

The sole responsibility for the content published on this document lies with the authors. It does not necessarily reflect the opinion of the Innovation and Networks Executive Agency (INEA) or the European Commission (EC). INEA or the EC are not responsible for any use that may be made of the information contained therein.

WP6 ICT Platform to enhance TSO/DSO coordination

TSO/DSO visualization tools

D6.3



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864298.

DOCUMENT CONTROL PAGE

Document	D6.3 TSO/DSO visualization tools
Түре	Other
DISTRIBUTION LEVEL	Public
DUE DELIVERY DATE	30 / 10 / 2022
DATE OF DELIVERY	30/11/2022
VERSION	V0.4
Deliverable Responsible	SOFTLAB
Author(s)	Clara Bagnasco, Christian Biasuzzi, Davide Longo, Massimo Ferraro, Lara Pinato
OFFICIAL REVIEWER(S)	Filipe Soares

DOCUMENT HISTORY

VERSION	Authors	Date	Changes
0.1	Clara Bagnasco, Christian Biasuzzi, Davide Longo, Massimo Ferraro, Lara Pinato	13/10/2022	First version of D6.3: index
0.2	Clara Bagnasco, Christian Biasuzzi, Davide Longo, Massimo Ferraro, Lara Pinato	28/10/2022	Introduction
0.3	Clara Bagnasco, Christian Biasuzzi, Davide Longo, Massimo Ferraro, Lara Pinato	25/11/2022	Visualization components sections
0.4	Clara Bagnasco, Christian Biasuzzi, Davide Longo, Massimo Ferraro, Lara Pinato	30/11/2022	Fixes. Version to be reviewed.
1.0			Final version

Table of Contents

1. INTRODUCTION	5
2. ICT GUI	5
3. VISUALIZATION COMPONENTS	7
3.1. Network management	7
3.1.1. Data loading	7
3.1.2. Network visualization	
3.2. Tools management	
3.2.1. Selection	
3.2.2. Configuration and execution	
3.2.3. Monitoring	
3.2.4. Results visualization	

Abbreviations and Acronyms

API	Application Programming Interface
CSS	Cascading Style Sheets
GUI	Graphical User Interface
HTML	HyperText Markup Language
ICT	Information and Communication Technologies
JS	JavaScript
PWA	Progressive Web App
REST	Representational State Transfer
SLD	Single Line Diagram
SPA	Single Page Application
SVG	Scalable Vector Graphics
UI	User Interface

1. Introduction

The results of ATTEST project include an opensource toolbox: a set of tools for supporting TSOs and DSOs during asset management and coordinated network planning and operation.

An ICT platform, depicted in the picture below, integrates the toolbox, and includes (1) a common data access layer enabling data integration, (2) an orchestration layer allowing the use of the tools and (3) an interface layer for accessing data and functionalities.



The interface layer, inside the ICT platform, provides a set of interactive visualization tools (graphical user interfaces) tailored according to the purpose and requirements of components in the toolbox, with the goal of enabling and enhancing the collaboration between operators and facilitating their network operation, maintenance and planning tasks.

This report accompanies the release of the software implementing the interface layer, and provides the following information:

- Section 2 describes the ICT GUI implemented and the framework used for integrating the visualization components.
- Section 3 lists and provides information about the different visualization components implemented.

For the installation guide of the ICT platform, including the interface layer, please refer to the appendix of deliverable D6.1 "TSO/DSO data access and storage component".

2. ICT GUI

The ATTEST ICT platform has been designed and implemented using a headless approach, separating the presentation layer and the User Interface (frontend) from the business logic and data layer (backend). The communication between frontend and backend takes place through API (see picture below).



This approach enhances the flexibility, making the platform modular and so more easily extendable and integrable with other systems.

In ATTEST the backend is the data access and storage component (please see deliverable D6.1 for details), while the frontend is described in this report. The API layer is implemented using REST Web Services, provided by the access and storage component, and used by the interface layer for accessing data and functionalities.

The interface layer has been implemented as a Progressive Web App (PWA), a type of application software delivered through the web, built using common web technologies including HTML, CSS, JavaScript, and WebAssembly. It is designed to be responsive, intended to optimize the user experience and to work on any platform with a standards-compliant browser, including desktop and mobile devices.

