Keynote Address

DPPS – A Petrobras DP Safety Program

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Petrobras/E&P Service

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DPC – DYNAMIC POSITIONING CONFERENCE

DPPS – A Petrobras Dynamic Positioning Safety Program

Introduction

DPPS – A Petrobras Dynamic Positioning Safety Program

1. *Petrobras Scenario*
2. *History of DPPS*
3. *DPPS Projects*

Petrobras Scenario

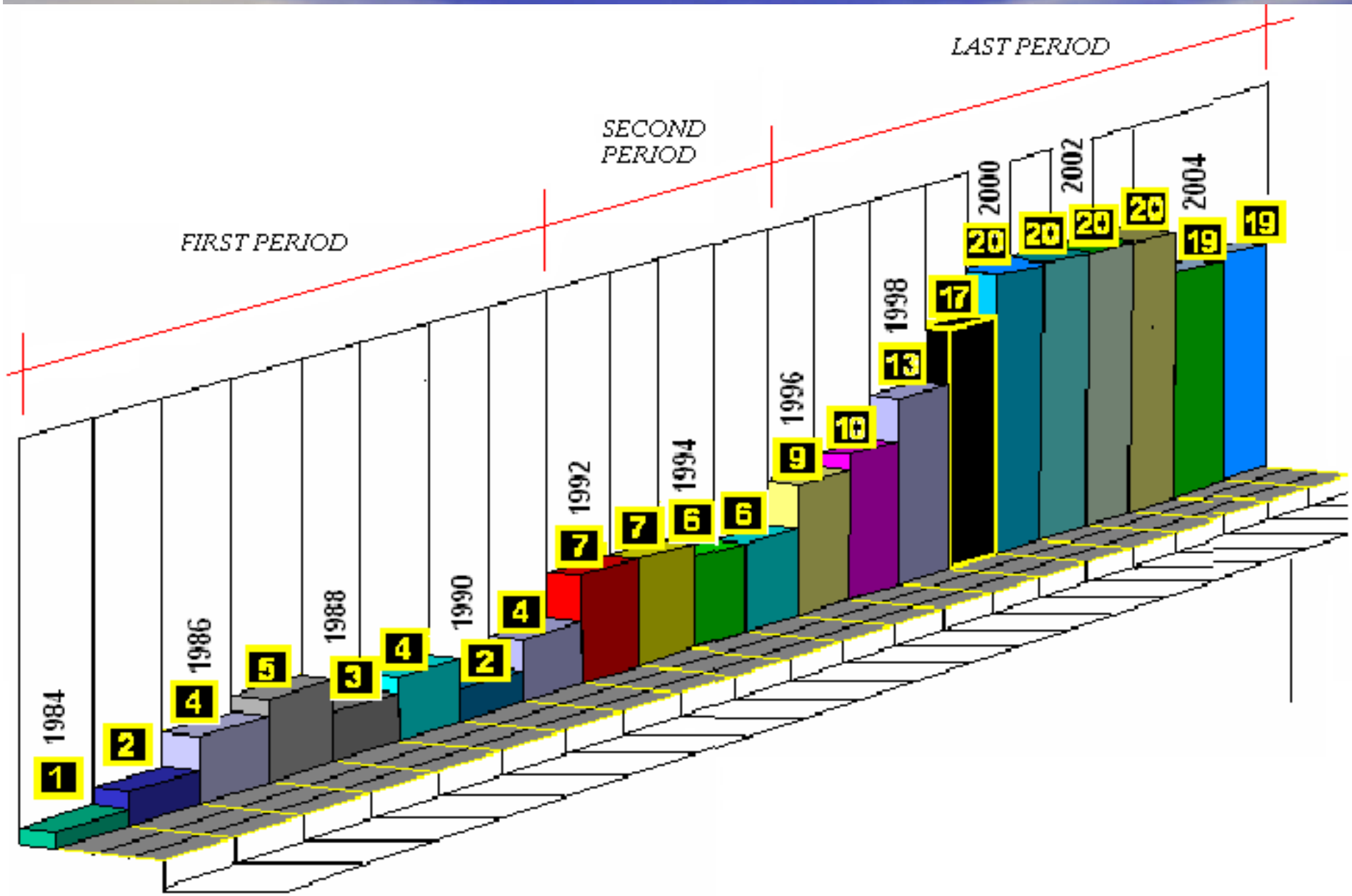
- DP rigs, a successful tool used to drill, complete and carry out workovers in sub sea wells.
- 80% of the Brazilian oil and gas production is extracted from the sea.
- Several different working environments, some of them specific to the Brazilian offshore fields.

