

ENHANCED WORK SAFETY IN PLANT MAINTENANCE PROCESS IN DISTRICT HEATING PLANT LJUBLJANA



Tomaž Lenart (TE-TOL)
Miha Ulčar (Sapphir d.o.o.)

Madrid, 18.04.2012

1. Termoelektrarna Toplarna Ljubljana

2. SAP PM: Key processes

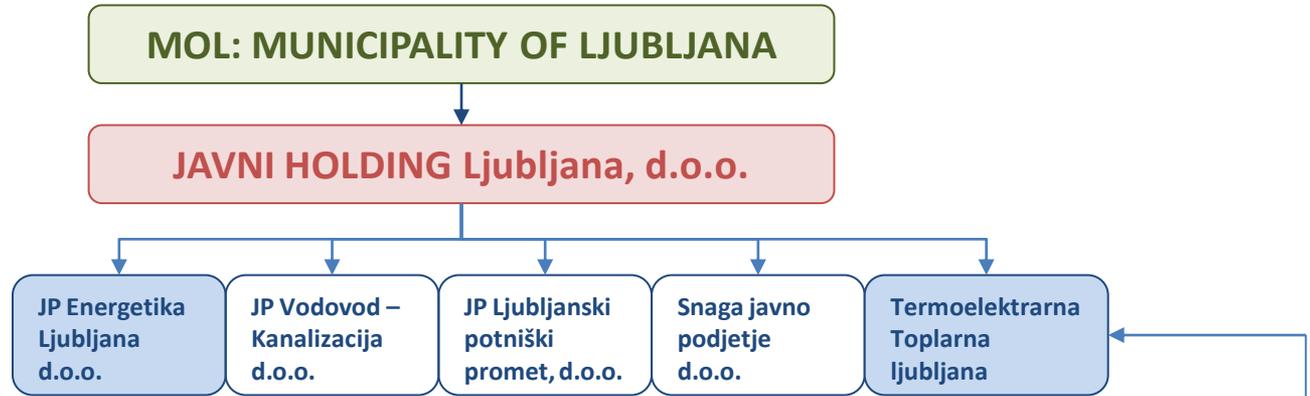
3. SAP WCM implementation project overview - Enhanced worker safety

4. SAP WCM process

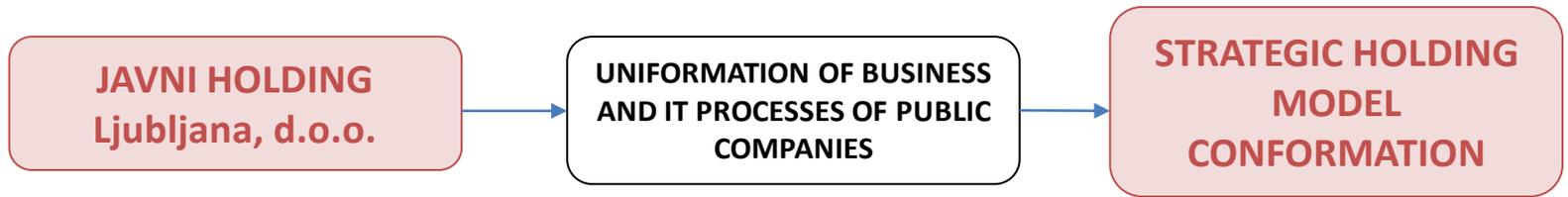
5. SAP PM and WCM in TE-TOL: Way forward

JHL SAP IMPLEMENTATION PROJECT

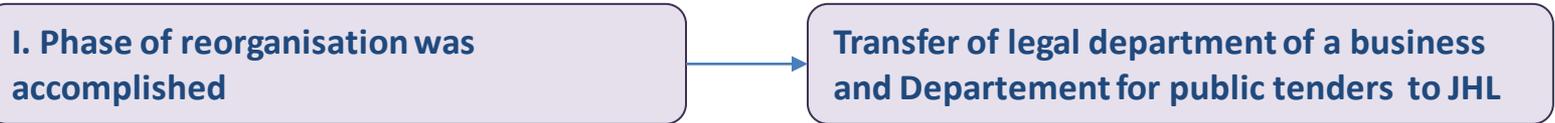
2007



2008

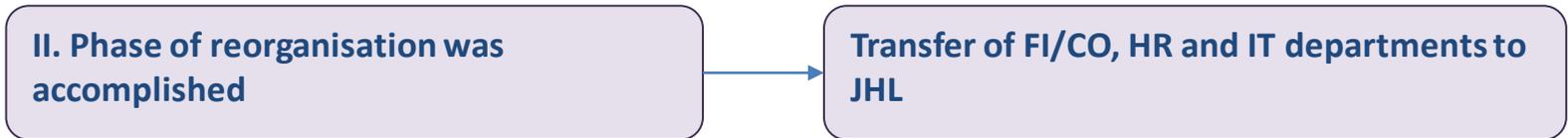


01.01 2009



01.05-2010

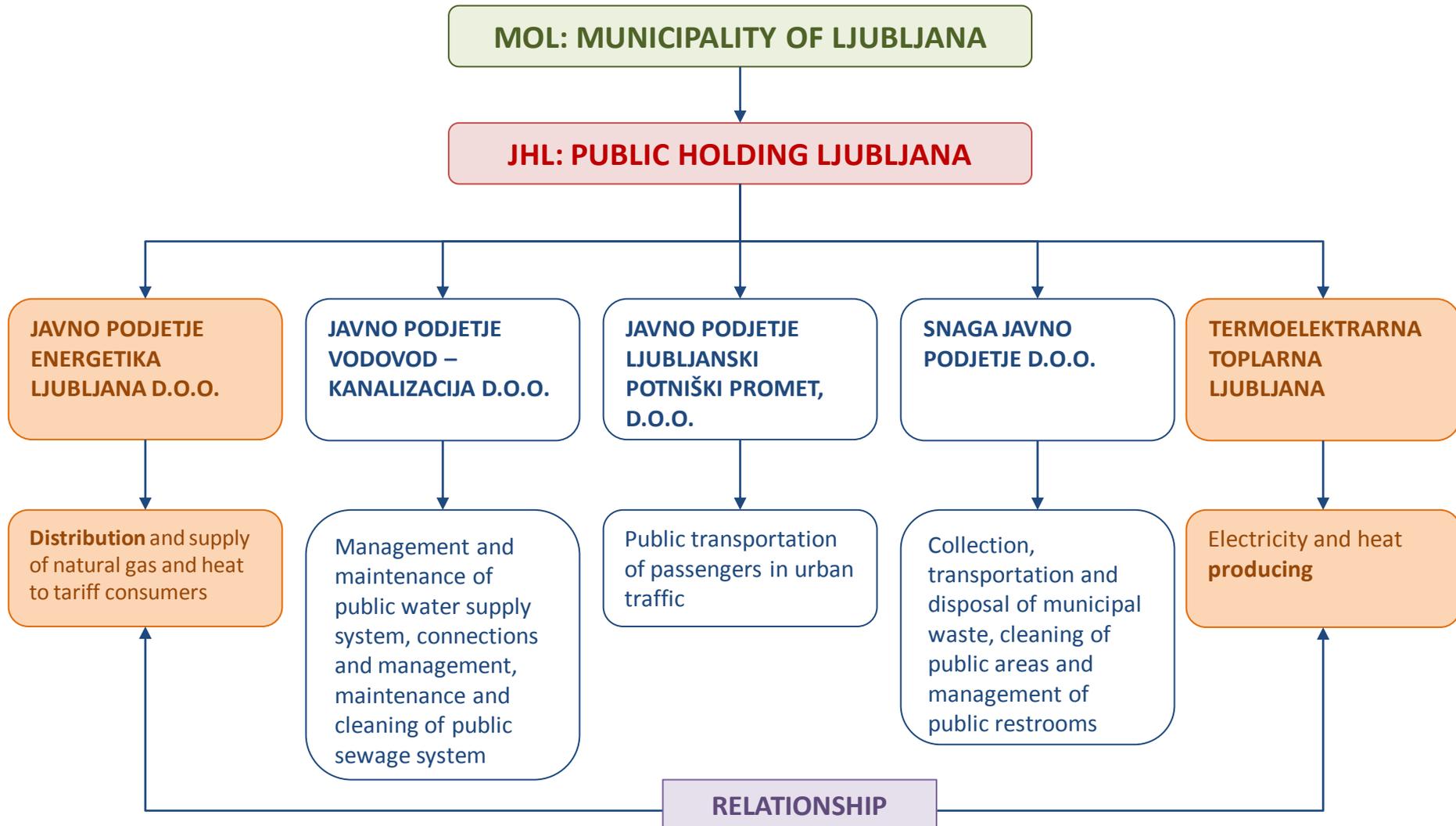
SAP



01.01.2012



PUBLIC HOLDING LJUBLJANA - TODAY



TERMOELEKTRARNA – TOPLARNA LJUBLJANA (TE-TOL)

TE-TOL is the biggest, highly-efficient cogeneration facility in Slovenia, producing electricity and heat in cogeneration.

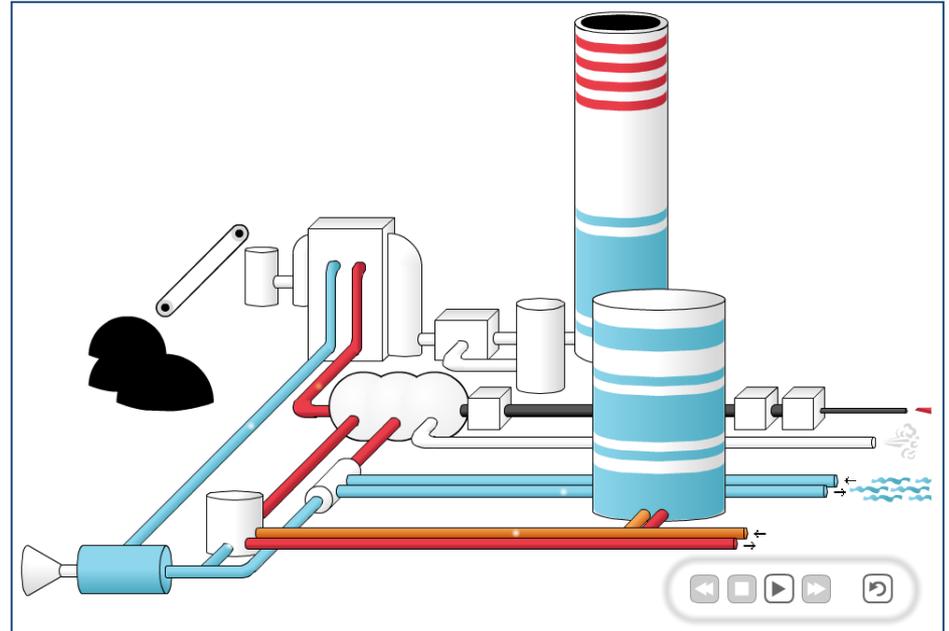
We are providing more than 90 percent of demand for heat in the district heating system of the city of Ljubljana, the capital of Slovenia, which represents about 50 percent of total heat demand in district heating systems of Slovenia.