We developed the PWA as a SPA (Single Page Application), i.e. a web application that interacts with the user by dynamically rewriting the current web page with new data from the web server, instead of the default method of a web browser loading entire new pages. The advantages of this approach are a quick loading time and a seamless user experience, making also easier to add advanced features to the web application.



The technology used to implement the PWA is React, a free and open-source front-end JavaScript library for building user interfaces based on UI components.

React uses a Component Based Architecture, a method for encapsulating individual pieces of a larger user interface (aka components) into self-sustaining, independent micro-systems.

A component is a small feature that makes up a piece of the user interface. These components exist within the same space, yet interact independently from one another. Components encapsulate well-defined functionalities, have their own structure, their own methods and their own APIs. Components are also reusable and can be "pasted" into interfaces at will. The independent nature of components allows for developers to create a UI with many different moving parts.

The different React visualization components developed during the project and integrated and used in the ICT interface layer are described in the following section.

The access to all the functionalities provided by the interface requires authentication. Parts of the interface are also customized, and some functionalities made available, according to the user role. The interface layer uses the services and integrates pages provided by the identity manager included in the ICT platform (please see deliverable D6.1 for details) for handling user authentication and getting user's data and roles.

3. Visualization components

The list of visualization components developed during ATTEST project, and integrated in the ICT platform interface layer (see section 2) are included in 2 main categories:

- Network management components, for loading networks and auxiliary data, and for networks and network elements visualizations.
- Tools management, to select, configure, run and monitor tools, and to visualize analysis results.

The different components available are reported in the following sections.

3.1. Network management

3.1.1. Data loading

These components are used to load into the system networks and all the necessary auxiliary data, i.e. profiles. The components allow both to input/select some network and profile parameters and to

upload the proper data files.



FIGURE 1 - NETWORK CREATION

		র্লHome a^csNetwork ≙ Tools আTasks ≜dso_user *
Upload data for network PT_DX_01_2020		
Upload a Network file Scegli file Nessun file selezionato	B Upload	× Remove Filters
€Back		

FIGURE 2 - NETWORK UPLOAD

Attest .	0.1-SNAPSHOT					☆ Home	: 중SNetwork 윤Tool	s ?≘Tasks ≜dso_us
Upload data for r	network PT_DX_01	1_2020						
Network file uploaded: Distribution_Netw	rork_PT1.m							
Generator Profile Profile Date	Season	Typical Day Mode						
gg/mm/aaaa:	Season V	✓ Typical day ✓ Mode	✓ Scegli file ►	Nessun file selezionato		Upload	× Remove Filters	
Load Profile								Files Uploaded A
Season	Typical Day	Mode		Time Interval	Name			Delete
Autumn	Business Day	Business day for a season		15 minutes	Network1_A_Bd.xlsx			•
Profile Date	Season	Typical Day Mode						
gg/mm/aaaa:	🗖 Autumn y	✓ Business day ✓ Business day	y 👻 Scegli file 🕴	Network1_A_Bd.xlsx				
Flex Profile	Season	Timbel Day Mode						
gg/mm/aaaa:	Season	Ypical day Mode	✓ Sceglifile f	Nessun file selezionato		Upload	× Remove Filters	



3.1.2. Network visualization

These components are meant to visualize network and network elements.

A visualization component lists all the networks loaded into the platform, showing also some information about them (country, distribution vs. transmission type, etc.) and providing access to some operations (e.g. single line diagram – SLD – visualization). The component uses a table representation, with the table lines (networks) sortable according to the different columns (network data).

		Attest 00.1.5M	VPSHOT								쑭Horr	ee ∰sNetwork ∰Tools :≘Tasks ≜dso_user *
١	١e	tworks										Create new Network
	D¢	Name 🗢	Mpc Name 🗢	Country 🗢	Type 🗘	Description 🗢	Is Deleted 🕈	Network Date 🗢	Version 🗢	Creation Date Time 🗢	Update Date Time 🗢	
	1	HR_Dx_01_2020	A_KPC_35()	HR	DX	T23 HR_DX_01_2020	false	25/11/22 00:00		25/11/2200:00	25/11/22 00:00	o 6 6 🗉 🖓 💷 🖊 🚺
		PT_DX_01_2020	Network1	PT	DX	T23 PT DX 01 2020	false	26/01/21 00:00		26/11/2200:00	26/11/22 00:00	o b b 🗉 🔨 👐 🖊 🚺
							s	howing $1 - 2$ of 2 items.				