Petrobras Scenario

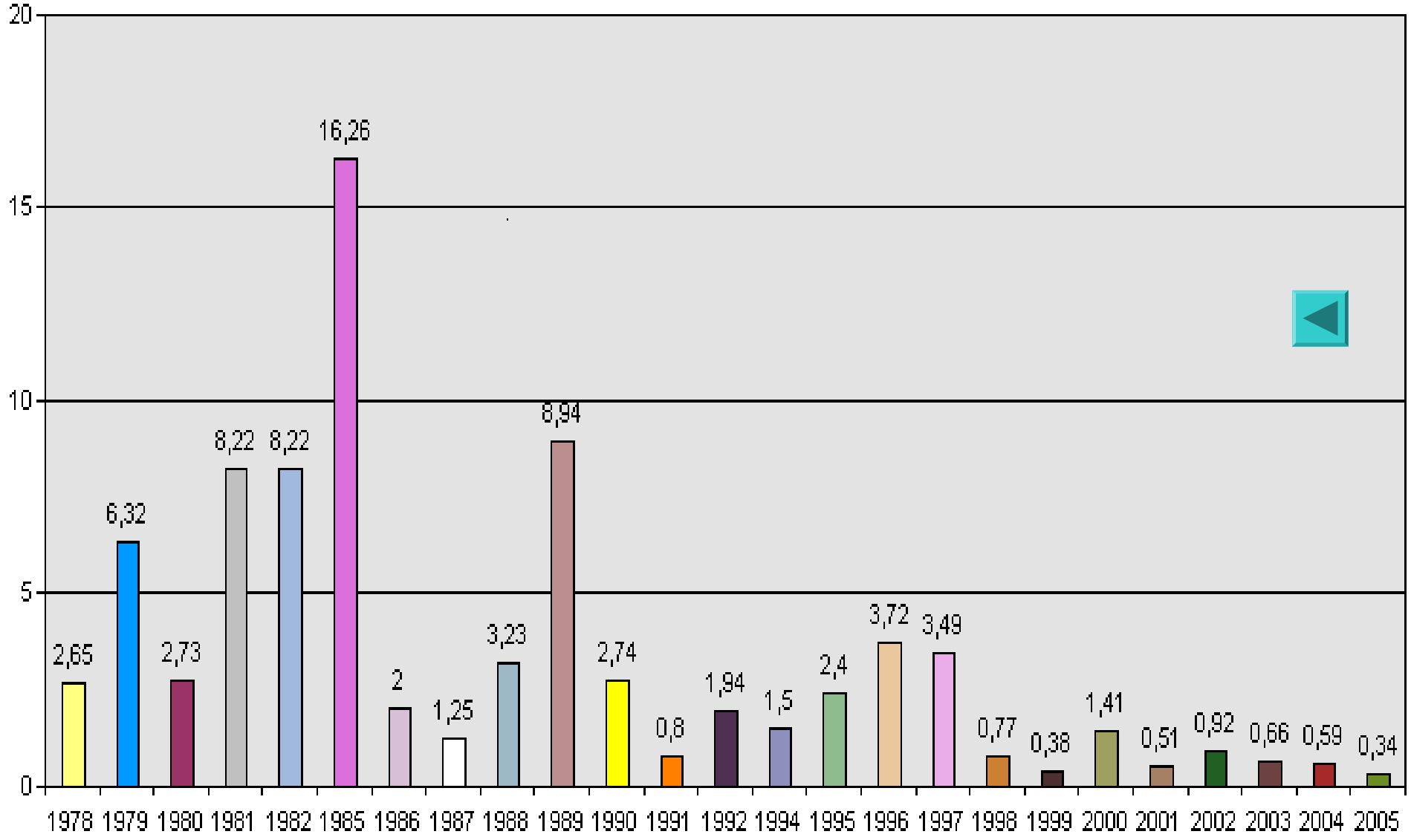
- Risk Contracts
  - 1978 - Sedco 471
  - 1980 - Ben Ocean Lancer
  - 1981/1982 – Pelerin
  - 1982 - Sedco 472

- First Petrobras Contract => Pelerin in 1984 , which in 1985, discovered the giant Marlim field, in Campos Basin, at 853 m wd.

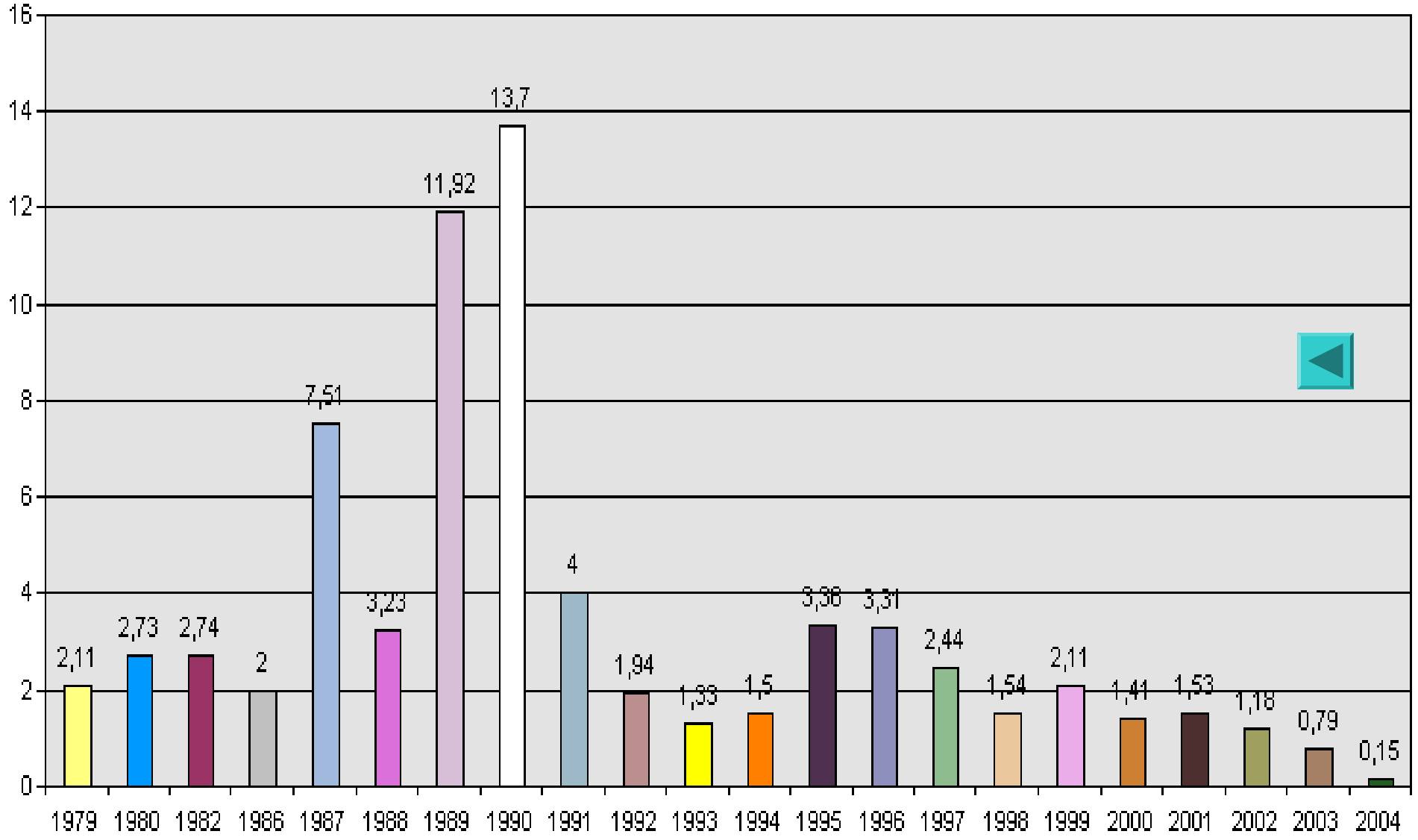
Number of DP vessels contracted by Petrobras



Black-out rate per 1000 operational days



Disconnection rate per 1000 operational days



DPPS History

First period

- Great number of DP incidents mainly due to the following reasons:
  - Poor operational procedures and lack of contingency plans;
  - Inappropriate operational safety limits;
  - Unfamiliarity of Petrobras technicians with DP rigs details.

