DEVELOPMENT AND APPLICATION METHODOLOGY FOR REVITALIZATION OF OVERHEAD LINES

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SUMMARY

In this paper procedures of 110 kV overhead lines (OHLs) revitalization will be presented in EPS' transmission network, and a proposal for revitalization planning procedures. During revitalization we should have in mind the following advantages:

- Possibility to use existing towers with some reparation work on replacement of worn out elements foundations, and towers anticorrosive protection, with aim to lengthen the whole OHL life for 40 years;
- To use existing OHL trace and existing tower place locations;
- To augment phase conductor temperature to +80 °C, instead of +40 °C to +60 °C nowadays;
- To adjust OHL to crossing and approaching objects;
- In case of conductor replacement, the possibility and economical justifiableness of other electrical equipment replacement should be analyzed. The participation of phase and protective conductor replacement in revitalization cost is about 75%.

The proposal of revitalization planning procedures is resulted from up-to-now experience. All over the world, there are great number of OHLs which are in operation long time and waiting for investment actions. These actions, as a rule, require radical technical and finacial operations. Having in mind the great significance of these lines for the power system operation, the great investment value and revitalization cost, we consider that the revitalization planning problem has particular interest for the OHLs’ proprietors all over the world.

In the paper, the diagnosis procedure of OHLs status, which are candidates for undertaking definite measures considering their age and behaviour in operation, is presented. With aid of complete OHL status diagnosis, revitalization methodology, we are coming to results which say what to undertake and to what extent (nothing to do, rehabilitation, revitalization for definite number of years is assessed, revitalization up to 5 years and reconstruction of OHL).

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This methodology perceives revitalization necessity (increasing transmission line capacity, increasing reliability, harmonisation with new regulations, economical and other reasons), with esteeming the actual state, decision making criteria, OHL parameters and equipment choice, and technical and economical analysis. With regard to extent of data and calculations, a computer programme, supporting mentioned methodology, has been designed.

**Keywords:** Overhead Lines – Revitalization Reliability – Risk – Management

1. **INTRODUCTION**

1.1. Introductory part

The intensive erection of 110 kV, 220 kV and 400 kV OHLs in Serbia began 1954, 1960 and 1970 respectively, it means that they are in operation 50, 45 and 35 years. Now, most problems appear with 110 kV OHLs and to some extent with 220 kV and very soon problems will be with 400 kV.

In the latest years, necessity for OHL revitalization is appeared, in other words, necessity for elaboration of methodology which is able to perceive this problem in its complexity.

The synthetic character of engineering and research work should be stressed out in relation with OHL revitalization, as well as in connection with foregoing preparation work, which must be done.

1.2. Definition of terms

- **OHL reconstruction** is total destruction of existing OHL and building of completely new one on the same trace, what is made when rehabilitation of towers and/or foundations are not justified according to technical and economical analysis;
- **OHL revitalization** includes series of measures to be undertaken on existing OHL in order to lengthen its exploitation life, i.e. to facilitate normal functioning of this OHL in advance defined period of time;
- **Revitalization of construction equipment (towers and/or foundations)** includes definite work on towers and/or foundations, when it is technically and economically justified, in order to lengthen the exploitation life of this equipment and of the OHL in the whole;
- **Revitalization of electrical equipment (conductor and/or jointing equipment and/or insulator and/or protective wire)** includes replacement of existing one with new one;
- **Equipment rehabilitation** includes some work on the equipment when it is technically and economically justified in order to lengthen the exploitation life of this equipment and of the OHL as whole.

2. **REVITALIZATION METHODOLOGY**

2.1. Basics on methodology

This methodology has been resulted from several years’ behaviour analysis of 110 kV, 220 kV and 400 kV OHLs in operation and experience gained by testing dismounted equipment from OHLs, as well as, the need to unite these experiences in the whole, which would serve to perceive the actual state of OHLs of highest voltage level in Serbia and the need for their revitalization. The author started from English experience L [1] combining it with our experiences.

OHL revitalization methodology is presented by algorithm in Fig. 1.

Methodology includes: OHLs’ data basis; OHL state diagnostics; OHL revitalization criteria; technical and economical analysis; OHLs’ ranking for revitalization; OHL parameters and equipment choice, and OHL revitalization extent and manner.

On the basis of OHL revitalization methodology we get answer to question of OHL revitalization necessity, yes or no, when, to what extent and in what manner it should be done.

