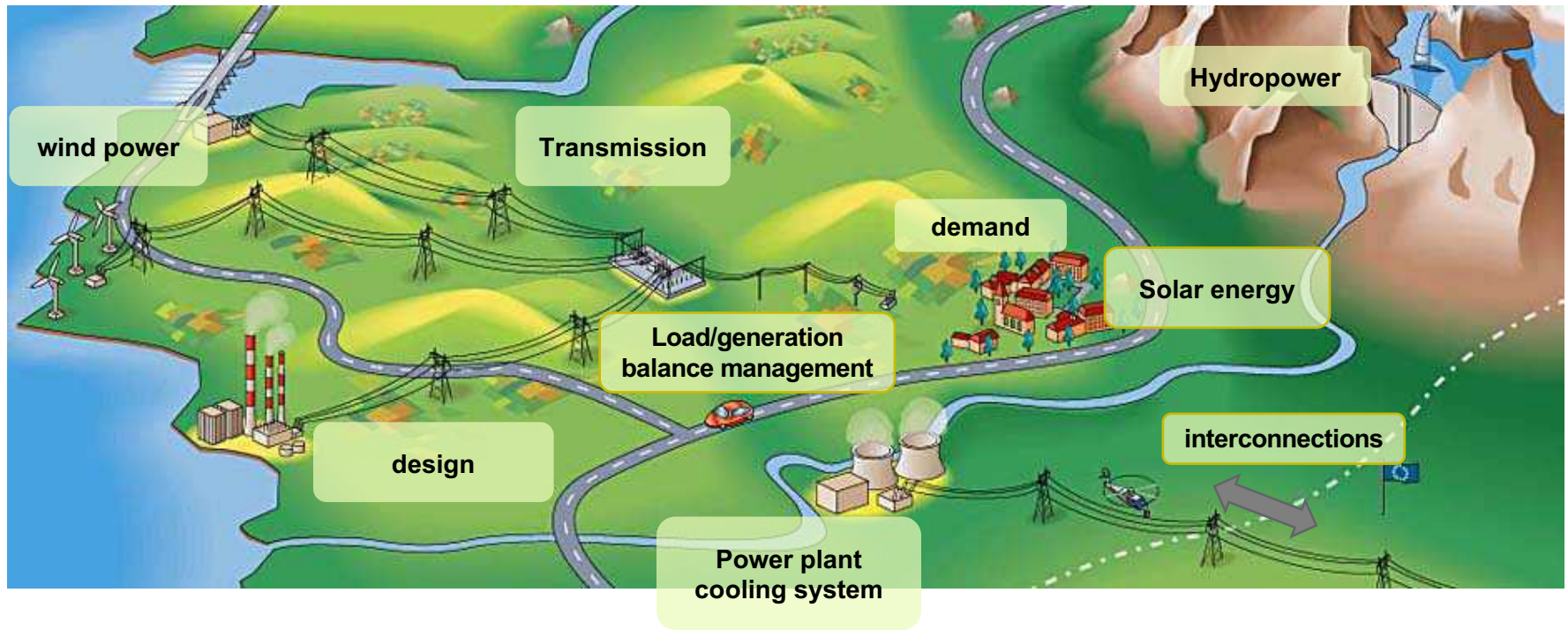
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Climate and EDF activities

Climate change may have many impacts on EDF activities

Changes in air temperature, precipitations, river flows, water temperature, sea level...