- Petrobras started to carried out many DP rig studies.

DPPS History

Second Period

- Increasing in the number of DP rigs
- 1992 => Creation of DPPS - Dynamic Positioning Safety Program
  - In partnership with foreign contractors
  - to avoid incidents or at least to minimize their consequences.
  - using a proactive policy.

DPPS History

Third Period

- 1996 => increase from 7 to 20 DP vessels
- Present DPPS structure
  - One Petroleum Engineer – focused on the operational area
  - Two Equipment Engineers – focused on equipment
  - Four Electrical Technicians – focused on DP audits & sea trials

DPPS Projects

- Petrobras independently developed a number of concepts, norms and procedures establishing an integrated "operational philosophy" for DP rigs

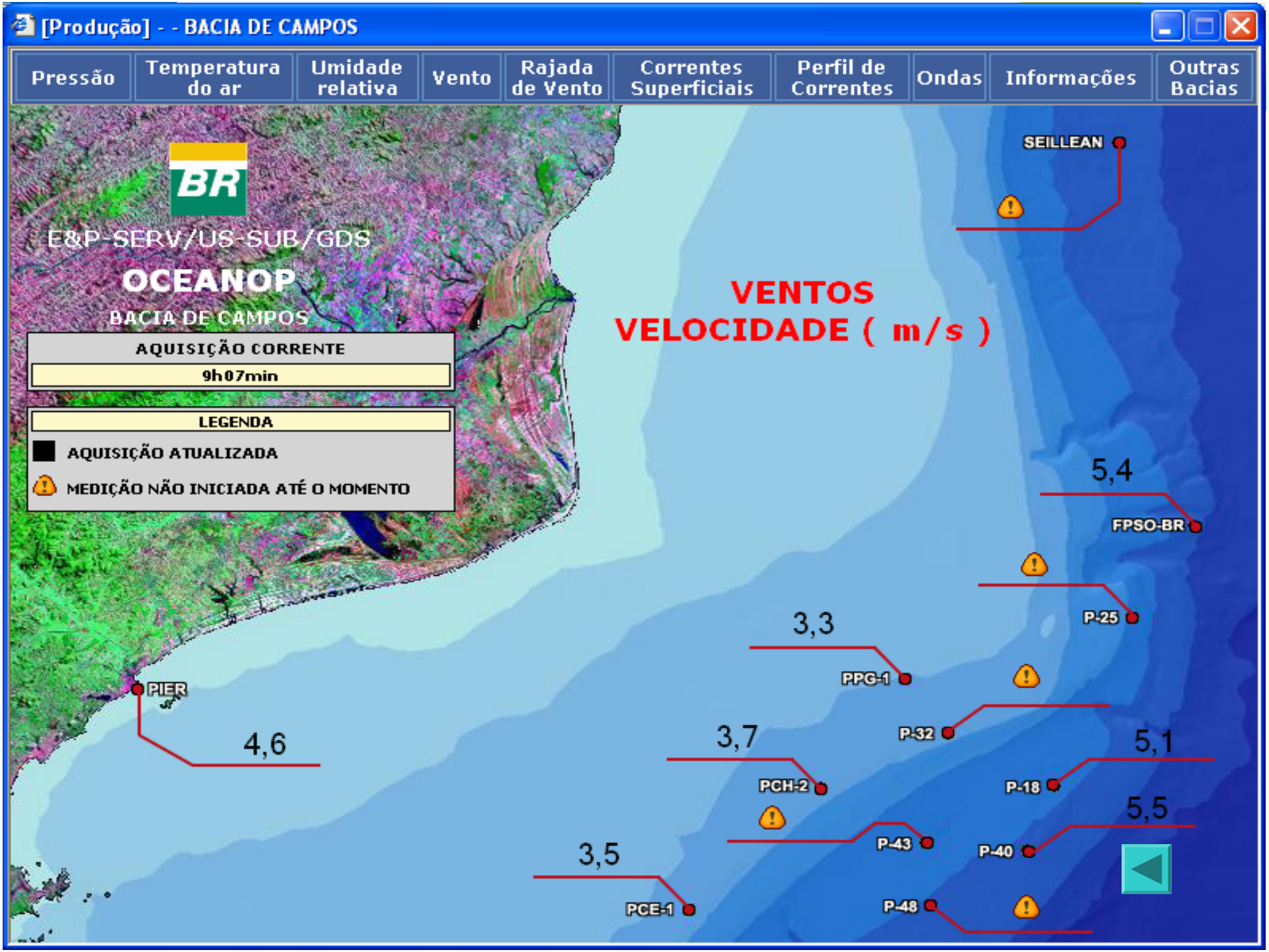
The principal challenges with DPPS are the following:

  - exploration in deep and ultra deep water;
  - coexistence of several units in close proximity and crowded seabed.
  - DP operations in shallow water.

- There are currently 14 projects in progress that aim to tackle each one of the challenges described above.