2.2. Data bases

For each examined OHL, data will be entered into the basis L[3], and the data serve to OHL state diagnostics and to give marks for its significance.

2.3. OHL state diagnostics

This chapter includes:
- **OHL behaviour in operation**, analysis of outages, replaced insulators, interventions, meteorological phenomena and overhaul on OHLs;
- **OHL project solution analysis**: survey, analysis and giving proposal for project solution enhancement;
Detailed OHL inspection is made to perceive the actual state and to give marks for the equipment state; Measurements on elements on OHLs and from them, measurements of OHL conductor and ground wire deflection, also towers’ earthing resistance and insulators’ resistance are made and Testing of equipment on OHLs or from them, towers, foundations, conductors, jointing equipment, insulators, insulator strings and ground wire are tested.

On the basis of complete diagnostics procedure of OHL state we come to information about OHL reliability, equipment state. Test results of dismounted parts from OHL serve to determine limit values and to estimate OHL remained life.

2.3.1. OHL behaviour in operation

Only OHL outages will be presented here.

OHL outages - The greatest care is dedicated to data entry concerning OHL outages, because they are significant and most complex data which are used for behaviour analysis. The programme is designed so that the data is entered successively estimating series of conditions which enable reliable data entry. Outages of one or more OHLs for a period of time less than a year, for one year and more years are given by the eq. (1).

\[
\text{n}_{\text{isp}} = \frac{100}{\sum_{i=1}^{n_{DV}} L_{km}} \times \frac{12}{\sum_{i=1}^{n_{DV}} n_{mes}} \times \sum_{i=1}^{n_{DV}} n_{isp} \times \left[ \frac{\text{outages}}{100 \text{ km}, \text{ year}} \right]
\]

where: \( n_{isp} \) - the number of outages on 100 km in a year; \( L_{km} \) - length of \( i \)th OHL; \( n_{mes} \) - number of months in operation of \( i \)th OHL; \( n_{DV} \) - the ident. number of examined OHLs; \( n_{isp} \) - the number of outages of \( i \)th OHL.

2.4. Revitalization criteria

In this chapter, particular attention is dedicated to determine and define revitalization criteria, because decision is made on the basis of them, whether OHL revitalization will be made and to what extent and in what manner. Decision on necessity of OHL revitalization, when and to what extent and how, has great specific weight. In this chapter, revitalization criteria are elaborated e.g.:
2.4.1. Real OHL state
The necessary conditions are determined on the basis of OHL behaviour analysis. Marks are given for the equipment on the basis of detailed OHL inspection in operation. The sufficient conditions are determined on the basis of equipment test results.

**Necessary conditions** - The period of OHL behaviour in operation should be as long as possible, but not shorter than last 5 years of operation. If there are no sufficient number of data of OHL behaviour that does not hinder the decision on limit values for equipment replacement and remained life estimation as well, but decreases information on OHL behaviour in operation i.e. necessity of increasing operation reliability. The sufficient conditions are presented in table I.

**Table I: Proposals for sufficient conditions for 110 kV, 220 kV and 400 kV OHL**

<table>
<thead>
<tr>
<th>Un (kV)</th>
<th>Outages</th>
<th>Replaced insulators</th>
<th>Interventions</th>
<th>Overhaul frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[ outages/(100 km,years)]</td>
<td>[%oo / year]</td>
<td>[interv. / (100km,year)]</td>
<td>[day / (100km, year)]</td>
</tr>
<tr>
<td>110</td>
<td>20</td>
<td>4.5</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>220</td>
<td>15</td>
<td>3.0</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>400</td>
<td>10</td>
<td>1.5</td>
<td>1</td>
<td>12</td>
</tr>
</tbody>
</table>

When the necessary conditions from the table I are not fulfilled, then the following is examined:

OHL age: if \( n_{st.dv} \geq n_{doz.dv} \) then the sufficient conditions for OHL will be examined, \( n_{doz.dv} \geq 35 \) [year] will be proposed.

Damages of towers; Cracks-damages of foundations; Ruptures-damages of conductors; when:

\[
K_{oš,pr} \geq 1/3 \text{ is proposed (2)}
\]

then the sufficient conditions will be surveyed also for other electrical equipment: Rupture-damage of jointing equipment; Rupture-damage of insulator and Rupture-damage of ground wire.