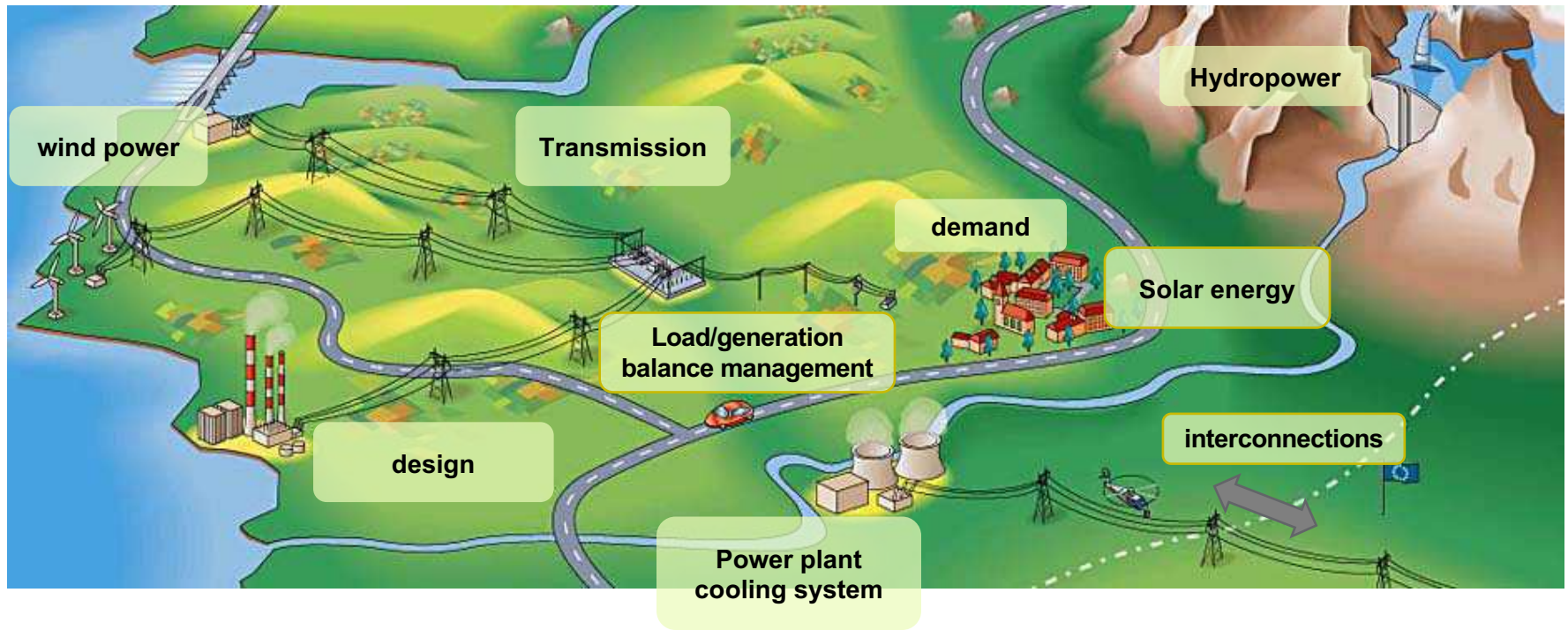


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At different time scales: decadal, mid/end of 21st century, more...