1. Weather Forecasts:

- **Objective** – provide all rigs with precise, reliable information and build up a data bank for our research center.
- **Present Situation -** wind and wave bulletins being delivered twice a day.
- **Future Plans –** Petrobras sea currents forecast project will be on line in the next few months.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Pressão
Temperatura do ar
Umidade relativa
Vento
Rajada de Vento
Correntes Superficiais
Perfil de Correntes
Ondas
Informações
Outras Bacias
BR
E&P-SERV/US-SUB/GDS
OCEANOP
BACIA DE CAMPOS
AQUISIÇÃO CORRENTE
9h07min
LEGENDA
AQUISIÇÃO ATUALIZADA
MEDIÇÃO NÃO INICIADA ATÉ O MOMENTO
VENTOS
VELOCIDADE (m/s)
SEILLEAN
5,4
FPSO-BR
P-25
3,3
PPG-1
PIER
4,6
3,7
PCH-2
P-32
5,1
P-18
5,5
P-40
P-43
3,5
PCE-1
P-48

2. DP incidents data bank (BDIP):

- **Objective** – learn from incidents to improve reliability.
- **Present Situation -** recently revised after software change.
- **Future Plans –** increased use of statistics and development of links with other software.

INCIDENTS SINCE 1978	Number
Operational Degradation	31
Yellow Alarm Status	106
Red Alarm Status	90
Degraded Operational Status	376
Immediate Red Alarm Status	53
Emergency Disconnections	128
Black-outs	56
Total Number of Operational Days	71040
Mean Time Between Disconnections	555
Mean Time Between Black-outs	1269

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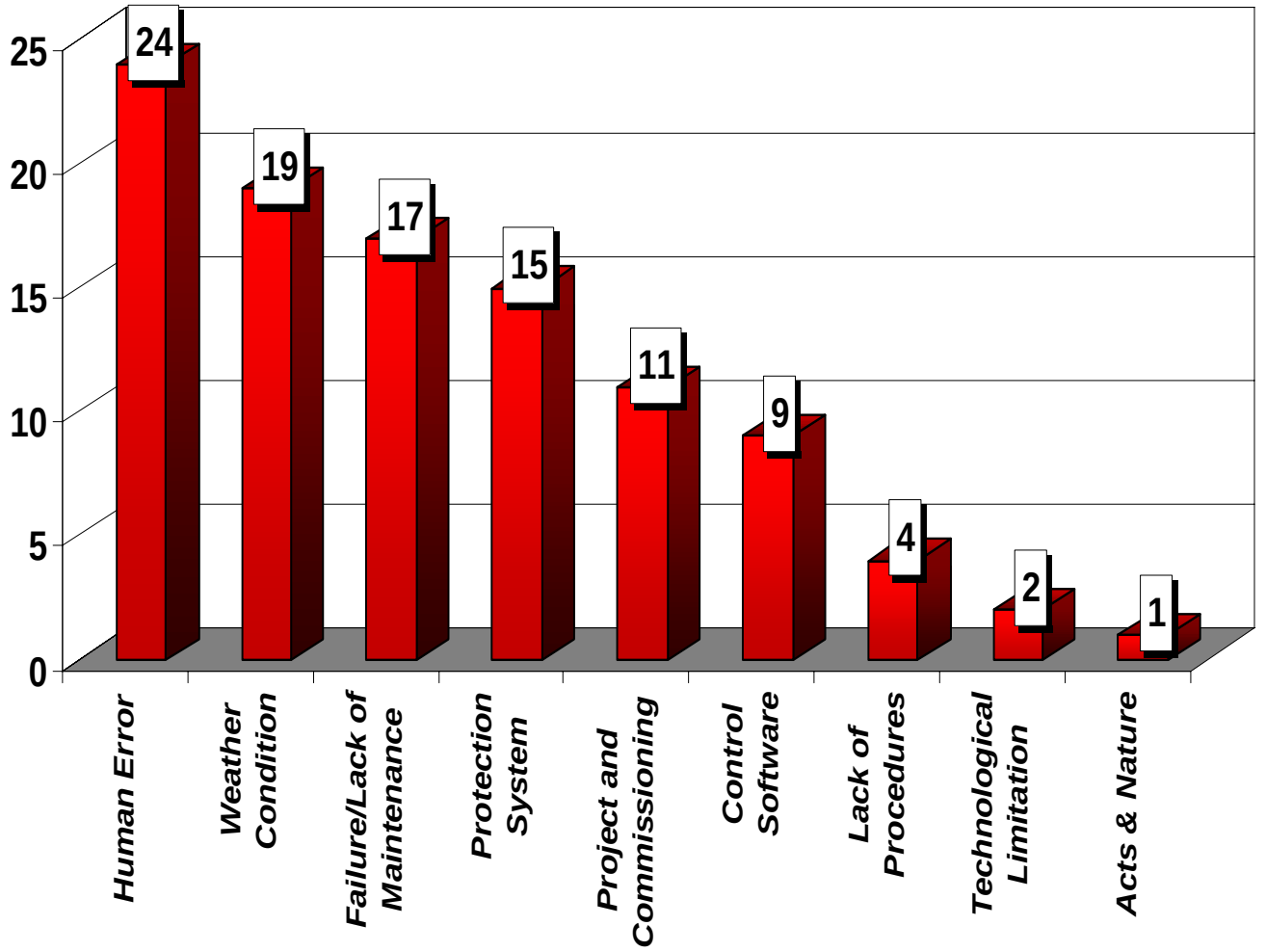
Red Alarm - Basic Cause - 1992/2004