**Sufficient conditions**

e) Giving marks for the OHL state - Marks are given for the state of equipment on the basis of "Report on detailed OHL inspection", and detailed OHL inspection is carried out according to "Instructions for detailed OHL inspection" and "Programme of detailed OHL inspection". Marks are given for the equipment state, for: towers; foundations; conductors; jointing equipment; insulators and ground wire, and the marks are following: 1: insufficient; 2: sufficient; 3: good; 4: very good i 5: excellent.

f) Equipment test results - OHL equipment test results serve as a basis for limit conditions calculations for the OHL equipment replacement and for the eventual OHL equipment remained life estimation.

On the basis of sufficient conditions under e) "Giving marks for the OHL state" and f) "Equipment test results", the limit values for equipment replacement are determined, where the deciding condition is under f) and condition under e) only slows down or speeds up the revitalization time or equipment remained life but it is not deciding.

2.4.2. Limit values for the OHL equipment replacement
Limit values are determined in order to set down the actual OHL equipment state: towers, foundations, conductors, ground wires, insulators and jointing equipment. It will be shown only for the conductors.

**Limit values for conductor replacement**

**Precondition:**
The conductor is retained, and limit values and remained life are not determined if the after-test (measured) conductor tensile strength is greater or equal to prescribed conductor tensile strength.

\[
\begin{alignat}{2}
\sigma_{stv.pr.čv.prov.} & \geq \sigma_{prop.pr.čv.prov.} \quad [daN / mm^2] \\
\sigma_{stv.pr.čv.prov.} & < \sigma_{prop.pr.čv.prov.} \quad [daN / mm^2]
\end{alignat}
\]

if the equ. (5) fullfilled then limit values are determined and remained life estimation eventually.

The actual conductor tensile strength is determined by testing the wires and the conductor and the result is compared with prescribed conductor tensile strength (which was valid when OHL being erected).
Conditions: Check of 1\textsuperscript{st} condition for actual conductor tensile strength decrement, 2\textsuperscript{nd} condition for allowed decrement of bending conductor steel wires and 3\textsuperscript{rd} condition for conductor ruptures-damages. Only the 1\textsuperscript{st} condition will be shown, because it is deciding for equipment replacement.

1\textsuperscript{st} condition

The conductor will be replaced when after testing it is found that the actual conductor tensile strength decrement $\Delta \sigma_{\text{stv.pr.}}$ greater than allowed conductor tensile strength decrement $\Delta \sigma_{\text{doz.pr.}}$:

\begin{align}
1. \quad & \Delta \sigma_{\text{stv.pr.}} [\%] > \Delta \sigma_{\text{doz.pr.}} [\%] \quad (6) \\
2. \quad & \Delta \sigma_{\text{stv.pr.}} [\%] \leq \Delta \sigma_{\text{doz.pr.}} [\%] \quad (7)
\end{align}

if equ. (7) fullfilled then the conductor remained life will be determined.

The actual conductor tensile strength decrement is calculated:

$$
\Delta \sigma_{\text{stv.pr.}} = \frac{\sigma_{\text{prop.pr.}} - \sigma_{\text{stv.pr.}}}{\sigma_{\text{prop.pr.}}} \cdot 100 \quad [\%]
$$

(8)

The allowed conductor tensile strength decrement is calculated:

$$
\Delta \sigma_{\text{doz.pr.}} = \frac{\sigma_{\text{proj.pr.}} - \sigma_{\text{doz.pr.}}}{\sigma_{\text{proj.pr.}}} \cdot 100 \quad [\%]
$$

(9)

If the 1\textsuperscript{st} and 2\textsuperscript{nd} condition are not checked and there are problems with rupture-damage of conductor, then the 3\textsuperscript{rd} condition is checked and depending on the necessity the conductor will be rehabilited, formulas are given in L [3].

2.4.3. OHL remained life estimation

Remained life for individual equipment will be determined as followed for: towers, foundations, conductors, ground wires, insulators and jointing equipment.

Only the 1\textsuperscript{st} condition for conductors will be shown.

Conductor remained life estimation - Conductor remained life estimation will be done when after testing it is found that the actual conductor tensile strength decrement $\leq$ than the allowed conductor tensile strength decrement. Check of 1\textsuperscript{st} condition for the actual conductor tensile strength decrement is made, 2\textsuperscript{nd} condition allowed decrement of bending conductor steel wires and 3\textsuperscript{rd} condition for conductor ruptures-damages. Only the 1\textsuperscript{st} condition for conductors will be shown, because it is deciding for conductor remained life estimation.