FIGURE 4 - NETWORKS LIST

Some visualization components allow to visualize data (e.g. voltage, active and reactive power) of the different elements of a network: buses, branches, etc. The components use a table representation of the data, allowing the user to sort the tables lines (network elements, e.g. buses) according to the different columns (elements data, e.g. active or reactive power).

	Attest													斧Home 뭄N
Bu	ses				HR_Dx_01_20	120		5 🔿 Br	anches	⊖ Generato	ors			
ID \$	Bus Num 🗢	Type 🗢	Active Power 🗢	Reactive Power 🖨	Conductance 🗢	Susceptance 🗢	Area 🗘	Vm 🖨	Va 🖨	Base Kv 🗢	Zone 🖨	Vmax 🖨	Vmin 🗘	Network 🗘
1	1	3	0	0	0	0	1	1	0	110	1	1.1	0.9	1
2										35		1.1	0.9	1
3										20		1.1	0.9	1
4										35		1.1	0.9	1
5										35		1.1	0.9	<u>1</u>
<u>6</u>										20		1.1	0.9	1
Z										35		1.1	0.9	1
8										35		1.1	0.9	1
2										110		1.1	0.9	1
10	10	1	0	0	0	0	1	1	0	35	1	1.1	0.9	1

FIGURE 5 - BUSES DATA

A component has also been developed to provide a single line diagram (SLD) visualization of the network. The component can show both a network level and a substation level representation of the SLD.



FIGURE 6 - SINGLE LINE DIAGRAM - NETWORK VIEW



FIGURE 7 - SINGLE LINE DIAGRAM - SUBSTATIONS VIEW

The SLD is rendered in SVG format, an open standard XML-based vector image format for defining twodimensional graphics, supporting interactivity and animation. The SVG file is provided by a Web Service made available by the data access and storage component, while the SLD interface component, besides visualizing the diagram, adds interactivity to it, allowing, for example, to zoom in a substation view, or navigate between substations, or to visualize data related to a network element (e.g. a chart of the profile of a generator or a load).



FIGURE 8 - SINGLE LINE DIAGRAM - LOAD PROFILE CHART

3.2. Tools management

These components are used to manage the whole execution process of a tool: selection of the tool to run, configuration and setting of the input parameters, execution and monitoring of the process. The GUI layer provides also interface components to visualize the results: the tools output.

3.2.1. Selection

This component supports the user in the selection of the tools to be run. The component has been designed with a carousel (a web component for displaying text, graphics and images in one interactive "sliding" block) for choosing the Work Package the tool the user would like to run belongs to, and some boxes for selecting a specific WP tool. Supporting the first step of the tool execution, the component also includes an element for choosing, using some search fields, the test case (network) the tool will analyze.

Att	test or				☆Home [®] eNetwork	≜Tools ⊞Tasks 🔳	Entities * 🍪 Administration	▼ &admin_attest ▼
¢	WP3 - Optimal Planning of Power Syste	m	WP4-Optimal Op	we ation of Power System		WP5 - Optimal Asset N	fanagement	
				••				
Search Test O	Cases							
Country	Туре	MPC Nam	ne (ontional)	From Date	To Date		Q Search	K Remove Filters
Country	iy pess	- MPCN	ine (optional)	gg/minoaaaa	gpmill/aaaa			
SGT Scenario Gener	ration Tool © Configure and run	T4.1 Tool for ancillary services activation	on in day ahead (DX) ure and run	T4.2 Tool for ancillary services activation in r Tool not rea	real time (DX) dy	T4.3 State Estimator Tool		
T4.4 Tool for anditary services activation in day alread (TX) Configure and run Too			on in real time (TX) ot ready	T4.6 Tool For Online Dynamic Security Asses Tool not rea	ssment dy			

FIGURE 9 - TOOLS SELECTION

3.2.2. Configuration and execution

These visualization components allow the user to configure the tools before running them. The components are designed according to the input of the different tools, supporting the users in the definition and selection of all the necessary parameters. The components use text, dropdown and checkbox input fields, modeling the different type of tools parameters. Where needed, the components support also the upload of files, if used as input by the tool.