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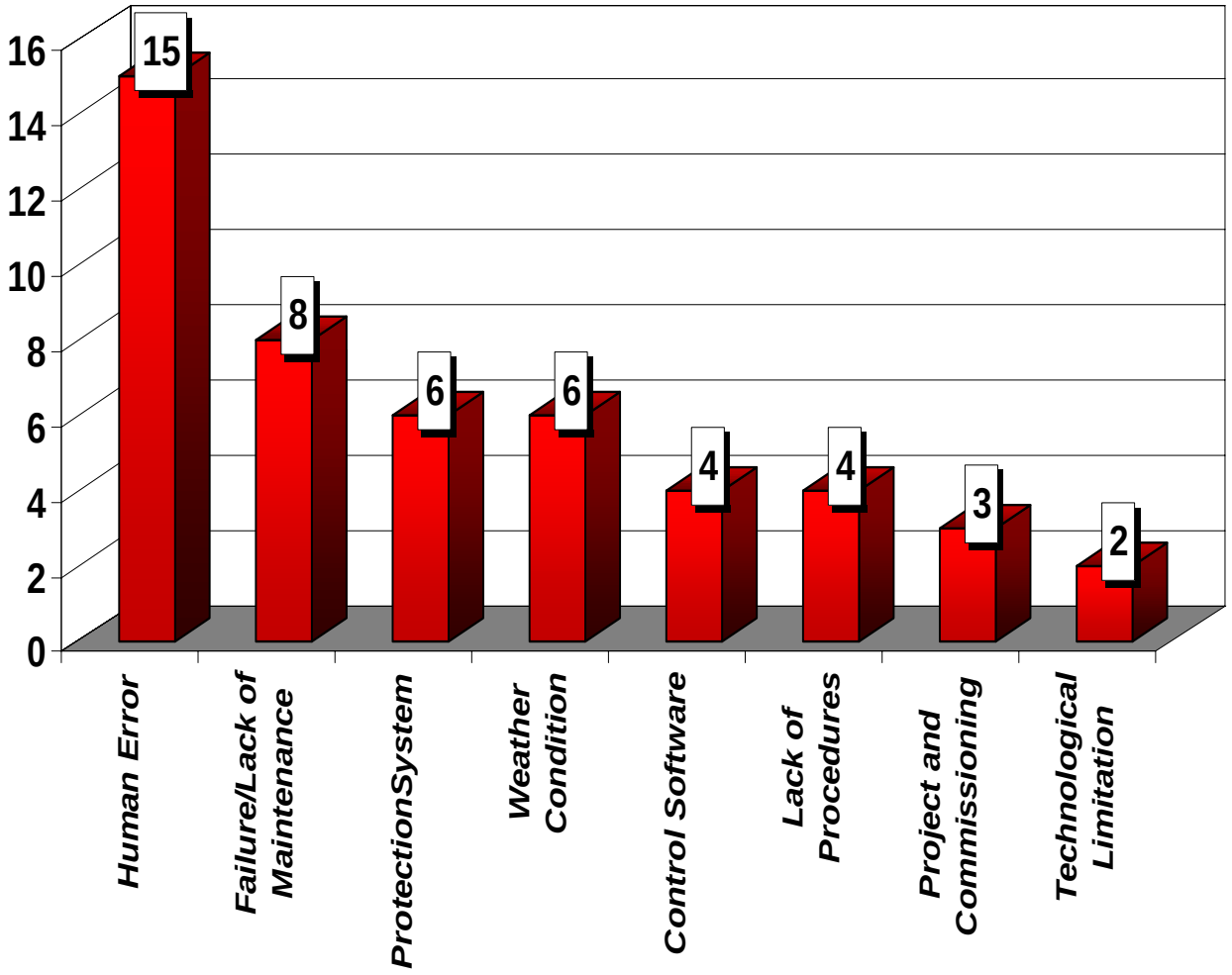
Red Alarm - Basic Cause - 2000/2004



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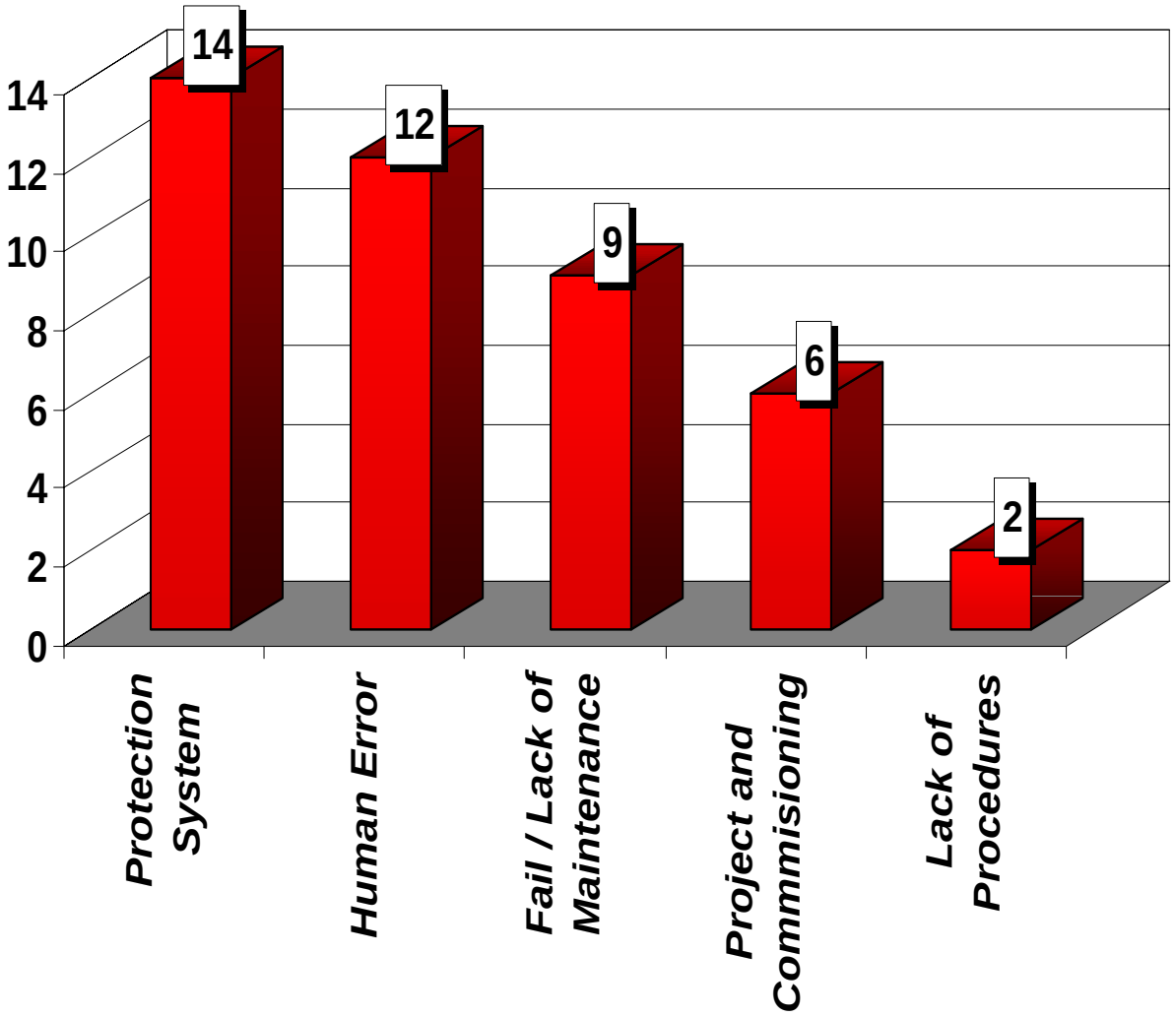
Blackout - Basic Cause - 1992/2004