1\textsuperscript{st} condition

Check of the actual conductor tensile strength decrement:

\begin{align}
1. \quad & \Delta \sigma_{\text{stv.pr.}} [\%] \leq K_{1, \text{pr.}} \cdot \Delta \sigma_{\text{doz.pr.}} [\%] \quad (10) \\
2. \quad & K_{1, \text{pr.}} \cdot \Delta \sigma_{\text{doz.pr.}} [\%] \leq \Delta \sigma_{\text{stv.pr.}} [\%] \leq K_{2, \text{pr.}} \cdot \Delta \sigma_{\text{doz.pr.}} [\%] \quad (11) \\
3. \quad & K_{2, \text{pr.}} \cdot \Delta \sigma_{\text{doz.pr.}} [\%] \leq \Delta \sigma_{\text{stv.pr.}} [\%] \leq \Delta \sigma_{\text{doz.pr.}} [\%] \quad (12)
\end{align}

It will be proposed: $k_{1, \text{pr.}} = 1/3$ i $k_{2, \text{pr.}} = 2/3$

2.5. Technical and economical analysis

We arrive to technical and economical analysis after estimating the remained life when the sufficient conditions are not fullfilled, and directly, when they are fullfilled or there are problems with equipment.

Technical and economical analysis is made and it serves to determine the extent and kind of necessary work on OHL depending on previously perceived state. The work can be: Rehabilitation (repair of damaged equipment); Revitalization (replacement of individual electrical equipment and/or repair work on towers and foundations) and Reconstruction (erecting of new OHL on the existing trace).

Because of limited space it is not presented, it is done in L[5].
2.6. OHL ranking for revitalization, reconstruction or rehabilitation

OHL ranking is made in order to determine the priority of OHLs supposed for revitalization in the next 5 years. It should be stressed out that the OHL ranking does not influence the decision which OHL should be revitalized, it only ranks them in priority, i.e. helps the proprietor. At ranking it is taken into account:

- **OHL significance in energetical sense** is determined according to OHL actual state in the transmission network, and it is: I - very important; II - important and III - less important.
- **OHL equipment significance** is determined according to its significance for OHL: 1st priority - towers; 2nd - foundations; 3rd - conductors; 4th - jointing equipment; 5th - insulators and 6th priority - zaštitno uže.
- **Work priority on OHL** is determined according to number of years for which the revitalization should be done: 1st priority - OHL revitalization at once, in other words for 0 years; 2nd priority - OHL revitalization for 1 year; 3rd priority - OHL revitalization for 2 years; 4th priority - OHL revitalization for 3 years; 5th priority - OHL revitalization for 4 years and 6th priority - OHL revitalization for 5 years.

Maximum of combinations for ranking of OHL for reconstruction is 1134. As the maximum number of combinations is to high, a table with a number of points for OHL equipment is made L[2], supposed for revitalization up to 5 years and it is 108.

The OHLs with greatest number of points will be revitalized first. When there are several OHLs with same number of points, first will be revitalized that one with most significance in the power system network.

2.7. Choice of meteorological parameters and OHL equipment

Choosing meteorological parameters and OHL equipment we should adjust their technical characteristics to up to date achievements.

- **Meteorological parameters choice** - At this stage, meteorological parameters should be adjust to the events on OHLs in operation and to newest information about their size.
- **OHL equipment choice** - Choosing equipment for revitalization special attention should be dedicated to augmentation of the OHL transmission capacity and reliability not deteriorating the statical stability of towers and of OHL in the whole.

Existing towers are revitalized, brought to proper state, so that they could serve for the next 40 years as the expected life of new electrical equipment (we think 45 years). OHL revitalization means retaining the existing towers and foundations with less work, which is also the case for tower and foundation rehabilitation or element replacement of towers and painting and electrical equipment replacement.

2.8. OHL revitalization extent and manner

On the basis of analysing each OHL individually, definite groups of 110 kV or DV 220 kV or DV 400 kV OHLs with aid of "Revitalization methodology for 110 kV, 220 kV and 400 kV OHLs" using computer programme and through complete procedure of chapters " Revitalization methodology for OHLs" we arrive to " OHL revitalization extent and manner ".

OHL revitalization extent depends on actual state of individuale OHL equipment a lot, from tower, foundation and phase conductor state specially.