Total installed power:

Electrical power	124 MW
Heat + process steam (TE)	350 MW

Possible annual generation:

Electricity (EE)	550 GWh
Heat + process steam (TE)	1.650 GWh



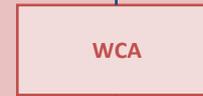
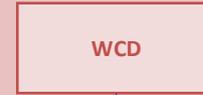
1. Termoelektrarna Toplarna Ljubljana
- 2. SAP PM: Key processes**
3. SAP WCM implementation project overview - Enhanced worker safety
4. SAP WCM process
5. SAP PM and WCM in TE-TOL: Way forward

TE-TOL SAP PM/CS PROCESS - INTEGRATION

SYSTEM INFO.:

- SAP ERP
- VER. 605
- IS-UTILITIES

WCM

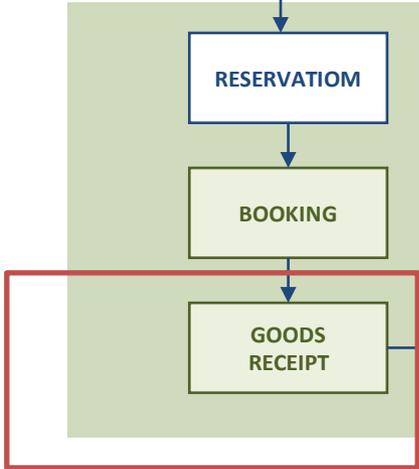


YES

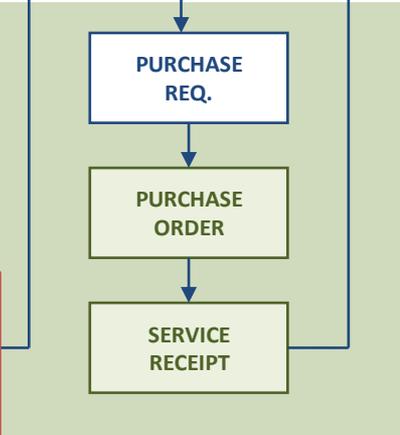
PM



WM



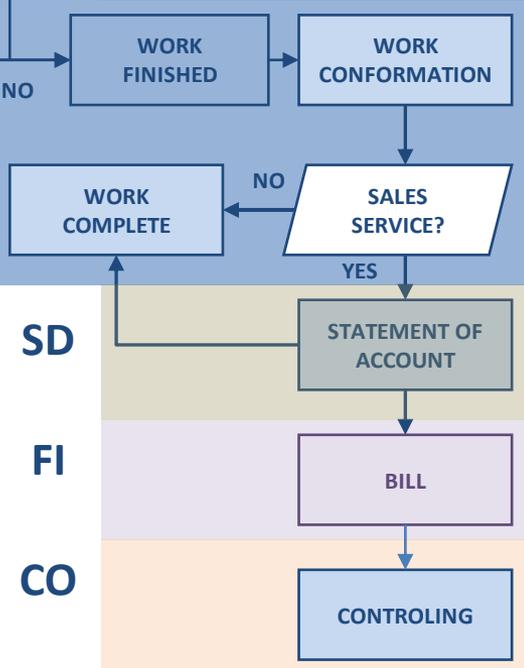
MM



SD

FI

CO



TE-TOL: SAP PM TECHNICAL OBJECTS MANAGEMENT

TECHNICAL DATA:

- Manufacturer,
- type, catalog number,
- serial number,
- weight, dimensions.....

LOCATION DATA:

- Functional location
- structure
- BOMs

SAFETY DATA:

- Safety measures,
- work permits

ORGANISATIONAL DATA:

- Cost center,
- asset number,
- responsible person,
- plant, department ...

SPECIFIC DATA:

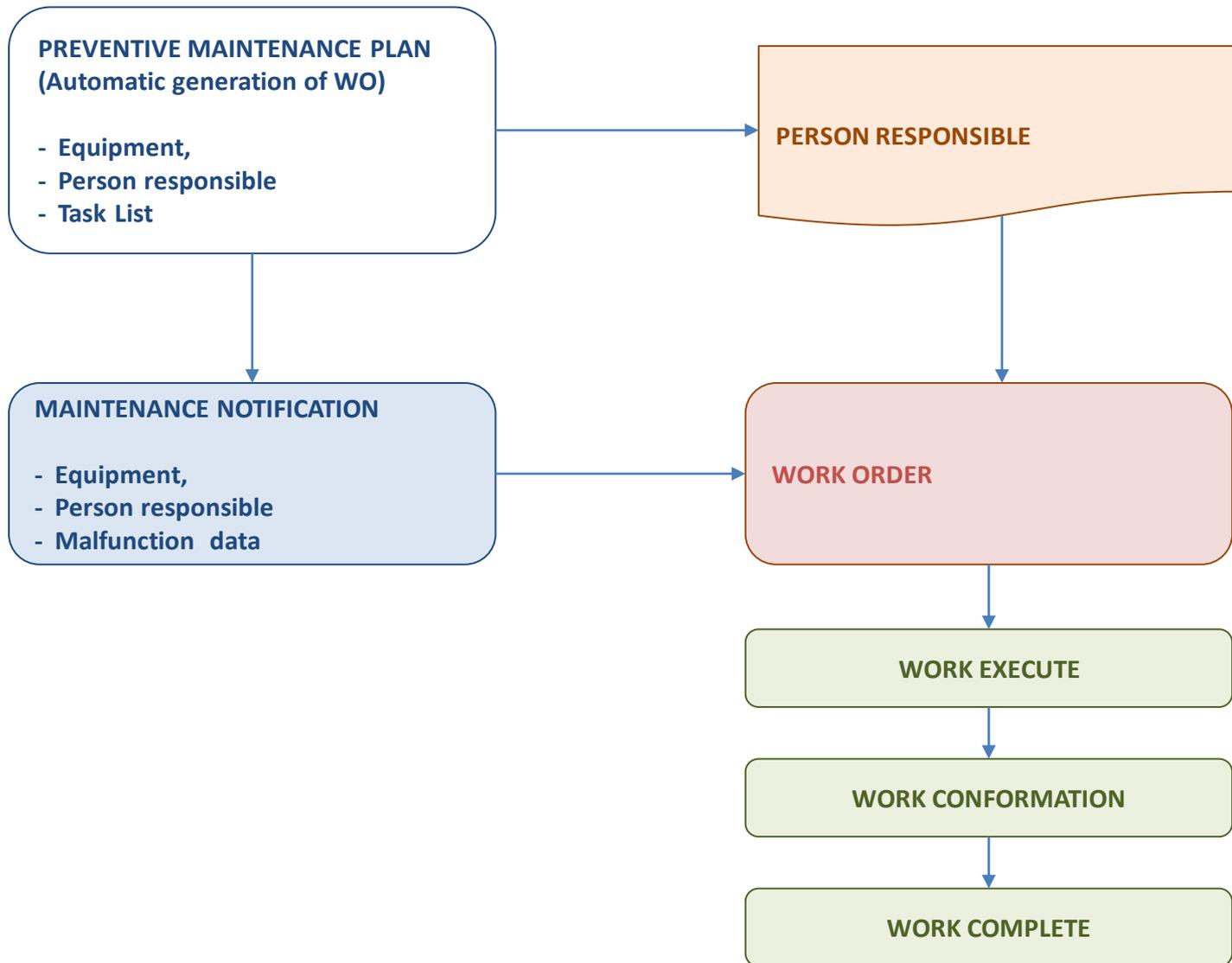
- Power
- suction/pressure high ,
- capacity
- ...

The screenshot displays the SAP PM interface for equipment management. The main window shows a list of equipment objects under the heading 'Seznam opreme (večstopenjsko): Seznam opreme'. The list includes various components like turbines, pumps, and valves, with columns for object ID, description, and dates.

Two detailed views are shown on the right:

- Prikaz opreme : Dodatni pod.1**: Shows general information for object 1190938, including its status (VGRA), location (POSTROJ PLINSKE TURBINE), and classification (KOTLOVNICA 5 - PLINSKA TURBINA).
- Prikaz opreme : Struktu...**: Shows the structure of the equipment, listing sub-components like filters, generators, and pumps with their respective positions and descriptions.