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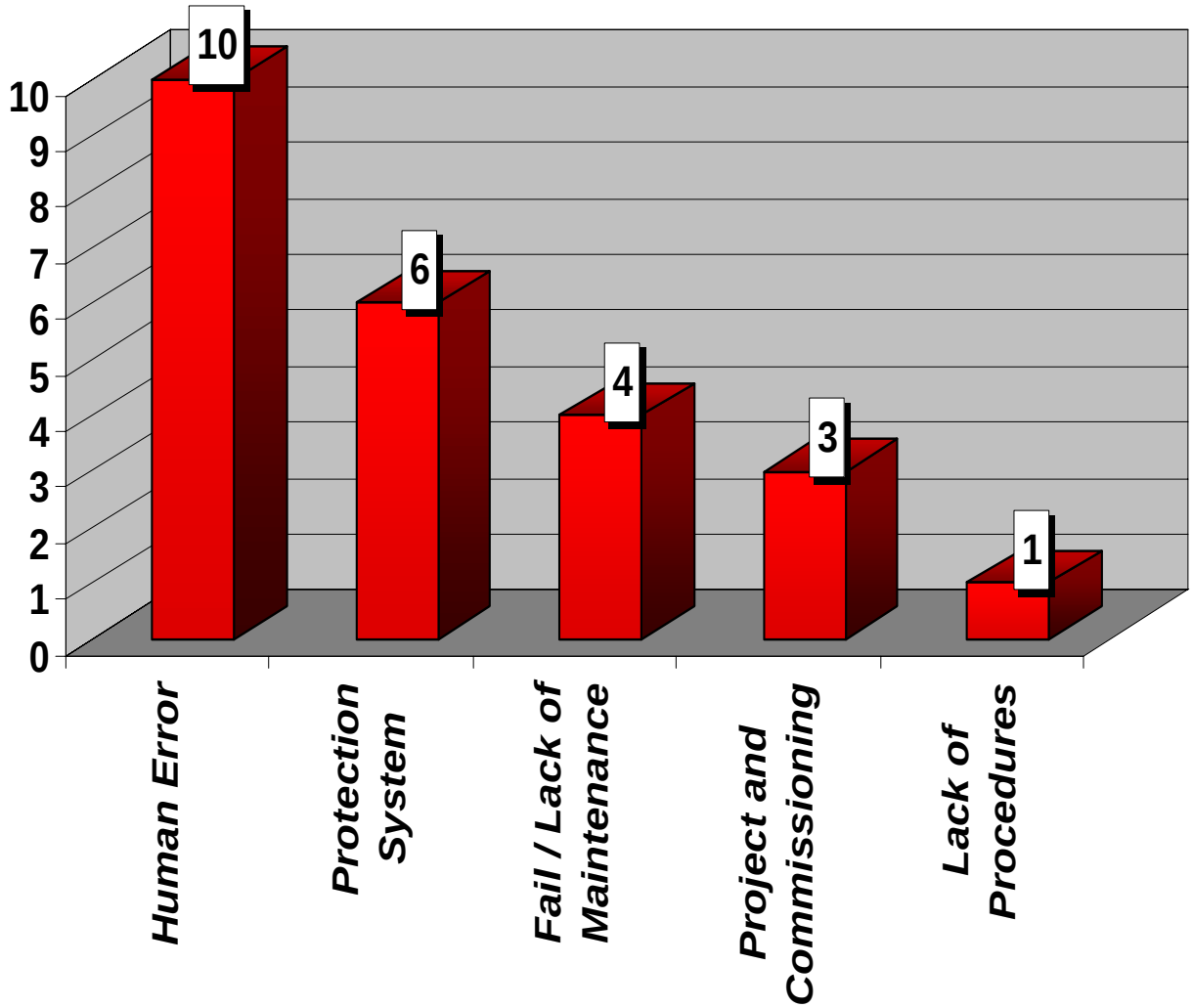
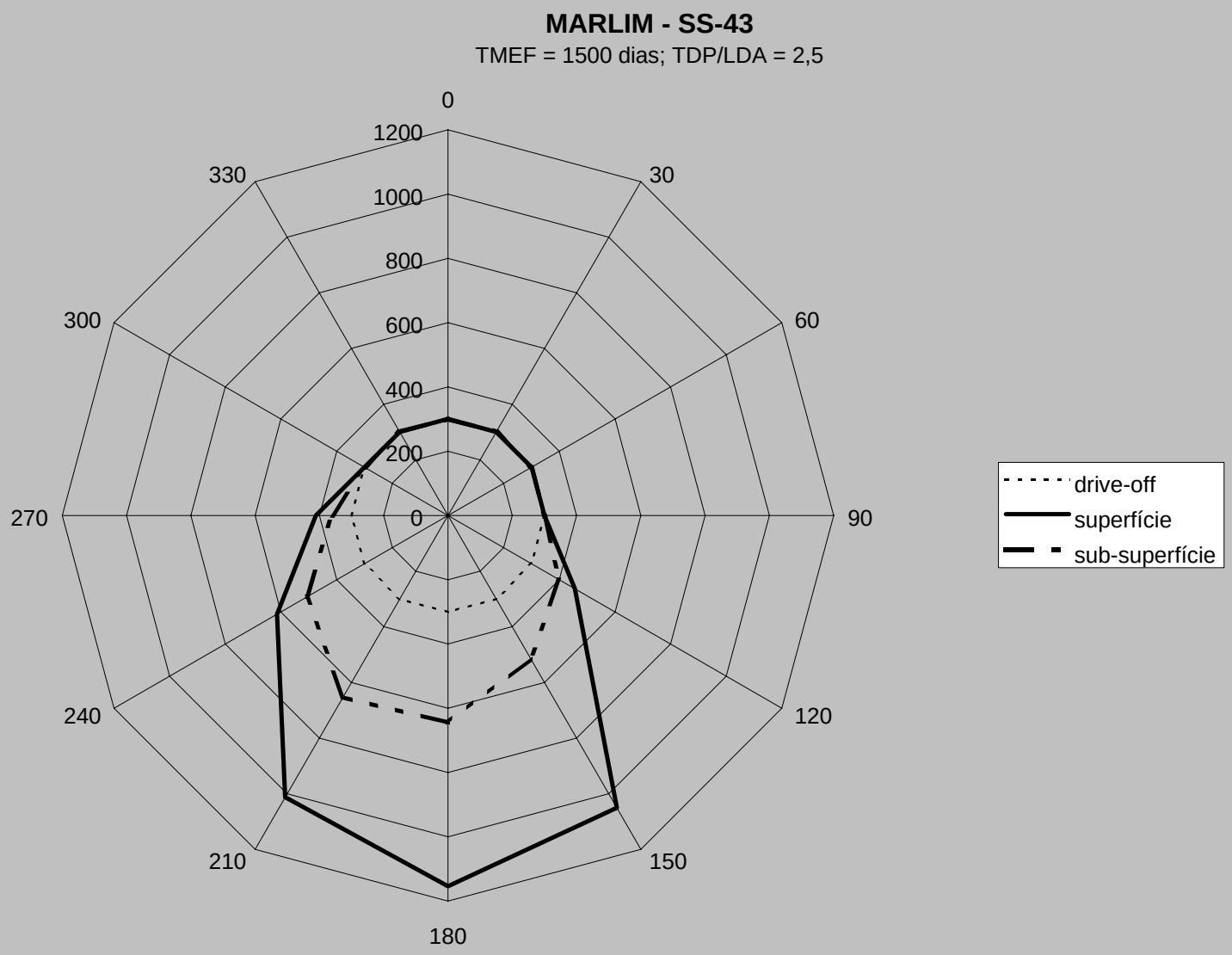
Blackout - Basic Cause - 2000/2004