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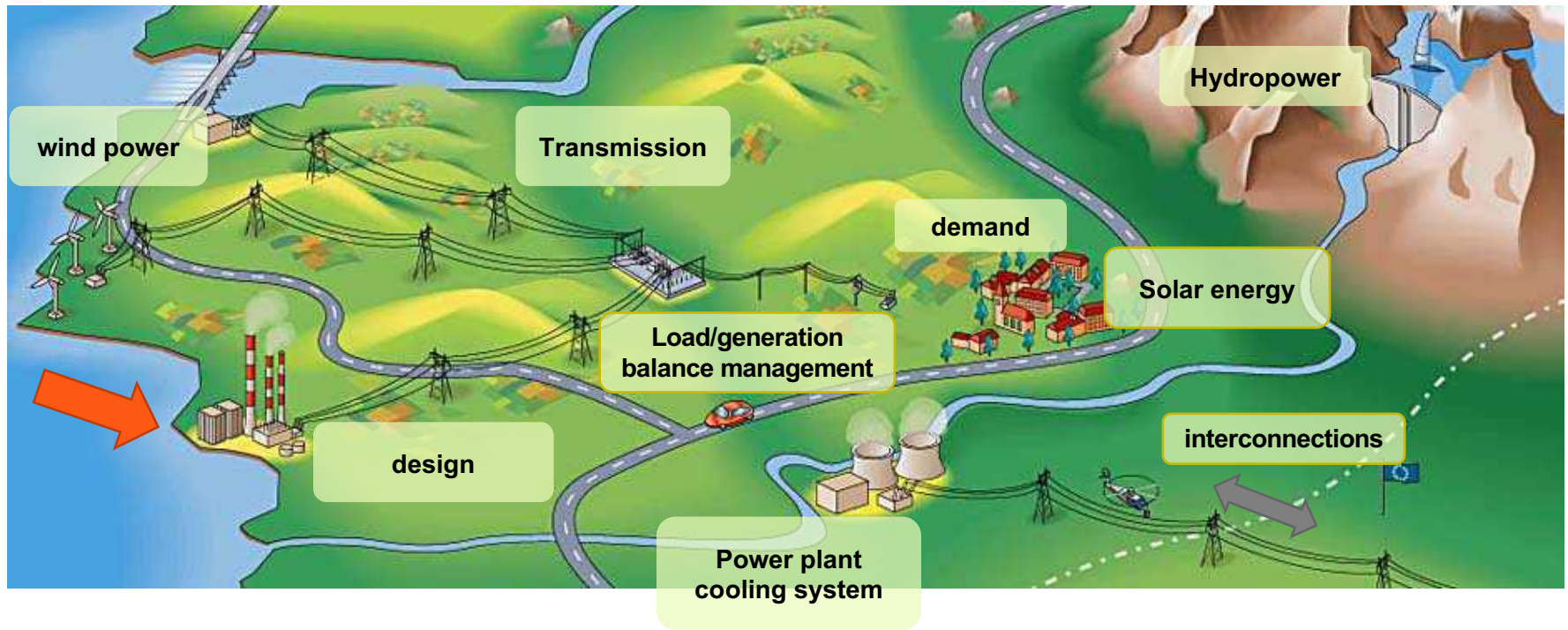