TE-TOL PM NOTIFICATION AND WORK ORDER MANAGEMENT



TE-TOL PM NOTIFICATION

<p>Kreiranje obvestila vzdrževanja: TOL Obvest. o okvari</p> <p>Obvestilo: 0000000001 T2 Okvara črpalke v kotlu 1 s pristroji</p> <p>Status obvest.: MOFN</p> <p>Nalog</p> <p>Osnovni podatki</p>	<p>SHORT TEXT AND STATUS</p>
<p>Referenčni objekt</p> <p>Tehnično mesto: TOL-01-001-01 Črpalke</p> <p>Oprema: 71000009 ČNE 1</p> <p>Sestav</p> <p>WHERE?</p>	<p>LOCATION DATA</p>
<p>Dejansko stanje</p> <p>Opis: Okvara črpalke v kotlu 1 s pristroji</p> <p>Predmet dolgi tekst</p> <p>Zaradi korozije je prišlo do okvare črpalke ČNE 1 v kotlu 1 s pristroji</p> <p>WHAT?</p>	<p>DESCRIPTION</p>
<p>Pristojnosti</p> <p>Skup. planerjev: VZD / 7001 Vzdrževanje</p> <p>Glav.delov.mes.: SSV / 7001 TETOL Služba strojnega vzdrževanj...</p> <p>Dobavitelj: 100071 ELEKTROINŠTITUT MILAN VIDMAR</p> <p>Odgovorni: 17003070 LENART Tomaž</p> <p>Obvestil: AKLINC Datum obvestila: 05.12.2011 08:35:12</p> <p>WHO?</p>	<p>PEOPLE/DEPARTMEN RESPONSIBLE</p>
<p>Podatki okvare</p> <p>Začetnje: 04.12.2011 08:35:12 <input checked="" type="checkbox"/> Izpad</p> <p>Konec motnje: 05.12.2011 08:35:12 Trajanje izpada: 24,00</p> <p>WHEN?</p>	<p>TERMINATION</p>
<p>Postavka</p> <p>Tekst</p> <p>Koda vzroka: ISSV ST01 Strojelom</p> <p>Tekst vzroka: Puščanje cevi nad črpalco</p> <p>Vnos 1 Od 1</p> <p>WHY?</p>	<p>MALFUNCTION DATA</p>

TE-TOL PM WORK ORDER PROCESS

WO CREATION

Kreiranje TETOL Tekoče vzdrževanje : Podatki lokacije

Nalog: 2701 | 00000000001 | Okvara črpalke v kotlu 1 s pristroji

Okvara črpalke v kotlu 1 s pristroji

WO COST OVERVIEW

Plan/dejansko primerjava

Podatki lokacije: 201000017 VULČEVA MED ŠT. 14, IN 16 (DN 104227)
 Vrsta naloga: Z201 VO Večja vzdrževalna dela infrastrukture
 Obrat: 2001 VO-KA
 Verz.plana: 0 Plan/Dej - verzija

Kumulirani podatki
 Legala vrednotenje
 Vključna šifra podjetja/objekta

Vrs. str.	Vrsta stroškov (Tekst)	Plan. str.	skupno
403001	PORAB. NADOM. DELI IN MAT. ZA VVD (S)		0,00
412001	STR. VEČJIH VZDRŽEVALNIH DEL		2,00
412003	STR. VEČJIH VZDRŽEVALNIH DEL - INFRASTR...		0,00
Bremenitev 2,00			
403001	PORAB. NADOM. DELI IN MAT. ZA VVD (S)		0,00
412003	STR. VEČJIH VZDRŽEVALNIH DEL - INFRASTR...		0,00
Poravnava 0,00			
Skupaj 2,00			

WO CONFORMATION

Potrditev za nalog vzdrževanja Vnos : Dejanski podatki

Nalog: 701000087 | Okvara črpalke v kotlu 1 s pristroji

Postopek: 0020 | Izdelavna ura zaposlenega

Status sistema: LANS

Podatki potrditve

Potrditev: 120203

Delovno mesto: SSV | 7001 | TETOL Služba strojne v

Kadr.št.: 17002937 | KOSEK Matjaž

Dejansko delo: | | Vrs. aktiv.

Konč.potrditev Ni preostDelo

Izknjiž.reserv. Preostalo delo

Začetek dela: 05.12.2011 10:19:21 | Dejansko traj.

Konec dela: 05.12.2011 10:19:21 | Konec napoved

Vzrok odmi ka: 0001 | Okvare stroja

Tekst potrditve: Delo dobro opravljeno

Zbir podatkov potrditve

Kumul. dej.delo: | | 0 | H | Dejan.traj

Predvideno delo: 2 | H | Planirano Trajan

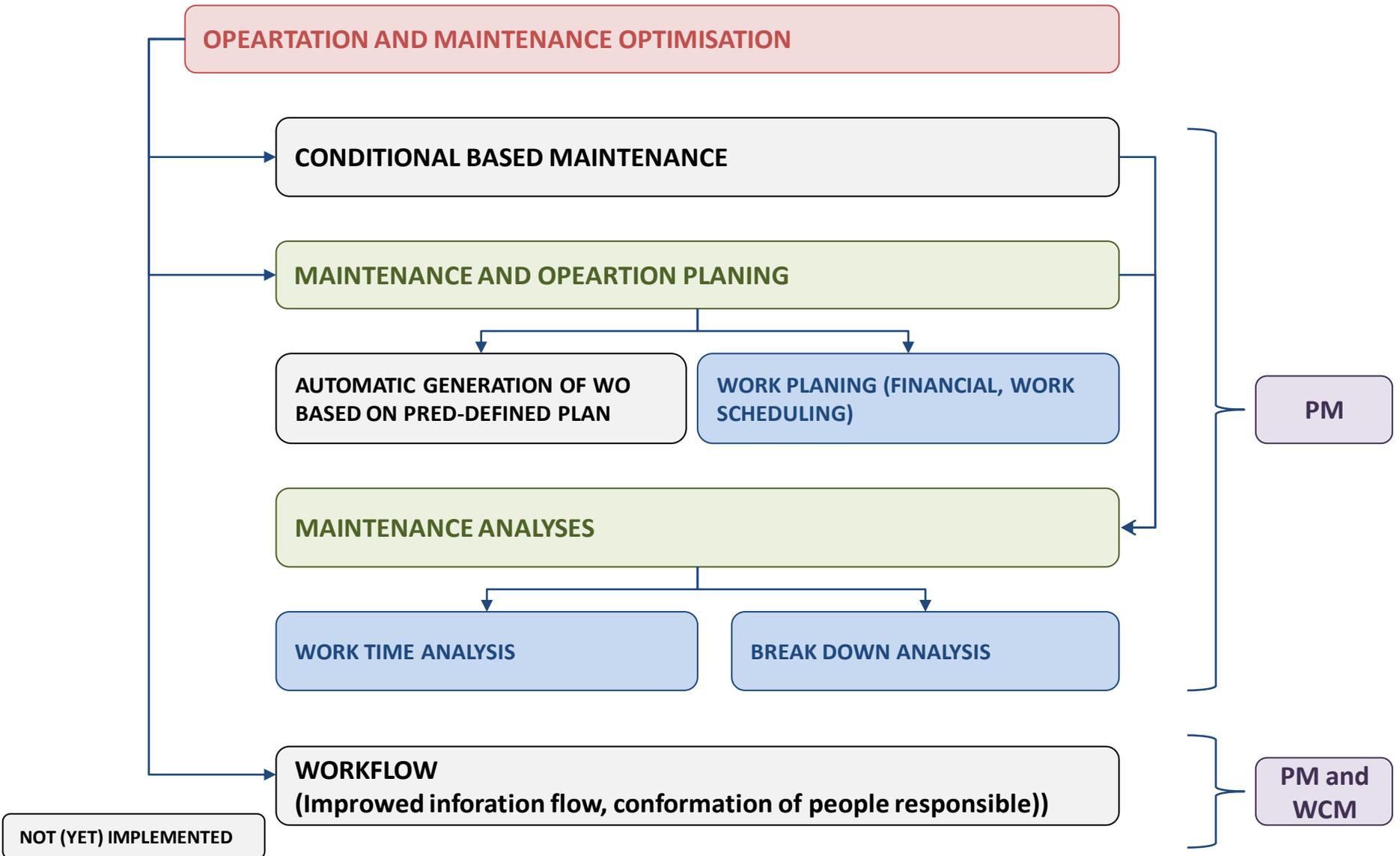
Dej.začetek: | | 00:00:00 | Dejanski konec