3. Restriction Diagram:

- **Objective** – minimize consequences in case of black-outs, using a tool called a restriction diagram that demonstrates a volume centered on the DP rig where no obstacles are permitted.
- **Present Situation -** second generation diagram (2G) being used and information collection for 3G.
- **Future Plans –** implementation of 3G**.**

Restriction Diagram



4. **Procedure Prior to Arrival on Location**:

- **Objective** – safe working conditions at new well locations.
- **Present Situation –** procedure describes escape routes, acoustic interference, nearby obstacles, etc.
- **Future Plans –** 3 rd dimension visualization of sea obstacles.

5. Position Reference System:

- **Objective** –reliability based on state of the art technology.
- **Present Situation –** permanent use of two DGPS and two independent acoustic systems.
- **Future Plans –** seek alternatives for the next scintillation period, which starts in 2008.

6. EDS and Degraded Status Criteria:

- **Objective** – to perform successful disconnections in all situations.
- **Present Situation -** guidelines for all operations as well as Degraded Status Criteria for all DP rigs.
- **Future Plans -** guidelines updating and new format for Degraded Status Criteria document.

- If the WSOG is not established, the following graph sums up our guidelines to work with DP rigs safely.

CAUSE	EFFECTS	CONSEQUENCE
Loss of Redundancy	Degraded	Without loss of position - Possible cease of operations (Critical Operation)
Progressive loss of station keeping capability	Yellow alarm/ red alarm	Loss of position with control – preparation for disconnection => disconnection
Sudden loss of station keeping capability (black-out)	Immediate red alarm	Loss of position without control => Immediate disconnection

- A degraded status signals a threat of an emergency disconnection. It means “loss of redundancy” of equipment or systems responsible for the station keeping capability of the unit. Redundancy is understood as: numerical, configuration, load rate and failure mode.

- When a degraded status is configured the staff must meet immediately to find the best solution for the well.

- The document “Degraded Status Criteria” is one of the most important results of a Petrobras inspection, done when a new rig is received or updated. It describes the minimum equipment and system configuration necessary for normal station keeping and also the general limit values for alarms in each stage of position loss, including all kinds of operations performed by the rig.