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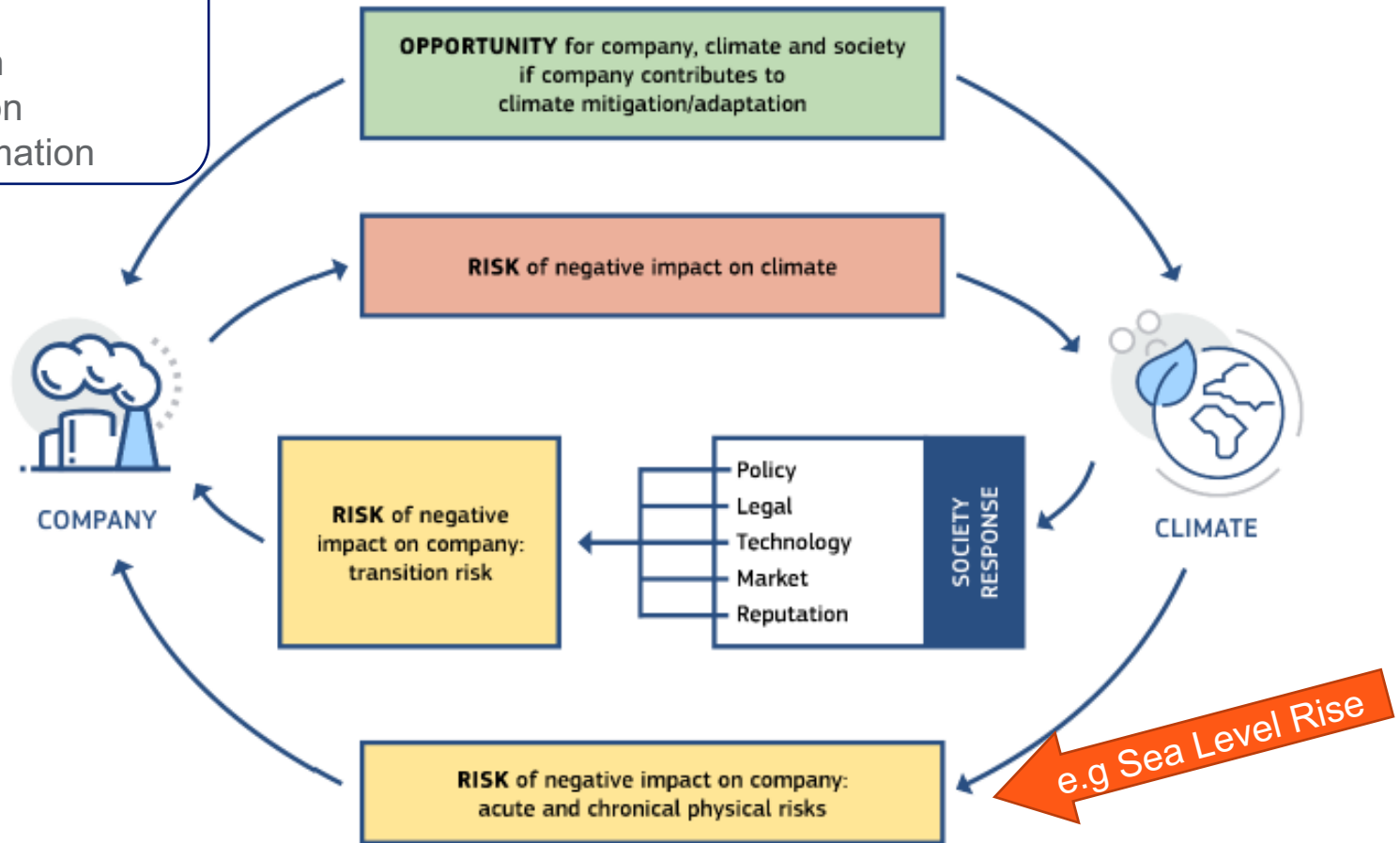
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Climate-related risks and opportunities

EDF involved in each aspect:

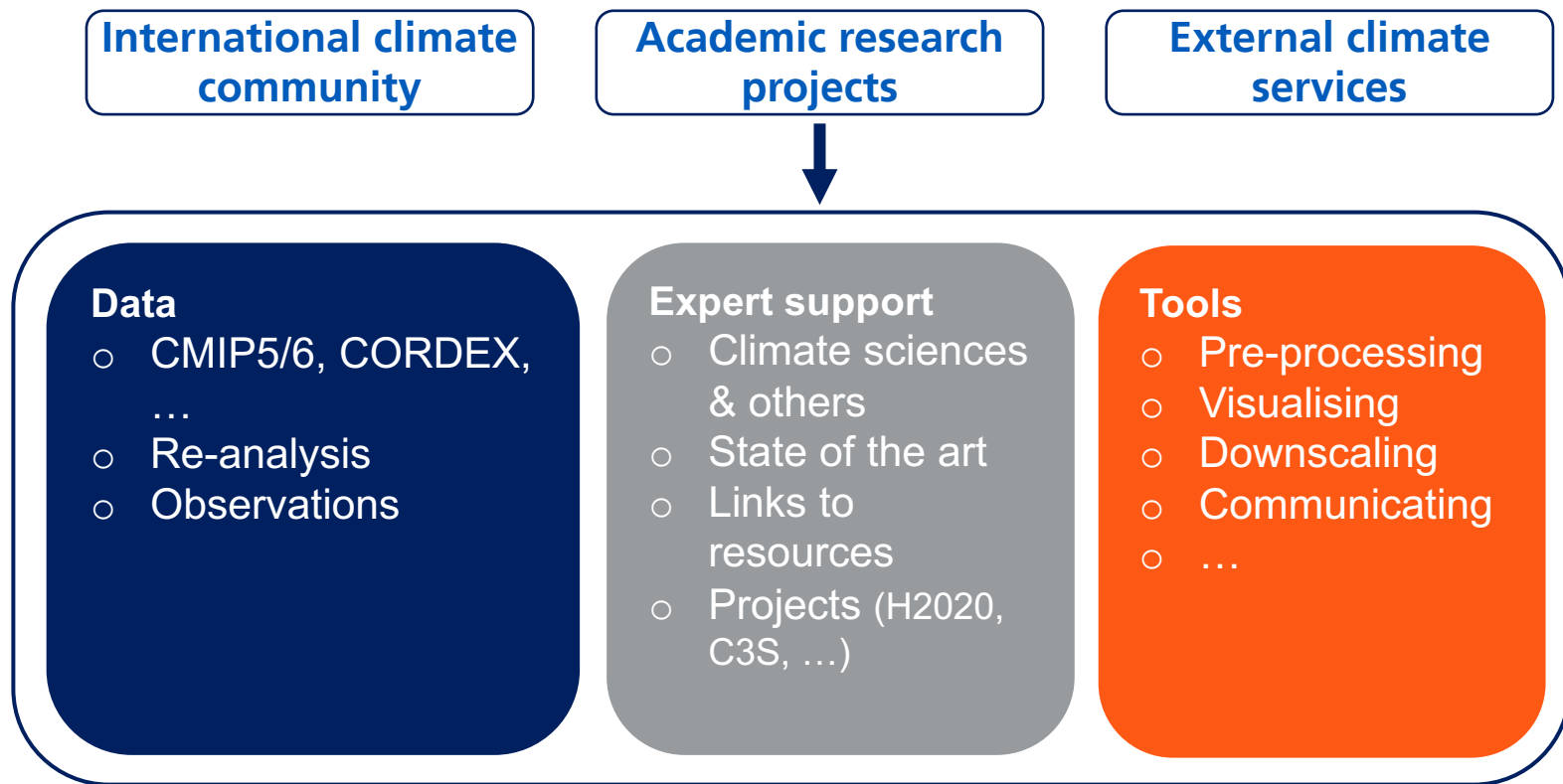
- Mitigation
- Adaptation
- Transformation



Source : EC Guidelines on reporting climate-related information, June 2019

EDF internal climate service

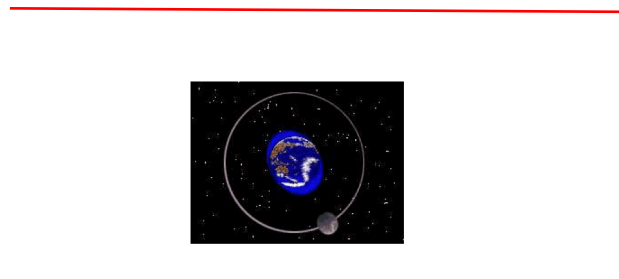
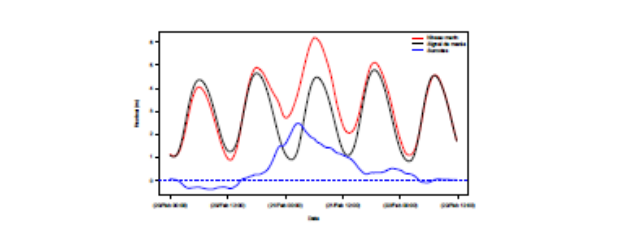
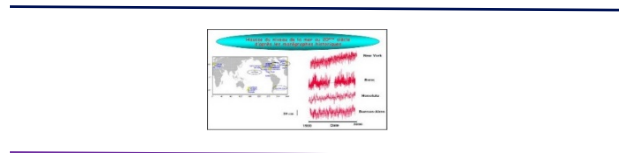
- Support every EDF entities in addressing the question of climate change on their activities
 - ➔ Resilience of their assets/activities, adaptation
- Insure consistency between impact studies: data, scenarios, methods