WO HISTORY

Prikaz nalogov in postopkov: Seznam nalogi in postopki

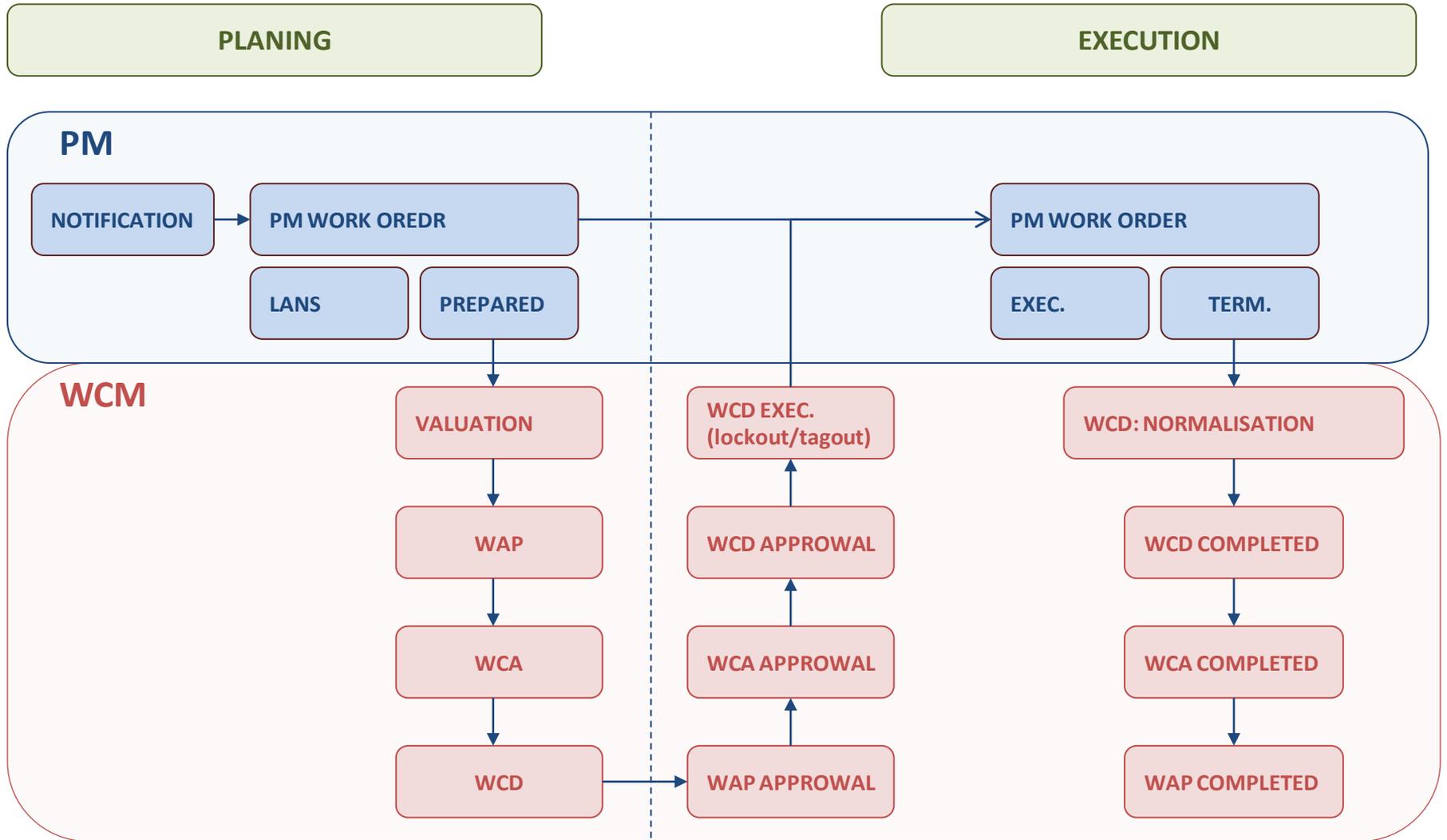
Nalog	Kratki tekst	Vrstil	VAV	Pos	Ndr	KlSstTkt	Kratki tekst postopek	Dejan.delo	En.	SO	GD&Mes
701000019	OKVARA DODELJENKA	7701	702	0010	ZM01		OKVARA DODELJENKA	1	EN	ARM	
701000019	OKVARA DODELJENKA	7701	702	0020	ZM01	7000001	Izdelavna ura zaposlenega	1	H	ARM	
701000019	OKVARA DODELJENKA	7701	702	0030	ZM01	ZTOL500	SSV ZI klučavčar	1	H	ARM	
701000019	OKVARA DODELJENKA	7701	702	0040	SM02	ZSTOL01	Naročlo zunanje storitev TETOL			ARM	
701000019	OKVARA DODELJENKA	7701	702	0050	ZM01		postavitve odra	5	EN	ARM	
701000019	OKVARA DODELJENKA	7701	702	0060	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	7	H	ARM	
701000019	OKVARA DODELJENKA	7701	702	0070	ZM01	ZTOL604	SGV ZI Šušdret	13	H	ARM	
701000020	postavitve odra okrog dodgajnika	7701	702	0010	ZM01		postavitve odra okrog dodgajnika	1	EN	SGV	
701000020	postavitve odra okrog dodgajnika	7701	702	0020	ZM01	7000001	Izdelavna ura zaposlenega	3	H	SGV	
701000020	postavitve odra okrog dodgajnika	7701	702	0030	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	11	H	SGV	
701000020	postavitve odra okrog dodgajnika	7701	702	0040	SM02	ZSTOL01	Naročilo kave za udeležence SAPa			SGV	
701000021	popravilo črpalke 3/3	7701	702	0010	ZM01	ZTOL604	SGV ZI Šušdret	5	H	VZD	SGV
701000021	popravilo črpalke 3/3	7701	702	0020	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	5	H	VZD	SGV
701000021	popravilo črpalke 3/3	7701	702	0030	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	3	H	VZD	SGV
701000021	popravilo črpalke 3/3	7701	702	0040	SM01	ZSTOL01	Naročlo zunanje storitev TETOL			VZD	SGV
701000022	postavitve odra na dodgajniku	7701	702	0010	ZM01		postavitve odra na dodgajniku	2	EN	SGV	
701000022	postavitve odra na dodgajniku	7701	702	0020	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	9	H	SGV	
701000023	potrebni ikopati jarek med tr	7701	702	0010	ZM01		potrebni ikopati jarek med tr			VZD	SGV
701000023	potrebni ikopati jarek med tr	7701	702	0020	SM01	ZSTOL01	Naročlo zunanje storitev TETOL			VZD	SGV
701000024	Popravilo stroja	7701	702	0010	ZM01		Popravilo stroja			SSV	
701000024	Popravilo elektro	7701	702	0020	ZM01		Popravilo elektro			SSV	
701000024	Popravilo gradbeno	7701	702	0030	ZM01		Popravilo gradbeno			SSV	
701000025	ČIŠČENJE ZALOGOVNIKOV BIOMASE	7701	702	0010	ZM01		ČIŠČENJE ZALOGOVNIKOV BIOMASE			VZD	SGV
701000025	ČIŠČENJE ZALOGOVNIKOV BIOMASE	7701	702	0020	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	8	H	VZD	SGV
701000026	Zamerjava manometra	7701	702	0010	ZM01		Zamerjava manometra			VZD	ARM
701000027	Zamerjava tofalora na k15 pri dodajniku	7701	702	0010	ZM01		Zamerjava tofalora			VZD	ARM
701000028	potrebni ikopati jarek med tr	7701	702	0010	ZM01		potrebni ikopati jarek med tr			SGV	
701000028	potrebni ikopati jarek med tr	7701	702	0020	SM01	ZTOL604	SGV ZI Šušdret	5	H	SGV	
701000029	potrebni ikopati jarek med tr	7701	702	0010	ZM01		potrebni ikopati jarek med tr			SGV	
701000029	potrebni ikopati jarek med tr	7701	702	0020	SM02	ZSTOL01	Naročlo zunanje storitev TETOL			SGV	
701000030	potrebni ikopati jarek med tr	7701	702	0010	ZM01		potrebni ikopati jarek med tr			SGV	
701000030	potrebni ikopati jarek med tr	7701	702	0020	SM01	ZSTOL01	Naročlo zunanje storitev TETOL			SGV	
701000031	TESTNI NALOG	7701	702	0010	ZM01		am			ARM	
701000031	TESTNI NALOG	7701	702	0020	ZM01		stromki			ARM	
701000031	TESTNI NALOG	7701	702	0030	ZM01		gradbenki			ARM	
701000032	Vzdrževanje - potrošni material	7701	702	0010	ZM01		Potrošni material			ARM	
701000033	popravilo el. motorja EACS1	7701	703	0010	ZM01		odprava okvare na el. motorju tr. traku			VZD	SEV
701000033	popravilo el. motorja EACS1	7701	703	0020	ZM01		odprava okvare na podzavku			VZD	SEV
701000033	popravilo el. motorja EACS1	7701	703	0030	ZM01	ZTOL603	SGV ZI Pk: Pol kvalificiran	8	H	VZD	SEV
701000034	Vzdrževanje kota 1	7701	702	0010	ZM01		Voževanje kota 1			ARM	
701000035	POPRAVILNO REGULACIJSKE LOPUTE RECI 1/3	7701	703	0010	ZM01		POPRAVILNO REGULACIJSKE LOPUTE RECI 1/3			VZD	SSV
701000035	POPRAVILNO REGULACIJSKE LOPUTE RECI 1/3	7701	703	0020	ZM01					VZD	SSV

TE-TOL: SAP PM IMPLEMENTATION – KEY BENEFITS



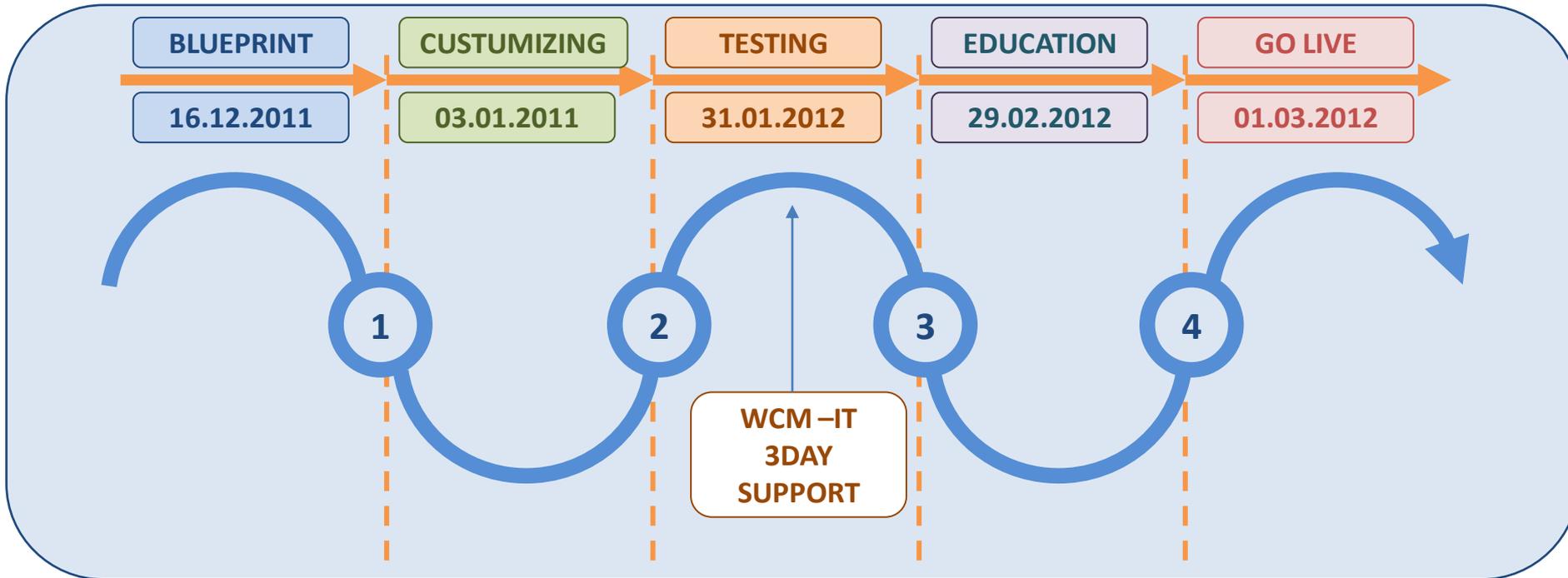
1. Termoelektrarna Toplarna Ljubljana
2. SAP PM: Key benefits
- 3. SAP WCM implementation project overview - Enhanced worker safety**
4. SAP WCM process
5. SAP PM and WCM in TE-TOL: Way forward

WHAT IS SAP WCM?