These GUIs also permit the user to start the execution of the tools

reselement	Attest DEV		4	給Home 풉Network	a ≜ Tools a⊟	Tasks I≣Entities ▼	Administration -	<u>å</u> admin
=	T3.1 Tool							
Test Case	selected							
ID	Name	MPC Name	Date					
	HR_DX_03_2020	ZG_DEMO()	2022-09-19T22:00:00Z					
Tool Para	meters							
0.045.0	1075 0 1125 0 15 0 225 0 3 0 5 0 75 1 2 5 10 2	20 30 40 50 60 80 100 250 500						<u> </u>
TRS Capa	cities [MVA]							
1,2,5,10),20,30,40,50,60,80,100,250,500							
Line Cost	s [currency/km]							
Default	: ()							
TSR Cost	s (currency)							
Default	: 0							
Continge	ncies List							
Default	:0							
Line Leng	th [km]							
Default	:0						Use Line Length Fro	om DB 📃

				FIGURE 10 - T	DOLS CONFIGURATION				
Test Case sele	cted								
ID	Name		MPC Name		Date				
20	ES_DX_01		SPfeeder1		2022-09-26T22:00:00Z				1
Assets File		Header		Variables	Dimension		Weights		
Scegli file	tool51s_El.csv	Support_ID	~	HI_KH_weighted_power	Economic Impact	~	0.3,0.3,0.3		
				✓ H2_birdlife_KPI					
				H3_defecs_severity_KPI 🗹					
Assets File		Header		Variables	Dimension		Weights	_	
Scegli file	tool51LA.csv	Support_ID	~	H2_Criticity	Life Assessment	~	0.25,0.25,0.25,0.25		
				H3_Condition					
Assets File		Header		Variables	Dimension		Weights		
Scegli file	tool51s_M.csv	Support_ID	~	Support_ID	Maintenance Strategy	~	0.5, 0.5		
				H2_defects 🗹					
				H3_defect_severity 🗹					
Coordinates (c	optional)								
Coordinates F	ile			Region	Coordinates Identifier		Latitude Column	Longitude Co	lumn
Scegli file	Cordinate.csv			Europe ~	additional_id	~	x	У	~
				_					
← Back							C'Retry	Show Results	Download Results



Tool Parameters Time Resolution 24	^
Scenario	
Selection of Flexible Options	
Active Power Curtailment	
Flex APC	
OLTC Transformer	
Plex OLTC	✓ OLICBin
Reactive Power from RES	
S Flex ADPF	
Participation of Flexible	
S Flex FL	2 Flex Bin
Usage of Electrical Storage	
Flex STR	STRBin

FIGURE 12 - TOOL CONFIGURATION

Mamo							
HR DX 05	2020	MPC Name		Date	T22-00-007		121
IIK_07_03_	2020			2022-07-17	122.00.002		
l Profiles							
sason	Typical Day	Mode	Time Interval	File Name	View Chart	Download	
utumn	Business Day	Business day for a season	15 minutes	NWCro_A_Bd.csv		ä	
utumn	Saturday	Weekend for a season	15 minutes	NWCro_A_Sa.csv		Li .	
utumn	Sunday	Weekend for a season	15 minutes	NWCro_A_Su.csv		B	D
oring	Business Day	Business day for a season	15 minutes	NWCro_S_Bd.csv		B	
ring	Saturday	Weekend for a season	15 minutes	NWCro_S_Sa.csv		B	
ring	Sunday	Weekend for a season	15 minutes	NWCro_S_Su_mod.csv		B	
mmer	Business Day	Business day for a season	15 minutes	NWCro_Su_Bd.csv		B	D
immer	Saturday	Weekend for a season	15 minutes	NWCro_Su_Sa.csv		B	
mmer	Sunday	Weekend for a season	15 minutes	NWCro_Su_Su.csv		В	
inter	Business Day	Business day for a season	15 minutes	NWCro_W_Bd.csv		В	
						1 to	10 of 12 IC < Page 1 of 2

FIGURE 13 - TOOLS CONFIGURATION

Some configuration pages, when allowing to load ODS/XLS files, also integrates an editor component for viewing and editing inline the content of the files. The configuration pages contain a "View/Edit" button that open the component for editing the file.