OHL revitalization manner, it will be done in optimal way, depending on given marks for the OHL actual state and individual equipment test results.

3. EXAMPLE OF METHODOLOGY APPLICATION FOR REVITALIZATION PLANNING

As illustration of methodology application and software tools, example of justifiableness analysis for revitalization of seven 110 kV OHL is presented. This OHLs was erected from 1957 to 1962, phase conductors are Al/steel 150/25 mm² with construction 26x2.7+7x2.15 mm² and portal towers, except OHL DV 124/1 and at entries into new 110/X kV transformer substation. For this analysis, the computer programme "OHL revitalization" is used.

For calculation, the data of OHL behaviour has been used, OHL is in operation from 1996 to 2002, equipment test results in field and laboratory as well. Only the results for phase conductors are presented.

Satisfaction of necessary conditions

On the basis of data about events on OHL which are in the data base, and proposed allowed necessary conditions changeable by OHL users, analysis has been done relating to satisfaction of necessary conditions for revitalization. Results of analysis for 110 kV OHLs are given in the table II.
Table II: Test results of necessary conditions for 110 kV OHLs

<table>
<thead>
<tr>
<th>Kind of condition</th>
<th>Allowed-Proposed</th>
<th>According to calculations of 110 kV OHL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>124/1 127/1 132/1</td>
<td>132/2 132/3 133/1 142/1</td>
</tr>
<tr>
<td>1. Outages (outages/100 km/year)</td>
<td>20 5 12.1 72.9 47.1</td>
<td>25.8 49.2 27.7</td>
</tr>
<tr>
<td>2. Replaced insulators(‰/year)</td>
<td>4.5 3.4 0.79 11.67</td>
<td>16.62 6.16 6.22 1.28</td>
</tr>
<tr>
<td>3. Interventions (interv/100 km/year)</td>
<td>3 1.7 4 1.4 3.1 1.2</td>
<td>2.7 3.5</td>
</tr>
<tr>
<td>4. Overhaul (day/100 km)</td>
<td>10 6.7 18.2 9.2 15.3</td>
<td>11.1 10.8 24.2</td>
</tr>
</tbody>
</table>

Necessary condition is fulfilled: yes or no no no no

From presented data in table we can see that 4 necessary conditions are not fulfilled, except OHL 132/2. As the all necessary conditions are not fulfilled the age of 110 kV OHL will be examined. As the age of examined OHL is over 35 year, they are potential candidates for revitalization. The procedure for giving marks for actual state of OHL candidate for revitalization is applied, both in field and laboratory. Even for OHL which are shorter than 35 years in operation, procedure for examining OHL equipment damages would be applied. Namely, 110 kV OHLs have had relatively great number of ruptures-damages, conductors specially, that leads to need of examination of fullfilling necessary conditions in order to assess necessity of revitalization. 110 kV OHLs in consideration have annual average number of conductor damages 5.4 ‰/year, and it is proposed not to be greater than 3 ‰/year

Satisfaction of sufficient conditions
Survey of sufficient conditions is not made for all electrical equipment, because the participation of phase conductor price in total revitalization price for electrical equipment is 65-70 %.

Garding marks for OHL equipment state - On the basis of detailed OHL inspection and events on OHL in operation, marks has been given form 1 to 5 for equipment of each OHL. The mark is 1 for conductor, jointing equipment and insulators; mark for towers and foundations is 2 and 3.

OHL significance in power system - OHL significance in power system is determined according to actual significance in transmission network and it is I for OHL 127/1, 132/2 i 142/1; II for OHL 132/1 and 133/1, and III for OHL 124/1 and 132/3.

Limit values for OHL equipment replacement
Satisfaction of preconditions for conductor replacement - Previous examination have shown the necessity of detailed state investigtions in field and laboratory. Analysis of 28 Al/steel 150/25 mm² conductor specimens has been made, what leads to necessity to apply procedure for determining limit values and assessment of conductor remained life.

Satisfaction of set of three limit values
1st condition: Conductor tensile strength decrement - The measured conductor tensile strength decrement is to 17,143 % from allowable value of 14.603%. for Al/steel 150/25, and with this, the condition for determining conductor remained life is fullfilled i.e. the time which is necessary to OHL revitalization.