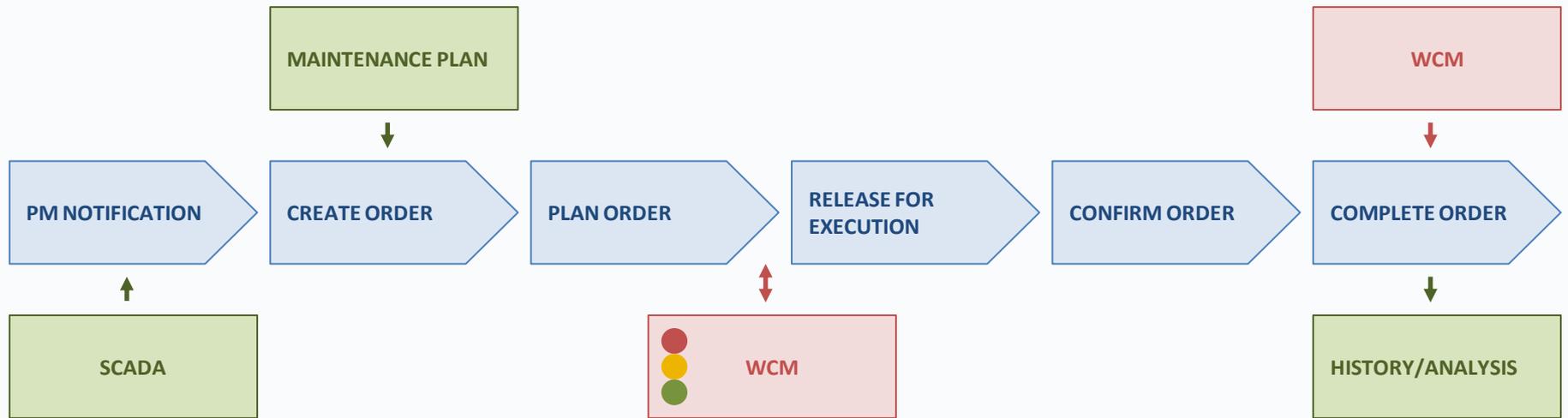


SAP WORK CLEARANCE MANAGEMENT HANDLES SAFETY-RELATED PROCESSES IN PLANT MAINTENANCE

JPE AND TE-TOL: ENHANCED WORKERS SAFETY – SAP WCM IMPLEMENTATION PROJECT

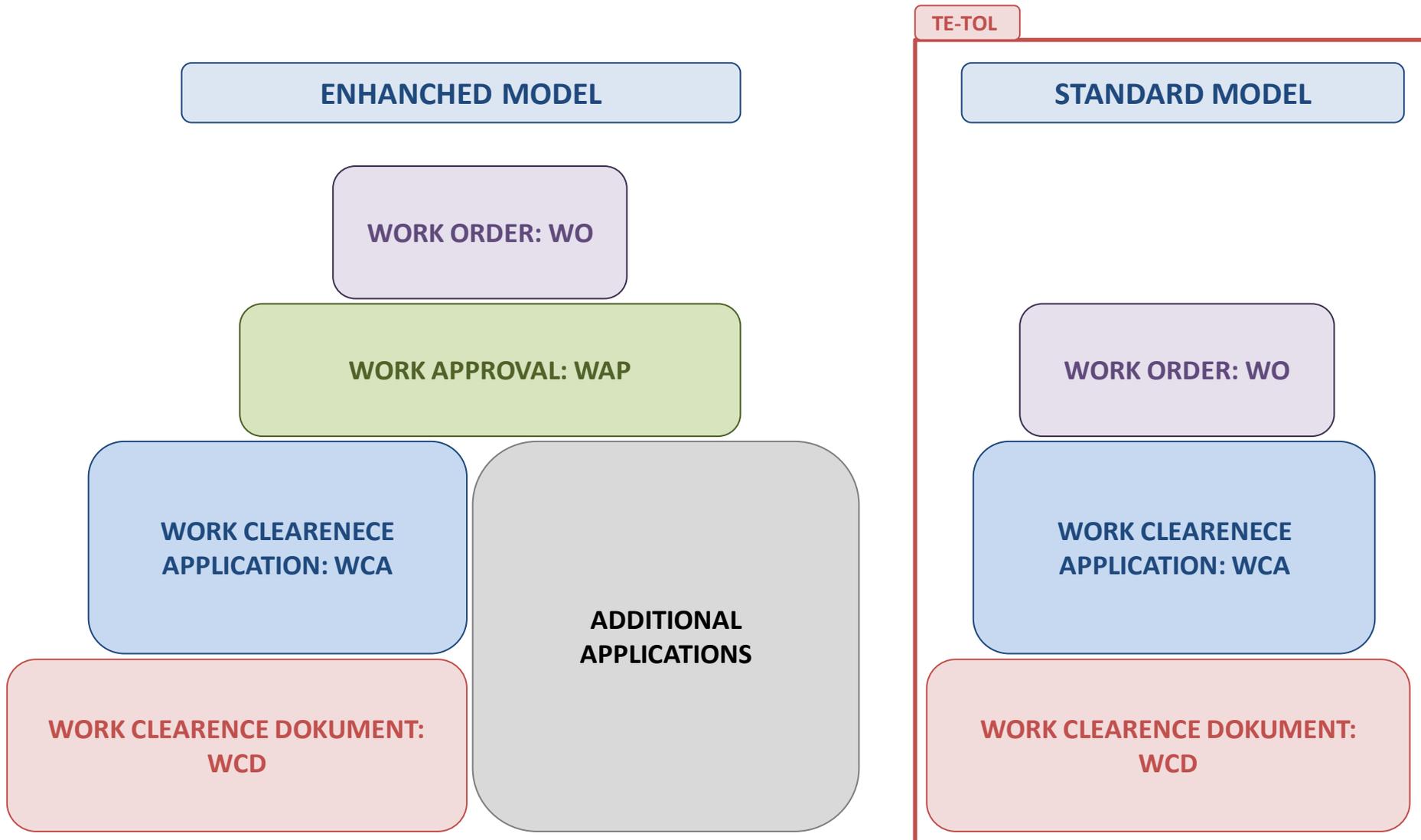


SAP WCM AND PM



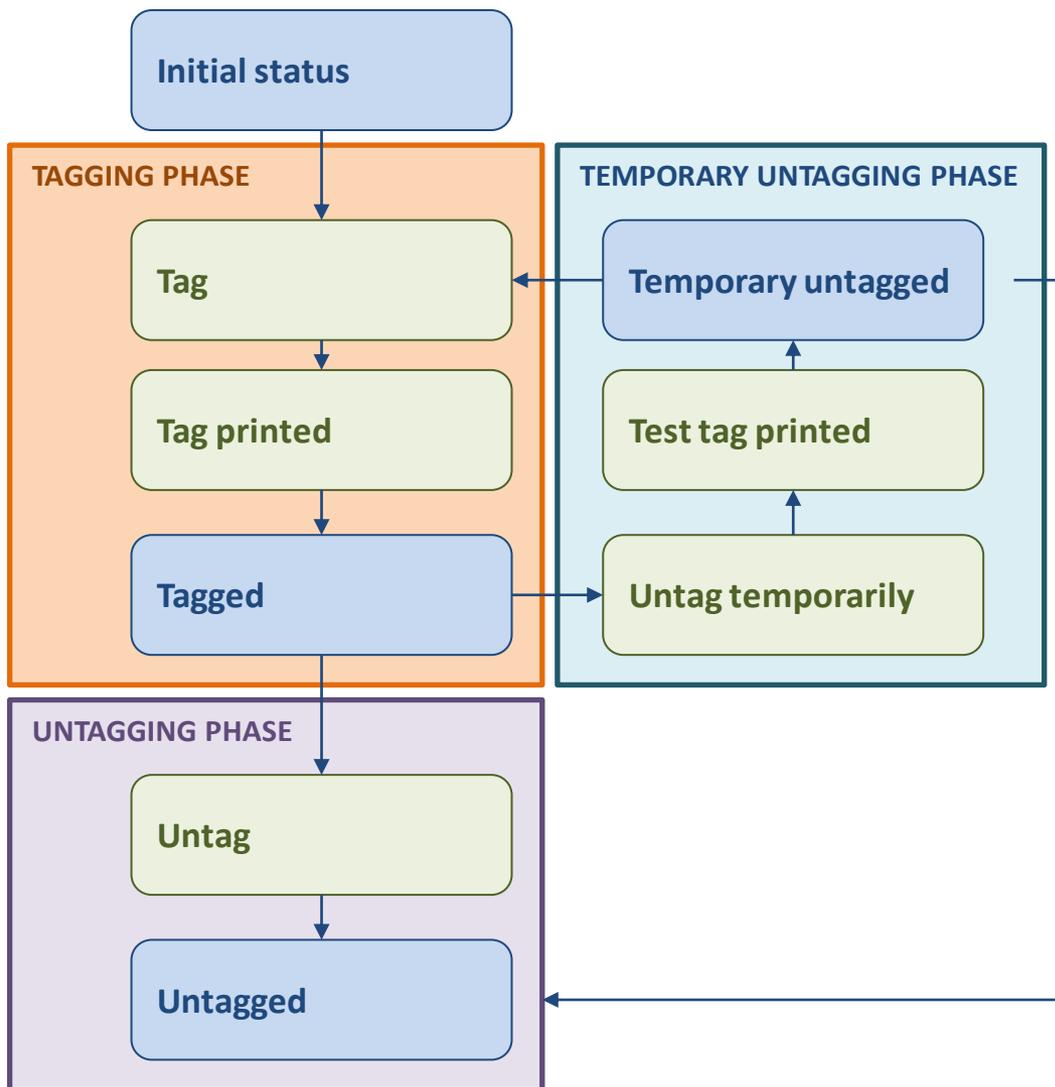
- In order to ensure that safety measures are performed for maintenance work tasks, you must activate Work Clearance Management for maintenance orders. These orders are indicated as WCM-relevant orders.
- The linking of orders to Work Clearance Management takes place at the header level of the order.
- You cannot perform the maintenance tasks for WCM-relevant orders, until you have issued the “Released for execution”.