=	T4.1 Tractability Tool			
Test Cas	e selected			
ID	Name	MPC Name	Date	
	UK_DX_01_2020_T41	UK_Urban_Network	2021-01-25T23:00:00Z	Υ.
No load	profiles found!			
Tool Para	ameters			
Upload a	uxiliary data			
Addition	al Flexibility Data			
Scegli	file uk_dx_01_2020_flex.ods	View/Edit		
Scenario	Generation Data			
Scegli 1	file scenario_gen.ods	View/Edit		
← Back				C'Reset ►Run







Sprea	dSheet														
Sceg	li file N	essun file sele	ezionato												
le*			ormal 👻 Arial 👻 1	.0 - B <i>I</i>	<u>U</u> S <u>A</u> À	. ⊞ 53 ≣	▼ + ▼ =		ΣΨ						
	A	E	в с	D	E	F	G	н		1	J	к	L	м	N
1	bus_i	hasGEN	isLOAD	SNOM_MVA	SX	SY	GX	GY							
2	1	0	1	1	0	0	0	0							
3	2	1	0	0	0	0	0	0							
4	3	0	1	0	0	0	0	0							
5	4	0	1	0	0	0	0	0							
6	5	0	1	0	0	0	0	0							
7	6	0	1	0.25	0	0	0	0							
8	7	0	1	0.1	0	0	0	0	ممامير						
9	8	0	1	0.16	0	0	0	0	Jownioad	I ALS/	VODSFIle				
10	9	0	1	0.8	0	0	0	0							
11	10	0	1	7.4	0	0	0	0 A	re you sure	you w	ant to download	d an XLSX/OD	S file? Choo	se the	
12	11	0	1	1.6	0	0	0	0 na	ame and the	e forma	at of the file				
13	12	0	1	0.16	0	0	0	0	E11						
14	13	0	1	0.25	0	0	0	0	File name	-		For	mat	×.	
15	14	0	1	2.23	0	0	0	0							
16	15	0	1	0.16	0	0	0	0					Dowr	hoad	
17	16	0	1	0.1	0	0	0	0				Geneer		lioud	
18	17	0	1	0.1	0	0	0	0							
19	18	0	1	0.63	0	0	0	0							
20	19	0	1	0.16	0	0	0	0							
21	20	0	1	3	0	0	0	0							
22	21	0	1	0.25	0	0	0	0							
23	22	0	1	0.63	0	0	0	0							
24	23	0	1	0.4	0	0	0	0							
25	24	0	1	0.4	0	0	0	0							
26	25	0	1	0.1	0	0	0	0							
27	26														
	+ …	Buses_Addt	Buses_OLTC_Addt	Lines_Addt	Lines_OLTC_Addt	Loads_Addt	RES_Addt	Gens_Addt	Gens_cost	_Addt	Storage_Addt	Storage_cost_	Addt pLoa	d_Profiles_Addt	qLoad_Profile
0	Gen_Profile	es_Max_Addt	pLoad_Orig(W)	Load_Orig(W)	'file:///D:/USMAN	Postdoc/JuLia/A1	TEST/OPF_cod	le/sequential-sn	mp-tractability	y/T4.1_S	econd_version_Tra	actability_Tool/in	put_data/pt_d	x_01_2020.ods'#I	Buses

FIGURE 16 - INLINE EDITOR COMPONENT

3.2.3. Monitoring

This visualization component is used to monitor the execution of the tools run by the users. The component list all the run performed, with some information about the processing (e.g. status, start and end), allowing to download the log file and view and download the analysis results. The component uses a table representation of the data, allowing the user to sort the tables lines according to the different columns.

		Attest	0.0.1-SNAJ	SHOT					含Home		盘Tools 普	∃Tasks	Entities •	a Administrati	on⊤ ≜a	dmin_attest ~
٦	[as	sks												Pofrach Liet	+ Creat	o now Tark
	D≑	Task Status ≑	Info 🗘	Date Time Start 🕈	Date Time End 🗢	Tool Log File 🗘	Simulation 🕈	Tool 🕈	User 🗢					Kenesitelse	T Citat	
	2	PASSED		26/11/22 11:12	26/11/22 11:15	log.txt	ab3a4705-5551-47f4-9a3f-3b77a9f03acc	T31_optToolDx	admin_attest	⊘ View	Download	iLog 🖥	Download Result	Show Result	s 🖋 Edit	Telete
		PASSED		26/11/22 10:59	26/11/22 11:02	log.txt	167af721-e9ff-486a-bde4-97fc4a8b2442	T41_Tractability_Tool	admin_attest	⊘ View	Download	iLog 🖥		s 🔒 Show Result	s 🥒 Edit	Telete
							Showing 1 - 2 or	f 2 items.								