Sizing seaside nuclear plants protection

1st term: 10 years

Regulatory requirements for the protection against submersion



Margin M to take into account changes in sea level between two inspections (10 years)

+

Storm skew surge : Upper bound of the confidence interval at 70% of the 1000-year return period level

+

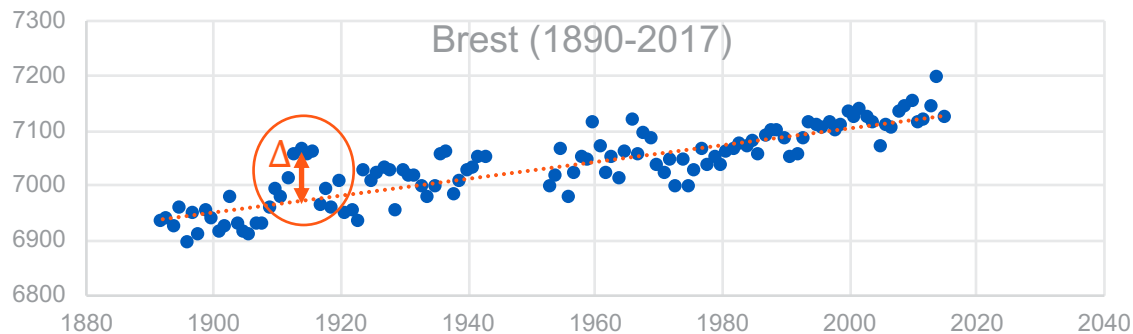
Highest astronomical tide

= Regulatory level

See Nuclear Safety Authority (ASN) flood guide

M Margin calculation

- Between two inspections, **10 years**
- Sea level rise has to be computed locally
- M is based on linear regression computed since the beginning of 20th century
 - $Y = aX + b$ with a in mm/y
 - M between two inspections is: $M = 2 \times a \times 10 + \Delta$
where Δ is the **maximum oscillation** of mean sea level around its regression (less than 10 cm)



And for longer term...

Sizing of long-term seaside EPR protections

→ sea level heights by 2100

- IPCC AR5:

- Global: « ...likely ranges are 0.26 to 0.55 m (RCP2.6), 0.32 to 0.63 m (RCP4.5), 0.33 to 0.63 m (RCP6.0) and 0.45 to 0.82 m (RCP8.5) (medium confidence) (Table TS.1, Figure TS.21, Technical Summary). For RCP8.5 the range at 2100 is 0.52 to 0.98 m »
- French coasts (fig. TS.23, Technical Summary)
 - The highest scenario (d, RCP2.6) is then $\approx +70$ cm (or $+60$ cm) around 2081-2100,
 - The lowest scenario (a, RCP8.5) should lead to $\approx +30$ cm.

→ To address the question of sizing by 2100 : pick the most unfavorable IPCC AR5 scenario, that is the most conservative

Optimization of NPP protection structures by 2100 is a very difficult task due to lots of uncertainties

- Models/scenarios
- Local dynamics of the sea level rise
- Antarctic/Arctic ice sheet melting and dynamics

Conclusion

- **EDF is impacted by climate change in each and every of its activities**
- **The question of climate change is seriously addressed by the Group for**
 - Mitigation / Adaptation / Transformation
 - Responsibility as a public service provider of electricity: a « first necessity good »
- **EDF has set up an internal Climate Service to support its entities:** data, expertise methods related to climate dynamics and climate change
- **Sea Level Rise is taken into account at several time scales for NPP protection sizing:**
 - Decadal: linear regression from of observations (centennial series)
 - By 2100: numbers from « worst » AR5 scenario
- **BUT**
 - a lot of uncertainties: models, scenarios, Antarctic and Arctic ice sheet melting and dynamics...
 - SLR has to be studied at a very local scale
- **Yes Coastal Climate services are of prime interest:**
 - Data
 - Understanding coastal dynamics under CC (SLR, water temp., submersions, ...)
 - Explaining uncertainties



Thank You