SAP WCM: STRUCTURE (Standard model was chosen for TE-TOL)

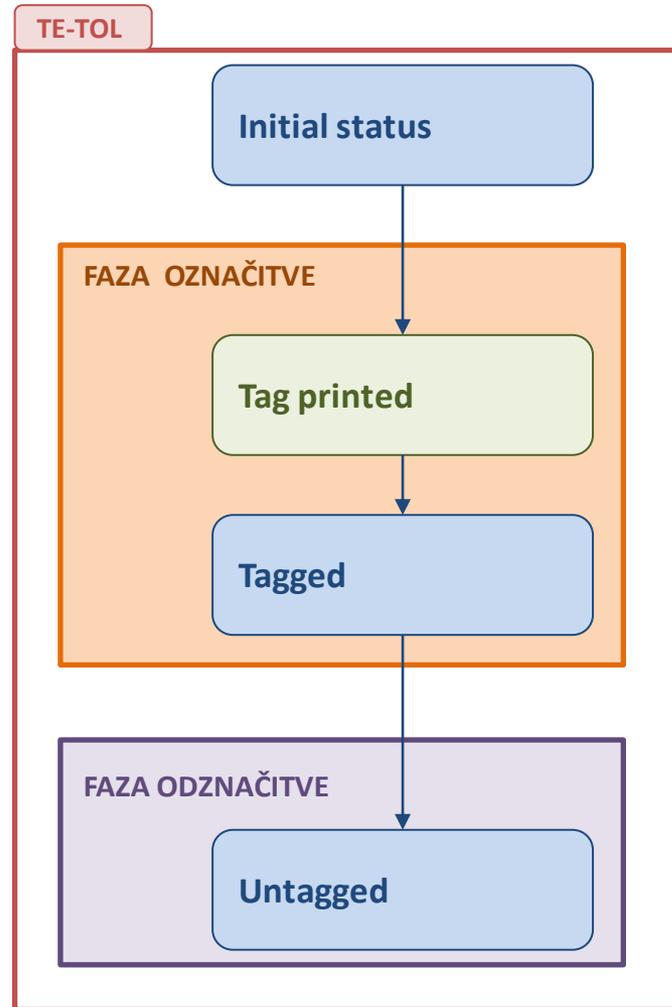


OPERATIONAL CYCLE (Reduced operational cycle was chosen for TE-TOL)

OPERATIONAL CYCLE

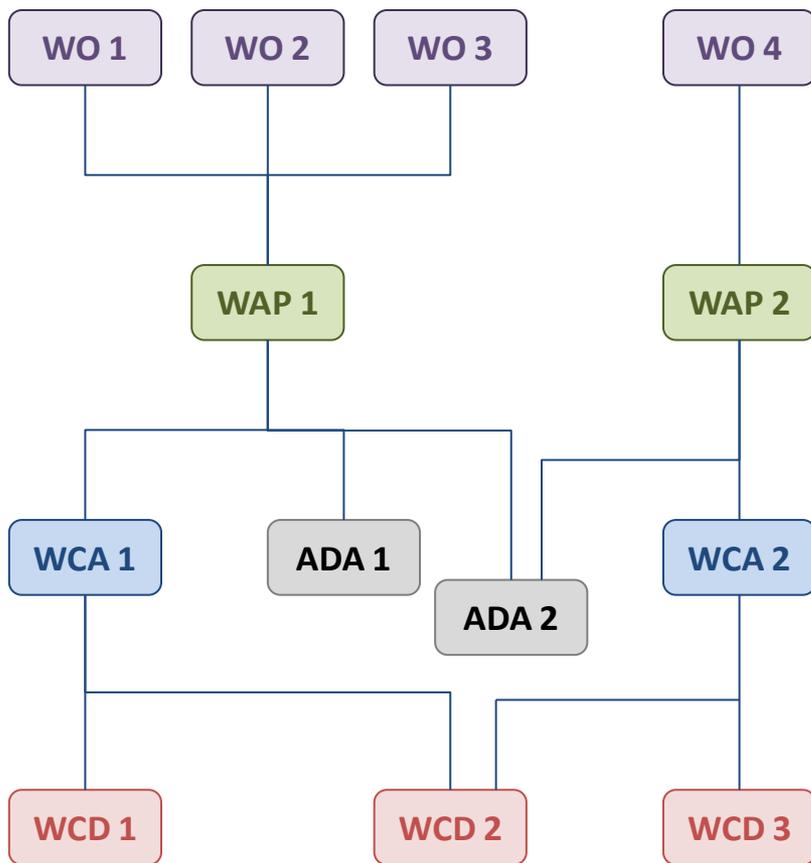


REDUCED OPERATIONAL CYCLE

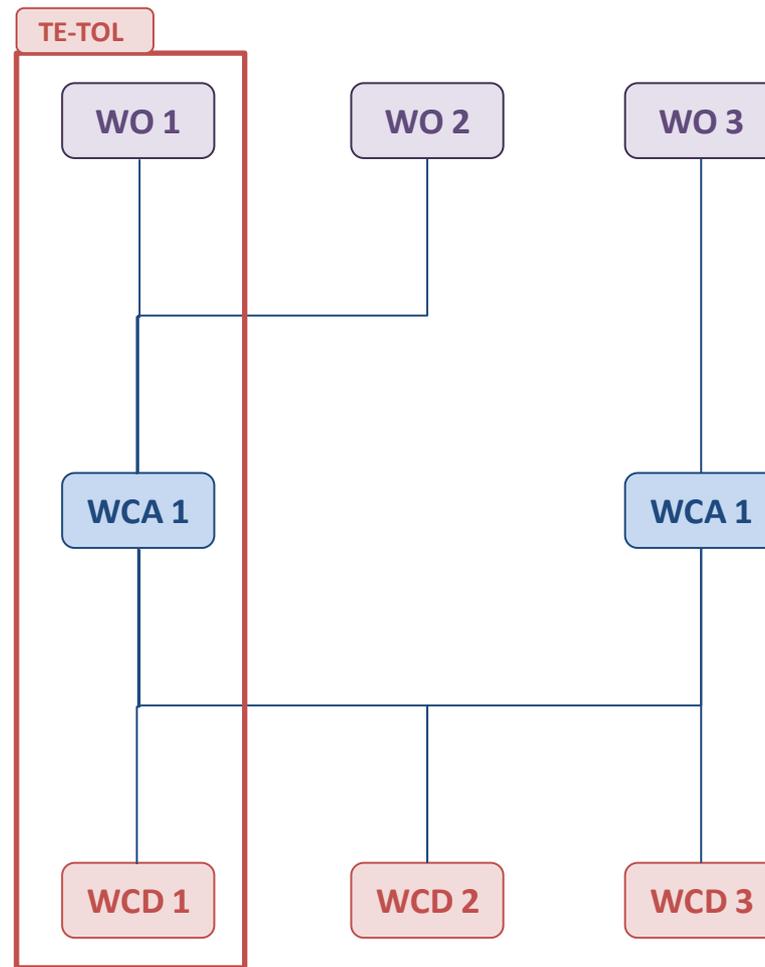


WCM OBJECTS – ASSIGNMENT RULES (WO/WCA/WCD = 1/1/1 was chosen for TE-TOL)

ENHANCED MODEL



STANDARD MODEL



WCM OBJECTS – WORK CLEARANCE APPLICATION (TE-TOL CUSTOMISATION)

Prikaz Varnostni delovni nalog

CC Nalog Dovoljenje za delo KAT.VARN.UK.

Identifikacija
Zahteva 710000011 bglad grabelj EAC60 (na dnu) 01

Nalog
Nalog 701000367 Pregled in kontrola transporterja EAC60.
Status TABG DRUC ABRV KKMP VOKL

Referenčni objekt
Tehnično mesto
Oprema 71900637 GRABLJE V ZALOGOVNIKU EAC60

STANDARDNI VARN. UKREPI OPOMBE

POTREBNE ZAUSTAVITVE IN MANIPULACIJE:
Zaustavitev sistema za polnjenje zalogovnikov biomase. Zaustavitev nakladalno razkladalnega transporterja EAC60.
Odpreti vrata pred zalogovnikom EAC 60 in jih zavarovati pred zapiranjem z obešanko.
Izklopiti in ločiti motorno zaščitno stikalo NNS5+BLS24 odcep 73Q1 elektromotornega pogona grabelj 1405EAC60-M020.
Izklopiti in zakleniti (z obešanko) stikalo 74Q1 na koti +8m.
Izklopiti in ločiti motorno zaščitno stikalo NNS5+BLS24 odcep 71Q1

Partner

Vloga	Partner	Ime	I. Naslov
Delovni nalog izd.	17003070	LENART Tomaž	LENART, , ,
Delo odobril	17001161	SAJOVEC Anton	SAJOVEC, , ,
Odg. za varn. ukr.	17003055	POVŠE Ciril	POVŠE, , ,
Odg. vodja vseh d.	17002937	KOSEC Matjaž	KOSEC, , ,

DODATNI VARNOSTNI UKREPI STATUS SISTEMA PRISTOJNOSTI

Požarna varnost
 Odklop
 Kontrolni list odra

WCA NUMBER AND SHORT TEXT

WORK ORDER DATA

REFERENCE OBJECT DATA

DESCRIPTION OF REQUIRED SAFETY MEASURES

PERSON RESPONSIBLE

ADDITIONAL DATA

WCM OBJECTS – WORK CLEARANCE DOCUMENT (TE-TOL CUSTOMISATION)

