

# ShuffleWorks® System: Enhanced EPRI Core Shuffler

## Background

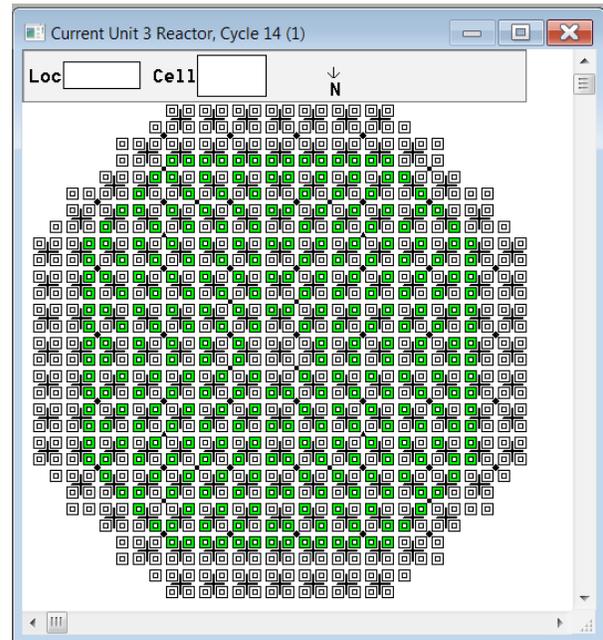
Westinghouse's ShuffleWorks® system is a computer-based system that helps utilities plan and monitor fuel/component movement activities more efficiently, resulting in reduced operating and maintenance costs. The ShuffleWorks system is designed to meet the offload/reload and in-core shuffling requirements of pressurized water reactor and boiling water reactor power plants.

Created for utility personnel involved in fuel movement, the ShuffleWorks system is an excellent tool for reactor engineers and outage personnel that saves time by avoiding the labor-intensive manual development of fuel-movement sequence sheets.

## Description

With the ShuffleWorks system, the customer can automatically or manually produce shuffle plans and modify them during an outage. The planning module directly accommodates core maintenance and fuel inspection outage needs, and extensive editing capabilities make it easy to gear shuffle plans to specific site requirements. It handles the widest variety of plant configurations, constraints (e.g., crane reachability, pool burn-up regions and shutdown margin checks) and equipment configurations.

A "batch move" facility automates the generation of a collection (or "batch") of steps for moving a group of assemblies from one area to another. The user simply selects assemblies and destination areas, which makes planning spent fuel pool re-racking simple and fast. In addition, with the ShuffleWorks system, multiple plans can be quickly produced for comparison in what-if planning sessions.



ShuffleWorks system screen map of a reactor core

The ShuffleWorks system also provides a thorough assortment of essential fuel information access tools, core and spent fuel pool maps and printed fuel transfer sheets. It has a software interface for information exchange with external data sources, such as Westinghouse's CaskWorks®, PoolWorks™, TracWorks® and SureTrac™ products. It also automatically downloads moves to computerize refueling machinery.

With the ShuffleWorks system, magnetic boards and markers used to track fuel moves can be replaced with a computer to maximize space in the control room and minimize the potential for disturbances.

## Deliverables

The ShuffleWorks system purchase includes:

- The ShuffleWorks system site license and documentation
- Custom ShuffleWorks system plant models
- Custom fuel transfer sheets
- On-site installation and training
- Phone support and one-year warranty with base scope purchase

FORM XXX.RE-FM.ZZ-0001-2						
ICA TRANSFER SHEET						
REPORT NO: 322			GENERATING UNIT			
AUTHORIZED: _____			UNIT: 1			
DATE: _____			ICA TRANSFER REPORT			
STEP	ITEM NO	INSERT	FROM	TO	OPERATION	TRANSFERRED BY
1	AB05		RX A8	UPENDER	Boral Specimens	
2	AB05		UPENDER	SF AX16	Boral Specimens	
3	M66	VS001		UPENDER	Boral Specimens	
4	M66	VS001	UPENDER	SF AS17	Boral Specimens	

ShuffleWorks system customized fuel-movement sheet

## Benefits

The ShuffleWorks system can reduce the overall time and costs associated with fuel management planning and outage monitoring and automatically provide documentation. Other benefits include:

- Optimizing outage time with in-core shuffles and efficient component swaps
- Creating challenging “what-if” planning sessions, simulating a wide variety of schemes that can lead to more efficient plans and outage savings
- Quick replanning during an outage when problems occur, minimizing costly outage time
- Accessing fuel information immediately (e.g., locations, orientations, insert types, etc.), making essential information readily available
- Providing real-time status of fuel/component movement during outage; up-to-date status for outage management
- Incorporating site-specific needs; e.g., adding or changing moves at any time, providing control and independence with site-specific, customized move sheets
- Training prior to actual outage

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## Cost Benefit

Shuffle planning software technology allows utilities to reduce manpower requirements for developing and verifying shuffle sequence plans without constraint, transcription or typographical errors. This technology typically saves utilities several weeks in pre-outage planning time.

The ShuffleWorks system reduces refueling time by providing more effective and optimized sequence plans and faster modifications during an outage. Experience indicates an average reduction of approximately 10 percent in the number of fuel moves, which translates into technical labor savings during a refueling.

## Experience

Installed and in use at more than 115 units worldwide, the ShuffleWorks system is the most widely used fuel-movement planning tool in the nuclear industry.

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