3.2.4. Results visualization

These components allow to visualize the results of the tools analysis.

The components are designed to show the results using different visualization elements, mainly tables and charts. The elements are interactive, allowing the users, for examples, to filter the data shown in charts.

Also the SLD component described in section 3.1.2 could possibly be used to visualize some tools output, highlighting some information in the diagram for a better and quicker identification of some phenomena.

The results interface components also use visualization elements provided directly by some tools (namely WP5 tools) as output, integrating them in the interface layer and making them available to the platform users. These elements include also a geographical representation of assets data, visualizing information on a map.

		∦Home සੈੰaNetw	vork ≜Tools ?≘Tasks ﷺ Entities ▼	✓ Administration ➤ Admin_attest
≡ T3.1 Results				
Country	Case Name			
case3	case3			
Total Cast (Euro-million)				
Туре	Scenario 1		Scenario 2	
Investment	0.11		0.11	
Flex				
Net Present Op				
				Show Chart ~
Operation cost (EUR-million/year)				
Scenario	2020	2030	2040	
Scenario 1	0	0	0	
Scenario 2				

FIGURE 18 - RESULTS IN TABLES



FIGURE 19 - RESULTS IN TABLES AND CHARTS

Attest or						含Home	뮵Network	₽Tools	f⊟Tasks	⊞Entities -	* Administration	- 🛓 admin
Results T4.4 Tool Results												
\equiv Charts												
Scenario			Contir	ngency								
Scenario 1			Contir	ngency 10								
Cost Type	Value	Description										
Geereation Cost	12169.535	Probability of No	ormal operation	n is 95% and 5% all of the post c	contingency states.							
Flexibility Cost												
Load curt. Cost												
Post contingency costs		Scenarios are eq	uiprobable.									
Flexibility Cost	0.234											
Load curt. Cost	1.208											
Total Cost	11561.084											
Elapsed time	36.652											
Active and Reactive Power	Active Power	2100 2110 2110 2110 2110 2100 2100	Gen_6 Gen_7 Gen_10 Gen_10 Gen_12 Gen_12 Gen_24 Gen_24		1 Reactive Down 0 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	07.00 06.00 04.00	Reactiv	e Power	19:00 19:00 17:00 16:00	23.00 21.00 21.00 20.00	Gen_6 Gen_7 Gen_9 Gen_10 Gen_12 Gen_24 Gen_24	

FIGURE 20 - RESULTS IN TABLES AND CHARTS



FIGURE 21 - RESULTS IN CHARTS







FIGURE 23 - RESULTS IN CHARTS



FIGURE 24 - WP5 RESULTS

T5.1 Characterization Tool Resul	its		
Main economic_impact	✓ View		
Boxplots + Centroids V	Pattern 4 Assets: 5, % 12.50	Pattern 5 Assets: 11, % 27.50	Pattern 6 1 Assets: 4, % 10.00
	cost_failure Pattern 1 Assets: 2. % 5.00	cost_failure Pattern 2 Assets: 10. % 25.00	cost_failure Pattern 3 Assets: 8, % 20.00
	0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5		

FIGURE 25 - WP5 RESULTS



FIGURE 26 - WP5 RESULTS

2 Definition of condition indicators Assets table	s Results				
			Assets		
	NAME	ECONOMIC IMPACT	LIFE ASSESSMENT	MAINTENANCE STRATGY	TOTAL_INDICATOR
	RQ8UCGAG//74-33-4	0.719	0.737	1.0	0.819
	RQ9W9OJR//74-32	0.804	0.897	0.75	0.817
	RQAUFPTH//74-33-2	0.719	0.737	0.875	0.777
	RQ3K0TFG//82	0.588	0.953	0.75	0.764
	SAM60AF0//D59-70	0.833		0.458	0.739
	RQBQDFTA//74-33	0.684	0.768	0.75	0.734
	RQA9HCG7//74-33-3	0.719	0.737	0.625	0.694
	RR0BE8R1//59-17	0.504	0.796	0.75	0.683
	RQ37A8RE//74-28		0.742		0.674
	RQ61SCFJ//74-30	0.564	0.665	0.75	0.659
	RQE5WOGE//74-34		0.665	0.625	0.608
	RQFQK18D//74-35	0.534	0.665	0.625	0.608

FIGURE 27 - WP5 RESULTS