WCA DATA + OPEARTIONAL SCREEN

Prikaz Dovoljenja za delo: Ekran stikala

DokumentOdklopa: 720000724 gled traku EAC61 1 / 1

Status: PRIP MNO INM ABGS

KONF	ZSL	ACS	IZLA	LANS	NOR	INM	NEAK
0	0	0	0	0	0	5	0

Tehnični objekt	OS	Stan.	odk.	TO	ZaOdk	VrS	Fi	LO	SO	StanNormal	UT	ZapNor
Kratki tekst	Komentar	DT	PD								OznOdklopa	Ključ
Status sistema	Status uporabnika											
10 N VRATA PRED ZALOGOVNIKOM EAC60	S	ODP	T02	0	K	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ST02	ZAP	T01	0	7000001218
ZUPAN Peter												
20 N MOTORNO ZAŠČITNO STIKALO GRABELJ EAC61	E	ODK	T01	0		<input type="checkbox"/>	<input type="checkbox"/>	ET01	PRI	T02	0	7000001219
1405EAC61-M020	GREGORIČ Bojan											
30 N MOTORNO ZAŠČITNO STIKALO VITLJA EAC61	E	ODK	T01	0		<input type="checkbox"/>	<input type="checkbox"/>	ET01	PRI	T02	0	7000001220
1405EAC61-M010	GREGORIČ Bojan											
40 N STIKALO 88Q0	E	IZV	T01	0		<input type="checkbox"/>	<input type="checkbox"/>	ET01	VST	T02	0	7000001221
GREGORIČ Bojan												
50 N STIKALO 90Q1	E	IZV	T01	0		<input type="checkbox"/>	<input type="checkbox"/>	ET01	VST	T02	0	7000001222
GREGORIČ Bojan												

OPERATIONAL CONDITION FOR TAGGING

OPERATIONAL CONDITION FOR UNTAGGING

FUNCTIONAL LOCATION TEXT

OPERATIONAL GROUP

COMMENT

PERSON RESPONSIBLE

OPERATIONAL TYPE AND PRINT FORMAT

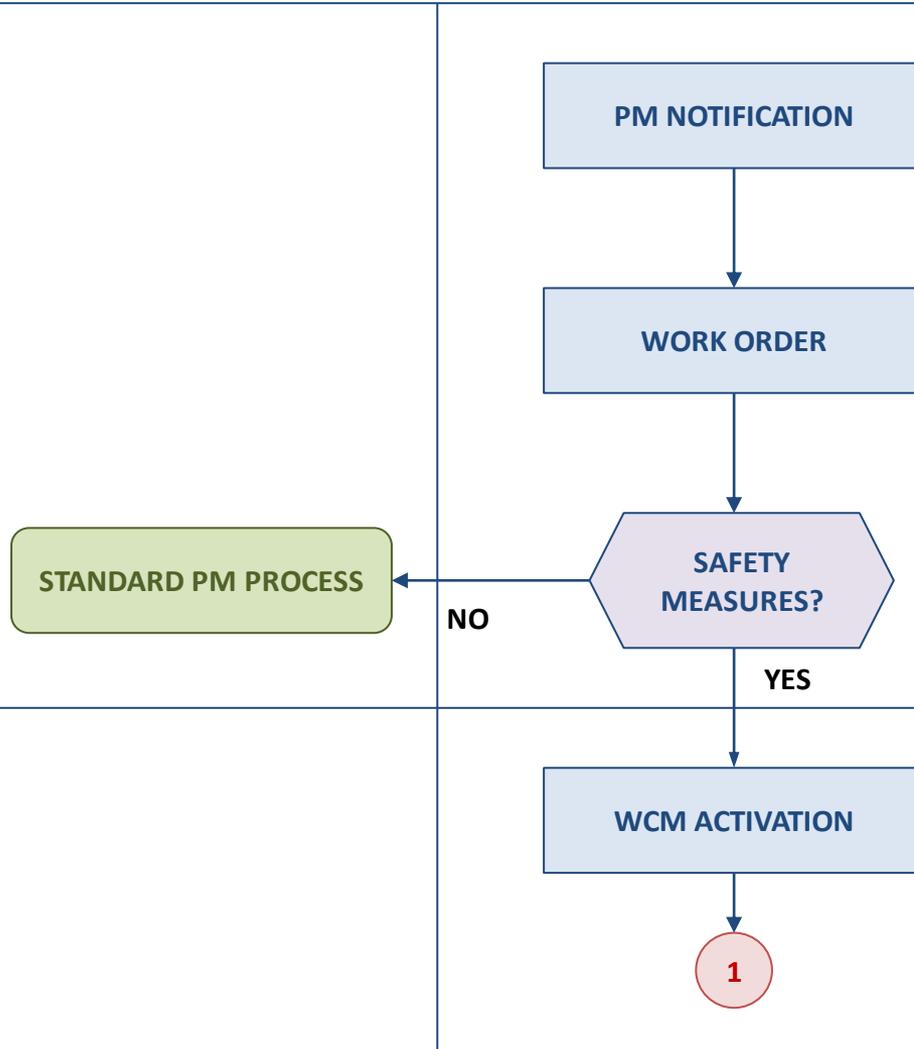
ITEM NUMBER

1. Termoelektrarna Toplarna Ljubljana
2. SAP PM: Key benefits
3. SAP WCM implementation project overview - Enhanced worker safety
- 4. SAP WCM process**
5. SAP PM and WCM in TE-TOL: Way forward

SAP PM/WCM PROCESS IN TE-TOL

PROCESS (STEPS)

COMMENT



Through approvals assigned to the maintenance order.

SAP PM/WCM PROCESS IN TE-TOL

PROCESS (STEPS)

COMMENT

1



Determination of people responsible:

- WCA created by
- Work approved by
- Responsible person for safety measures at work site
- Responsible person for all work activities
- Group lider

Determination of procedures:

1. Required shutdowns and manipulations,
2. Required safety measures,
3. Special remarks



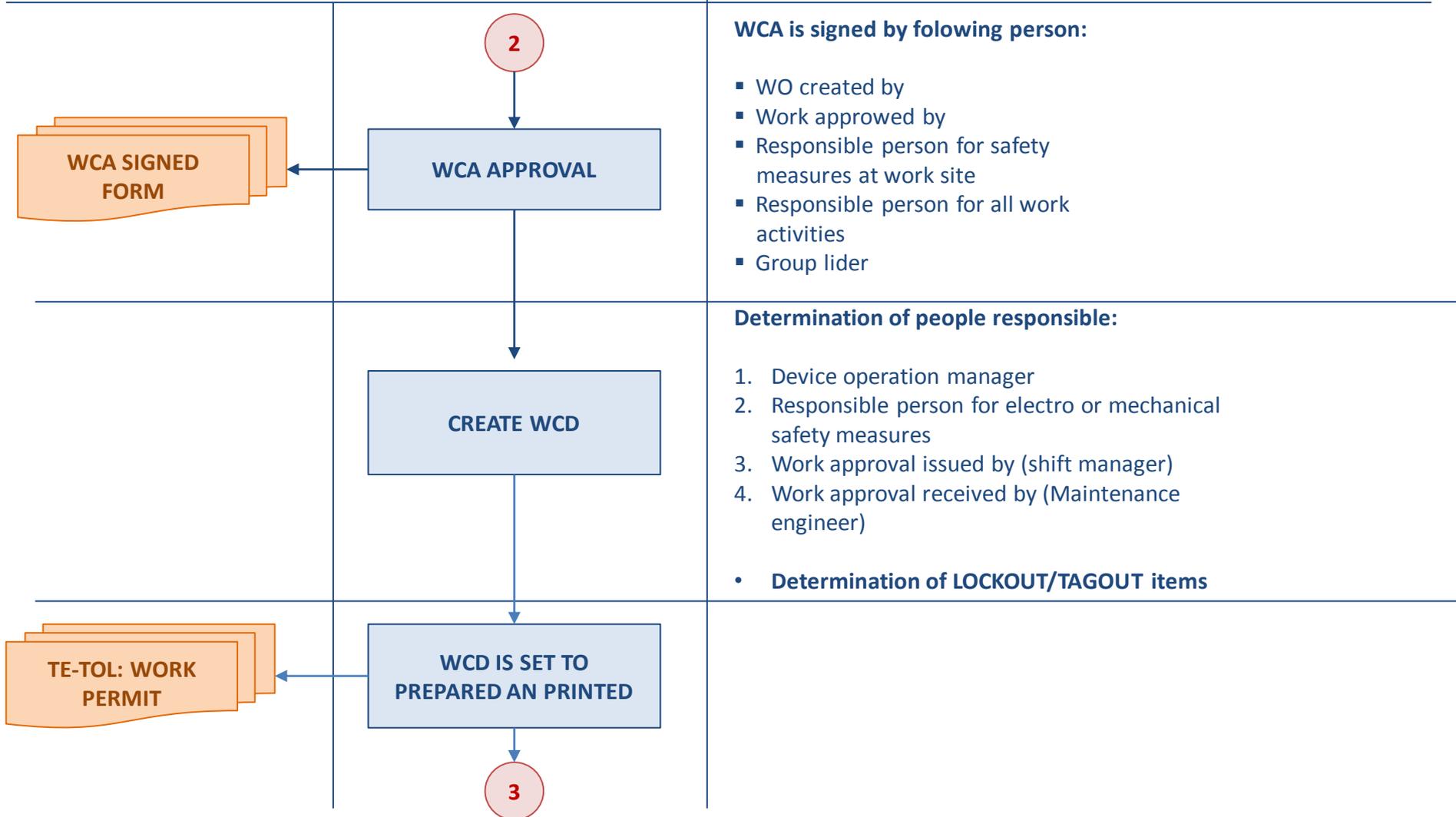
WCA is set to Prepared and printed

2

SAP PM/WCM PROCESS IN TE-TOL

PROCESS (STEPS)