2nd condition: Decrement of bending conductor steel wires - On basis of laboratory measurements, number of bending conductor steel wires of specimen has been calculated, and it has value of 63.1% for Al/steel 150/25 mm². Allowed decrement of bending conductor steel wires is proposed to be 50% from the prescribed value, although OHL proprietors could choose any other value. Consequently, for the conductor the measured number of bending conductor steel wires is greater than the allowed value.

3rd condition: Number of conductor ruptures-damages due to conductor fatigue caused by vibrations with supporting clamps - The number of ruptures-damages due to conductor fatigue caused by vibrations with supporting clamps is got from data base and it is 5.4 (‰/year) (calculated by tower and phase), and this condition is fullfilled. It should be stressed out that this condition and 2nd condition are not decisive for conductor replacement but it influences determining conductor remained life. In so far, according to the technical and economical analysis the conductor rehabilitation is not justified, then it will be replaced.

After foregoing procedure, the OHL parameters and equipment, the revitalization extent and manner will be chosen. On the basis of assessment of the conductor remained life: given marks for equipment state, test results and technical and economical analysis with OHL significance, the message from the programme report is given in the table III in Fig. 2.
Table III: Message, what to do on 110 kV OHL

<table>
<thead>
<tr>
<th>OHL no.</th>
<th>L km</th>
<th>price Euro</th>
<th>1st con</th>
<th>2nd con</th>
<th>3rd con</th>
<th>Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>132/2</td>
<td>13.962</td>
<td>226660</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>Revitalization for 1 y.</td>
</tr>
<tr>
<td>132/1</td>
<td>29.574</td>
<td>744995</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>Revitalization for 1 y.</td>
</tr>
<tr>
<td>132/3</td>
<td>24.374</td>
<td>601937</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Revitalization for 1 y.</td>
</tr>
<tr>
<td>142/1</td>
<td>30.874</td>
<td>681010</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>Revitalization for 3 y.</td>
</tr>
<tr>
<td>133/1</td>
<td>30.874</td>
<td>849035</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>Revitalization for 3 y.</td>
</tr>
<tr>
<td>127/1</td>
<td>24.766</td>
<td>196471</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>Revitalization for 5 y.</td>
</tr>
<tr>
<td>124/1</td>
<td>34.327</td>
<td>943993</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>Revitalization for 5 y.</td>
</tr>
</tbody>
</table>

Sequence of revitalization: OHL 132/2, 132/1, 132/3, 142/1, 133/1, 127/1 i 124/1.

On examined 110 kV OHL, the following should be done:

- OHL revitalization should be made: Al/steel 150/25 mm² conductor replacement by 185-A2-37 with construction 37x2.7 mm or by conductor with better mechanical and electrical characteristics, ground wire steel III 35 mm² by more conductive type SAxy or Ax/SAXy (installing OPGW on OHL 132/1, 2 and 3 and on any other OHL provided there is a necessity), jointing equipment, insulators, foundation, tower and staying repair, tower anticorrosive protection.
- Foundation and tower repair, anticorrosive tower protection should be made on sections where the electrical equipment is not replaced.

4. CONCLUSION

1. It is desirable to make a study about high voltage OHL revitalization methodologies, which are applied in Power companies. Study should give a survey of basic principles and review of intentions relating to methodology development and application or experiences gained during application.
2. In the course of high voltage OHL revitalization, the old regulations and new as well should be applied with previously defined conditions.
3. Revitalization is done when its price does not overshoot 50 % of new OHL price.
4. It is necessary to define minimal reliability coefficients, which are allowed with revitalization.
5. Individual equipment should be replaced, e.g. phase conductors, when the actual conductor tensile strength decrement (gained by testing all wires with minimum three conductor specimens and the conductor as a whole) is less than the allowed conductor tensile strength decrement.
6. Al/steel 150/25 mm² phase conductors with construction 26x2.7+7x2.15 mm used on 110 kV OHL are mechanically weak, reason for that is the conductor core construction and the allowed conductor tensile strength decrement, where: n=7 i ∆σ_{dorz, pr, cv, prov}=14.603 (%).
7. Approach to high voltage OHLs revitalization is based on analysis of OHL behaviour in operation, detailed inspection and OHL equipment test results. Running the procedure which is required by the methodology, we arrive to revitalization necessity, extent and manner.
8. By means of 110 kV OHL, reliability would be achieved at higher level and current load would be increased 30-60 % (day with sunshine) and 15-30 % (day without sunshine) with durable augmentation of conductor temperature from +60 °C to +80 °C.

5. LITERATURE