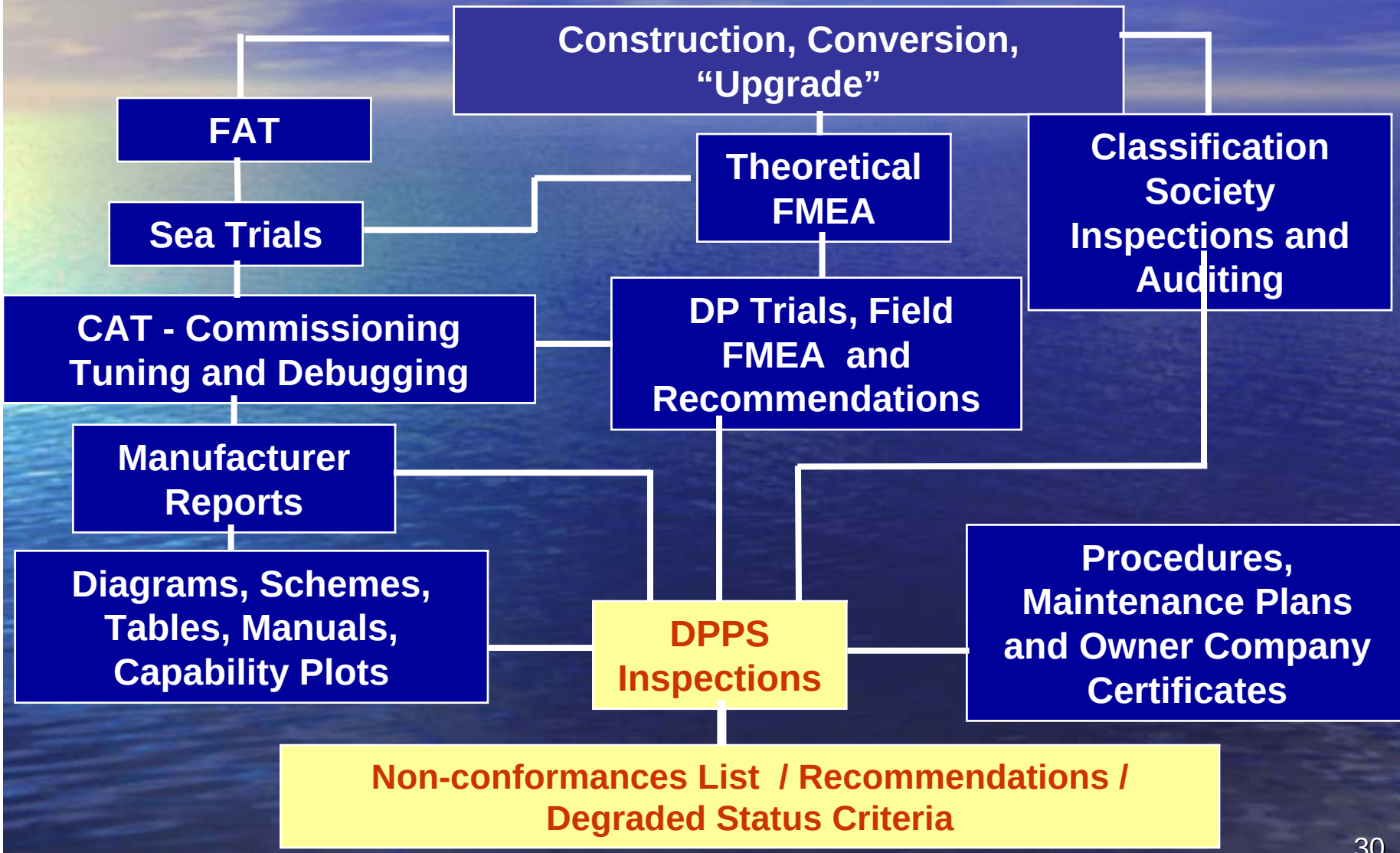
7. Contingency Plans for Uncontrolled Drift (black-out situation):

- **Objective** – prepare key DP personnel for emergency situations.
- **Present Situation -** black-out tests performed each semester for all DP rigs.
- **Future Plans–** establish goals for black-out time recovery, with or without simulated failures.

8. DP Rig Audit:

- **Objective** – audit technical specification, procedures and personnel behavior using a multi-disciplinary work team in charge of rig inspections. Main focus – find and eliminate potential single point failures.
- **Present Situation –** conduction of vessel acceptance and annual trials.
- **Future Plans –** develop new software that automates audits, uses a tablet PC and interconnects with other software.

- The flow chart describes the steps to be followed before acceptance trials are carried out on a new DP rig:



9. Non-conformances Data Bank (SPS):

- **Objective** – software to manage and control non-conformances.

- **Present Situation –** comprehensive status report on all non-conformances, including:
  - software alerts Petrobras staff about the time remaining to confirm non–conformances solutions carried out by contractors.
  - % solved in a stipulated period of time
  - historical trends for its solution, etc.

- **Future Plans – continuous improvements such as**
  - alerts Petrobras staff about the time spent by contractors to solve non-conformances.
  - classification of non-conformances according the time spent for solution, etc.

10. Bid Requirements:

- **Objective** – keep technical specifications updated using cost / benefit analyses of new technology and/or lessons learned from incidents.
- **Present Situation -** last update conducted in 2004 at a seminar with the participation of contractors.
- **Future Plans –** continuous improvement of bid requirements taking into account feedback from periodic meetings with contractors.

11. Key DP Personnel Log Book:

- **Objective** – software to reduce human errors by registering and confirming employee's professional qualification / expertise.
- **Present Situation –** employee data bank software being developed to register all key personnel.
- **Future Plans –** to meet not only international requirements but those of Petrobras as well, which in fact are more detailed and demanding than international ones.

12. On Board Petrobras Representative Training:

- **Objective** – improve Petrobras representatives DP knowledge
- **Present Situation –** all on board Petrobras representatives attend training courses**.**
- **Future Plans –** to constantly improve aforementioned courses.

- **PETROBRAS REPRESENTATIVE KIT**

  – \\sbcfs01a\us-ss\CPSE\Gestão\06- Gestão das Informações\Diversos\DPPS\Kit Fiscal DPPS

- Section A – DP Rigs Characteristics.
- Section B – DP Incidents Data Bank (BDIP).
- Section C – DP Rigs Emergency Disconnections on WCT/ PAB.
- Section D – DP Rigs Moving Between Wells Procedure.
- Section E – Well Stimulation Vessel Procedure.
- Section F – Acoustic Interference Procedure.
- Section G – Emergency Disconnection Procedure.
- Section H – Operational Limits in Accordance with Environmental Conditions.
- Section I – Degraded Status Criteria.
- Section J – Guidelines for Emergency Disconnections.
- Section K – Weather Forecast and DP Status.
- Section L – Restrictions Diagram.
- Section M – Black-out Simulation Test Procedure.

13. DPPS Quality Control:

- **Objective** – satisfy Petrobras quality control guidelines.
- **Present Situation-** an indicator named TSODP (DP Operations Safety Rate), registers black-out or emergency disconnections. For 2005 the goal is less than five incidents. There have been two incidents so far this year.
- **Future Plans -** focus on human errors.

14. New Projects:

- **Objective** – improve reliability on other DP vessels working for Petrobras.
- **Present Situation –** acceptance trials for 10 DP shuttle tankers, 4 well stimulation vessels and other DP vessel types.
- **Future Plans –** our operational policy implemented on all DP vessels.

Thank You