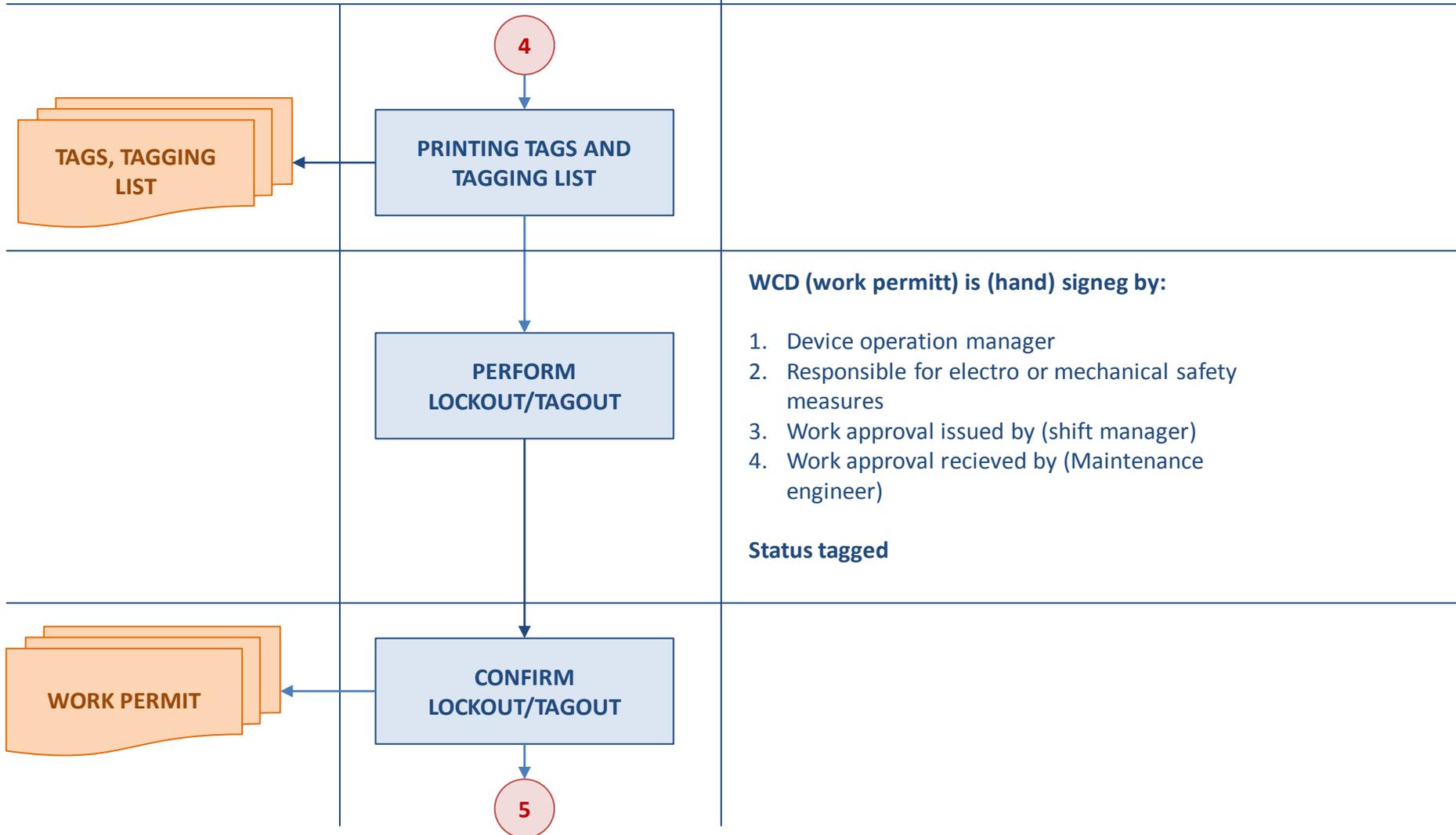
COMMENT



SAP PM/WCM PROCESS IN TE-TOL

PROCESS (STEPS)

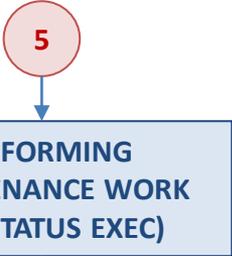
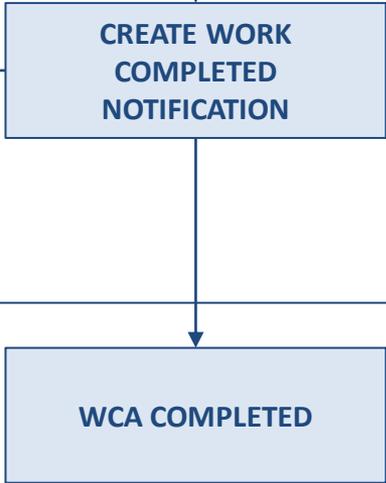
COMMENT



SAP PM/WCM PROCESS IN TE-TOL

PROCESS (STEPS)

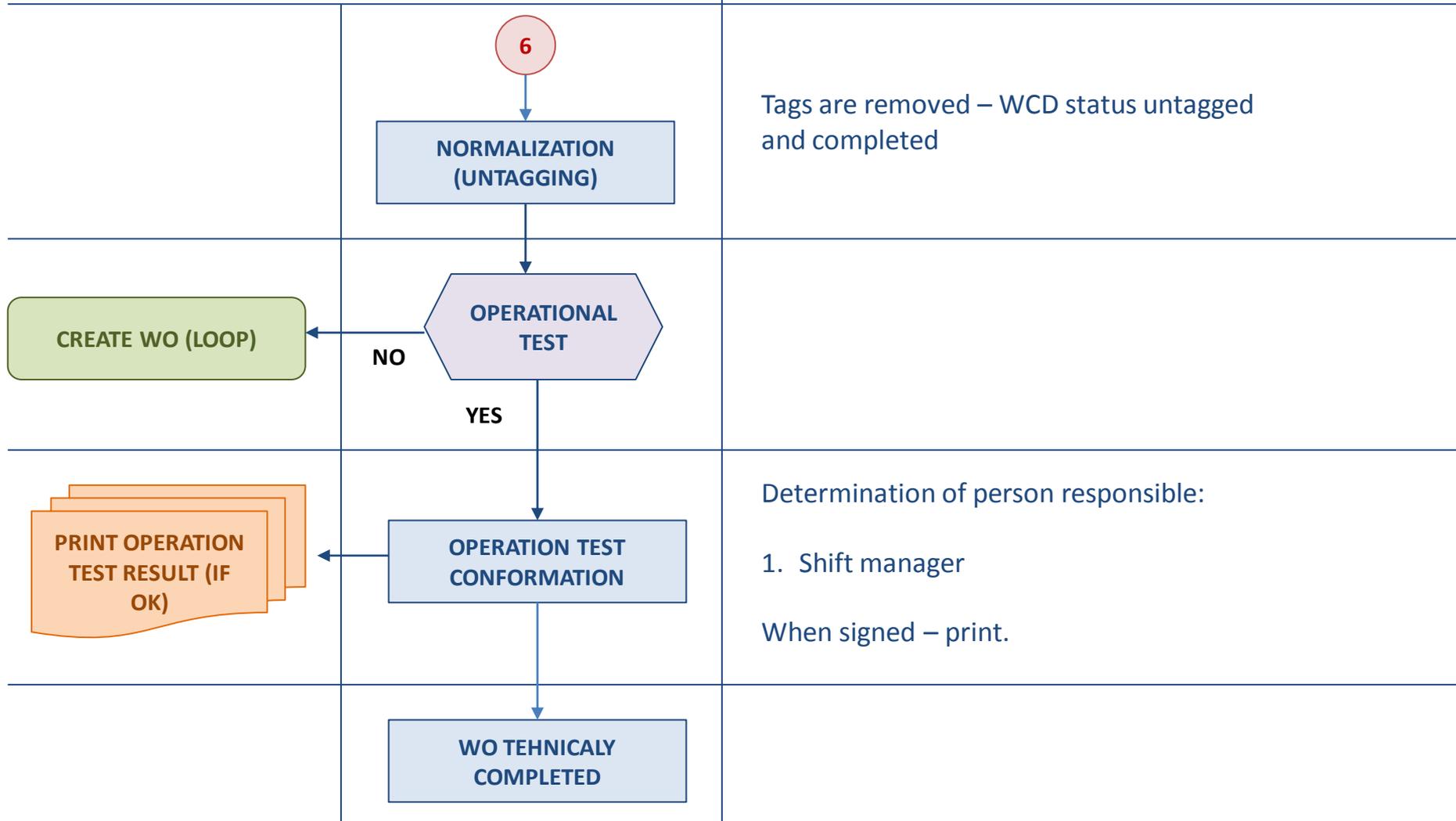
COMMENT

	 <p>PERFORMING MAINTENANCE WORK (WO STATUS EXEC)</p>	<p>Work order is released for execution. Maintenance work is performed.</p>
	 <p>CREATE WORK COMPLETED NOTIFICATION</p> <p>WCA COMPLETED</p>	<p>Determination of person responsible:</p> <ol style="list-style-type: none"> 1. Maintenance work manager 2. Maintenance department manager 3. Device hand over by 4. Device received by 5. Notification interposed by <p>When all signatures are collected – set WO to Work completed</p>
		<p>WCA is automatically completed</p>

SAP PM/WCM PROCESS IN TE-TOL

PROCESS (STEPS)

COMMENT



Tags are removed – WCD status untagged and completed

Determination of person responsible:

1. Shift manager

When signed – print.

KEY BENEFITS OF IMPLEMENTING SAP WCM MODULE

1. POSSIBILITY OF CREATING WCD LIBRARY (System enables person responsible to create WCD template(s) for each functional location (equipment)).



WCD template 1

WCD template 2

WCD template 3

2. EFFECTIVE USE OF CONFLICT RULES – (Warning system)



3. SAP WCM IN FULLY INTEGRATED IN EXISTING PM PROCESSES

1. Termoelektrarna Toplarna Ljubljana
2. SAP PM: Key benefits
3. SAP WCM implementation project overview - Enhanced worker safety
4. SAP WCM process
5. **SAP PM and WCM in TE-TOL: Way forward**

SAP PM AND WCM IN TE-TOL: WAY FOWARD

PM

CONDITION BASED MAINTENANCE
(SCADA/SAP INTEGRATION)



SCADA

SAP PM

WCM

ELECTRONIC CONFORMATIONS OF
APPROVALS

WCM PROCESS UPGRADE TROUGH
RELEVANT BADIS

WORKFLOW

CREATE
NOTIFICATION/WO/WCA

ASSIGN PERSON
RESPONSIBLE

INBOX

SAP ERP MOBILITY SUPPORT

ADDITIONAL INFO



Mr. sc. Miha Ulčar

Consultant

e-mail: miha.ulcar@sapphir.com GSM: + 386 (0) 31 649 127

SAPPHIR Management consulting d.o.o.
Mobile: +386/31/649 127 Phone/Fax: +386/1/4235146
Address: Rozna dolina c I 15, 1000 Ljubljana, Slovenia